

**UNDERSTANDING THE GENDER GAP
IN
SECONDARY TECHNOLOGY EDUCATION PROGRAMS OF MONTANA**

by

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TABLE OF CONTENTS

APPROVAL	ii
STATEMENT OF PERMISSION TO USE	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	v
ABSTRACT	vi
CHAPTER 1: THE PROBLEM AND ITS SETTING	1
Introduction	1
Purpose of the Study	3
Need for the Study	3
Objectives	6
Assumptions	6
Limitations	7
Definitions	8
Summary of the Problem and Its Setting	9
CHAPTER 2: REVIEW OF RELATED LITERATURE	10
The Importance of Technological Literacy	10
Females and Technology	10
Legislation Regarding Gender Equity in Technology Education	11
Female Participation in Technology Education	12
Teaching Females About Technology	13
Suggested Barriers to Female Participation in Technology Education	14
Social Barriers	14
Educational Barriers	15
Technology Education in Montana	17
Summary of the Review of Literature	18
CHAPTER 3: PROCEDURE	20
Introduction	20
Sample Selection	20
Development of the Instrument	21
Data Analysis	23
Summary of the Procedure	24

CHAPTER 4: PRESENTATION AND INTERPRETATION OF DATA	25
Introduction	25
Demographic Data	25
Descriptive Data	33
Summary of the Data Analysis	41
CHAPTER 5: SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS	43
Summary	43
Conclusions	44
Recommendations	45
REFERENCES	48
APPENDICES	51
Appendix A: Enrollment Figures	52
Appendix B: Participating Technology Educators	54
Appendix C: Preliminary Research Instrument	57
Cover Letter	58
Preliminary Survey	59
Appendix D: Final Research Instrument	62
Instructor's Instructions	63
Final Cover Letter	64
Final Survey	65
Thank You Card	68
Reminder Card	68

LIST OF TABLES

Tables	Pages
Table 1. Economic Base of Community	26
Table 2. Parental/Living Situation of Participants	27
Table 3. Survey Participants Who Had Siblings at Home	28
Table 4. Mother's (Stepmother's) Level of Education	29
Table 5. Father's (Stepfather's) Level of Education	29
Table 6. Occupation of Survey Participant's Mother (Stepmother)	30
Table 7. Occupation of Survey Participant's Father (Stepfather)	31
Table 8. Classification of Participating Schools	32
Table 9. Responding Students. School Size.	33
Technology Education Participants	
Table 10. Technology Education Class Enrollment	33
Table 11. Number of Females in Reported Technology Educ. Classes	34
Table 12. Gender of Technology Education Instructor	34
Table 13. Course Content of Technology Education Class	35
Table 14. Reason for Participating in Technology Education	35
Table 15. Reason for Almost Not Taking Technology Education	36
Table 16. Satisfaction With Technology Course	36
Table 17. Reasons for Not Enjoying Technology Education	37
Table 18. Reasons for Not Taking Technology Education	38
Table 19. Desired Course Content of Technology Education	39
Table 20. Desired Course Content of Continued Technology Education	39
Table 21. Is Technology Education Important	40
Table 22. Future Career Plans	41

ABSTRACT

The purpose of this study was to determine if there are environmental, social, or educational barriers to female participation in secondary technology education programs in Montana schools. The study was conducted because female enrollment in technology education programs is, and has been for many years, considerably lower than male enrollment in such programs.

A questionnaire was developed to gather data that might help educators to understand the reasons for the extreme gender imbalance in technology education programs. The questions evolved through studies of similar previous research tools, discussion with other educators, and input from a test group of students who completed a preliminary survey.

Twenty-nine schools were asked to participate in the survey process. These schools were identified through a stratified-random selection process to include an appropriate balance of Class AA, A, B, and C schools from across Montana. Data from the twenty-three responding schools are presented in the study.

A convenient-random sample of twelfth-grade females was selected by technology educators from the participating schools. Each instructor was asked to administer the survey to a predetermined number of students, both technology education participants and non-technology education participants. Of the 190 questionnaires distributed, 137 were completed and returned.

The major conclusion of the study is that stereotypes about vocational training persist. In spite of the need for technological literacy, students view vocational /technical training as less meaningful than academic training. A notable number of study participants indicated four main reasons for not participating in technology education: They are not interested in it, technology education is not required for high school graduation or college entrance, they have no time for technology courses after completing required courses, and they simply do not want to participate in technology education.

CHAPTER 1

THE PROBLEM AND ITS SETTING

Introduction

Throughout history humans have used technology, in process and in product, to adapt their environment. Technology is inventing and using tools that extend human capabilities. It is the "HOW that links WHAT IS to WHAT SHOULD BE" (Kerka, 1994).

The study of technology, technology education, may seem similar to vocational education because it revolves around experience-based teachings. Yet it also incorporates the application of math, science, and computer concepts. In technology education, students learn to "live technology" (Hunter, 1992, p. 26). Their future quality of life will depend upon the attitudes, values, and abilities with which they can cope with technology.

The age of industry is past; success in today's workplace requires both academic and technological literacy. Technological literacy means that a person understands that technology is used to solve problems and human needs. A person who is technologically literate can make informed decisions regarding technological goods and services. He/she can adapt technology to meet new situations and can adapt to meet new technologies. Without technological literacy, a person is not really educated.

Historically, vocational education has been characterized by a high degree of sex segregation (Robbin, 1992). In fact, before Title IX of the Education Amendments in 1972, access to non-traditional courses as well as to some vocational schools was legally denied to females. As a result, male students were concentrated in industrial and

agricultural education, while females were in home economics and entry-level clerical occupations. All secondary students need to be technologically literate; however, as in other vocational programs, enrollment in technology education programs is primarily male.

Even during the past decade when Americans have boasted of sexual enlightenment, research regarding gender roles in the classroom has been far from encouraging. Despite legislation demanding gender equity in schools and despite the feminist movement of the twentieth century, "society's gender-sorting machinery still grinds away, steering girls forcefully into outdated female roles" (Schrof, 1993, p. 42).

Female access to male-dominated occupations--those with higher salaries, greater benefits, and longer career paths--has been restricted. Presently, females represent 45% of the workforce, but they are clustered in only 20 of 400 occupational categories (LeBreton; Loevy, 1992). According to Robbin (1992), more than three fourths of them are employed in traditionally female-dominated occupations.

Silverman and Pritchard (1993a) concluded that females faced issues of sexism and stereotypes regarding appropriate career choices. Although they might have enjoyed technology and other vocational classes, they saw no connection to their world of work and felt as if they did not belong. "Females have been relegated to training for fields stereotyped as female or 'pink-collar'" (Lakes; Pritchard, 1991, p. 2). Educators must empower female students in both traditional and nontraditional programs.

Purpose of the Study

A vital part of the secondary vocational education programs today is the issue of gender- equity training for teachers. In fact, at least a few schools in all 50 states have hired gender-equity trainers (Schrof, 1993). However, enrollment in technology education programs has not achieved a balance of gender. The first step toward eliminating the gender gap in technology education is to attempt to understand the reasons for it. The purpose of this study was to identify possible causes of gender inequity in the secondary technology education programs of Montana.

Need for the Study

Technology has a profound impact on the world of work. It is becoming an increasingly important factor in the nation's economy. Historically, technological innovations have given rise to new jobs. As we near the year 2000, the transformation from a manufacturing to an information/service-based economy will cause significant workforce issues.

The importance of technology education in secondary schools cannot be overstated. "Technological literacy is vital to individual, community, and national economic prosperity" ([International] Technology Education Association, 1996, p. 6). All workers will need to be technologically literate because the skill requirements of the workplace will be immersed in technology (Sommers, 1995) But understanding technology may mean more than just a paycheck for these workers: "Beyond economic vitality is the realization that how people develop and apply technology has become

critical to future generations, society, and even the Earth's continued ability to sustain life" (International, 1996, p. 6). Schools and educators share a responsibility to prepare students for the future and to provide them with the resources needed to be economically successful and morally responsible citizens.

Unfortunately, many female students are not achieving technological literacy. They are discouraged from taking technology education in high school because stereotypes about appropriate careers for females still exist.

They don't know enough about technological careers, don't connect what they are learning in the classroom with careers and are uninformed about economic realities and the world of work. They often see work as either some kind of profession, like lawyer or doctor, or work in an office or store. They don't realize there are a lot more options, especially in technological fields (Silverman and Pritchard, 1993a, p. 4).

A recent study examined the technology education programs of middle and secondary schools in Connecticut. The results indicated a variety of reasons for the lack of female participation in these programs. Among the findings were such issues as peer attitudes, sexual stereotyping, class format, self confidence, and scheduling difficulties. Many of the females in the study also indicated that they perceived technology education programs as having little connection to the real world (Silverman & Pritchard, 1993b).

Some researchers claim that female attitudes about non-traditional studies and careers are determined by their parents—that parents treat sons and daughters differently right from birth. Later as children enter school, parental influence again reinforces the gender issue. Males generally are encouraged to explore mechanical and scientific

activities while females are directed to pursue artistic and literary interests (McInerney, Park, 1986).

Husher (1992) felt that schools must change their approach to technology education so that more females will pursue careers in technology:

There is a need to interest many more young people in scientific and technological careers so that America can stay competitive in a global economy. But the trend in higher education is downward--as fewer men emerge from engineering schools in the coming years, the candidate pool for jobs in science and technology keeps shrinking. If we want to maintain the size and caliber of our scientific work force, then women must participate (p. 2).

