Personal computer data telecommunications development in Montana high schools
by John Rodger Schorger, Jr

A professional paper submitted in partial fulfillment of the requirements for the degree of Master of Science in Technology Education
Montana State University
© Copyright by John Rodger Schorger, Jr (1992)

Abstract:
This study was designed to determine the extent of development and the current uses of personal computer data telecommunications systems in Montana's public senior high schools. To determine the extent of that development, a set of four objectives designed to identify schools with telecommunications capabilities and examine their operation in particular subject areas was created.

Two survey instruments were used to provide the necessary data. The first instrument identified 117 out of 173 Montana public high schools which had personal computer data telecommunications capabilities. Of the 117 schools identified, a population of 296 teachers involved with personal computer data telecommunications in their schools was established. The second instrument was then sent to 160 teachers who had been drawn from that population of 296 teachers. The data collected fell into four general areas: demographic; equipment used, both hardware and software; subject use; and implementation information.

Based on the results of this study, it was concluded that more than two-thirds of high schools have personal computer data telecommunications capabilities; that IBM or IBM clones are the most commonly used computer; that the modem speeds of 1200 and 2400 baud were used about equally; that schools normally had dedicated telephone lines available for personal computer data telecommunications; that almost three-quarters of the schools had a telephone line available in the classroom; that Procomm telecommunications software was clearly the most used software; that slightly more than four-fifths of the schools surveyed did not offer a specific course in personal computer data telecommunications; that subject areas which use personal computer telecommunications were led by computer science and business; and that teachers considered connecting to information services as the most important use of personal computer data telecommunications for their students, while messaging was rated most important for the teachers themselves.
PERSONAL COMPUTER DATA TELECOMMUNICATIONS

DEVELOPMENT IN MONTANA HIGH SCHOOLS

by

John Rodger Schorger, Jr.

A professional paper submitted in partial fulfillment
of the requirements for the degree
of
Master of Science
in
Technology Education

MONTANA STATE UNIVERSITY
Bozeman, Montana

May 1992
APPROVAL

of a professional paper submitted by

John Rodger Schorger, Jr.

This professional paper has been read by each member of the graduate committee and has been found to be satisfactory regarding content, English usage, format, citations, bibliographic style, and consistency, and is ready for submission to the College of Graduate Studies.

Date: May 29/92

Chairperson, Graduate Committee

Approved for the Major Department

Date: May 29/92

Head, Major Department

Approved for the College of Graduate Studies

Date: May 29, 1992

Graduate Dean
STATEMENT OF PERMISSION TO USE

In presenting this paper in partial fulfillment of the requirements for a master's degree at Montana State University, I agree that the Library shall make it available to borrowers under rules of the Library. Brief quotations from this paper are allowable without special permission, provided that accurate acknowledgment of the source is made.

Permission for extensive quotation from or reproduction of this paper may be granted by my major professor, or in his absence, by the Dean of Libraries when, in the opinion of either, the proposed use of the material is for scholarly purposes. Any copying or use of the material in this paper for financial gain shall not be allowed without my written permission.

Signature: [Signature]
Date: 5/27/92

ACKNOWLEDGEMENTS

I wish to thank all who helped and contributed to making this study possible. In particular I wish to thank Dr. Eric Strohmeyer and Mr. Mark Rogstad, members of my graduate committee; and department faculty members Dr. Kenneth Bruwelheide and Mr. Scott Davis for assistance throughout this study.

An additional special thanks is due Dr. Doug Polette, my major advisor, for sharing his intense interest in Technology Education and for his help in navigating the forces that be.

Finally, I wish to express my unending gratitude to my wife Marian, for her support and understanding during this year of absence, and to my children, Ashley and Colleen, who have persevered throughout it all.
**TABLE OF CONTENTS**

<table>
<thead>
<tr>
<th>LIST OF TABLES</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSTRACT</td>
<td>x</td>
</tr>
<tr>
<td>CHAPTER:</td>
<td></td>
</tr>
<tr>
<td>1. INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>Purpose of the Study</td>
<td>3</td>
</tr>
<tr>
<td>Objectives</td>
<td>3</td>
</tr>
<tr>
<td>Need for the Study</td>
<td>4</td>
</tr>
<tr>
<td>Definition of Terms</td>
<td>6</td>
</tr>
<tr>
<td>Limitations</td>
<td>7</td>
</tr>
<tr>
<td>Assumptions</td>
<td>7</td>
</tr>
<tr>
<td>2. REVIEW OF LITERATURE</td>
<td>8</td>
</tr>
<tr>
<td>History of Development</td>
<td>8</td>
</tr>
<tr>
<td>Current Development</td>
<td>10</td>
</tr>
<tr>
<td>Summary</td>
<td>13</td>
</tr>
<tr>
<td>3. METHODOLOGY</td>
<td>15</td>
</tr>
<tr>
<td>Population</td>
<td>15</td>
</tr>
<tr>
<td>Instrument Design</td>
<td>16</td>
</tr>
<tr>
<td>Data Collection</td>
<td>18</td>
</tr>
<tr>
<td>Data Analysis</td>
<td>20</td>
</tr>
<tr>
<td>4. RESULTS AND ANALYSIS</td>
<td>22</td>
</tr>
<tr>
<td>Identification Survey Data</td>
<td>22</td>
</tr>
<tr>
<td>Telecommunications Capabilities</td>
<td>22</td>
</tr>
<tr>
<td>Population Identification</td>
<td>24</td>
</tr>
<tr>
<td>Telecommunications Survey Data</td>
<td>24</td>
</tr>
<tr>
<td>Demographic Data</td>
<td>25</td>
</tr>
<tr>
<td>Equipment Data: Hardware</td>
<td>29</td>
</tr>
<tr>
<td>Equipment Data: Software</td>
<td>39</td>
</tr>
<tr>
<td>Subject Area Use</td>
<td>40</td>
</tr>
<tr>
<td>Implementation Information</td>
<td>43</td>
</tr>
</tbody>
</table>
### TABLE OF CONTENTS--Continued

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS</td>
<td>49</td>
</tr>
<tr>
<td>Summary</td>
<td>49</td>
</tr>
<tr>
<td>Conclusions</td>
<td>51</td>
</tr>
<tr>
<td>Recommendations</td>
<td>53</td>
</tr>
<tr>
<td>REFERENCES</td>
<td>54</td>
</tr>
<tr>
<td>APPENDICES</td>
<td>57</td>
</tr>
<tr>
<td>A: Identification Survey</td>
<td>58</td>
</tr>
<tr>
<td>B: Data Telecommunications Survey</td>
<td>60</td>
</tr>
<tr>
<td>C: Data Telecommunications Survey Cover Letter</td>
<td>64</td>
</tr>
<tr>
<td>D: Data Telecommunications Survey Followup Cover Letter</td>
<td>66</td>
</tr>
<tr>
<td>E: List of Respondents Schools</td>
<td>68</td>
</tr>
<tr>
<td>F: Comments to the Question: How Did You Learn About Telecommunications</td>
<td>72</td>
</tr>
<tr>
<td>G: List of Two Most Used Software</td>
<td>76</td>
</tr>
<tr>
<td>H: Teaching Subject Areas</td>
<td>82</td>
</tr>
</tbody>
</table>
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Identification Survey Responses</td>
<td>23</td>
</tr>
<tr>
<td>2.</td>
<td>Telecommunications Capabilities</td>
<td>23</td>
</tr>
<tr>
<td>3.</td>
<td>Population of Teachers</td>
<td>24</td>
</tr>
<tr>
<td>4.</td>
<td>Responses by School Classification</td>
<td>25</td>
</tr>
<tr>
<td>5.</td>
<td>School Faculty Size for Respondents</td>
<td>26</td>
</tr>
<tr>
<td>6.</td>
<td>Average Class Size of Responding Teachers</td>
<td>27</td>
</tr>
<tr>
<td>7.</td>
<td>Years of Teaching Experience of Respondents</td>
<td>27</td>
</tr>
<tr>
<td>8.</td>
<td>Respondents Personal Computer Data Telecommunications Years of Use</td>
<td>28</td>
</tr>
<tr>
<td>9.</td>
<td>IBM or IBM Clone Computers Used for Data Telecommunications</td>
<td>30</td>
</tr>
<tr>
<td>10.</td>
<td>Apple Computers Used for Data Telecommunications</td>
<td>31</td>
</tr>
<tr>
<td>11.</td>
<td>Macintosh Computers Used for Data Telecommunications</td>
<td>31</td>
</tr>
<tr>
<td>12.</td>
<td>Frequency of Types of Computers Used for Data Telecommunications Compared</td>
<td>32</td>
</tr>
<tr>
<td>13.</td>
<td>Baud Rate (300) Used for Data Telecommunications</td>
<td>32</td>
</tr>
<tr>
<td>14.</td>
<td>Baud Rate (1200) Used for Data Telecommunications</td>
<td>33</td>
</tr>
<tr>
<td>15.</td>
<td>Baud Rate (2400) Used for Data Telecommunications</td>
<td>34</td>
</tr>
<tr>
<td>Table</td>
<td>Description</td>
<td>Page</td>
</tr>
<tr>
<td>-------</td>
<td>-----------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>16.</td>
<td>Baud Rate (Other) Used for Data Telecommunications</td>
<td>35</td>
</tr>
<tr>
<td>17.</td>
<td>Frequency of Baud Rates Used for Data Telecommunications Compared</td>
<td>35</td>
</tr>
<tr>
<td>18.</td>
<td>Dedicated Lines Used for Data Telecommunications</td>
<td>36</td>
</tr>
<tr>
<td>19.</td>
<td>Multi-Use Lines Used for Data Telecommunications</td>
<td>37</td>
</tr>
<tr>
<td>20.</td>
<td>Frequency of Types of Telephone Lines Used for Data Telecommunications</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>Compared</td>
<td></td>
</tr>
<tr>
<td>21.</td>
<td>Classroom Availability of Telephone Lines</td>
<td>38</td>
</tr>
<tr>
<td>22.</td>
<td>Telephone Line Access Outside the Classroom</td>
<td>38</td>
</tr>
<tr>
<td>23.</td>
<td>Software Choices of Respondents</td>
<td>39</td>
</tr>
<tr>
<td>24.</td>
<td>Personal Computer Data Telecommunications Class Offered</td>
<td>40</td>
</tr>
<tr>
<td>25.</td>
<td>Subject Area Use of Personal Computer Data Telecommunications Skills</td>
<td>42</td>
</tr>
<tr>
<td>26.</td>
<td>Respondents Teaching Subject Area</td>
<td>43</td>
</tr>
<tr>
<td>27.</td>
<td>Respondents Importance Rating of Personal Computer Data Telecommunications</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>Operations Performed by Students</td>
<td></td>
</tr>
<tr>
<td>28.</td>
<td>Respondents Importance Rating of Personal Computer Data Telecommunications</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>Operations Performed by Respondents</td>
<td></td>
</tr>
<tr>
<td>Table</td>
<td>Description</td>
<td>Page</td>
</tr>
<tr>
<td>-------</td>
<td>-----------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>29.</td>
<td>Numbers of Students Respondents Have Using Personal Computer Data Telecom-</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>munications</td>
<td></td>
</tr>
<tr>
<td>30.</td>
<td>Number of Teachers Using Personal Computer Data Telecommunications in Their</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>Respective School as Determined by Respondents</td>
<td></td>
</tr>
</tbody>
</table>
This study was designed to determine the extent of development and the current uses of personal computer data telecommunications systems in Montana's public senior high schools. To determine the extent of that development, a set of four objectives designed to identify schools with telecommunications capabilities and examine their operation in particular subject areas was created.

