A study of the effects of the Food and Fiber Literacy project on participating teachers
by Darren Paul Crawford

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Agricultural Education
Montana State University

Abstract:
This project was a quasi-experimental study to evaluate the effects of the Food and Fiber Literacy Project on the participating teachers and their respective schools. A one-group, pretest-posttest design was used (Gall, Borg & Gall, 1996) The population consisted of the teachers who voluntarily participated in the Food and Fiber Systems Literacy project at selected test schools in Townsend, Montana; Woodland, California; and Yale, Oklahoma.

Responses to the items in the instrument were entered into a Microsoft Excel spreadsheet, then analyzed using SPSS 7.5 for Windows ®. Means and standard deviations were calculated for each question in the instruments. T-tests were done to search for significant differences between pretest and posttest responses to individual questions and responses in the five concept areas. A one-way Analysis of Variance (ANOVA) was performed in each of the five categories to find any significant differences among the three schools in pretest and posttest responses.

Focus group interviews were conducted to gain insights into teachers' attitudes, perceptions, feelings and beliefs about the effectiveness of the project and the quality and usability of the resources and materials used in the Food and Fiber Systems Literacy project (University of Texas, Houston, 1996)..

Data analysis revealed that the Food and Fiber project did affect their attitudes and perceptions about agriculture.

Responses to the focus group interview questions showed an increased awareness of agriculture and the food and fiber industry in their communities. Teachers also expressed an increase in class participation on the part of the students. Students were making more real life connections to their schoolwork and appeared to be retaining more information after the lessons. Teachers were using more technology and resources within their community as a result of the Food and Fiber Literacy project. Most participants in the project agreed that materials and lessons associated with the Food and Fiber Literacy project were very usable and the concepts were easily integrated and combined with existing curriculum.

The Food and Fiber Systems Literacy Framework would be an excellent model for other agricultural literacy programs to help effectively integrate food and fiber concepts into the curriculum. It could also be used to help states meet curriculum integration goals.

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APPROVAL

Of a thesis submitted by

Darren Paul Crawford

This thesis has been read by each member of the thesis 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.

Martin J. Frick (Committee Chair) Date 11/19/98

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Approved for the College of Graduate Studies

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Karen P. Crawford

11/19/98

Date

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ABSTRACT

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Data analysis revealed that the Food and Fiber project did affect their attitudes and perceptions about agriculture.

Responses to the focus group interview questions showed an increased awareness of agriculture and the food and fiber industry in their communities. Teachers also expressed an increase in class participation on the part of the students. Students were making more real life connections to their schoolwork and appeared to be retaining more information after the lessons. Teachers were using more technology and resources within their community as a result of the Food and Fiber Literacy project. Most participants in the project agreed that materials and lessons associated with the Food and Fiber Literacy project were very usable and the concepts were easily integrated and combined with existing curriculum.

The Food and Fiber Systems Literacy Framework would be an excellent model for other agricultural literacy programs to help effectively integrate food and fiber concepts into the curriculum. It could also be used to help states meet curriculum integration goals.

CHAPTER ONE

THE PROBLEM

Introduction

As we approach the 21st century, we must evaluate the agricultural knowledge of our nation's population. America started out as a nation based on agriculture, but for over 40 years, ninety percent of the population has not been directly connected to production of food and fiber (Douglass, 1985). Agriculture, which relates to any sector of the industry supplying farm inputs or engaging in the production, processing, or distribution of agricultural products, is still the world's largest and most essential industry (University of California, Davis; Milton Hershey School, 1996). The food and fiber system affects everyone the world over. We all consume its products, in the food we eat to the clothes we wear to the houses in which we live. America has relied on the food and fiber system to provide us with the most abundant, least expensive supply of food in the world. We have done so with fewer and fewer members of society involved in the direct production of food and fiber (Birkenholz, Harris & Pry, 1994).