Statistics for technology education programs in Montana reflect low enrollment by females. (Statistics for secondary technology education enrollment by females in Montana may be found in Appendix A.) Montana is a primarily rural area where females commonly engage in physical, outdoor types of work. But in education and career choice, females continue to follow traditional goals. Many females follow academic courses of study, but those who choose to pursue vocational training generally select less technology-oriented careers.

More females must participate in technology for our nation to remain competitive in the global economy (Husher, 1993). Educators in Montana must also work toward opening the field of technology to women. To do this requires that technology education programs in secondary schools of Montana strive for gender equity. Wulf (July 9, 1996) believed that Montana's schools have made little progress toward gender equity in technology education programs: "I believe the main reason for this is the raising of high

school graduation and college entrance requirements. Girls don't have time to take technology education."

This study will seek to identify existing environmental, educational and social barriers for female participation in Montana's secondary technology education programs. Only after understanding why this imbalance exists, can change occur.

Objectives

In order to accomplish the purpose of this study, the following specific objectives were established:

- 1) To determine the educational, environmental and social barriers to female participation in secondary technology education programs, as perceived by twelfth-grade females enrolled in such programs and
- 2) To determine the educational, environmental and social barriers to female participation in secondary technology education programs, as perceived by twelfth-grade females not enrolled in such programs.

Assumptions

- 1) Technology education programs are a vital part of secondary schools in Montana.
- 2) Technology education programs in secondary schools in Montana are available to females.

- 3) There are barriers to female participation in technology education programs in secondary schools in Montana.
- 4) Female students enrolled in technology education programs can perceive environmental, educational and social barriers to their participation in technology education.
- 5) Female students not enrolled in technology education programs can perceive environmental, educational and social barriers to their participation in technology education.

Limitations

The following limitations were identified for this study:

- 1) The study will be directed at a sample of twelfth-grade female students from a sample of the ninety-eight secondary schools in Montana offering technology education to female students (as reported to OPI).
- 2) Due to the size of the study population and the selection method, the data may provide only a partial view of perceived barriers to female participation in technology education programs in the state of Montana.

Definitions

Certain terminology may be unique to this study. These terms are defined below.

- 1) Technology: The tools that extend human capabilities, the systems within which the tools are used, and an approach to the management of the environment (Kerka, 1994).
- 2) Technology Education: Education about technology. It focuses on developing skills essential for success as lifelong learners. It fosters creativity, systematic problem-solving, decision-making, and critical thinking and design skills in a cooperative laboratory environment (Hickey, 1994).
- 3) Technological Literacy: Possession of the knowledge and skills necessary to adapt to constantly emerging new technologies, new work methods, and new markets (Selby, 1993).
- 4) Gender Equity: The elimination of sex bias/discrimination in education (Lovelace; Teddlie, 1993).
- 5) Sex/Gender Stereotyping: Attributing behaviors, abilities, interests, values and roles to a person or a group of persons on the basis of their sex (Murphy; Vetter, 1990).
- 6) Class AA Schools: Schools having an enrollment of 1000 or more students and/or being geographically situated to accommodate grouping with other such schools (Montana High School Association, 1996).

- 7) Class A Schools: Schools having an enrollment of 400-999 students and/or being geographically situated to accommodate grouping with other such schools (MHSA, 1996).
- 8) Class B Schools: Schools having an enrollment of 100-399 students and/or being geographically situated to accommodate grouping with other such schools (MHSA, 1996).
- 9) Class C Schools: Schools having an enrollment of up to 175 students and/or being geographically situated to accommodate grouping with other such schools (MHSA, 1996).

Summary of the Problem and Its Setting

As we near the twenty-first century, technological literacy becomes increasingly important. In fact, if Thomas Jefferson were here today, he might insist that the right to be technologically literate be among our inalienable rights. Yet, at least where females are concerned, our schools are falling short. And the schools of Montana are no exception. This study was an attempt to investigate the reasons for gender inequity in the enrollment in secondary technology education programs of Montana.

CHAPTER 2

REVIEW OF RELATED LITERATURE

The Importance of Technological Literacy

Technology has been part of human life for over a million years, but in recent decades technology has caused more remarkable change to occur than ever before in history. Today, we all are living with technology. We now are completely surrounded by technological systems. We have become dependent upon the products and services to be greatly affected by new technological developments. Ours is a highly technological society.

Puk (1993) defined an educated person as one who uses technology to "improve the human condition by creating new things or modifying existing things" (p. 27). Our culture and economy are based on a widening variety of technologies. Success in today's workplace requires that we be technologically literate.

Females and Technology

By the year 2000, 80% of women ages 25-54 will be employed. They will comprise more than 47% of the labor force (Blosser, 1990). Adequate educational preparation can allow women to experience previously unexplored opportunities for occupational and economic well-being.

Women today enter non-traditional jobs and careers with increasing frequency, yet they continue to experience limitations on their earning power and opportunities for advancement. Perhaps this is a reflection of society's slowness to change decades of social

behavior. Despite some women's entry into non-traditional employment, they continue to be concentrated in low-paying, low-status occupations: secretaries, nurses, and elementary school teachers. "For most women, opportunity is little more than an extension of the traditional care-giving responsibilities of mother and homemaker" (Goodland; Keating, 1990, p. 96).

Women in secondary education need role models of successful women in non-traditional careers. They also need to accept the fact that they must be flexible, that they must acquire different skills, and that they will probably not have just one career. They need a sense of economic reality and an understanding of the world of work (Silverman; Pritchard, 1993b).

Legislation Regarding Gender Equity in Technology Education

On paper, the gender equity situation looks much better than it is. In fact, a variety of laws and programs have sought to establish equality. Unfortunately, success is still a long way off.

On July 1, 1972, the *Education Amendments of 1972* became law. These amendments included Title IX which mandated that all education programs receiving federal aid give females equal standing with males. These amendments were designed originally to make discrimination against women in employment illegal. They also provided the legal platform upon which later legislation for education was built (Murphy; Vetter, 1990).

In 1973, the *Women's Educational Equity Act* (WEEA) initiated a program that supported equal education rights for females, offering gender equity material for all education levels (Koch, 1994).

The *Vocational Amendments of 1976* first addressed gender equity in vocational education. The amendments required programs to eliminate gender bias/discrimination in vocational education, to encourage males and females to prepare for employment in nontraditional fields, and to provide support services for individuals to participate in nontraditional programs (Lovelace; Teddlie, 1993).

The *Carl D. Perkins Vocational Education Act* (October 19, 1984) was perhaps the most effective legislation designed to encourage female participation in technology education. This statute changed the federal vocational education policy by requiring states to spend a percentage of their federal funds on programs to eliminate gender bias and expand opportunities for females in vocational education. Title III, Part E defined a state grant program designed to "provide incentives for industry-education partnerships and to ensure that programs developed under this part are relevant to labor market demands and accessible to all segments of the population, including women" (Cusick; Wolfe, 1985, p. 6). Participation in such programs is an excellent avenue for entering a technology field.

Female Participation in Technology Education

The transition from industrial arts to technology education made the subject more attractive to both males and females. The Perkins legislation was, in part, intended to encourage the growth of female participation in technology education. However, female

participation in technology education programs did not increase significantly between 1982 and 1992. Furthermore, the level of female participation was proportionately much lower than that of males (National Center for Educational Studies, 1996).

At the college level, few women participate in technology teacher education. As recently as 1989, a study showed males comprised 89.9% of students enrolled in TTE (Technology Teacher Education) programs across the nation. This area of study is still predominantly male (Miller, 1991).

Teaching Females About Technology

Educators must appreciate the different learning styles of females and their different approach to technology (Koch, 1994). The hands-on activities of technology education appeal to the concentration skills, patience and attention to detail exhibited by girls (Silverman; Pritchard, 1993a).

An important factor for attracting and maintaining the interest of girls in technology and computer classes seems to be a cooperative learning environment (Schrof, 1993). Teachers can help by designing their classrooms and their lessons to "foster comfort and confidence in using technology (Koch, 1994, p. 19).

Female students will accept technology education more readily if they are given positive female role models. They must see that women in non-traditional occupations involving science and technology are not "weird" and most likely are not geniuses (Granstam, 1988).

Suggested Barriers to Female Participation in Technology Education

Social Barriers

A dominant social barrier to female participation in technology education is gender-role stereotyping, especially among adolescents (McInerney, Park, 1986). At a very early age parental influence plants ideas about gender roles. According to Granstam (1988) attitudes regarding gender roles are established practically from birth. "Girls learn from mothers and female teachers that a 'good girl' attempts to please others and puts her own needs last. The traditional female ideal of 'sugar and spice' keeps girls from studying 'male' subjects and encourages them to hide their intellect" (Schrof, 1993, p.43). Many girls grow up hearing that females are supposed to be helpless with regard to tasks that might get them dirty or might require some mechanical knowledge (Schrof, 1993).

Parents thoughtlessly contribute further to the gender-role stereotyping with their actions regarding home computers. Often sons are sent to summer computer camps or the family computer is placed in the son's bedroom making it practically "off-limits" to the daughter.