Two survey instruments were used to provide the necessary data. The first instrument identified 117 out of 173 Montana public high schools which had personal computer data telecommunications capabilities. Of the 117 schools identified, a population of 296 teachers involved with personal computer data telecommunications in their schools was established. The second instrument was then sent to 160 teachers who had been drawn from that population of 296 teachers. The data collected fell into four general areas: demographic; equipment used, both hardware and software; subject use; and implementation information.

Based on the results of this study, it was concluded that more than two-thirds of high schools have personal computer data telecommunications capabilities; that IBM or IBM clones are the most commonly used computer; that the modem speeds of 1200 and 2400 baud were used about equally; that schools normally had dedicated telephone lines available for personal computer data telecommunications; that almost three-quarters of the schools had a telephone line available in the classroom; that Procomm telecommunications software was clearly the most used software; that slightly more than four-fifths of the schools surveyed did not offer a specific course in personal computer data telecommunications; that subject areas which use personal computer telecommunications were led by computer science and business; and that teachers considered connecting to information services as the most important use of personal computer data telecommunications for their students, while messaging was rated most important for the teachers themselves.
CHAPTER 1

INTRODUCTION

Telecommunications in the Information Age is having a great impact on the world as we know it. The area of education is no exception. As indicated by Wilson (1987), the use of the computer to integrate electronic technologies has provided unlimited opportunities for the delivery of information and learning. These unlimited opportunities, coupled with the accelerating change from the Industrial Age to the Information Age, have made it very important for educators to offer instruction in the types of technologies that students are likely to encounter when they enter the work force.

Telecommunications has been identified as one of the rapidly advancing technologies. The abundance of telecommunications technologies provides a variety of electronic distribution alternatives in video, voice, data and facsimile communications formats (Wilson, 1987). As cited by Barker (1990), these delivery systems will allow the continued advancement of distance learning technologies, which many writers and practitioners have seen as the great
curriculum equalizer benefitting rural schools in the 1990s and beyond (Barker, 1987; Benson and Hirschen, 1987; Schamber, 1988). An example of this change in the general population is indicated by McCarrol (1991) when he remarks that at the present time, more people are working with their heads than their hands to produce more than a third of the nation's $5.5 trillion GNP. Such change in the work force and the advance of technology has provided an opportunity for the increased use of telecommunications in education. How this potential for the further use of telecommunications is used and how it can be integrated into the classroom for educational purposes is a pressing problem. Resolution of this issue will have consequences far into the future.

Individuals involved with Montana's educational system may benefit tremendously by using the existing telecommunications technologies to provide distance learning opportunities. As indicated in the Final Report for Montana Education Telecommunications Project (1990), a telecommunications network could provide needed support in the areas of broadening the curriculum, advanced placement programming, special programs for the emotionally disturbed, and programs for the physically impaired. Other opportunities provided by telecommunications technology mentioned by Weinstein and Roschwalb (1990) are quick and efficient improvements in curriculum, in teacher training, and in school administration. Such advancements can only happen if there
is a telecommunications system in place to deliver the needed information to the proper place at the appropriate time and if such a system is facilitated by trained personnel.

**Purpose of the Study**

The purpose of this study was to determine the extent of development and the current uses of personal computer data telecommunications systems in Montana's public senior high schools.

**Objectives**

The following objectives were directed to Montana public senior high school data telecommunication systems:

1. To identify Montana public senior high schools that have personal computer data telecommunication systems;
2. To determine the hardware and software components used in the identified schools' personal computer data telecommunications systems;
3. To determine in which subject areas high school teachers use personal computer data telecommunications in the classroom; and
4. To determine the most important types of telecommunications operations which are being performed in the classroom by students and teachers.

Need for the Study

The future telecommunications delivery needs of education are difficult to predict, but at the present time school administrators are finding it more and more problematic to provide on-site teacher training programs and to deliver high quality educational programs to economically varied and population-diverse school districts (Weinsten and Roschwalb, 1990). A report by the Office of Technology Assessment (1989) stated that although distance learning has gone beyond the expectation of just serving isolated rural schools and has linked communities with one another to bring a variety of experts and information to the classroom, many students and teachers still do not have access to these needed experts and information; clearly, a gap continues to exist between the classroom and available information and experts. Telecommunications may bridge this gap. In a nation committed to educational equity for all students, the distribution of opportunities for electronic learning are crucial (Mecklenburger, 1990).

Establishing a telecommunications system for Montana schools would be of major benefit to the students and
teachers who would have access to those additional resources and educational opportunities in their classrooms. School systems, state offices, and other school districts would also benefit from increased access to current educational information. In light of such information, this study has created useful baseline information for assessing future growth of telecommunications in Montana.

As noted in the needs assessment section of the Final Report for Montana Education Telecommunications Project (1990), schools across the state have programmatic needs in math and science, library support programs, courses and materials to broaden the curriculum, advanced placement courses, and foreign language courses that could be met by telecommunications systems. Also stated in the same study, a multi-technology solution was recommended for Montana, with the first phase being personal computers equipped with modems. The Final Report recommended that personal computer modems be supplied to each school as well as the needed training and a statewide data network.

Since the completion of the Final Report for Montana Educational Telecommunications Project of 1990, those recommendations are being followed. This study has therefore determined the extent of current development and use, by subject areas, of data telecommunications in Montana secondary schools. The Montana Educational Telecommunications Network (METNET) has conducted telecommunications
research in Montana concerned primarily with its equipment recipients; however, an interest has been expressed in receiving the results of this study since it deals with all Montana public high schools rather than METNET equipment recipients only. The results of this study may be used to strengthen and increase the use of telecommunications in order to broaden, diversify, and internationalize school curriculums in Montana. Furthermore, this study has established a base of information which may be used by the Office of Public Instruction, bulletin board system operators, and state educators in order to make decisions for the future of educational data telecommunications in Montana.

Definition of Terms

The following terms are defined in order to minimize misunderstanding:

1. Telecommunications: Refers to any transmission of information over distance by any electronic means (Sullivan, Lewis, Cook 1988);

2. Personal computer data telecommunications system: A system comprised of a personal computer, modem, telecommunications software, and a telephone line which allows the user to connect to another data telecommunications system;
3. Modem: A hardware interface that allows a computer to send signals over the telephone line; and
4. Data: Any computer information capable of being transmitted.

Limitations

The following limitations were identified for this study:
1. This study was limited to teachers in all Montana public senior high schools which have personal computer data telecommunications capabilities; and
2. Personal computer data telecommunications systems was the only telecommunications systems considered in this study.

Assumptions

Basic assumptions accepted for this study were as follows:
1. Personal computer data telecommunications will continue to become an integral part of education in Montana; and
2. The existence of a personal computer data telecommunications system in a school will indicate some level of use.
CHAPTER 2

REVIEW OF LITERATURE

The use of telecommunications of all types is not an end in itself but a means to an end. As such, it is a tool that can be used well, poorly, or not at all in the classroom. However, the technology does not have any value apart from its application, and as with any tool, it is useless sitting in a cabinet or on a shelf. Therefore, the real challenge in the classroom is how to use this tool. Educators are faced with the choice of using this new technological tool to replicate the status quo (Levinson, 1990) or, as Faibisoff and Willis (1987) suggest, to provide a revolution in education by concentrating, above all, on the learner and learning rather than on the teacher, the system, or the process.

History of Development

In the past, communication in the classroom has largely been limited to the voice of the teacher and printed text. With the development of radio and television, new communications methods entered the classroom, but they did not encourage either direct or indirect interaction between
users of that technology. These traditional media types (Milheim, 1989) have been supplemented in recent years by two new types, computers and satellites, which have emerged as effective distance delivery devices for providing instruction. With the advent of these new media types and changes in television technology, a variety of delivery systems has become available, and they all include some component of interactivity. Wilson (1987) lists the technologies that best facilitate and support educational activities: video communications, audiographic technologies, telephone systems, and computer communications. Nevertheless, in spite of the technology's availability, "the potential for computer-assisted instruction...is yet to be realized" (Faibisoff and Willis, 1987).

For the educator, several questions arise from the generation of so many delivery systems, e.g., which system should be chosen for a particular school district, and will that system become obsolete by the time it is operational? However, Dede (1990) suggests that the problem of obsolescence will not develop, since the trend is toward synthesis in the evolution of information technology and the emergence, rather than the divergence, of those technologies. As to which system to choose, Barker (1990) believes that when investigating any network or technology for distance delivery, the success of the system depends more on the quality and usefulness of the content delivered and received
than upon the choice of equipment. Clearly, though, any new concept will be lost without practical applications; as can be expected, then, the application of these educational delivery systems incorporates some concern and confusion about whether the learner and the educator will use telecommunications or electronic devices to interactively follow any given course program (Bruder, 1989).

**Current Development**

Is telecommunications just a technological fad, and will it become obsolete, just as many other ideas in education have become obsolete? Goldberg (1988) thinks not. He suggests that telecommunications is a unique technology that can dissolve conventional classroom walls, make geographical distances immaterial, and create classrooms of tomorrow using the curricula in place today. This position is supported by Peterson (1990) who states:

Just as the Berlin Wall dissolved before the eyes of the world, the boundaries that exist between the classroom and the community can be dissolved by the introduction of computers, modems, and telephone lines. Children the world over, like workers in modern industry, can be linked in sharing data (p.6).
The current situation is not whether telecommunications is viable in the classroom, but how to deliver information to the classroom and integrate such information into the curriculum. According to Peterson, (1990), "It is a sad commentary that today we can instantly send messages 3,000 miles across this country. . .and still not get [that information] the last 200 feet into one of the most important places in the nation, the classroom."