Even though fewer and fewer Americans are involved in the production of food and fiber, an increasing number are very concerned with what they perceive as inappropriate practices in the production of food and fiber (National Agriculture Research and Extension Users Advisory Board, 1991). According to Erwin (1993, p. 66-67),

within the Environmental Protection Agency "many fine, conscientious government employees were writing regulations for farmers while they themselves did not understand agriculture." With an increased interest in developing policies related to the environment and the use of land, water, fertilizer and fossil fuels (Brown & Kane, 1994), we need to find people in positions of power who are literate about our food and fiber system. The American public also needs to understand the basic concepts of agriculture. Even though we live in a nation with the lowest per capita food cost in the world, much of the general public is unaware of where and how their food is produced (National Resource Council, 1988). With advancements in agriculture, many people are now able to pursue careers that are removed from agriculture. With this trend, fewer and fewer people are directly connected with the production of agricultural products that they use everyday. According to Thompson (1986, p.1), if we allow our citizens to "...remain ignorant of basic facts about food, agriculture and natural resource systems, the activities of agricultural colleges will increasingly be perceived as serving only the interests of a narrow constituency." The effects of this on society today and in the future will be very serious. Those who will be making influential decisions will not understand the significance of our food and fiber system on our society (Frick, 1990). Society will benefit by teaching our children about agriculture at a young age.

The National Research Council (1988) reported that agriculture is only being taught in secondary vocational agriculture courses, and is not being taught in the elementary schools of this nation. With the small number of students who take agricultural education courses, it is difficult to see how this problem will get any better.

The National Research Council (1988) suggested that all students needed to receive instruction about agriculture beginning in kindergarten and continuing through the twelfth grade. The National Research Council also suggested that integrating agriculture into existing subjects and curriculum would be more effective than creating a separate area of study.

Purpose of the Study

The purpose of this study was to determine the change in attitudes toward the food and fiber system and toward the implementation of the Food and Fiber Systems Literacy Framework in the test schools in Woodland, California; Yale, Oklahoma; and Townsend, Montana. Results are based on eacher responses to a 40-item survey instrument, and focus group interviews conducted at schools participating in the Food and Fiber Literacy project.

Need for the Study

Fishbein and Ajzen (1975) stated that that people tend to rely on their own knowledge, observations and personal experiences to make decisions. Osborne and Dyer (1996) related this statement to agriculture by saying, "Knowledge of students' attitudes toward agriculture will, theoretically, provide an indication of their interests in pursuing agriculture as a field of study and professional pursuit" (p. 252). Terry, Herring & Larke (1992) found that student teachers in elementary education who had more

background and knowledge about agriculture tended to have more positive perceptions about agriculture.

Teachers tend to teach about subjects with which they are familiar and comfortable (Holmes Group, 1986). Teachers usually heavily draw on their own experience and background as a context for teaching, which directly influences the information that is taught and how it is presented to the students (Humphrey, Stewart & Linhart, 1993). If we want our teachers to be able to teach about our food and fiber system, they must be knowledgeable about the subjects and concepts that are a part of the food and fiber system.

From these statements, we can conclude that there was a need for a way to help teachers become more familiar and knowledgeable about agriculture in order to help them teach it to their students. Balschweid, Thompson and Cole (1997) found that teachers who had participated in the Summer Agriculture Institute at Oregon State University only integrated agriculture into five or fewer lessons per school year. They also found that major barriers to integrating agriculture into existing curriculum were the lack of information and the time it takes to make changes in the curricula. The Food and Fiber Systems Literacy project, sponsored by the W. K. Kellogg Foundation was intended to provide lessons, background information and inservice training to teachers at selected test schools in order to integrate food and fiber concepts into the curriculum in kindergarten through eighth grade. To determine the effectiveness of the project, it was necessary to evaluate the changes in the teachers' attitudes and perceptions about our food and fiber system.

According to Malcolm (1997), an evaluation of the Food and Fiber Systems Literacy project needed to be conducted at the end of the first year of the project. Malcolm said the evaluation should attempt to evaluate the changes in the attitudes and perceptions of the teachers as a result of the project.

Objectives

The specific objectives of this study were to:

1. Determine the effects of the Food and Fiber Systems Literacy project on the participating teachers' attitudes and perceptions about agriculture.
2. Assess teachers' perceptions about how the Food and Fiber Systems Literacy project has affected students, classrooms and their teaching.
3. Assess teachers' perceptions about how the Food and Fiber Systems Literacy project has impacted their communities, schools and student engagement and achievement.