At school, females may be ridiculed if they display interest or talent for technology. In some cases, "boys are afraid that they'll be made fun of if girls do better so they respond by laughing at girls' ideas. ...Or they demonstrate their 'masculinity' by taking over" (Silverman; Pritchard, 1993a, p. 3). Kerka (1993) found that fear of sexual harassment and the stress of dealing with uncomfortable boy/girl situations makes persistence in nontraditional education difficult.

Because parents put more emphasis on sons' abilities in scientific and technical studies, daughters must be self-motivated regarding technology (Blosser, 1990).

Unfortunately, they are handicapped by the "internal, self-imposed limitations influenced by cultural messages girls receive" (Kerka, 1993, p. 1). Females persist in the notion that there are still some jobs only males should do. As a result, females have lower self-efficacy regarding the male-dominated area of technology education (Busch, 1995).

Silverman and Pritchard (1993b) believed that there are not enough female role models in the field of technology. According to one study, females shied away from technology education because they viewed science/technology females as being "nerdy." One female stated that she was reluctant to attend a summer technology camp because she thought "they'd all be girls wearing thick glasses with adhesive tape around the middle" (Husher, 1993, p. 16). Attitudes like these must be changed if more females are to participate in technology education.

Educational Barriers

The major responsibility for the gender inequity in technology education lies within the schools. Schools send some "not too subtle" signals that females are not expected to excel in science and technology. They are expected to excel in honors English, sociology, languages and the like (Peltz, 1990). Many schools actually track females into gender stereotyped careers. This gender segregation "mirrors gender divisions in the labor force" (Lakes; Pritchard, 1991, p. 2).

According to Lewis (1991), females are ignored—albeit subtly—in the curriculum. Even textbooks written to meet gender guidelines contain language bias, or they neglect discussion of females as leaders in technology. Technology projects are seldom “gender neutral” but are more appealing to males (Silverman; Pritchard, 1993a). Furthermore, in elementary school, when females could be “turned on” to technology; they are faced with computer games of a “shoot-em-up,” militaristic nature (McInerney; Park, 1986).

Harvey (1986) mentioned several academic myths that may be factors in low female participation in technology education. The first myth is that females outperform males in subjects that require verbal ability while males outperform females in mathematics and related subjects. The second myth is that elementary schools are hospitable to females and hostile to males. In fact, the opposite is true: According to Harvey (1986), academic and behavioral problems with males take time from school and, as a result, females are ignored rather than encouraged. Perhaps the most damning myth is this: “Educational excellence and equity in education are not compatible. One must be achieved at the expense of the other” (Harvey, 1986, p. 511). Certainly, schools must take a strong look at their philosophies and their programs if they wish to address gender equity.

Teacher attitudes play a significant role in achieving gender equity. Many female elementary teachers lack the confidence in their ability to touch on certain technology-related subjects early in a child’s education. They often ask males the technical questions or seek their assistance for classroom tasks related to technology (Koch, 1994). Teachers introduce, subconsciously, the stereotype that males are more successful in technology

than females (McInerney; Park, 1986). Students usually work only up to but not beyond the level of expectation held by their teachers. Thus, if teachers do not encourage them, females may not venture into non-traditional fields.

Often, teaching methods discourage equity within the classroom. Teachers' questioning methods are biased. Males are called on more frequently, and their answers are given more attention (Peltz, 1990). Harvey (1986) found that males are usually given more detailed instructions and more assistance than females. Because of this, females learn to become helpless. Silverman and Pritchard (1993a) also noted that teachers treated females differently. They expected more from them, particularly in terms of behavior.

Technology Education in Montana

The technology education programs in the secondary schools of Montana reflect the same enrollment patterns as other schools nationwide. Although Montana is a sparsely populated state where females often enter non-traditional fields, few females participate in technology education. Wulf (July 9, 1996) felt that more progress was made toward gender equity from 1980 to 1990 than has been made in this decade.

Overall figures from the ninety-eight schools that reported technology education enrollments indicate a significant decrease in the total number of technology education students within the last three years. Female participation has increased slightly. Class A schools report the highest enrollment in technology education programs while Class B schools report the highest female enrollment, both in number of females and percentage of

females in technology education. Unfortunately the highest ranking of 17.2% still does not take the female standing out of the non-traditional or 25% bracket.

Under the Computer Equity Expert Project, a computer programming class in one Montana school did report a marked increase in female enrollment (Koch, 1994). However, success stories like these are rare. Broader-based technology education programs continue to draw a predominantly male enrollment.

What is going on in our schools? Why are females unable or reluctant to participate in technology education programs? Even in Montana, technology permeates our lives more each day. Females cannot exclude themselves from the career opportunities in technology. Educators must uncover the reasons for lack of female participation in such programs and then strive to correct the causes of inequity.

Summary of the Review of Literature

Many writers and educators point to the need for technological literacy yet female students still appear reluctant to participate in technology education. Earlier studies have indicated a variety of possible social and educational barriers to female participation in technology education. Many of these barriers may be blamed on deeply rooted cultural beliefs, but some of the barriers to female participation in technology education are practical ones. The back-to-basics shift in education leaves little time for electives. College-bound students who must take foreign language and extra math and science have no room for non-core subjects like technology. And technology classes are often

scheduled at the same time as music or art classes. When students must choose which classes are the most valuable, technology usually loses out.

Enrollment figures for technology education classes in Montana (as shown in Appendix A) indicate a similar trend in Montana. Regardless of the size of school, few female students are participating in technology education. This study attempted to identify the barriers to female participation in technology education programs in the secondary schools of Montana.

CHAPTER 3

PROCEDURE

Introduction

The intent of this study was to explore possible factors for the gender imbalance in the technology education programs of secondary schools in Montana. Previous studies and discussions with educators had suggested reasons for the disparity; however, female students themselves are best able to explain their reluctance to participate in technology education. Direct questioning of the female students in the secondary schools of Montana was not feasible. For this reason, a questionnaire administered to female students was the most appropriate tool for obtaining the desired data.

This chapter explains the overall procedure followed during this study. Part 1 describes how the sample population was determined. Part 2 explains the development of the survey instrument, and Part 3 examines the statistical method used to analyze the data obtained through the survey.

Sample Selection

The total population for the study included twelfth-grade female students from the 98 schools reporting technology education enrollment figures to the Montana Office of Public Instruction. For descriptive research, a sample of 10% of the population is considered minimum (Gay, 1992), requiring participation by at least 10 schools. However, to achieve an appropriate sample of schools from each of the four class sizes, twenty-nine schools (30% of the schools in the reporting population) were identified

through a stratified-random selection process. First, reporting schools were numbered within groups according to whether they were Class AA, Class A, Class B, or Class C. Then, random selection was accomplished with the use of the table "Ten Thousand Random Numbers" (Gay, 1992, p. 570). A list of schools asked to participate can be found in Appendix B.

A sample of twelfth-grade females was selected by technology educators from the participating schools. Each instructor was asked to administer the survey to a predetermined number of students: an equal number of technology education participants and non-technology education participants. This number represented 30% (generously above the minimum 10% level) of the female technology education students as reported by that school the previous year and a matching number of non-technology education participants. The overall sample number was 190 twelfth-grade female students. The resulting sample more than represented 10% (94) of the average 936 technology education females, plus a matching number of non-technology education females. Names of participating students are unknown.

Development of the Instrument

The instrument for this study was developed, in part, by reviewing previous questionnaires and instruments for similar studies in other states. Further assistance was provided by Dr. Scott Davis. Multiple-choice questions were designed to generate demographic information as well as information regarding social, environmental or educational barriers to female participation in technology education programs.

A preliminary questionnaire was tested by administering it to a convenient sample of twelfth-grade female students. This sample included 52 students from Broadwater High School, Townsend, Montana. Students were encouraged to provide feedback regarding any questions they felt were ambiguous or misleading. They were also invited to add further comments or ideas regarding the substance of the questionnaire. Their response was particularly helpful in clarifying and modifying questions. A copy of the cover letter and the instrument used can be found in Appendix C.

The first mailing of the final instrument to the population sample occurred on March 17, 1997. The technology educator from each selected school was sent the designated number of questionnaires and asked to select study participants. A copy of the cover letter to each instructor can be found in Appendix D. The questionnaire was also accompanied by a second cover letter for each student. This letter explained the purpose of the survey and encouraged students to participate. Pens were provided to assist students with the process. A copy of the survey cover letter and the final instrument can be found in Appendix D.

Tracking of participant response was managed through the use of Thank You cards. Upon return of packet, each educator was sent a note of thanks. The initial response for survey participation was about 55%, with 16 of the 29 schools responding.

Unmailed Thank You cards indicated the names of educators who had not responded to survey needs within three weeks of the initial mailing. These educators were sent a reminder card on April 8, 1997. Another 7 schools responded after receiving the reminder card. That brought the response total to 79%, well within the 70% range

necessary for validity (Gay, 1992). Copies of the Thank You card and the reminder card can be found in Appendix D.

Data Analysis

The study was designed to obtain information regarding possible reasons for the gender imbalance in technology education programs. Each survey question was followed by several answer choices. The simplest way to present the results was to indicate the percentage of responders who selected each alternative for each item. Also, possible relationships between demographic information and technology education participation were investigated by comparing responses on one item with responses on other items. Although patterns and/or correlations seemed to be present in the data, these relationships were merely speculative and were not included in the analysis.