As previously cited, Peterson (1990) addressed the utilization of computers, modems, and telephone lines in the classroom to connect the world. Furthermore, Clark (1988) said that most telecommunications in the field of education involve personal computers connected by a modem to standard telephone lines. Included in this research is The Final Report For The Montana Educational Telecommunications Project (1990), which has pointed out an obstacle to access of the state data networks--the scarcity of modems for the school computers. The report subsequently recommends that personal computer modems should be supplied to schools. The implication is that personal computer data telecommunications, while not the only means to reach the classroom, appears to be a leader in telecommunications--but not without the proper equipment.

An issue that needs to be addressed by educators is traditional classroom delivery versus delivery by telecommunications. A study by Foell (1989) at the University
of Georgia compared two groups of university students, a control group taking a traditional class and an experimental group taking the same class using modems and computers. No statistical difference was found between the groups in their perceptions of either delivery system, nor were there any differences noted on their average overall class scores. The Office of Technology Assessment (1989) appears to support Foell's findings, stating that in most instances, distance learning appears to be as effective as face-to-face instruction in the classroom.

The last issue to address is how to implement new telecommunications technology in the classroom. Goldberg (1988) insists instructional telecommunications is implementable right now because its content is based on existing curricula. Dede (1990) agrees, saying that in general, new technologies are initially used to reach existing objectives more efficiently using traditional methods, and that only with experience do users recognize that advances in technology offer the potential for accomplishing new objectives more effectively in innovative ways. These statements imply that telecommunications can be used in the classroom as it exists without imposing large-scale curriculum changes; furthermore, the changes will take place after implementation, not before.
Summary

Dede (1990) forecasts that for at least another 15 years, the information technologies will continue to rapidly increase in power while decreasing in cost. However, cost is certainly a factor to be addressed if telecommunications is to continue to expand. Peterson (1990) looks at the issue from the point of view that the question facing educators and policymakers should not be what it is going to cost us to modernize our education system, but what it is going to cost if we do not make the essential investments in technology and training. Implied is that it could be more costly—both in terms of money and in terms of our students' ability to compete for employment in the world marketplace—to ignore technology than to use it. Mecklenburger (1990) puts the issue another way. He states that sooner rather than later communications and telecommunications will become essential to education, whether used by today's educators or by a new breed that will freely exploit the technology. His implication is that educators ought to use the new technology or be replaced by educators who will. As indicated, it appears that distance education mediated by personal computer data telecommunications can be effective for classroom instruction. As cited by Weinstein and Roschwalb (1990), the primary issue is raised by John Sculley, chairman and chief executive officer of Apple Computer, who asks:
How is it that we have recognized the economic value of Industrial Age tools...and yet we don't seem to recognize the economic value of Information Age tools in education?...If we're going to be successful in this global economy, we've got to change the way people think, communicate, learn, and work. We can do this with many of the technologies that we have today. We just have not applied them with the same passion and energy that we applied them in the commercial marketplace (Sculley, 1989).
CHAPTER 3

METHODOLOGY

This descriptive study used two survey instruments. The first identified schools with personal computer data telecommunications capabilities as well as a group of teachers responsible for instruction and use of telecommunications, and the second gathered telecommunications information from Montana public high schools in the following areas: telecommunications hardware and software components; subject areas that use data telecommunications; and the types of telecommunications operations that are performed. The process of mailings and follow-up took place over a three-month period beginning January 7, 1992 and ending with data collection termination on March 31, 1992.

Population

The target population of this study was established by an identification survey distributed to all public senior high schools in Montana. A double postcard survey was sent to all principals of Montana public high schools (Appendix A). The
list of schools was determined from the Office of Public Instruction's Directory of Montana Public Schools, and the actual mailing list was generated by the Office of Public Instruction from its computer data base.

The purpose of this first round was two-fold: (1) to determine the schools that had personal computer data telecommunications capabilities, and (2) to determine which teacher or teachers were responsible for personal computer data telecommunications implementation and use. The results of this identification survey provided the population of teachers which were then surveyed. In addition, a 2400 baud modem was offered in a drawing to increase the response rate to both surveys.

**Instrument Design**

Two survey instruments were designed by the researcher for this study. As mentioned previously, the first survey--which will be called the identification survey--dealt with establishing the population for the subsequent survey. The identification survey (Appendix A) was designed to determine if a school had data telecommunications capabilities and who was responsible for the use of data telecommunications in the classroom. The two questions on the double postcard, along with the cover letter, were developed by the researcher and reviewed by the committee chairman before being mailed.
The second instrument (Appendix B), which will be called the data telecommunications survey, was designed by the researcher using the information gathered while completing the review of literature for this study along with extensive assistance from members of his graduate committee.

The data telecommunications survey was organized into four sections. The first section dealt with the types of hardware and software equipment that were being used in the school system. The instrument was designed to determine the types of computers being used; the types of modems being used; the types and number of telephone lines being used; and the types of telecommunications software being used.

The second section of the instrument allowed for the identification of subject areas which had incorporated personal computer data telecommunications. Subject areas were listed and broken into two groups. Membership in one group was determined by whether telecommunications skills were taught and used in the subject area; membership in the second group was determined by whether telecommunications skills were being used but not formally taught as a specific subject area. In addition, it was determined whether or not the school offered a specific course in personal computer data telecommunications of at least one quarter in duration.

The third section of the instrument dealt with identifying the types of operations performed and the importance placed on individual operations carried out by students and teachers
to implement personal computer data telecommunications in the classroom. A list was provided to indicate the type of operation performed and how important it was. The operations were rated on a scale of 1 (most important) to 9 (least important).

The fourth and final section dealt with demographic information. Questions were asked to determine school size; number of years of teaching experience; number of years of personal computer data telecommunications use, both personally and in the classroom; and how the respondent learned telecommunications skills.

To verify readability and clarity, the data telecommunications survey was reviewed several times by graduate committee members prior to pilot testing. A pilot test was then conducted with the assistance of thirteen secondary teachers attending a regional technology education workshop in Miles City. Based on their suggestions and comments, minor changes were made in order to improve the clarity of the instrument. The revised instrument was again reviewed by a graduate committee member before being mailed.

Data Collection

On January 7, 1992 the identification surveys were sent to 173 Montana public high school principals. The survey contained a cover letter and two questions dealing with
telecommunications usage. A list of respondents and non-respondents was kept for tracking purposes. There were 113 respondents to the original mailing and 60 non-respondents. From those 60 non-respondents, a random sample of 22 non-respondents was then drawn for a telephone follow-up, which was conducted on January 22, 23, and 24, 1992 for a total of 135 principals responding. This number of responses accounts for a 78% return rate.

The selection process of teachers to be surveyed was conducted as follows: Of the 135 schools which responded to the identification survey, 18 did not have personal computer data telecommunications capabilities, leaving 117 schools identified as having personal computer data telecommunications capabilities. Two hundred ninety-six teachers were identified as being involved with this type of telecommunications. If only one person in the school had been identified, that person was selected. If more than one person had been identified, a random roll of dice determined the selection. This process obtained 117 representatives, i.e., one representative from each school. Additional teachers needed to be selected to increase the sample size to 168. This sample size was determined by a formula which used the number of teachers identified (296) and which provided the sample size necessary whereby it is possible to be 95% confident that those results will not deviate from the parameter value by more than 5% (Cochran, 1977). Those
additional teachers were selected from the cards which identified more than one teacher responsible for personal computer data telecommunications by first selecting a random number from a random numbers table and then selecting every fourth teacher, a process that had been predetermined in order to provide the appropriate number of teachers. The sample size was thus increased from 117 to 160.

The data telecommunications surveys were mailed to the 160 selected teachers on February 20, 1992. The mailing included a cover letter (Appendix C), a self-addressed, stamped envelope, and the data telecommunications survey. A list of respondents and non-respondents was kept for tracking purposes. A follow-up mailing was then sent on March 10, 1992. This mailing contained a followup cover letter (Appendix D), a self-addressed, stamped envelope, and a data telecommunications survey. The initial mailing provided 97 returns, and the follow-up mailing provided 43 returns for a total of 140 surveys returned, an 87.5% return rate.

**Data Analysis**

The data were entered and organized on an IBM compatible computer using dBase III Plus. Analysis of the data was provided by using SPSS/PC to determine frequency distributions, means, and standard deviations. Data obtained
were used to develop the tables which are presented in Chapter 4 of this study.
CHAPTER 4

RESULTS AND ANALYSIS

The results of this study are presented in two sections. The first section deals with the identification survey which identified the schools with telecommunications and which determined the population for the second survey. A list of the 140 responding teachers and their respective schools can be found in Appendix E. The second section deals with the data telecommunications survey containing the following categories: demographic data; equipment data for hardware and software; subject area use; and implementation information.

Identification Survey Data

The information gathered by the use of this survey is presented in the following two sections.

Telecommunications Capabilities

For this study, all Montana public high schools were included in the identification survey. The number of schools was determined to be 173 from the Office of Public Instruction's directory of Montana Public schools. The
initial mailing was sent to the principals of the identified schools, providing 113 responses (65%). A telephone follow-up was then conducted which secured 22 additional responses (13%) for a total response rate of 78 percent. These data are presented in Table 1.

<table>
<thead>
<tr>
<th>Mailings</th>
<th>Principals</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Mailing</td>
<td>113</td>
<td>65</td>
</tr>
<tr>
<td>Follow-up</td>
<td>22</td>
<td>13</td>
</tr>
<tr>
<td>Total</td>
<td>135</td>
<td>78</td>
</tr>
</tbody>
</table>

In Table 2, the total number of responses (135) are broken down further to show the number of schools which have telecommunications capabilities and the schools which do not. The initial mailing produced 101 yes responses (75%) and 12

<table>
<thead>
<tr>
<th>Capability</th>
<th>Initial Rd.</th>
<th>Follow-up</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>101</td>
<td>16</td>
<td>87</td>
</tr>
<tr>
<td>No</td>
<td>12</td>
<td>6</td>
<td>13</td>
</tr>
</tbody>
</table>
no responses (9%). The telephone follow-up produced 16 yes responses (12%) and 6 no responses (4%).

**Population Identification**

Included in the initial survey was a question designed to identify the teachers responsible for instruction and the use of personal computer telecommunications in the schools which were identified as having telecommunications capabilities. As shown in Table 3, of the total 117 identified schools, 38 schools identified one teacher, and 79 identified more than one teacher. Total teachers identified were 296: 38 from the schools with one teacher identified; and 258 from the schools with more than one teacher identified.

Table 3. Population of Teachers.