Assumptions

The following assumptions were made concerning this study:

1. Teachers in kindergarten through eighth grade have some knowledge and perceptions about agriculture.
2. Agriculture affects those who teach kindergarten through eighth grade in some way.

3. Agriculture is important to the future of this country, and teaching elementary students about our food and fiber system will benefit the food and fiber system.

Limitations

The population for this study was limited to those teachers who voluntarily participated in the Food and Fiber Systems Literacy project at the three test schools selected.

Results of this study can only be inferred to the teachers who participated in the Food and Fiber Systems Literacy project at the three test schools in: Yale, Oklahoma; Townsend, Montana; and Woodland, California.

The time frame of this study was from the time the pretest was administered in May 1997 through the time the posttest was administered in May of 1998.

Definitions

Agricultural literacy: Understanding and possessing a knowledge of our food and fiber system (Frick, 1990).

Food and fiber systems: Includes all activities necessary to produce, harvest, process and transport food and fiber products (U. C. Davis, Milton Hershey School , 1996).

CHAPTER TWO

REVIEW OF LITERATURE

Defining Agricultural Literacy

Since the Smith-Hughes act of 1917, education in agriculture, which is what agricultural education is all about, has been well defined. Education *about* agriculture, however, does not necessarily fit into this definition. In 1988, Frick contended that, "The virtues of vocational agriculture have been suppressed because of the demand for vocational training in agriculture outlined in the Smith-Hughes legislation in 1917" (p.14). This is a major concern to the future of agriculture in this nation. Agriculture is too important a topic to be taught only to the small proportion of students who take vocational agriculture or are pursuing a career in agriculture (National Resource Council, 1988). Most people would agree that there is a need for a basic understanding of agriculture, the agriculture industry, and it's importance to the citizens of this country and the world, but the general public has a hard time defining "agricultural literacy" (Frick, Birkenholz, Gardner & Machtmes 1995, p. 130).

Literacy has often been associated with the ability to read and write at a functional level in society. Of course as society has changed, so has our definition of literacy. In the 1800's, some would define a literate person as someone who could read and write their own name, but now the term literacy includes reading signs, packages, and a bus

schedule (Miller, 1989). The definition of literacy changes with the times, but always means that a person has a functional level of ability in order to respond to real world reading tasks (Bormuth, 1975). Similarly, functional agricultural literacy can be thought of as a minimum level of knowledge and understanding, and not as a perfect level of understanding (Frick & Spotanski, 1990).

In order to find an acceptable definition of agricultural literacy in modern society, we can start with Douglass's early attempt (1985):

> There are certain pieces of information which are so basic to agricultural literacy that serious consideration should be given to their integration into any curriculum. The list is still tentative, but it includes a description of the place of agriculture in human history; a philosophical investigation of the purposes of agriculture, with some attention to ethical considerations; and an examination of the links between nutrition and human development from the perspective of social science. It also includes a basic introduction to the biochemistry of agroecosystems; a comparative analysis of agricultural technologies, including an assessment of their impacts on ecological and social communities; a description of the institutions of political power that shape agricultural decisions in different societies; and a basic treatment of the demographic transition from higher to lower rates of population growth and the roles that the consumption and production of food play in that transition. (p.18)

With this as an example of a very thorough, but not very functional definition of agricultural literacy, we can turn to a shorter version of this definition that appeared in The Agricultural Education Magazine by Law and Pepple (1990):

> Agricultural literacy may be defined as the development of the individual in the principles and concepts underlying modern agricultural technology. As defined here, it applies to producing, processing, distributing, marketing, and consuming the products of the food and fiber system. It also includes an awareness of the impact agriculture has on the environment, on society, and on everyday living of the individual. (p. 10)

This definition was certainly shorter and more to the point, but did not provide a functional definition. In an article appearing in The Agricultural Education Magazine, Frick and Spotanski (1990) laid out three basic areas that agricultural literacy needs to address: 1) an understanding of the applied processes or methods of agriculture, 2) the basic vocabulary of agricultural terms, and 3) the impact of agriculture on society. Frick devised a more detailed definition of agricultural literacy for his doctoral dissertation, which is probably the most accepted definition today:

> Agricultural literacy is understanding and possessing a knowledge of our food and fiber system. An individual possessing such knowledge would be able to synthesize, analyze, and communicate basic information about agriculture. Basic agricultural knowledge includes: the production of plant and animal products, the economic impact of agriculture, its societal significance, agriculture's important relationship with natural resources and the environment, the marketing and processing of agricultural products, public agricultural policies, the global significance of agriculture, and the distribution of agricultural products. (1990, p. 41)

Through this definition, we begin to understand that Agricultural literacy is not just knowing the procedures associated with production agriculture or simply knowing a group of facts that are associated with agriculture. Rather, it is a basic understanding of agriculture and the food and fiber industry, and of the importance of this industry to the citizens of this country (Frick & Wilson, 1996).

Agricultural Education

Agricultural education has changed along with the new goals and requirements for agricultural literacy. In the 1963 Vocational Education Act expanded agricultural

education to include career preparation in fields other than just agricultural production (U.S. Congress, 1963). Still, the majority of America's youth know little about agriculture when they enter school, and are only slightly better informed when they graduate from high school (National Research Council, 1988)

In a Hall's study, Agricultural Literacy Programs: Current Status (1991), it was found that 18 states do not have a current program of instruction about agriculture as of February 1991. This indicated that a significant amount of work needed to be done so students received education about agriculture in at least one grade (Hall, 1991).

With the National Research Council's recommendation (1988) that children receive instruction about agriculture from kindergarten through twelfth grade, it was evident that something needed to be done differently. According to Stewart (1989), agricultural literacy information must be infused into the existing curricula, which would eliminate the need for a separate class. Williams and White (1991), while commenting on the fragmentation of current agricultural instruction, pointed out that, "If we expect our nation's youth to understand and appreciate American agriculture, instruction about agriculture must be included in the day to day curriculum" (p. 10)

In addition, relatively fewer students are taking vocational agriculture in high school. Agriculture is too important a subject to only be taught to the relatively small percentage of students pursuing vocational agriculture studies or considering careers in agriculture (National Research Council, 1988). Dyer and Osborne (1994) stated that the Illinois enrollment in high school agriculture programs had dropped from 29,502 students in 1979 to 11,733 students in 1991. Possible reasons for this shift were that more

students were planning to go to college, which leaves fewer elective credits in which to take courses about agriculture; the urbanization of rural areas; and a possible shift in the image and perceptions about agriculture (Dyer & Osborne 1994).

According to the National Research Council:

> Few systematic educational efforts are made to teach or otherwise develop agricultural literacy in students of any age. Although children are taught something about agriculture, the material tends to be fragmented, frequently outdated, usually farm-oriented, and often negative or condescending in tone. (National Research Council 1988, p.9)

This goes beyond just agricultural education in our schools. Every successive generation in our society has become increasingly agriculturally illiterate (Birkenholz, 1990). All people, regardless of ethnicity or sex, depend on and have a vested interest in agriculture (Law & Pepple, 1990).

The general public gets its knowledge of agriculture from a variety of sources. "Public impressions of agriculture have been tainted by the actions of special interest groups and information provided through the media" (Lichte & Birkenholz 1993, p. 15). The public often bases personal decisions and policy decisions on information that is misconceived and selectively incomplete, as was demonstrated by the "Alar" scare in the 1980's (Ames, 1989; EPA, FDA & USDA, 1989; Evans, 1989; Moore, 1989). Tinsdale (1991) further explains how this type of public reaction can happen:

> As fewer people are directly involved in production agriculture, public support of the industry becomes even more important. Agriculturally literate people can make personal informed decisions about agriculturally related topics such as food safety, genetic engineering and pesticide versus non-pesticide issues. Those

> without this basic understanding react without reason, frightened for themselves and their families. The resulting damage to the industry is not easily repaired (p. 11)

Related Articles

In their 1993 study, Humphrey, Stewart and Linhart reported that teachers with agricultural experience tend to have greater knowledge and a more positive perception of agriculture than teachers with little to no experience in agriculture. This presents a challenge for agricultural educators since relatively few people have direct experience with agriculture.