First, questionnaires were sorted two ways: by school class size (AA, A, B, C) and by participation or non-participation in technology education classes. Although the original sample was to include an equal number of technology education students and non-technology education students, the resulting sample groups were less evenly distributed. Ninety-two of the respondents were technology education students while only 45 were non-technology education students. This may have occurred because the instructors who administered the surveys to the non-technology students were unaware if the students had participated in technology education programs at a previous school.

Next, survey results were tracked for frequency of response and percentage of response. Most percentages are based on totals for the previously mentioned groups. When appropriate, some of the data relate to smaller groups within those groups.

Summary of the Procedure

The intent of this study was to find reasons for the lack of female participation in secondary technology education programs in Montana. A survey instrument was designed to explore possible educational, environmental and social barriers to female participation in technology education. Technology instructors from twenty-nine Montana schools were chosen, through random selection, to participate in the study. They were to select 190 twelfth-grade female students, both technology participants and non-technology participants, to complete the survey.

Response rate by study participants was 79%, easily within the range necessary for validity. The actual number of completed surveys was 137-92 from technology students and 45 from non-technology students. Answers to the twenty-one multiple-choice questions were tracked for frequency of response and percentage of response. The resulting data are descriptive of the participating schools but may not be representative of a larger population. The nature of the survey questions made further analysis unnecessary and inappropriate.

CHAPTER 4

PRESENTATION AND INTERPRETATION OF DATA

Introduction

The research instrument elicited two types of data: demographic and descriptive. Questions 1-9 addressed characteristics of the survey population. Questions 10-21 were designed to explore educational issues or environmental or social barriers regarding technology education.

Data from 92 technology education students and 45 non-technology education students appear within the totals. Tables indicate both numbers and percentages for various survey responses. Percentages are based upon totals within relevant groups.

Demographic Data

The data in Table 1 show the number and percentage of respondents whose communities were impacted by six basic types of business or industry. Respondants were grouped according to school size and participation and non-participation in technology education. Percentages were based upon those smaller groups, not the total number of respondents. Participants were invited to select more than one answer if appropriate.

Because of the economic base of Montana, the majority of survey participants were from communities where agriculture and timber were a significant part of the economic base. Naturally, a considerable number of students from Class AA schools—the larger communities—indicated other sources of revenue as well. Manufacturing,

government and recreation were also noted frequently by both technology education and non-technology education students from those areas.

Table 1. Economic Base of Community.

	Technology Educ. Participants (92)				Non-Technology Educ. Participants (45)			
	Class AA	Class A	Class B	Class C	Class AA	Class A	Class B	Class C
	(15)	(24)	(24)	(29)	(12)	(11)	(14)	(8)
Agriculture	10 67%	10 42%	14 58%	27 93%	9 75%	7 64%	7 50%	7 88%
Manufacturing	7 47%	3 13%	0 0%	0 0%	7 58%	0 0%	1 7%	0 0%
Government	8 53%	3 13%	9 38%	5 17%	8 67%	0 0%	3 21%	3 38%
Recreation	9 60%	11 46%	0 0%	4 14%	9 75%	1 9%	2 14%	0 0%
Mining	3 20%	2 8%	0 0%	0 0%	2 17%	0 0%	5 36%	1 13%
Timber	9 60%	16 67%	0 0%	7 24%	7 58%	4 36%	5 36%	0 0%

The data in Table 2 indicate the parental/living situation of the survey participants. Data are sorted as in Table 1. Most of the participants live with their mother and father, but many students reported living with their mother alone or with their mother and a stepfather. There was little difference in the data between the two groups of students: those who participated in technology education programs and those who did not.

Table 2. Parental/Living Situation of Participants.

	Technology Educ. Participants (92)				Non-Tech. Educ. Participants (45)			
	Class AA (15)	Class A (24)	Class B (24)	Class C (29)	Class AA (12)	Class A (11)	Class B (14)	Class C (8)
Mother & Father	11 73%	12 50%	11 46%	14 48%	7 58%	7 64%	8 57%	5 63%
Mother	1 7%	4 17%	4 17%	5 17%	3 25%	0 0%	3 21%	1 13%
Father	1 7%	1 4%	1 4%	1 3%	0 0%	0 0%	0 0%	0 0%
Mother/Stepfather	1 7%	4 17%	5 21%	7 24%	2 17%	3 27%	2 14%	2 25%
Father/Stepmother	0 0%	1 4%	0 0%	1 3%	0 0%	1 9%	1 7%	0 0%
Living on Own	1 7%	2 8%	3 13%	1 3%	0 0%	0 0%	0 0%	0 0%

The data in Table 3 indicate the number of survey participants who had siblings or step-siblings living in the family home. Again, percentages were based upon the smaller groups as indicated for Tables 1 and 2. There was nothing in this data to suggest that there is any connection between having brothers at home and participating or not participating in a technology education program. In fact, the numbers among both groups of participants seemed to be evenly divided concerning the existence and the gender of siblings.

Table 3. Survey Participants Who Had Siblings at Home.

	Technology Educ. Participants (92)				Non-Technology Educ. Participants (45)			
	Class AA (15)	Class A (24)	Class B (24)	Class C (29)	Class AA (12)	Class A (11)	Class B (14)	Class C (8)
Brothers (Stepbrothers)	5 33%	11 46%	17 71%	20 69%	9 75%	8 73%	8 57%	4 50%
Sisters (Stepsisters)	7 47%	8 33%	12 50%	18 62%	4 33%	9 82%	7 50%	6 75%

Table 4 presents data regarding the mother's level of education. Students were asked to indicate whether their mother (stepmother) had completed high school only, some college or vocational training, or a college degree.

Among the participants in technology education, an average of 38% of the students indicated that their mothers had only a high school education, and approximately 33% reported that their mothers had some college or vocational education. Only 26% of these students indicated that their mothers had obtained a college degree.

Among the respondents who did not participate in technology education, however, an average of 45% indicated that their mothers had obtained a college degree. Thirty-two percent of the students within this group indicated that their mothers had some college or vocational education; whereas, only 23% reported that their mothers had only a high school education.

Tables 6 & 7 present occupational data about the survey participants' parents. Among both groups of respondents, both technology education participants and non-technology education participants, the data were rather scattered. Any variety of response seems related to size of community rather than participation in technology education.

Table 6. Occupation of Survey Participants' Mothers (Stepmothers).

	Tech. Education Participants (92)				Non-Tech. Education Participants (45)			
	Class AA (15)	Class A (24)	Class B (24)	Class C (29)	Class AA (12)	Class A (11)	Class B (14)	Class C (8)
Executive/Admin./ Management	2 13%	5 21%	2 8%	4 14%	4 33%	0 0%	2 14%	2 25%
Professional Specialty	3 20%	0 0%	3 13%	3 10%	1 8%	3 27%	5 36%	2 25%
Technician and/or Related Support	0 0%	2 8%	2 8%	0 0%	1 8%	1 9%	2 14%	0 0%
Marketing/Sales	2 13%	1 4%	0 0%	2 7%	2 17%	0 0%	0 0%	0 0%
Admin.Support/Clerical/ Secretarial	1 7%	6 25%	2 8%	7 24%	1 8%	5 45%	1 7%	0 0%
Service	2 13%	6 25%	8 33%	4 14%	0 0%	2 18%	2 14%	1 13%
Agricultural/Forestry/ Fishing/Mining/Related	0 0%	1 4%	1 4%	5 17%	0 0%	0 0%	0 0%	1 13%
Construction Trades	0 0%	1 4%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%
Mechanics/Installation/ Repair	0 0%	0 0%	0 0%	0 0%	0 0%	1 9%	0 0%	0 0%
Production/ Manufacturing	0 0%	1 4%	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%
Unemployed Outside Home	4 27%	4 17%	4 17%	8 28%	3 25%	0 0%	2 14%	2 25%

Table 7. Occupation of Survey Participants' Fathers (Stepfathers).

	Tech. Education Participants (92)				Non-Tech. Education Participants (45)			
	Class AA (15)	Class A (24)	Class B (24)	Class C (29)	Class AA (12)	Class A (11)	Class B (14)	Class C (8)
Executive/Admin./ Management	2 13%	5 21%	2 8%	2 7%	2 17%	2 18%	3 21%	2 25%
Professional Specialty	3 20%	2 8%	4 17%	4 14%	6 50%	2 18%	1 7%	1 13%
Technician and/or Related Support	2 13%	2 8%	1 4%	0 0%	0 0%	1 9%	1 7%	0 0%
Marketing/Sales	0 0%	1 4%	2 8%	1 3%	0 0%	0 0%	0 0%	0 0%
Admin.Support/Clerical/ Secretarial	0 0%	0 0%	0 0%	0 0%	0 0%	0 0%	1 7%	0 0%
Service	2 13%	3 13%	5 21%	2 7%	2 17%	0 0%	0 0%	1 13%
Agricultural/Forestry/ Fishing/Mining/Related	1 7%	5 21%	2 8%	9 31%	1 8%	4 36%	3 21%	4 50%
Construction Trades	1 7%	3 13%	1 4%	6 21%	0 0%	1 9%	2 14%	0 0%
Mechanics/Installation/ Repair	2 13%	2 8%	2 8%	3 10%	0 0%	0 0%	1 7%	0 0%
Production/ Manufacturing	1 7%	0 0%	0 0%	0 0%	0 0%	1 9%	0 0%	0 0%
Unemployed Outside Home	2 13%	3 13%	4 17%	2 7%	0 0%	1 9%	2 14%	0 0%

The data in Table 8 indicate the number and class size of schools that were asked to participate and the number of schools that responded to the questionnaire. Analysis of

the data revealed that 4 or 17% of the schools responding were Class AA. Five or 22% of the schools were Class A schools. Seven of the schools responding or 30% were Class B, and the remaining 7 or 30% were Class C. All of the Class AA and Class A schools invited to participate in the study did so. Two of the selected Class B schools did not return the questionnaires, while 4 of the selected Class C schools did not.