<table>
<thead>
<tr>
<th>Identified</th>
<th>Schools</th>
<th>No. Teachers ID.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID.1</td>
<td>38</td>
<td>38</td>
</tr>
<tr>
<td>ID.&gt;1</td>
<td>79</td>
<td>258</td>
</tr>
<tr>
<td>Total</td>
<td>117</td>
<td>296</td>
</tr>
</tbody>
</table>

**Telecommunications Survey Data**

Data presented in this section are organized into four distinct tables. The first table deals with demographic
data, the second table deals with equipment data, the third table deals with subject area use, and the fourth table deals with implementation information.

Demographic Data

As indicated in Chapter Three, the data telecommunications survey was mailed to 160 randomly chosen teachers representing 117 schools; 140 of those surveys were returned. Table 4 displays the data that represent the number of responses received from each of the four classifications of public schools in Montana. The results are as follows: class AA, 12 responses (8.6%); class A, 23 responses (16.4%); class B, 28 responses (20%); class C, 72 responses (51.4%); and there were 5 non-responses (3.6%).

Table 4. Responses by School Classification.

<table>
<thead>
<tr>
<th>Class</th>
<th>Responses</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA</td>
<td>12</td>
<td>8.6</td>
</tr>
<tr>
<td>A</td>
<td>23</td>
<td>16.4</td>
</tr>
<tr>
<td>B</td>
<td>28</td>
<td>20.0</td>
</tr>
<tr>
<td>C</td>
<td>72</td>
<td>51.4</td>
</tr>
<tr>
<td>No Response</td>
<td>5</td>
<td>3.6</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>100.0</td>
</tr>
</tbody>
</table>
As shown in Table 5, 75 teachers (54%) responded that they teach in school systems which employ 1 to 25 teachers, 23 teachers (16%) responded that they teach in school systems which employ 26 to 50 teachers, 6 teachers (4%) responded that they teach in school systems which employ 51 to 75 teachers, 7 teachers (5%) responded that they teach in school systems which employ 76 to 100 teachers, and 11 teachers (8%) responded that they teach in school systems which employ more than 100 teachers. Eighteen teachers did not respond (13%).

Table 5. School Faculty Size for Respondents.

<table>
<thead>
<tr>
<th>Faculty Size</th>
<th>Respondents</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Response</td>
<td>18</td>
<td>13</td>
</tr>
<tr>
<td>1 to 25</td>
<td>75</td>
<td>54</td>
</tr>
<tr>
<td>26 to 50</td>
<td>23</td>
<td>16</td>
</tr>
<tr>
<td>51 to 75</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>76 to 100</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>100 or more</td>
<td>11</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>100</td>
</tr>
</tbody>
</table>

Average class size of responding teachers is presented in Table 6. The results are as follows: 50 teachers (36%) had classes of 1 to 10 students; 50 teachers (36%) had classes of 11 to 20 students; 27 teachers (19%) had classes of 21 to 30
students; 1 teacher (1%) had a class of more than 30 students; and 12 teachers did not respond (8%).

Table 6. Average Class Size of Responding Teachers.

<table>
<thead>
<tr>
<th>Average Size</th>
<th>Teachers</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Response</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>1 to 10</td>
<td>50</td>
<td>36</td>
</tr>
<tr>
<td>11 to 20</td>
<td>50</td>
<td>36</td>
</tr>
<tr>
<td>21 to 30</td>
<td>27</td>
<td>19</td>
</tr>
<tr>
<td>30 or more</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>100</td>
</tr>
</tbody>
</table>

The years of teaching experience of the respondents are presented in Table 7. Among the responding teachers, 28

Table 7. Years of Teaching Experience of Respondents.

<table>
<thead>
<tr>
<th>Years Exp.</th>
<th>Teachers</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Response</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>1 to 5</td>
<td>28</td>
<td>20</td>
</tr>
<tr>
<td>6 to 10</td>
<td>27</td>
<td>19</td>
</tr>
<tr>
<td>11 to 15</td>
<td>26</td>
<td>19</td>
</tr>
<tr>
<td>16 or more</td>
<td>47</td>
<td>34</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>100</td>
</tr>
</tbody>
</table>
(20%) had 1 to 5 years of experience, 27 (19%) had 6 to 10 years of experience, 26 (19%) had 11 to 15 years of experience, and 47 (34%) had 16 years or more of teaching experience. There were 12 (8%) non-responses to this question.

The data in Table 8 show the years of personal computer data telecommunications experience of responding teachers. Two classifications are shown: years of personal use; and years of classroom use. Personal use data collected are as follows: 77 teachers (55.0%) have 1 to 3 years of use; 41 teachers (23.6%) have 4 to 6 years of use; 5 teachers (3.5%) have 7 to 9 years of use; 3 teachers (2.1%) have 10 to 12 years of use; and 22 teachers (15.7%) did not respond. Classroom use data collected are as follows: 79 teachers

<table>
<thead>
<tr>
<th>Years Used</th>
<th>Personal Use</th>
<th>Classroom Use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>No Response</td>
<td>22</td>
<td>15.7</td>
</tr>
<tr>
<td>1 to 3</td>
<td>77</td>
<td>55.0</td>
</tr>
<tr>
<td>4 to 6</td>
<td>41</td>
<td>23.6</td>
</tr>
<tr>
<td>7 to 9</td>
<td>5</td>
<td>3.5</td>
</tr>
<tr>
<td>10 to 12</td>
<td>3</td>
<td>2.1</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>100.0</td>
</tr>
</tbody>
</table>
(56.4%) have 1 to 3 years of use; 19 teachers (13.5%) have 4 to 6 years of use; 0 teachers (0%) responded 7 to 9 years of use; 2 teachers (1.4%) have 10 to 12 years of use; and 40 teachers (28.6%) did not respond to the question.

Observation of the answers to the open-ended question, "How did you learn about telecommunications?" (Appendix F) seems to indicate that a large portion of the responding teachers learned about telecommunications from workshops and conferences rather than through enrollment in a class. Many respondents mentioned Big Sky Telegraph, Edunet, Metnet, and unspecified workshops as their source of training. Other sources mentioned were AgriData, Montana Business Education Association, Montana State University, and the Office of Public Instruction. Another source to be considered, when observing the answers to this question, is the number (12) of respondents who mentioned that they were self-taught.

**Equipment Data: Hardware**

The data in Table 9 show the frequency of the number of IBM or IBM clones used for personal computer data telecommunications and the percentage of the total respondents (140) which that number represents. The results ranged from 43 teachers (30.7%) using 1 IBM or IBM clone computers for data telecommunications to 11 teachers (7.9%) using more than 5 IBM or IBM clone computers for data telecommunications.
Table 9. IBM or IBM Clone Computers Used for Data Telecommunications.

<table>
<thead>
<tr>
<th>No. of Computers</th>
<th>Responses</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Response</td>
<td>32</td>
<td>22.9</td>
</tr>
<tr>
<td>1</td>
<td>43</td>
<td>30.7</td>
</tr>
<tr>
<td>2</td>
<td>27</td>
<td>19.3</td>
</tr>
<tr>
<td>3</td>
<td>18</td>
<td>12.9</td>
</tr>
<tr>
<td>4</td>
<td>8</td>
<td>5.7</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>0.7</td>
</tr>
<tr>
<td>&gt;5</td>
<td>11</td>
<td>7.9</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 10 shows the frequency and percentage data for Apple computers used for data telecommunications. The usage for Apple computers ranged from 36 teachers (25.7%) using 1 Apple computer to 5 teachers (3.6%) using more than 5 Apple computers for data telecommunications.

In addition, data were collected for Macintosh computer use for data telecommunications which are shown in Table 11. The responses in this instance range from 28 teachers (20.0%) using 1 Macintosh computer to 2 teachers (1.4%) using more than 5 Macintosh computers for data telecommunications.

One respondent indicated he/she used one computer of another type for data telecommunications. This response accounted for 0.7% of the 140 respondents.
Table 10. Apple Computers Used for Data Telecommunications

<table>
<thead>
<tr>
<th>No. of Computers</th>
<th>Responses</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Response</td>
<td>75</td>
<td>53.6</td>
</tr>
<tr>
<td>1</td>
<td>36</td>
<td>25.7</td>
</tr>
<tr>
<td>2</td>
<td>14</td>
<td>10.0</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>4.3</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>1.4</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>1.4</td>
</tr>
<tr>
<td>&gt;5</td>
<td>5</td>
<td>3.6</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 11. Macintosh Computers Used for Data Telecommunications.

<table>
<thead>
<tr>
<th>No. of Computers</th>
<th>Responses</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Response</td>
<td>94</td>
<td>67.1</td>
</tr>
<tr>
<td>1</td>
<td>28</td>
<td>20.0</td>
</tr>
<tr>
<td>2</td>
<td>11</td>
<td>7.9</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>2.1</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>1.4</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>&gt;5</td>
<td>2</td>
<td>1.4</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Table 12 is constructed to display the data for the types of computers without the percentages for comparison purposes. This table contains the frequency data for IBM or IBM clone computers, Apple computers, Macintosh computers, and the one computer listed as "other."

Table 12. Frequency of Types of Computers Used for Data Telecommunications Compared.

<table>
<thead>
<tr>
<th>Type of Computer</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>&gt;5</th>
<th>N/R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>139</td>
</tr>
<tr>
<td>IBM or Clone</td>
<td>43</td>
<td>27</td>
<td>18</td>
<td>8</td>
<td>1</td>
<td>11</td>
<td>32</td>
</tr>
<tr>
<td>Apple</td>
<td>36</td>
<td>14</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>75</td>
</tr>
<tr>
<td>Macintosh</td>
<td>28</td>
<td>11</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>94</td>
</tr>
</tbody>
</table>

Another equipment area investigated was the type and speed of the modems used by the respondents. The data included in Table 13 show the frequency of the number of modems used for

Table 13. Baud Rate (300) Used for Data Telecommunications

<table>
<thead>
<tr>
<th>No. of Modems</th>
<th>Responses</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Response</td>
<td>136</td>
<td>97.1</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td>2.9</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>100.0</td>
</tr>
</tbody>
</table>
data telecommunications and the percentage of the total respondents (140) which that number represents. At the 300 baud rate there were only 4 responses (2.9%) in the 1 modem category.

Table 14 shows frequency and percentage data for 1200 baud rate modems used for data telecommunications. The range represented is from a high of 36 teachers (25.7%) using one 1200 baud modem to a low of 3 teachers (2.1%) using five 1200 baud modems for data telecommunications.

Table 14. Baud Rate (1200) Used for Data Telecommunications

<table>
<thead>
<tr>
<th>No. of Modems</th>
<th>Responses</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Response</td>
<td>61</td>
<td>43.6</td>
</tr>
<tr>
<td>1</td>
<td>36</td>
<td>25.7</td>
</tr>
<tr>
<td>2</td>
<td>22</td>
<td>15.7</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>7.1</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>2.1</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>2.1</td>
</tr>
<tr>
<td>&gt;5</td>
<td>5</td>
<td>3.6</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>100.0</td>
</tr>
</tbody>
</table>

The data in Table 15 display frequency and percentage data for 2400 baud rate modems used for data telecommunications. As indicated by the table, the responses range from a high of
35 teachers (25.0%) using one 2400 baud modem to a low of 3 teachers (2.1%) using five 2400 baud modems for data telecommunications.

Table 15. Baud Rate (2400) Used for Data Telecommunications.

<table>
<thead>
<tr>
<th>No. of Modems</th>
<th>Responses</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Response</td>
<td>56</td>
<td>40.0</td>
</tr>
<tr>
<td>1</td>
<td>35</td>
<td>25.0</td>
</tr>
<tr>
<td>2</td>
<td>22</td>
<td>15.7</td>
</tr>
<tr>
<td>3</td>
<td>12</td>
<td>8.6</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>2.9</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>2.1</td>
</tr>
<tr>
<td>&gt;5</td>
<td>8</td>
<td>5.7</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>100.0</td>
</tr>
</tbody>
</table>

The last baud rate category was listed as "other" in the survey. Data presented in Table 16 show the frequency and percentage results. Eleven teachers (7.9%) responded they used other baud rates with 1 modem, and 2 teachers (1.4%) said they used other baud rates with 3 modems for data telecommunications.

Table 17 is constructed to display the data for the various baud rates without the percentages for comparison
purposes. This table contains the frequency data for individual baud rates of 300, 1200, 2400, and "other."

Table 16. Baud Rate (Other) Used for Data Telecommunications (N=140).

<table>
<thead>
<tr>
<th>No. of Modems</th>
<th>Responses</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Response</td>
<td>122</td>
<td>87.1</td>
</tr>
<tr>
<td>1</td>
<td>11</td>
<td>7.9</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>3.6</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>1.4</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 17. Frequency of Baud Rates Used for Data Telecommunications Compared.

<table>
<thead>
<tr>
<th>Baud Rate</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>&gt;5</th>
<th>N/R</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>136</td>
</tr>
<tr>
<td>1200</td>
<td>36</td>
<td>22</td>
<td>10</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>61</td>
</tr>
<tr>
<td>2400</td>
<td>35</td>
<td>22</td>
<td>12</td>
<td>4</td>
<td>3</td>
<td>8</td>
<td>56</td>
</tr>
<tr>
<td>Other</td>
<td>11</td>
<td>5</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>122</td>
</tr>
</tbody>
</table>

In the next series of tables, data are presented concerning the types and numbers of telephone lines available to the responding teachers. The classification of "other"
had one responding teacher (0.7%) who used 1 telephone line which was not a dedicated or multi-use line. The data in Table 18 show the frequency of responses to the number of dedicated telephone lines available. The responses range from 60 teachers (42.9%) who have the use of one dedicated line to 0 teachers (0.0%) who has more than 5 dedicated lines to use for data telecommunications.

Table 18. Dedicated Lines Used for Data Telecommunications

<table>
<thead>
<tr>
<th>No. of lines</th>
<th>Responses</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Response</td>
<td>44</td>
<td>31.4</td>
</tr>
<tr>
<td>1</td>
<td>60</td>
<td>42.9</td>
</tr>
<tr>
<td>2</td>
<td>25</td>
<td>17.9</td>
</tr>
<tr>
<td>3</td>
<td>9</td>
<td>6.4</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>0.7</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>0.7</td>
</tr>
<tr>
<td>&gt;5</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>100.0</td>
</tr>
</tbody>
</table>

The data arrayed in Table 19 show the frequency of response to the number of multi-use telephone lines available. Responses extend from 39 teachers (27.9%) using 1 multi-use line to 4 teachers (2.9%) using more than 5 multi-use lines for data telecommunications.
Table 19. Multi-Use Lines Used for Data Telecommunications

<table>
<thead>
<tr>
<th>No. of lines</th>
<th>Responses</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Response</td>
<td>57</td>
<td>40.7</td>
</tr>
<tr>
<td>1</td>
<td>39</td>
<td>27.9</td>
</tr>
<tr>
<td>2</td>
<td>22</td>
<td>15.7</td>
</tr>
<tr>
<td>3</td>
<td>12</td>
<td>8.6</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>2.1</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>2.1</td>
</tr>
<tr>
<td>&gt;5</td>
<td>4</td>
<td>2.9</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>100.0</td>
</tr>
</tbody>
</table>

The final table dealing with telephone line use compares the frequency of telephone lines available with the two types of lines and the one "other" selection. These comparison data are presented in Table 20.

Table 20. Frequency of Types of Telephone Lines Used for Data Telecommunications Compared.

<table>
<thead>
<tr>
<th>Type of Line</th>
<th>Lines Used</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Dedicated</td>
<td>60</td>
</tr>
<tr>
<td>Multi-Use</td>
<td>39</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
</tr>
</tbody>
</table>
Teacher responses to the question of whether telephone line access was available in their classrooms were as follows: 103 yes (73.6%); 35 no (25.0%); and 2 no response (1.4%). Table 21 presents these data.

Table 21. Classroom Availability of Telephone Lines (N=140).

<table>
<thead>
<tr>
<th>Available</th>
<th>Responses</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>103</td>
<td>73.6</td>
</tr>
<tr>
<td>No</td>
<td>35</td>
<td>25.4</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td>1.4</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>100.0</td>
</tr>
</tbody>
</table>

If telephone access were not available in the classroom, respondents were asked to rate the difficulty of access. The

Table 22. Telephone Line Access Outside the Classroom

<table>
<thead>
<tr>
<th>Access</th>
<th>Responses</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Response</td>
<td>92</td>
<td>65.7</td>
</tr>
<tr>
<td>Very Convenient</td>
<td>5</td>
<td>3.6</td>
</tr>
<tr>
<td>Convenient</td>
<td>25</td>
<td>17.9</td>
</tr>
<tr>
<td>Difficult</td>
<td>13</td>
<td>9.3</td>
</tr>
<tr>
<td>Very Difficult</td>
<td>5</td>
<td>3.6</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>100.0</td>
</tr>
</tbody>
</table>
ratings provided were (1) very convenient, (2) convenient, (3) difficult, and (4) very difficult. Twenty-five respondents (17.9%) rated the access as convenient while 5 respondents (3.6%) rated the access as very convenient or very difficult. These data are contained in Table 22.

**Equipment Data: Software**

Respondents were asked to list the two most used telecommunications software in their school in the order of their frequency of use (Appendix G). The categories were as follows: most used; and used. The data in Table 23 show the

<table>
<thead>
<tr>
<th>Software Name</th>
<th>Most Used</th>
<th>Used</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>Procomm</td>
<td>61</td>
<td>43.6</td>
</tr>
<tr>
<td>Hyper Access 5</td>
<td>13</td>
<td>9.3</td>
</tr>
<tr>
<td>Microsoft Works</td>
<td>9</td>
<td>6.4</td>
</tr>
<tr>
<td>Quick Link</td>
<td>7</td>
<td>5.0</td>
</tr>
<tr>
<td>Other</td>
<td>37</td>
<td>26.4</td>
</tr>
<tr>
<td>No Response</td>
<td>13</td>
<td>9.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>140</td>
<td>100.0</td>
</tr>
</tbody>
</table>

responses to the rating categories and the frequency of selection of a particular software. In the most used
category, IBM and Apple versions of Procomm were listed 61 times (43.6%), while Quick Link was listed 7 times (5.0%). Software programs with fewer than 5 responses are included in the "other" designation for the most used classification. In the used category, both versions of Procomm were selected most often with 14 responses (10.0%); Quick Link was not listed.

**Subject Area Use**

The data in Table 24 show whether a specific class of at least one quarter in length was offered in personal computer data telecommunications and the resulting percentages.

**Table 24. Personal Computer Data Telecommunications Class Offered.**

<table>
<thead>
<tr>
<th>Offered</th>
<th>Responses</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>16</td>
<td>11.4</td>
</tr>
<tr>
<td>No</td>
<td>116</td>
<td>82.9</td>
</tr>
<tr>
<td>No Response</td>
<td>8</td>
<td>5.7</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Most teachers--116 responses (82.9%)--indicated that a specific class in personal computer data telecommunications is not offered in their school, while few teachers--16
responses (11.4%) indicated that their school offers a specific class in personal computer data telecommunications.

The data in Table 25 show the frequency of response and their percentages by subject area, determined by using the total number of subject area responses (278) to this specific question concerning the teaching and use of personal computer data telecommunications. Also included in Table 25 are the frequency of response and the percentages by subject area, determined by using the total number of subject area responses (136) to this specific question concerning the use of data telecommunications skills in subject areas where the skill is not taught. As might be expected, Computer Science received the most responses with 44 (15.87%) in the taught and used subject area; it also received the most responses, with 16 (11.8%) in the used only subject area. Physical Education received the least responses with 1 (.04%) for the taught and used subject area, it also received the least responses in the used only subject area with 2 responses (1.5%).

In addition respondents were asked to identify their specific teaching subject area. The data in Table 26 show the six subject areas with 10 or more responses, and the rest are included in the "other" area. A full list can be found in (Appendix H). Business received the most responses with 21 (15%) followed by Library Science with 17 responses (12%), Mathematics with 16 responses (11.4%), Computer Science with
15 responses (11%), Vocational Agriculture with 11 responses (8%), and Science with 10 responses (7%). The remaining subjects were grouped together with 47 responses (34%).

Table 25. Subject Area Use of Personal Computer Data Telecommunications Skills.