Table 8. Classification of Participating Schools.

Classification of School	Participating	Non-participating
AA	4 (17%)	0
A	5 (22%)	0
B	7 (30%)	2
C	7 (30%)	4
Total Number of Schools	23	6

The data in Table 9 refer to the number of students who responded to the questionnaire, whether these students were or had been technology education students and the size of school that they attended. Twenty-seven or 20% of students responding were from Class AA schools. Of these 27, 15 were or had been enrolled in technology education classes. Among Class A schools were 35 or 26% of the respondents. Twenty-four of these respondents were or had been enrolled in technology education classes. Thirty-eight or 28% of the students who responded attended Class B schools. Among these 38 students, 24 were or had been enrolled in technology education classes. Thirty-seven or 27% of the students responding were from Class C schools. Of these 37 students, 29 or were or had been enrolled in technology education classes.

Table 9. Responding Students. School Size. Technology education Participants.

School Classification	Technology Education Students (% of respondents)	Non-Technology Education Students (% of respondents)
AA	15 (11%)	12 (9%)
A	24 (18%)	11 (8%)
B	24 (18%)	14 (10%)
C	29 (21%)	8 (6%)
Total Number of Students	92 (67%)	45 (33%)

Descriptive Data

Questions 10 through 17 elicited information from only those survey participants who were currently or had previously been enrolled in a technology education class. As shown in Table 9, 67% of the survey participants had participated in a technology education class; however, not all of them responded to every question.

The data presented in Table 10 indicate pupil enrollment in the survey participants' technology education classes. None of the Class AA survey participants were in classes of 1-10 students just as none of the Class B participants were in classes of thirty or more. Most frequently reported technology education class sizes in Class AA, Class A, and Class B schools were 11-20 students.

Table 10. Technology Education Class Enrollment.

Class Size	Class AA (15)	Class A (24)	Class B (24)	Class C (29)
1-10 Students	0 0%	3 13%	10 42%	15 52%
11-20 Students	8 53%	13 54%	13 54%	11 38%
21-30 Students	5 33%	6 25%	1 4%	1 3%
30+ Students	2 13%	2 8%	0 0%	2 7%

Table 11 clearly demonstrates that extremely low numbers of female students were found in the technology education classes of the survey participants. A majority of respondents, averaging 72% from all classes of schools, reported that fewer than six females were enrolled in their technology classes. Only 5 participants indicated that there were more than ten females in their classes.

Table 11. Number of Females in Reported Technology Education Classes.

Females in Class	Class AA (15)	Class A (24)	Class B (24)	Class C (29)
1-5	10 67%	19 79%	18 75%	19 66%
6-10	4 27%	3 13 %	6 25%	8 28%
11-15	1 7%	2 8%	0 0%	2 7%
16+	0 0%	0 0%	0 0%	0 0%

The data in Table 12 again underscore the lack of female participation in technology education. Not only do few female students participate in technology education, but few female technology instructors exist, as well. Of the 92 students responding to the survey, only 10 reported having a female instructor. Several of the students reported having both a male and a female instructor.

Table 12. Gender of Technology Education Instructor.

Gender	Class AA (15)	Class A (24)	Class B (24)	Class C (29)
Male	14 93%	22 92%	23 96%	25 86%
Female	3 20%	2 8%	1 4%	4 14%

Table 13 presents data regarding the course content of technology education classes. Two areas of instruction, communications technology and construction technology, were reported most frequently by the respondents. The female instructors indicated in Table 12 were involved primarily with communications technology.

Table 13. Course Content of Technology Education Class.

Content	Class AA (15)		Class A (24)		Class B (24)		Class C (29)	
Communications Technology	2	13%	16	67%	14	58%	9	31%
Transportation Technology	4	27%	0	0%	7	29%	6	21%
Construction Technology	9	60%	6	25%	8	33%	16	55%
Manufacturing Technology	3	20%	2	8%	3	13%	5	17%

Three possible reasons for participating in technology education were explored. The resulting data are presented in Table 14. In all class sizes of schools, the majority of respondents reported taking technology education simply because they were interested in it. Twenty-four percent of the participants from Class C schools indicated that technology education was a required component of their local school curriculum. Ten or 42% of the students from Class B schools and 11 or 38% of the students from Class C schools reported that they needed the class to complete their schedules.

Table 14. Reason for Participating in Technology Education.

Reason	Class AA (15)		Class A (24)		Class B (24)		Class C (29)	
Interested in Technology	12	80%	22	92%	16	67%	15	52%
School Requirement	2	13%	2	8%	2	8%	7	24%
Needed Class to Complete Schedule	3	20%	3	13%	10	42%	11	38%

Technology education participants were asked whether they had considered not studying technology and if so, why. Many of these participants did not respond to this question. Among the students who did respond, the most frequently indicated reason was that they felt the technology education curriculum did not pertain to their future plans. A significant number also reported that they feared the course material might be too difficult or that they might be the only female in class. Table 15 presents the data.

Table 15. Reason for Almost Not Taking Technology Education.

Reason	Class AA (15)		Class A (24)		Class B (24)		Class C (29)	
Did Not Pertain to Future Plans	2	13%	5	21%	2	8%	15	52%
Afraid Material Would Be Too Difficult	2	13%	5	21%	4	17%	3	10%
Feared Ridicule by Classmates	0	0%	1	4%	1	4%	1	3%
Feared Being Only Female in Class	3	20%	3	13%	6	25%	3	10%
Parents Tried to Discourage Me	0	0%	0	0%	0	0%	0	0%

Technology education students were also asked if they had enjoyed participating in such programs. An overwhelming number of these female students reported that they were, indeed, very satisfied with the programs. Table 16 shows the resulting data regarding satisfaction with technology classes.

Table 16. Satisfaction With Technology Course.

Enjoyed the Class	Class AA (15)		Class A (24)		Class B (24)		Class C (29)	
Yes	14	93%	22	92%	21	88%	26	90%
No	1	7%	2	8%	3	13%	3	10%

Technology education participants who indicated dissatisfaction with their technology programs were given the opportunity to explain the reasons for their dissatisfaction. Table 17 presents the data regarding specific reasons that students did not enjoy their experience with technology education. Data from line 3 of Table 16 are listed in the table and were used to determine percentages. Since so few respondents had been dissatisfied, the numbers are very low; however, the strongest reason appears to be lack of interest in course material.

Table 17. Reasons for Not Enjoying Technology Education.

Reason	Class AA (1)	Class A (2)	Class B (3)	Class C (3)
Material Was Too Difficult	0 0%	1 50%	0 0%	0 0%
Not Interested in Course Material	1 100%	2 100%	2 67%	2 67%
Uncomfortable in Non-traditional Class	0 0%	0 0%	0 0%	0 0%
Harassment by Male Students	1 100%	0 0%	1 33%	0 0%
Instructor Seemed to Favor Males	0 0%	1 50%	0 0%	2 67%

Question 18 of the questionnaire was directed toward the non-technology education participants. They were asked why they had not participated in a technology education class. Three reasons arose most frequently.

- ◆ The students were not interested in technology education.
- ◆ The course was not required for high school graduation or college entrance.
- ◆ The students had no time to take such classes after taking the required classes.

Environmental and social barriers to participation in technology education did not appear significant. Only one respondent feared the equipment might be unsafe. Similarly, only one student feared harassment by other students if she participated in technology education. Two students reported that they disliked the physical environment or facility for the class. The data concerning reasons for not taking technology education are found in Table 18.

Table 18. Reasons for Not Taking Technology Education

Reason	Class AA (12)		Class A (11)		Class B (14)		Class C (8)	
Not Interested in Technology Education	5	42%	3	27%	2	14%	1	13%
Feared Material Would Be Too Difficult	2	17%	2	18%	4	29%	0	0%
Not Required for Grad./College Entrance	5	42%	4	36%	6	43%	1	13%
No Time After Required Courses	5	42%	4	36%	11	79%	6	75%
Counselor Advised Against It	0	0%	0	0%	0	0%	0	0%
Feared Equipment Might Be Unsafe	0	0%	0	0%	0	0%	1	13%
Disliked Environment/Facility for Class	0	0%	0	0%	0	0%	2	25%
Feared Harassment by Other Students	0	0%	0	0%	1	7%	0	0%
Did Not Want To	3	25%	1	9%	1	7%	3	38%

Non-technology education participants were also asked to indicate the type of technology education class in which they would consider participating. The overwhelming majority of students from each of the class sizes of schools reported that they would take a technology education course that focused on communications technology. The data for

the other three types of technology education may suggest that the respondents did not fully understand the course descriptors. Complete data follow in Table 19.

Table 19. Desired Course Content of Technology Education.