<table>
<thead>
<tr>
<th>Subject Area</th>
<th>Taught &amp; Used #</th>
<th>%</th>
<th>Used Only #</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Science</td>
<td>44</td>
<td>15.8</td>
<td>16</td>
<td>11.8</td>
</tr>
<tr>
<td>Business</td>
<td>43</td>
<td>15.5</td>
<td>12</td>
<td>8.8</td>
</tr>
<tr>
<td>Vocational Ag.</td>
<td>30</td>
<td>10.8</td>
<td>12</td>
<td>8.8</td>
</tr>
<tr>
<td>Other</td>
<td>25</td>
<td>9.0</td>
<td>21</td>
<td>15.4</td>
</tr>
<tr>
<td>Foreign Language</td>
<td>22</td>
<td>7.9</td>
<td>11</td>
<td>8.0</td>
</tr>
<tr>
<td>Technology Ed.</td>
<td>17</td>
<td>6.1</td>
<td>4</td>
<td>2.9</td>
</tr>
<tr>
<td>Mathematics</td>
<td>16</td>
<td>5.8</td>
<td>8</td>
<td>5.9</td>
</tr>
<tr>
<td>Chemistry</td>
<td>15</td>
<td>5.4</td>
<td>5</td>
<td>3.7</td>
</tr>
<tr>
<td>Language Arts</td>
<td>14</td>
<td>5.0</td>
<td>9</td>
<td>6.6</td>
</tr>
<tr>
<td>Social Studies</td>
<td>12</td>
<td>4.3</td>
<td>9</td>
<td>6.6</td>
</tr>
<tr>
<td>Industrial Arts</td>
<td>10</td>
<td>3.6</td>
<td>4</td>
<td>2.9</td>
</tr>
<tr>
<td>Biology</td>
<td>9</td>
<td>3.2</td>
<td>9</td>
<td>6.6</td>
</tr>
<tr>
<td>Earth Science</td>
<td>7</td>
<td>2.5</td>
<td>5</td>
<td>3.7</td>
</tr>
<tr>
<td>Physics</td>
<td>7</td>
<td>2.5</td>
<td>7</td>
<td>5.1</td>
</tr>
<tr>
<td>Art</td>
<td>6</td>
<td>2.2</td>
<td>2</td>
<td>1.5</td>
</tr>
<tr>
<td>Physical Ed.</td>
<td>1</td>
<td>0.4</td>
<td>2</td>
<td>1.5</td>
</tr>
<tr>
<td>Total</td>
<td>278</td>
<td>100.0</td>
<td>136</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Table 26. Respondents Teaching Subject Area

<table>
<thead>
<tr>
<th>Subject Area</th>
<th>Responses</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business</td>
<td>21</td>
<td>15.0</td>
</tr>
<tr>
<td>Library Science</td>
<td>17</td>
<td>12.1</td>
</tr>
<tr>
<td>Mathematics</td>
<td>16</td>
<td>11.4</td>
</tr>
<tr>
<td>Computer Science</td>
<td>15</td>
<td>10.7</td>
</tr>
<tr>
<td>Vocational Ag.</td>
<td>11</td>
<td>7.9</td>
</tr>
<tr>
<td>Science</td>
<td>10</td>
<td>7.1</td>
</tr>
<tr>
<td>Other</td>
<td>44</td>
<td>31.4</td>
</tr>
<tr>
<td>No Response</td>
<td>6</td>
<td>4.3</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Implementation Information

In this section, teachers were asked to rank the importance of selected uses of personal computer data telecommunications operations for their students (see Table 27) and for themselves (see Table 28). The data in Table 27 show the frequencies of a particular rank rating, given by the respondents, of a specific personal computer data telecommunications operation performed by the respondents' students. The rating scale given for rank order was 1 as the most important operation performed by the students to 9 as the least important operation performed by the students. The top two operations receiving responses for each rank of
Table 27. Respondents Importance Rating of Personal Computer Data Telecommunications Operations Performed by Students.

<table>
<thead>
<tr>
<th>Operations Performed</th>
<th>Importance Rating By No. of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Most Important</td>
</tr>
<tr>
<td></td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>Messaging</td>
<td>33 26 17 13 11 6 7</td>
</tr>
<tr>
<td>Connecting to</td>
<td>44 25 10 11 7 4 3</td>
</tr>
<tr>
<td>Information Services</td>
<td></td>
</tr>
<tr>
<td>Downloading</td>
<td>16 26 25 18 5 5 6</td>
</tr>
<tr>
<td>Uploading</td>
<td>5 14 16 16 10 7 6</td>
</tr>
<tr>
<td>Searching Data Base</td>
<td>13 14 15 8 18 15 8</td>
</tr>
<tr>
<td>Computer Conferencing</td>
<td>6 4 5 9 12 22 17 13 3 49</td>
</tr>
<tr>
<td>Online Interactive Tutorial</td>
<td>15 3 8 12 14 11 19 9 1 48</td>
</tr>
<tr>
<td>Remote Mainframe Access</td>
<td>5 3 3 3 2 7 11 42 8 56</td>
</tr>
<tr>
<td>Other</td>
<td>1 0 0 1 0 0 1 0 10 127</td>
</tr>
<tr>
<td>Total</td>
<td>138 115 99 91 85 80 79 77 33 463</td>
</tr>
</tbody>
</table>
importance are as follows: (1) connecting to information services: 44 responses, with messaging coming in second at 33 responses; (2) messaging and downloading tied with 26 responses; (3) downloading: 25 responses, with messaging coming in second at 17 responses; (4) downloading: 18 responses, with uploading coming in second at 16 responses; (5) searching data base: 18 responses, with uploading coming in second at 16 responses; (6) computer conferencing: 22 responses, with searching data base coming in second at 15 responses; (7) online interactive tutorial: 19 responses, with computer conferencing coming in second at 17 responses; (8) remote mainframe access: 42 responses, with computer conferencing coming in second at 13 responses; and (9) "other": 10 responses, with remote mainframe access coming in second at 8 responses.

The data in Table 28 show frequencies of a particular rank rating, given by the respondents, of a specific personal computer data telecommunications operation performed by the responding teachers. The rating scale given for rank order was 1 as the most important operation performed by the respondents to 9 as the least important operation performed by the respondents. The top two operations receiving responses for each rank of importance are as follows: (1) messaging: 49 responses, with connecting to information services coming in second at 41 responses; (2) downloading and messaging tied with 30 responses; (3) downloading: 34

<table>
<thead>
<tr>
<th>Operations Performed</th>
<th>Importance Rating By No. of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Most Important</td>
</tr>
<tr>
<td></td>
<td>1  2  3  4  5  6  7  8  9  N/R</td>
</tr>
<tr>
<td>Messaging</td>
<td>49  30  8  11  7  7  3  2  0  23</td>
</tr>
<tr>
<td>Connecting to Information Services</td>
<td>41  27  13  13  9  4  1  0  2  30</td>
</tr>
<tr>
<td>Downloading</td>
<td>6   30  34  16  9  6  3  1  1  34</td>
</tr>
<tr>
<td>Uploading</td>
<td>4   6   18  26  20 13  6  3  1  43</td>
</tr>
<tr>
<td>Searching Data Base</td>
<td>12  12  16  12  22  19  5  0  2  40</td>
</tr>
<tr>
<td>Computer Conferencing</td>
<td>10  8   8  11  8  19  22 4  1  49</td>
</tr>
<tr>
<td>Online Interactive Tutorial</td>
<td>5   1   4  5   7  10  31 24 2  51</td>
</tr>
<tr>
<td>Remote Mainframe Access</td>
<td>8   3   6  2   3  5  12 43 8  50</td>
</tr>
<tr>
<td>Other</td>
<td>0   0   0  0   0  0  0 1  13 126</td>
</tr>
<tr>
<td>Total</td>
<td>135 117 107 96 85 83 83 78 30 446</td>
</tr>
</tbody>
</table>
responses, with uploading coming in second at 18 responses; 
(4) uploading: 26 responses, with downloading coming in 
second at 16 responses; (5) searching data base: 22 
responses, with uploading coming in second at 20 responses; 
(6) computer conferencing and searching data base tied with 
19 responses; (7) online interactive tutorial: 31 responses, 
with computer conferencing coming in second at 22 responses; 
(8) remote mainframe access: 43 responses, with online 
interactive tutorial coming in second at 24 responses; and 
(9) "other": 13 responses, with remote mainframe access 
coming in second at 8 responses.

The data in Table 29 show the frequencies and percentages 
of the number of students the respondents have who use 
personal computer data telecommunications. According to the 
data in Table 29, most respondents (61 [43.6%]) have groups 
of students in the 1 to 10 classification while the least 
number of respondents (2 [1.4%]) indicated they have a group 
in the 30 to 40 classification.

The data in Table 30 show the frequencies and percentages 
of the number of teachers who use personal computer data 
telecommunications in their respective school systems as 
determined by those respondents. The data in Table 30 
indicate most responding schools (101 [72.1%]) have from 1 to 
5 teachers who use personal computer data telecommunications 
while the least number of responses (1 [0.7%]) was indicated
for the 11 to 15 group of teachers using personal computer data telecommunications.

Table 29. Numbers of Students Respondents Have Using Personal Computer Data Telecommunications.

<table>
<thead>
<tr>
<th>Number</th>
<th>Students</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Response</td>
<td>34</td>
<td>24.3</td>
</tr>
<tr>
<td>1 to 10</td>
<td>61</td>
<td>43.6</td>
</tr>
<tr>
<td>11 to 20</td>
<td>25</td>
<td>17.9</td>
</tr>
<tr>
<td>21 to 30</td>
<td>9</td>
<td>6.4</td>
</tr>
<tr>
<td>30 to 40</td>
<td>2</td>
<td>1.4</td>
</tr>
<tr>
<td>40 or more</td>
<td>9</td>
<td>6.4</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 30. Number of Teachers Using Personal Computer Data Telecommunications in Their Respective Schools As Determined by Respondents.

<table>
<thead>
<tr>
<th>No. Teachers/School</th>
<th>Schools</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Response</td>
<td>18</td>
<td>12.9</td>
</tr>
<tr>
<td>1 to 5</td>
<td>101</td>
<td>72.1</td>
</tr>
<tr>
<td>6 to 10</td>
<td>17</td>
<td>12.1</td>
</tr>
<tr>
<td>11 to 15</td>
<td>1</td>
<td>0.7</td>
</tr>
<tr>
<td>16 to 20</td>
<td>3</td>
<td>2.2</td>
</tr>
<tr>
<td>Total</td>
<td>140</td>
<td>100.0</td>
</tr>
</tbody>
</table>
CHAPTER 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The purpose of this chapter is to present a summary along with conclusions and recommendations concerning the identification and data telecommunications surveys which were used to determine the extent of development and current uses of personal computer data telecommunications systems in Montana's public senior high schools.

Summary

This study's main intent has been to determine the extent of development and the current uses of personal computer data telecommunications systems in Montana's public senior high schools in order to judge the future development of personal computer data telecommunications. To determine the extent of that development, a set of four objectives designed to identify schools with telecommunications capabilities and examine their operation in particular subject areas was created:

1. To identify Montana public senior high schools that have personal computer data telecommunication systems;
2. To determine the hardware and software components used in the identified schools' personal computer data telecommunications systems;
3. To determine in which subject areas high school teachers use personal computer data telecommunications in classroom; and
4. To determine the most important types of telecommunications operations which are being performed in the classroom by students and teachers.

Two survey instruments were used to provide the necessary data. These instruments were designed with considerable help from the faculty members of the Department of Education and the Department of Agricultural and Technology Education at Montana State University.

The literature appears to forecast that for at least another 15 years, the information technologies will continue to rapidly increase in power while decreasing in cost. Therefore, the relevant question facing educators and policymakers should not be what it is going to cost to modernize the educational system, but what it is going to cost if the educational system does not make those essential investments in technology and training. Clearly, it will be more costly to ignore technology than to use it. It has become apparent that distance education mediated by personal computer data telecommunications can be effective for classroom instruction.
In order to provide effective classroom instruction through personal computer data telecommunications in Montana, it is necessary to determine the state's current data telecommunication capabilities. Two surveys were developed to collect that information.

The first instrument identified 117 out of 173 Montana public high schools which had personal computer data telecommunications capabilities. Of the 117 schools identified, a population of 296 teachers involved with personal computer data telecommunications in their schools was established.

The second instrument was then sent to 160 teachers who had been drawn from that population of 296 teachers. Out of those 160 surveys, 140 were returned for a 87.5% return rate. The data collected fell into four general areas: demographic; equipment used, both hardware and software; subject use; and implementation information.

**Conclusions**

Based on the analysis of the data collected by the two surveys, the researcher drew the following conclusions:

1. Slightly more than two-thirds of Montana public high schools have personal computer data telecommunications capabilities;
(2) IBM or IBM clones are the most commonly used computer for personal computer data telecommunications followed by Apple computers and then Macintosh computers;

(3) The modem speeds of 1200 and 2400 baud were used about equally, followed by the "other" speed classification;

(4) Schools had dedicated telephone lines available for personal computer data telecommunications about as often as they had multi-use lines available;

(5) Almost three-quarters of the schools had a telephone line available in the classroom;

(6) Procomm telecommunications software was clearly the most used software;

(7) The study indicates that slightly more than four-fifths of the schools surveyed did not offer a specific course in personal computer data telecommunications;

(8) Subject areas which use personal computer telecommunications were led by computer science and business, but many other areas were represented with no clear leader; and

(9) It was found in this study that teachers considered connecting to information services as the most important use of personal computer data telecommunications for their students, followed by messaging; while messaging was rated most important
for the teachers themselves with connecting to information services second.

**Recommendations**

The results of the data presented in this study suggest the following recommendations:

(1) Since Montana public high schools have the equipment to data telecommunicate, it appears that more teacher training needs to be made available across the curriculum to increase the use of personal computer telecommunications in the schools;

(2) An in-depth study of how personal computer data telecommunications can be integrated into classroom instruction, complete with lesson plan formats, is needed;

(3) A survey should be conducted to determine whether the cost of long distance telephone service has inhibited the growth of personal computer data telecommunications; and

(4) A study should be conducted to determine the education needs and wants of teachers, students, and administrators which could be serviced by bulletin board systems.


Levinson, E., (1990, October). Will technology transform education or will the schools co-opt technology. Phi Delta Kappan pp. 121-126.


APPENDICES
APPENDIX A

IDENTIFICATION SURVEY
Dear Principal,

This is an identification survey to establish a sample of teachers who are involved with telecommunications using personal computers, modems and telephone lines. The information you provide will be kept strictly confidential. School and teacher names will be eliminated from the research paper. This research is being completed for a Masters of Science degree in Technology Education. Information you supply is critical for this study, please take a few moments to fill out and mail the attached postcard. Upon receipt of your completed card your school will become eligible for a drawing that will give away a 2400 baud modem.

Thank you for your help in this study.

Sincerely,

[Signature]

John R. Schorger

1. Does your school have a personal computer and a modem attached to a telephone line available for student and teacher use?  
   YES_______ NO_______

2. If you answered yes to the above question, please list the person or persons involved with this type of telecommunications and mail this card to become eligible for the drawing. If you answered no to the above question please mail this card to become eligible for the drawing.

(Please print names)

1. ____________________________________________

2. ____________________________________________

3. ____________________________________________

4. ____________________________________________
APPENDIX B

DATA TELECOMMUNICATIONS SURVEY
Data Communications Survey

Data telecommunications, for the purposes of this study, will be defined as a telecommunications system that is comprised of a personal computer, modem, software and a telephone line which allows the user to connect to another data telecommunications system.

Equipment

Hardware:

1. Please indicate the number and type of computers used for data telecommunications in your school by circling the appropriate number. Do not list computers that are not linked to a modem.

   a. IBM or clone 1 2 3 4 5 More
   b. Apple 1 2 3 4 5 More
   c. Macintosh 1 2 3 4 5 More
   d. Other:_______________ 1 2 3 4 5 More

2. Please indicate the baud rate and number of modems used in data telecommunications in your school by circling the appropriate number:

   a. 300 baud 1 2 3 4 5 More
   b. 1200 baud 1 2 3 4 5 More
   c. 2400 baud 1 2 3 4 5 More
   d. Other:__________ 1 2 3 4 5 More

3. Identify the type and number of telephone lines available in your school for data telecommunications by circling the appropriate number.

   a. Dedicated line 1 2 3 4 5 More
   b. Multi-use school line 1 2 3 4 5 More
   c. Other:_________________ 1 2 3 4 5 More

4. Is line access available in your classroom? Yes ___ No____

5. If the answer is no to the above question please rate the difficulty of access by checking the most appropriate description.

   Very Convenient___ Convenient___ Difficult___ Very Difficult___

Software:

Please list the names of the two most used telecommunications software programs in your school in the order of their frequency of use. Do not list information services.

Examples: IBM- Pro Comm or Mac-White Knight

1. Most used: ________________________________
2. Used: ________________________________
Classes

1. Does your school offer a specific class in personal computer data telecommunications that is at least one quarter in length?
   Yes ___ No ___

   A. Please check all subject areas where personal computer data telecommunications skills are taught and used in your school.

   Art ___ Foreign Language ___ Physics ___
   Biology ___ Industrial Arts ___ Social Studies ___
   Business ___ Language Arts ___ Tech. Ed. ___
   Chemistry ___ Mathematics ___ Vo. Ag. ___
   Computer Science ___ Physical Ed. ___ Other: ______
   Earth Science ___

   B. Please check other subject areas where personal computer data telecommunications skills are used but instruction is not provided.

   Art ___ Foreign Language ___ Physics ___
   Biology ___ Industrial Arts ___ Social Studies ___
   Business ___ Language Arts ___ Tech. Ed. ___
   Chemistry ___ Mathematics ___ Vo. Ag. ___
   Computer Science ___ Physical Ed. ___ Other: ______
   Earth Science ___

2. What is your teaching subject area? ______________________________

Implementation

1. Please rank in order of importance the following uses of personal computer data telecommunications for your students. (1 most important, 9 the least important)

   STUDENTS

   _____ Messaging
   _____ Connecting to information services
   _____ Downloading files
   _____ Uploading files
   _____ Searching data base
   _____ Computer conferencing
   _____ Online interactive tutorial
   _____ Remote mainframe access
   _____ Other: ___________________

2. How many students do you have that use personal computer data telecommunications? (Do not count an individual student more than once)
   Number ______
2. Please rank in order of importance the following uses of personal computer data telecommunications for yourself. (1 most important, 9 the least important)

TEACHER

[ ] Messaging
[ ] Connecting to information services
[ ] Downloading files
[ ] Uploading files
[ ] Searching database
[ ] Computer conferencing
[ ] Online interactive tutorial
[ ] Remote mainframe access
[ ] Other:____________________

How many other teachers in your school use personal computer data telecommunications? Number:____

Demographic Information

1. Please indicate the class of your school system by circling the appropriate designation. AA A B C

2. How many teachers are there in your school system? ________

3. What is your average class size? ________

4. How many years have you been teaching? ________

5. How many years have you been using personal computer data telecommunications?

   a. Personally ________
   b. In classroom ________

6. How did you learn about telecommunications?

Thank you for taking the time to complete this survey. Please return by sealing the survey with the enclosed sticker. Postage and addressing has been provided.
APPENDIX C

DATA TELECOMMUNICATIONS SURVEY

COVER LETTER
Dear Teacher,

Thank you for taking the time to fill out this survey. Being a teacher on leave myself, I can appreciated how difficult it is to find time to do something extra. This survey has been designed to take less than fifteen minutes to complete. I am asking you to take this time out of your schedule to provide information about personal computer data telecommunications in Montana. Information gathered by this survey will be used in a Masters of Science degree in Technology Education professional paper and be made available to the Office of Public Instruction, the Technology Education program and library at Montana State University.

Your answers will be kept strictly confidential and your name will not appear in the research results. The survey forms are coded only for statistical purposes. Every survey is extremely important to this research project so please take the time to complete and return the survey as soon as possible. The completed survey must be received by March 18, 1992 for your school to be come eligible for a drawing that will award a 2400 baud modem.

Thank you again for your response and the help it will provide.

Sincerely,

John R. Schorger
APPENDIX D

DATA TELECOMMUNICATIONS SURVEY

FOLLOWUP COVER LETTER
10 March 1992

Dear Teacher,

Several weeks ago I sent a telecommunications survey to you. It is critically important to this study that I receive as many returns as possible. Would you please take the time to fill out this survey and return it. A second survey form and postage is enclosed. If you have returned the survey please disregard this letter but if you have not I would greatly appreciate the ten to fifteen minutes you give to this project.

Thank you again for your response and the help it will provide.