Desired Course Content	Class AA (12)	Class A (11)	Class B (14)	Class C (8)
Communication Technology	5 42%	8 73%	10 71%	4 50%
Transportation Technology	2 17%	1 9%	4 29%	2 25%
Construction Technology	2 17%	2 18%	6 43%	2 25%
Manufacturing Technology	0 0%	1 9%	2 14%	1 13%

Students who had participated in technology education were also polled to discover whether they would take another course in technology education and if so, which type of technology would they be most interested in. As with the non-technology education participants, these students preferred communications technology. Table 20 presents these data.

Table 20. Desired Course Content for Continued Technology Education.

Desired Course Content	Class AA (15)	Class A (24)	Class B (24)	Class C (29)
Communications Technology	3 20%	3 13%	6 25%	4 14%
Transportation Technology	3 20%	0 0%	1 4%	1 3%
Construction Technology	1 7%	3 13%	2 8%	3 10%
Manufacturing Technology	1 7%	1 4%	1 4%	0 0%

All survey participants were asked about the importance of technology education. Despite their personal involvement or lack of involvement with technology education, nearly all respondents stated that they felt technology education was important. Many students discussed the prevalence of technology in modern life and the probable technological advances of the future. Exact data regarding this issue are presented in Table 21.

Table 21. Is Technology Education Important.

Student Classification	Response	Class AA (15, 12)	Class A (24, 11)	Class B (24, 14)	Class C (29, 8)
Technology Education Student	Yes	14 93%	24 100%	23 96%	28 97%
Non-Technology Education Student		11 92%	10 91%	14 100%	8 100%
Technology Education Student	No	1 7%	0 0%	1 4%	1 3%
Non-Technology Education Student		1 8%	1 8%	0 0%	0 0%

Finally, all students were asked about future career plans following graduation from high school. An average of 14% of the students reported plans to seek immediate employment. Only about 9% of the students indicated an interest in vocational training. Approximately 77% of the students, both technology and non-technology education participants, indicated plans to attend college. Another 6% of the respondents stated

their intentions to enter military service. The numbers, as presented in Table 22, suggest that some students responded more than once.

Table 22. Future Career Plans.

	Technology Education Participants (92)				Non-Tech. Education Participants (45)			
	Class AA (15)	Class A (24)	Class B (24)	Class C (29)	Class AA (12)	Class A (11)	Class B (14)	Class C (8)
Immediate Employment	2 13%	6 25%	2 8%	4 14%	2 17%	2 18%	0 0%	1 13%
Vocational Training	2 13%	4 17%	2 8%	2 7%	1 8%	1 9%	0 0%	0 0%
College	12 80%	15 63%	18 75%	22 76%	8 67%	10 91%	13 93%	7 88%
Military	1 7%	0 0%	2 8%	2 7%	1 8%	0 0%	2 14%	0 0%

Summary of the Data Analysis

While much of the data obtained from the survey seems unremarkable, survey results confirm that female enrollment in technology education is low. Furthermore, there are few female technology instructors in the secondary schools of Montana.

Communications technology is the primary course content for those classes taught by females.

The most notable reasons for non-participation in technology education seem to be lack of time, lack of interest and the fact that technology education is not a required course in most Montana schools. A noticeable number of respondents also indicated that they felt technology education had little relevance to their future career plans. Previous studies had suggested that fear of harassment by other students or fears about personal safety might prevent participation in technology education. However, these factors were mentioned by few survey participants. In fact, a clear majority of the technology education students reported enjoying the class once they were enrolled.

CHAPTER 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this research was to identify possible reasons for the lack of female participation in technology education programs of secondary schools in Montana.

Specific objectives for this study were as follows:

1. To determine if there are any common environmental barriers that discourage females from participating in technology education programs.
2. To determine if educational barriers limit female participation in technology education.
3. To determine if social factors affect the level of female participation in technology education programs.

Information gathered during the review of literature indicated that female participation in technology education programs is considerably lower than that of males. Both nationally and in Montana, enrollment of females in secondary technology education is low when compared to male enrollment. Yet the nature of today's economy and work place makes it more crucial than ever that all students become technologically literate. Educators must strive to understand the gender gap in technology education and work to correct this disturbingly lopsided enrollment trend.

The instrument used in this study was developed by examining previous survey instruments, by consulting with Dr. Scott Davis and by testing survey questions on a preliminary population sample. The actual sample population was determined by a

stratified-random selection process. Actual participants in the study remained anonymous.

Initially, an equal number of technology education students and non-technology education students were asked to participate. However, in the end approximately twice as many technology education students participated in the survey as did non-technology education students. Regardless, their answers may be representative of larger population groups.

Conclusions

Upon reviewing the results of the survey, several conclusions may be drawn. First, most female secondary education students do not wish to participate in technology education programs for three main reasons:

- ◆ They are not interested in technology.
- ◆ They have no time for it after taking the required courses.
- ◆ Since technology education is not required for high school graduation or college entrance, it is considered less important than academic subjects.

Secondly, most of the females who participate in technology education classes enjoy them. The few students who do not enjoy technology education contend they are not interested in the course content, yet they also agree that technology education is important. Few female technology education students suffer hostility from other students or from their technology instructor. Nor are they afraid of the class environment.

A third conclusion is that there are few female technology educators in the secondary schools of Montana. Most of these female instructors teach communications technology or computer classes.

Another conclusion may be that the level of education of the students' mother affected their decision to participate or not participate in technology education. Those whose mothers have followed academic careers and pursued a college degree may be less likely to participate in technology education.

A fifth conclusion is that female technology education enrollment in Class B secondary schools is higher than in other class schools. Perhaps the diversity of the population base in Class B communities generates more interest in technology education.

The strongest conclusion is that stereotypes about vocational training persist. Despite the increasing need for technological literacy, students still view vocational/technical training as less meaningful than academic training. Technology education often becomes the "dumping ground" for less academic students. To many, being educated means graduating from an academic institution. Technology education has an image problem.

Recommendations

In review of the data and conclusions from this study, the researcher suggests the following:

1. Recommendation – The State of Montana must act to promote female enrollment in secondary technology education programs. The gender imbalance (See Appendix A) is alarming.

2. Recommendation – Technology educators should more actively recruit female enrollment for their programs and instill in students a desire for technological literacy.
3. Recommendation – Technology educators must also ensure that the environment in which they teach is not threatening to female students. Females must feel safe from harassment and from physical harm.
4. Recommendation – Secondary guidance counselors should strive for more equitable scheduling when designing academic schedules. Scheduling technology education courses opposite college-entrance courses discourages participation in technology education.
5. Recommendation – School districts may benefit from requiring that all students take an introductory course in technology. Most technology education participants reported enjoying their technology courses. Having a "mini" course in technology would generate more interest for the subject.
6. Recommendation – Researchers should conduct a further and more complete study regarding gender inequity in technology education. Perhaps the study should be aimed at younger students.
7. Recommendation – Researchers should investigate the relationship between family structure and/or level of education and the daughter's interest in technology education.

8. **Recommendation – Researchers should study Class B schools in Montana to determine why more female students from those schools participate in technology education.**

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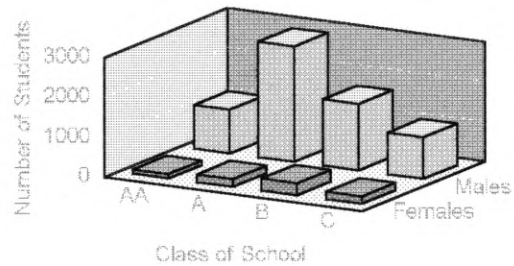
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APPENDICES