Sincerely,

John R. Schorger
APPENDIX E

LIST OF RESPONDENTS SCHOOLS
1. Alberton HS
2. Anaconda HS
3. Augusta HS
4. Beaverhead Co HS
5. Belgrade HS
6. Big Sandy HS
7. Bigfork HS
8. Bigfork HS
9. Billings Pub Schools
10. Billings Pub Schools
11. Billings West HS
12. Blue Sky School
13. Blue Sky School
14. Box Elder School
15. Bozeman HS
16. Bozeman HS
17. Bozeman HS
18. Brady Pub Schools
19. Bridger HS
20. Broadwater Co HS
21. Browning HS
22. Broadwater Co HS
23. Butte High School
24. Carter Co HS
25. Cascade HS
26. Cascade HS
27. Charlo HS
28. Charlo Pub Schools
29. Chester HS
30. Chinook HS
31. Choteau HS
32. Circle HS
33. Colstrip Pub Schools
34. Colstrip Pub Schools
35. Conrad HS
36. Conrad High School
37. Culbertson HS
38. Custer Co HS
39. Custer Co.H S
40. Custer Pub Schools
41. Custer Public Schools
42. Cut Bank High School
43. Darby HS
44. Dawson Co HS
45. Denton Public Schools
46. Drummond Pub Schools
47. Dutton Pub Schools
48. Fergus HS
49. Fergus High School
50. Flathead High School
51. Flaxville Pub Schools
52. Foid High School
53. Forsyth HS
54. Fort Benton
55. Frazer Pub Schools
56. Frazer Public Schools
57. Garfield Co HS
58. Geraldine Pub Schools
59. Geyser Pub Schools
60. Glasgow HS (*)
61. Glasgow HS
62. Grass Range Pub Schools
63. Great Falls HS
64. Great Falls Pub Schools
65. Hardin High School
66. Harlem HS
67. Harlowton Pub Schools
68. Harlowtown Pub Schools
69. Harrison Pub Schools
70. Harrison Pub Schools
71. Havre HS
72. Havre HS
73. Helena Pub Schools
74. Helena Pub Schools
75. Hinsdale Pub Schools
76. Hot Springs H.S.
77. Huntley Project H S
78. Jefferson HS
79. Judith Gap Schools
80. Kremlin-Gildford Schools
81. Lambert Public Schools
82. Lincoln Co HS
83. Madison Valley HS
84. Malta HS
85. Medicine Lake HS
86. Melstone Pub Schools
87. Moore Pub Schools
88. Opheim Pub Schools
89. Outlook Pub Schools
90. Park Senior HS
91. Peerless Pub Schools
92. Plains HS (*)
93. Plains HS
94. Polson HS
95. Polson HS
96. Poplar HS
97. Powder River Co. Dist HS
98. Pryor Pub Schools
99. Rapelje Pub Schools
100. Reedpoint Pub Schools
101. Roberts Pub Schools
102. Ronan HS
103. Ronan HS
104. Rosebud Pub Schools
105. Rosebud Pub Schools
106. Roy Pub Schools
107. Ryegate Pub Schools
108. Saco HS
109. Saco High School
110. Scobey HS
111. Shields Valley Schools
112. Shelby HS
113. Shepherd High School
114. Sheridan Schools
115. Shields Valley Schools
116. Sidney HS
117. Sidney HS
118. St Regis Pub Schools
119. St. Regis Pub Schools
120. Stanford Pub Schools
121. Stevensville HS
122. Stevensville HS
123. Sweet Grass Co HS
124. Terry Pub Schools
125. Three Forks Pub Schools
126. Three Forks
127. Valier Pub Schools
128. Valier Pub Schools
129. Victor School
130. White Sul Spgs HS
131. White Sul Spgs Pub
132. Whitewater Pub Schools
133. Wibaux HS
134. Willow Creek Pub Schools
135. Willow Creek Pub Schools
136. Winifred Pub Schools
137. Winnett Pub Schools
138. Winnett Public Schools
139. Wolf Point HS
140. Wolf Point HS

* Denotes schools which received a 2400 baud modem as a drawing prize.
APPENDIX F

COMMENTS TO THE QUESTION:

HOW DID YOU LEARN ABOUT TELECOMMUNICATIONS?
Administrative courses - Taught computer literacy courses at AgriData workshop.
Agridata instruction from MSU.
As a requirement for a superintendent.

Big Sky Telegraph.
Big Sky Telegraph.
Big Sky Telegraph.
Big Sky Telegraph.
Big Sky Telegraph.
Big sky telegraph demonstration at Big Sky Reading.
Big sky, western college.
Books.
Brick wall.
Business education conference and workshop.

Chemistry safety classes.
Classes through WMC.
Classes.
Classes and self instruction.
College education and Big Sky Telegraph.
College Telecommunications class.
Conferences on telecommunications and distance learning, MEA conference, MCCC news letter.
Conferences.
Conference. Participated in Multi-media workshop at MSU Summer 1990.
Courses and Reading.
Course work.

Dept Ag & TE MSU.
Distance learning conference to Big Sky Telegraph.
Distance learning conference in Billings.
Distance learning workshop, curriculum consortium.

Edunet.
Edunet.
Edunet.
Edunet.
Edunet Flyers, Big Sky Flyers.
EMC Class.

Fellow teacher.
Fellow teacher.
Frank Odasz of WMC.

Golden triangle Curriculum Cooperative.

I became a facilitator for the Metnet system. I have been using Metnet for teacher exchange and am starting pen pals for students.
I learned from Judy Andeson, our director of Technology. Impact Project. Impact Program by NSF at UM and MSU. Impact project "Integrated Mathematics Program and Computer Information sent by university system to the school system. Inservice and workshops.

Knowledge from others.

Library job requirement.
Literature.

Magazines.
MBEA conference in Billings.
MBEA conferences and workshops.
MBEA Convention.
Media/methods, conferences, salesmen.
Metnet, Magazines.
Metnet.
Metnet.
Metnet & Edunet, Star Schools.
Metnet, Edunet.
Montana Home Economics Association.
MSTA.
MSU.
MSU training on AgNet.
MVA leadership conference.

National Geographic Kids Network field testing.
Northern Montana College for a number of years.

On my own, mostly trial and error and through teaching other teachers.
One day Workshop MSU.
OPI Workshop.
OPI Workshop.
OPI Workshop.
OPI Workshop.
OPI Workshop.

Personal interest.
Primary self taught, Agnet and AgriData.

Reading.
Reading.
Reading, and edunet, impact.
Readings and workshops.

Sam.
Science Lab Safety- Continuing Education through M.S.U.
Self, magazines.
Self taught.
Self Taught.
Self taught plus on-line course work.
Self Taught.
Self taught.
Self taught.
Self Taught.
Self taught.
Self taught, Edunet.
Self taught.
Seminar, self taught.
Summer school WMC.
Summer School and professional workshops.

Through classes taken at MSU - Physics, through MCTM.
Through computer science teacher and while in navy.
Through educational workshops for distance learning.
Through Edunet and college classes.
Through impact project.
Through Northeastern Montana Curriculum Consortium.

Update.
Update conference.

We use telecommunication to teach foreign languages.
When I was getting my teaching certificate at MSU Agridata Services was my first exposure.
Workshops.
Workshops.
Workshops.
Workshops.
Workshops.
Workshops.
Workshops.
Workshops.
Workshops and Big Sky Telegraph.
Workshops and online class.
Workshop at EMC with instructor from WMC.
Workshops, Metnet.
Workshops, teachers, Metnet.
Workshop through professional organizations.

Young Scholars, Summer workshop.
APPENDIX G

LIST OF TWO MOST USED SOFTWARE
First choice of software:

Agridata
Apple - Pro Comm - IBM
Apple - Pro Comm
Apple Prometheus
Apple ProComm
Apple ProComm
Apple - Pro Comm
Apple - procomm
Apple Prometheus ProComA

beagle brothers telecom
Big Sky Telegraph
Binkley Term
Bit Com
Bit Comm

Cross Talk

Data Linker

Edunet

First Choice

G Async-server for net

HA5
HA5

Hyper Access
Hyper Access
Hyper Access 5
Hyper Access 5
Hyper Access
Hyper Access
Hyper Access Five
Hyper Access 5
Hyper Access 5
Hyper Access
hyperaccess

IBM
IBM First Choice
IBM
IBM ProComm
IBM ProComm
IBM Pro Comm
IBM procomm
IBM Pro Comm
IBM Works
IBM
IBM ProComm

MS Works
MS Works
MS Works"
MS Works
MS Works
MS Works
Microsoft Works
Microsoft Works
Microsoft Works

Mac

Modem Manager
Modem Master
Modem Master
Modem Master

National Geographic
National Geographic Net

Point
Point to point
Point to point

ProComm
ProComm
Pro Comm
Pro Comm
ProComm
Pro Comm
Pro Comm
ProComm
Pro Comm
Pro Comm
Pro-Comm
Pro Comm
Pro Comm
Pro-Comm
Pro Comm
Pro Comm
Pro-Comm
Pro Comm
Pro Comm
Pro -comm
ProComm
ProComm
ProComm
ProComm
ProComm
Pro Comm
ProComm
ProComm
Pro Comm - Apple & IBM
ProComm
ProComm
ProComm
ProComm
ProComm
ProComm
ProComm
ProComm
ProComm
ProComm
ProComm
ProComm
Promethesus
Quick Link
Q-Link
Quick Link II
Quick Link
Quick Link
Quick link
Quick Link II
Red Ryder
red ryder
smartcom
Smart Comm
Talk is cheap
Telecom
Tele Comm
Second choice of software:

AccessII
AgriData
Apple AccessII
Apple
Appel Access
Apple access II
Apple Data Linker
Apple ProComm
Apple Access
Apple IIE
Apple Pro Com
Apple works telecom

Crosstalk
Edunet
GeoComm

HA5
Hyper Access
Hyper Access 5
Hyper Access 5

Hayes

IBM Crosstalk
IBM Hyper Access
IBM ProComm

METZ

MS Works
MS Works
Microsoft Works
Microsoft Works
Microsoft Works
Microsoft works
Microsoft
Microsoft works

Mac Microphone
MetNet
NASA

PC-Link
Point
Point

ProComm
Pro Comm
Pro Comm
Pro Comm
procomm
ProComm Plus
ProComm
ProComm
Pro Comm
ProComm
Pro Comm

Prodigy
Prodigy

Prometheus

Quick Mail for Mac

Telix

White Knight
APPENDIX H

TEACHING SUBJECT AREAS
Chapter 1

Chemistry
Chemistry

Computer
Computer
Computer
Computer
Computer
Computer
Computer and Ag. Ed.
Computer coordinator
Computer English
Computer, gifted and talented, music
Computer/math
Computer/math
Computer/science/math
Computer science
Computer resource

Counselor
Counselor network coordinator

Earth Science
Earth Science

Elementary Education

English
English, German, Library

German, English, Lib.
German, English, Computer, Librarian

HS Principal

Home Economics
Home Economics
Home Economics, computer science

IA/TE

Junior High Math and Library

Librarian
Librarian
Librarian
Librarian
Librarian
Librarian/math
Library
Library
Library
Library
Library
Library
Library
Library and distance learning
Library/media
Library/media
Library/media/distance learning
Math
Math
Math
Math
Math
Math
Math and distance learning
Math/computers
Math/computers
Math/computers
Math/computers
Math/computers
Math/physics/computers
Math/science/computers
Math/science

Music

Physics/Chemistry

Principal
Principal

Science
Science
Science
Science
Science
Science
Science
Science
Science
Science
Science and History

Social Studies/Library

Staff support/computer aide

Tech. Ed
Tech. Ed
Tech. Ed
Tech. Ed
Tech. Ed
Tech. Ed
Tech. Ed
Tech. Ed

Technology coordinator
Vo. Ag.
Vo. Ag.
Vo. Ag.
Vo. Ag.
Vo. Ag.
Vo. Ag.
Vo. Ag.
Vo. Ag.
Vo. Ag. and T.E.