APPENDIX A
ENROLLMENT FIGURES
FOR
SECONDARY TECHNOLOGY EDUCATION PROGRAMS
IN
MONTANA
1993/94, 1994/95, 1995/96

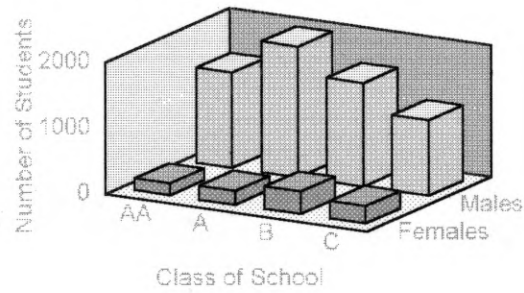
Tech Ed Enrollment

1993-94



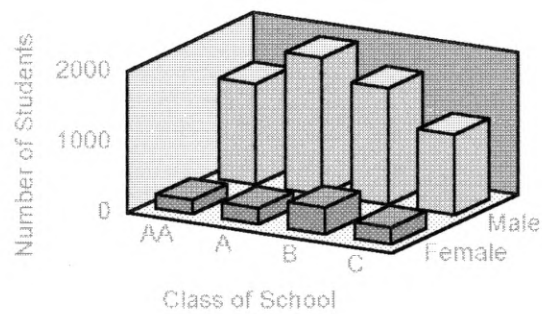
Tech Ed Enrollment

1994-95



Tech Ed Enrollment

1995-96



APPENDIX B

PARTICIPATING TECHNOLOGY EDUCATORS

PARTICIPATING TECHNOLOGY EDUCATORS

Vincent Long
Billings Sr. H.S.
425 Grand Ave.
Billings, MT 59101

Dan Cornell
Butte High School
Wyoming & Propyry
Butte, MT 59701

Brad Madison
Capital High
100 Valley Drive
Helena, MT 59601

Mark Bryn
Big Sky High School
3100 S. Ave. W.
Missoula, MT 59801

Phillip Odegard
Browning Sr. H.S.
Box 610
Browning, MT 59417

Melvin Rice
Beaverhead Co. H.S.
104 N. Pacific St.
Dillon, MT 59725

Steve Hammer
Dawson City High School
Box 701
Glendive, MT 59330

Mark Beckwith
Columbia Falls H.S.
PO Box 1259
Columbia Falls, MT 59912

David Oswald
Hardin High School
702 N. Terry St.
Hardin, MT 59034

Jade Melby
Baker High School
Box 659
Baker, MT 59313

Jeff Forbes
Jefferson High School
312 S. Main
Boulder, MT 59632

Jim Carroll
Conrad High School
215 S. Maryland
Conrad, MT 59425

Bruce Barta
Fairview High School
Box 467
Fairview, MT 59221

Bob Hodge
Florence Carlton H.S.
5602 OK Hwy. 93
Florence, MT 59833

David Riggin
Glasgow High School
Box 28
Glasgow, MT 59230

Jim Regan
Shelby High School
NW of Shelby
Shelby, MT 59474

Dean Dewing
Shepherd High School
Box 8
Shepherd, MT 59079

Eugene Posivio
St. Ignatius High School
Box 400
St. Ignatius, MT 59865

John Masonovich
Belt Valley Public Schools
Box 197
Belt, MT 59412

David Heppner
Box Elder H.S.
Box 205
Box Elder, MT 59521

Lee Barnett
Rocky Boy Tribal H.S.
Rocky Boy Rte., Box 620
Box Elder, MT 59521

Daniel Brown
Dodson High School
Box 278
Dodson, MT 59524

Bernard Sethaler
Grass Range H.S.
Box 58
Grass Range, MT 59032

Doug Richards
Harrison H.S.
PO Box 7
Harrison, MT 59735

Darrell Laubach
Power High School
Box 155
Power, MT 59468

Jesse Kibbee
Centerville High School
693 Highway 227
Sand Coulee, MT 59472

Dick Richardson
Superior High School
410 Arizona Ave.
Superior, MT 59872

Lyle Swenson
Terry High School
215 E. Park
Terry, MT 59349

Vince Forsman
White Sulphur Springs H.S.
Box C
White Sulphur Springs, MT
59645

APPENDIX C

COVER LETTER AND PRELIMINARY SURVEY

COVER LETTER

Julie A. Diehl
PO Box 470170
Winston, MT 59647
(406) 227-5742

December 18, 1996

I am conducting research into the gender inequity in current technology education programs. Technology educators seek to understand why females continue to avoid involvement in such classes as wood shop, machine shop, drafting, and advanced computer applications and programming. The key to improving these programs, so that they attract and serve females more effectively, is understanding the barriers that currently exist.

Mr. Nugent has agreed to help me by distributing this questionnaire so that you may complete it and return it during class time. You can help by doing your best to answer truthfully. If any question seems confusing, please indicate that by writing a short comment near the question. This will allow me to make improvements before sending the survey to other research participants around Montana.

Please **DO NOT PUT YOUR NAME ON THE QUESTIONNAIRE**. All answers are to remain anonymous and will be used solely to process information about a larger group, of which you are a small part. You can be assured of complete confidentiality. None of your answers will impact you directly.

Although you may not benefit personally from the results of this research, future students in the public school systems of Montana may. Understanding why females are reluctant to participate in technology education programs can help schools to make the necessary changes. Some day, gender equity--in all areas of education--may become a reality.

Thank you for your assistance.

Sincerely,

Julie A. Diehl

PRELIMINARY SURVEY

TECHNOLOGY EDUCATION SURVEY

As you answer the following questions, remember that your information is anonymous.
The survey is designed to study a population sample rather than individuals.

- 1) I live in a community that has the following in its economy: (Mark all that apply.)

☐ AGRICULTURE	☐ GOVERNMENT	☐ MINING
☐ MANUFACTURING	☐ RECREATION	☐ TIMBER
☐ _____		

- 2) The following best describes the parental unit where I usually live:

☐ MOTHER & FATHER	☐ MOTHER	☐ FATHER	☐ _____
☐ MOTHER/STEPFATHER	☐ FATHER/STEPMOTHER		

- 3) I have _____ (step/half) brothers and _____ (step/half) sisters who live with me.

- 4) My mother's level of education is

☐ HIGH SCHOOL	☐ SOME COLLEGE
☐ COLLEGE GRADUATE	☐ _____

- 5) My father's level of education is

☐ HIGH SCHOOL	☐ SOME COLLEGE
☐ COLLEGE GRADUATE	☐ _____

- 6) My mother's occupation is
 - ☐ EXECUTIVE/ADMINISTRATIVE/MANAGEMENT
 - ☐ PROFESSIONAL SPECIALTY
 - ☐ TECHNICIAN AND RELATED SUPPORT OCCUPATION
 - ☐ MARKETING/SALES
 - ☐ ADMINISTRATIVE SUPPORT/CLERICAL/SECRETARIAL
 - ☐ SERVICE OCCUPATION
 - ☐ AGRICULTURAL, FORESTRY, FISHING, MINING & RELATED
 - ☐ CONSTRUCTION TRADES
 - ☐ MECHANICS/INSTALLATION/REPAIR
 - ☐ PRODUCTION/MANUFACTURING
 - ☐ CURRENTLY UNEMPLOYED

- 7) My father's occupation is
- ☐ EXECUTIVE/ADMINISTRATIVE/MANAGEMENT
 - ☐ PROFESSIONAL SPECIALTY
 - ☐ TECHNICIAN AND RELATED SUPPORT OCCUPATION
 - ☐ MARKETING/SALES
 - ☐ ADMINISTRATIVE SUPPORT/CLERICAL/SECRETARIAL
 - ☐ SERVICE OCCUPATION
 - ☐ AGRICULTURAL, FORESTRY, FISHING, MINING & RELATED
 - ☐ CONSTRUCTION TRADES
 - ☐ MECHANICS/INSTALLATION/REPAIR
 - ☐ PRODUCTION/MANUFACTURING
 - ☐ CURRENTLY UNEMPLOYED
- 8) The school that I attend has an enrollment of
- ☐ FEWER THAN 200
 - ☐ 200-500
 - ☐ 500-1000
 - ☐ MORE THAN 1000
- 9) I am or have been enrolled in a technology education class
- ☐ YES
 - ☐ NO (If no, skip to question #17.)
- 10) The number of students enrolled in the technology education class is/was
- ☐ 1-10
 - ☐ 11-20
 - ☐ 21-30
 - ☐ MORE THAN 30
- 11) The number of females in the technology education class is/was
- ☐ 1-5
 - ☐ 6-10
 - ☐ 11-15
 - ☐ MORE THAN 15
- 12) The technology education instructor is/was
- ☐ MALE
 - ☐ FEMALE
- 13) I took the technology education class because (Mark all that apply.)
- ☐ I AM INTERESTED IN TECHNOLOGY
 - ☐ IT WAS A REQUIREMENT
 - ☐ I NEEDED ANOTHER CLASS TO FILL MY SCHEDULE
 - ☐ _____
- 14) I almost did not take the technology education class because (Mark all that apply.)
- ☐ I WAS AFRAID THE MATERIAL WOULD BE TOO HARD
 - ☐ I THOUGHT MY CLASSMATES WOULD MAKE FUN OF ME
 - ☐ I WAS AFRAID I WOULD BE THE ONLY GIRL IN CLASS
 - ☐ MY PARENTS TRIED TO DISCOURAGE ME
 - ☐ _____

- 15) I enjoy/enjoyed the technology education class
☐ YES ☐ NO
- 16) I do/did not enjoy the technology education class because (Mark all that apply.)
☐ THE MATERIAL IS/WAS TOO DIFFICULT
☐ I AM NOT/WAS NOT VERY INTERESTED IN THE MATERIAL
☐ I AM/WAS EMBARRASSED TO BE IN A NON-TRADITIONAL CLASS
☐ THE BOYS GIVE/GAVE ME A HARD TIME
☐ THE INSTRUCTOR SEEMS/SEEMED TO FAVOR THE BOYS
☐ _____
- (If you answered questions #10-#16, skip to question #18.)
- 17) I did not take a technology education class because (Mark all that apply.)
☐ I DID NOT NEED IT FOR GRADUATION OR COLLEGE ENTRANCE
☐ I HAD NO TIME FOR IT AFTER TAKING REQUIRED OR DESIRED COURSES
☐ I HAD SCHEDULING CONFLICTS
☐ I DID NOT WANT TO (EXPLAIN) _____

- 18) I feel most girls do not take technology education classes because (Mark all that apply.)
☐ THEY FEAR THE MATERIAL IS TOO DIFFICULT
☐ THEY ARE NOT INTERESTED IN TECHNOLOGY
☐ THEY PREFER TO TAKE TRADITIONAL CLASSES
☐ THEY FEAR HARASSMENT BY THEIR PEERS
☐ _____
- 19) I think technology education is important.
☐ YES, BECAUSE _____
☐ NO, BECAUSE _____
- 20) My plans following graduation include
☐ IMMEDIATE EMPLOYMENT ☐ COLLEGE
☐ VOCATIONAL/TECHNICAL TRAINING ☐ MILITARY
☐ _____

Thank you for your assistance with this survey.
 Please accept the pen, along with my thanks.



APPENDIX D

**INSTRUCTOR'S INSTRUCTIONS
FINAL COVER LETTER AND FINAL SURVEY
THANK YOU CARD AND REMINDER CARD**

INSTRUCTOR'S INSTRUCTIONS

P.O. Box 470170
Winston, MT 59647
March 15, 1997

FIELD(School Name)
FIELD(School Address)
FIELD(City, ST Zip)

Dear Mr. FIELD(Last Name):

I am a graduate student at MSU, working toward a Master of Science degree in Technology Education. As part of my research project, I have examined the enrollment figures of technology education programs in the secondary schools of Montana. Statistics from the last four years indicate a remarkable disparity between the number of females enrolled in these programs and the number of males. The key to improving technology education programs, so that they attract and serve females more effectively, is to determine why females avoid involvement in vocational related courses.

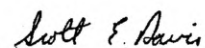
I need your support in my research. Through random selection FIELD(School Name) has been chosen for inclusion in the population sample. You can help by distributing the enclosed questionnaires to several of your female twelfth-grade students. Please select FIELD(total students) students, FIELD(half students) who currently participate in vocational related classes education and FIELD(half students) who do not currently participate in vocational related classes. If possible, allow them to complete the surveys during class time and return them to you immediately. After all students have completed the questionnaire, please return them in the enclosed envelope. Your prompt response will assist in the data collection process.

Understanding why females are reluctant to participate in technology education programs can help schools to make the necessary changes. As a technology educator, you will appreciate being a part of this process.

Thank you for your assistance; I appreciate your time and support.

Sincerely,

Julie A. Diehl



Scott Davis, Ph. D.

FINAL COVER LETTER

Julie A. Diehl
PO Box 470170
Winston, MT 59647

March 17, 1997

Dear Student:

I am conducting research concerning the enrollment numbers of current technology education programs in the secondary schools of Montana. Technology educators need to understand why females avoid involvement in vocational related programs. The key to improving these programs, so that they attract and serve females more effectively, is to determine why females avoid involvement in vocational related courses.

Your teacher is helping by distributing this questionnaire so that you may complete it and return it during class time. You can help by doing your best to answer truthfully. If any question seems confusing or if you feel that none of the answer choices is appropriate for you, please add comments of your own.

Please **DO NOT PUT YOUR NAME ON THE QUESTIONNAIRE**. All answers are to remain anonymous and will be used solely to process information about a larger group, of which you are a small part. You can be assured of complete confidentiality. None of your answers will impact you directly.

Understanding why females are reluctant to participate in technology education programs can help schools to make the necessary changes. Thank you for your assistance with this valuable research project.

Sincerely,

Julie A. Diehl

FINAL SURVEY

TECHNOLOGY EDUCATION SURVEY

As you answer the following questions, remember that your information is anonymous.

The survey is designed to study a population sample rather than individuals.

- 1) In my community the economy is primarily based on: (Mark all that apply.)

☐ AGRICULTURE	☐ GOVERNMENT	☐ MINING
☐ MANUFACTURING	☐ RECREATION	☐ TIMBER
☐ _____		

- 2) The following best describes the parental unit where I usually live:

☐ MOTHER & FATHER	☐ MOTHER	☐ FATHER	☐ _____
☐ MOTHER/STEPFATHER	☐ FATHER/STEPMOTHER		

- 3) I have ____ brothers and ____ sisters who live with me. (Include step/half siblings.)

- 4) My mother's (stepmother's) level of education is

☐ HIGH SCHOOL	☐ SOME COLLEGE
☐ COLLEGE GRADUATE	☐ _____

- 5) My father's (stepfather's) level of education is

☐ HIGH SCHOOL	☐ SOME COLLEGE
☐ COLLEGE GRADUATE	☐ _____

- 6) My mother's (stepmother's) occupation is
 - ☐ EXECUTIVE/ADMINISTRATIVE/MANAGEMENT
 - ☐ PROFESSIONAL SPECIALTY
 - ☐ TECHNICIAN AND RELATED SUPPORT OCCUPATION
 - ☐ MARKETING/SALES
 - ☐ ADMINISTRATIVE SUPPORT/CLERICAL/SECRETARIAL
 - ☐ SERVICE OCCUPATION
 - ☐ AGRICULTURAL, FORESTRY, FISHING, MINING & RELATED
 - ☐ CONSTRUCTION TRADES
 - ☐ MECHANICS/INSTALLATION/REPAIR
 - ☐ PRODUCTION/MANUFACTURING
 - ☐ CURRENTLY UNEMPLOYED

- 7) My father's (stepfather's) occupation is
 - ☐ EXECUTIVE/ADMINISTRATIVE/MANAGEMENT
 - ☐ PROFESSIONAL SPECIALTY
 - ☐ TECHNICIAN AND RELATED SUPPORT OCCUPATION
 - ☐ MARKETING/SALES
 - ☐ ADMINISTRATIVE SUPPORT/CLERICAL/SECRETARIAL
 - ☐ SERVICE OCCUPATION
 - ☐ AGRICULTURAL, FORESTRY, FISHING, MINING & RELATED
 - ☐ CONSTRUCTION TRADES
 - ☐ MECHANICS/INSTALLATION/REPAIR
 - ☐ PRODUCTION/MANUFACTURING
 - ☐ CURRENTLY UNEMPLOYED

- 8) The school that I attend has an enrollment of

☐ FEWER THAN 200	☐ 500-1000
☐ 200-500	☐ MORE THAN 1000

- 9) I am or have been enrolled in a technology education class
☐ YES ☐ NO (If no, skip to question #18.)
- 10) The number of students enrolled in the technology education class is/was
☐ 1-10 ☐ 11-20 ☐ 21-30 ☐ MORE THAN 30
- 11) The number of females in the technology education class is/was
☐ 1-5 ☐ 6-10 ☐ 11-15 ☐ MORE THAN 15
- 12) The technology education instructor is/was
☐ MALE ☐ FEMALE
- 13) The course content was primarily
☐ COMMUNICATIONS TECHNOLOGY
☐ TRANSPORTATION TECHNOLOGY
☐ CONSTRUCTION TECHNOLOGY
☐ MANUFACTURING TECHNOLOGY
- 14) I took the technology education class because (Mark all that apply.)
☐ I AM INTERESTED IN TECHNOLOGY
☐ IT WAS A REQUIREMENT
☐ I NEEDED ANOTHER CLASS TO FILL MY SCHEDULE
☐ _____
- 15) I almost did not take the technology education class because (Mark all that apply.)
☐ IT DOES NOT PERTAIN TO MY FUTURE PLANS
☐ I WAS AFRAID THE MATERIAL WOULD BE TOO HARD
☐ I THOUGHT MY CLASSMATES WOULD MAKE FUN OF ME
☐ I WAS AFRAID I WOULD BE THE ONLY GIRL IN CLASS
☐ MY PARENTS TRIED TO DISCOURAGE ME
☐ _____
- 16) I enjoy/enjoyed the technology education class
☐ YES (If yes, skip next question) ☐ NO
- 17) I do not/did not enjoy the technology education class because
 (Mark all that apply.)
☐ THE MATERIAL IS/WAS TOO DIFFICULT
☐ I AM NOT/WAS NOT VERY INTERESTED IN THE MATERIAL
☐ I AM/WAS EMBARRASSED TO BE IN A NONTRADITIONAL CLASS
☐ THE BOYS GIVE/GAVE ME A HARD TIME
☐ THE INSTRUCTOR SEEMS/SEEMED TO FAVOR THE BOYS
☐ _____
- (If you answered questions #10-#17, skip to question #20.)
- 18) I did not take a technology education class because (Mark all that apply.)
☐ I AM NOT INTERESTED IN TECHNOLOGY
☐ I WAS AFRAID THE MATERIAL WOULD BE TOO DIFFICULT
☐ I DID NOT NEED IT FOR GRADUATION OR COLLEGE ENTRANCE
☐ I HAD NO TIME AFTER TAKING REQUIRED COURSES
☐ THE COUNSELOR ADVISED ME NOT TO
☐ I THOUGHT THE EQUIPMENT MIGHT BE UNSAFE
☐ I DID NOT LIKE THE FACILITY/ENVIRONMENT WHERE THE CLASS
 WASTO BE HELD
☐ I FEARED HARASSMENT BY OTHER STUDENTS
☐ I DID NOT WANT TO (EXPLAIN)_____

- 19) I would take a technology class if the content was based on
☐ COMMUNICATION TECHNOLOGY
☐ TRANSPORTATION TECHNOLOGY
☐ CONSTRUCTION TECHNOLOGY
☐ MANUFACTURING TECHNOLOGY
☐ _____
- 20) I think technology education is important.
☐ YES, BECAUSE _____

☐ NO, BECAUSE _____

- 21) My plans following graduation include
☐ IMMEDIATE EMPLOYMENT ☐ COLLEGE
☐ VOCATIONAL/TECHNICAL TRAINING ☐ MILITARY
☐ _____

Thank you for your assistance with this survey.
Please accept the pen, along with my thanks.



THANK YOU CARD

Dear Mr. FIELD (Last Name),

Thank you for assisting me with my survey. Your help in this research project is greatly appreciated.

Respectfully yours,

REMINDER CARD

Dear Mr. FIELD (Last Name),

As you may recall, your school was selected to participate in a research project concerning females in technology education programs of Montana. On March 17, 1977, I sent you a packet of materials to assist in this process. As of now, I have not received a response from you. Your assistance in this research is valuable; please respond as soon as you are able.

Thank you

Sincerely,