Harris and Birkenholz (1996) found that instructors who taught in a school with an agricultural education program had relatively high knowledge scores and positive perceptions about agriculture. Dyer and Osborne (1995) also stated that guidance counselors in schools with applied science in agriculture courses had a more positive attitude toward agriculture. Dyer, Lacey and Osborne (1996) looked at the affect of high school agriculture courses on freshmen in the College of Agriculture at the University of Illinois. They found that those who had high school agriculture courses or were members of 4-H and FFA had higher knowledge scores and a more positive perception of agriculture than those who have had little to no exposure to agriculture. They also found that students with these exposures were significantly more likely to complete their degrees in the College of Agriculture.

Frick, Birkenholz, Gardner & Machtmes (1995) surveyed rural and urban inner city students, and found that both had very low knowledge scores in the areas of: Plants

in Agriculture and Agricultural Policy Issues. They also recommended that instructional assistance be provided to both preservice and inservice elementary and secondary teachers to assist them in bringing agricultural concepts into the classroom. In a similar study of 4-H members, it was shown that 4-H members have a high overall mean of agricultural knowledge, though they, too, were particularly low in the area of Plants in Agriculture (Frick, Birkenholz & Machtmes 1995). Flood and Elliot's (1994) study in Arizona found no significant differences in agricultural literacy between people who were 4-H members and the rest of their population.

Many studies have been conducted on the feasibility of integrating agriculture into the science curriculum in secondary and elementary schools. Johnson and Newman's 1993 study found that administrators, counselors and science teachers who are in schools with a pilot agriscience course have favorable perceptions and more support for the new curriculum. They went on to point out that science teachers are very agreeable to granting science credit to agriscience courses. Trexler (1997) recommended that education about our food and fiber system would help supplement areas of science that are neglected in our schools because they are difficult to teach, such as the interrelationships between plants and animals.

In relation to this study, Malcolm (1997) being a member of 4-H or FFA affected how teachers responded to questions relating to understanding agriculture.

CHAPTER THREE

METHODOLOGY

This chapter describes the procedures that were used in completing this study. This chapter is organized into six different sections; (1) Population Selection, (2) Instrument Design, (3) Instrument Validation, (4) Focus Group Interview Question Development, (5) Data Collection and (6) Data Analysis.

Population Selection

The Food and Fiber Project committee sought the participation of three public schools in different geographic regions of the nation. They selected three different states for school sites based on geographic, culture, ethnic, and socio-economic diversity. The committee wanted a school from a rural area, one from a suburban area, and one from an urban area. Within each of the three states (California, Montana and Oklahoma), several public schools were targeted for an interview. The schools were selected for this project based on an interview conducted by the selection committee.

The teacher population for this study consisted of 51 teachers from the three different schools ranging from elementary to eighth grade middle school teachers. Of the 51 teachers participating in this project, 38 were female and 13 were male. Ten of those teachers were from a town larger than 100,000 people. Eighteen teachers were from a town with a population of 10,000 to 100,000. Four teachers lived near a town with a

population of 2501 to 10,000. Another thirteen teachers were from a town with a population between 1000 and 2500. Four teachers were from a town with less than 1000 people.

Instrument Design

This quasi-experimental study employed a one-group pretest, posttest treatment format (Gall, Borg & Gall, 1996). The instrument assessed the Food and Fiber Systems literacy level of the teachers before they started teaching the Food and Fiber Systems curriculum in their classroom.

This instrument was developed with the assistance of a committee of agricultural educators and statisticians at two land grant institutions in the United States. The data collection instrument used in the pretest was organized into two different sections. The first section contained a series of items that addressed attitudes and perceptions of Food and Fiber Literacy. A series of 40 questions were chosen from the five different sections in the Food and Fiber Systems Literacy Framework (1996). The five different concept areas were (A) Understanding Agriculture, (B) Historical, Cultural, and Geographical Significance, (C) Science: Agricultural - Environmental Interdependence, (D) Business and Economics, and (E) Food, Nutrition, and Health. Within each section a series of items were compiled. The final set of items used on the survey was refined by a group of experts whose field of expertise and knowledge was the Food and Fiber industry. Eight items from each of the five sections were chosen to form a 40-item survey. A Likert-type scale, ranging from (1) Strongly Agree to (5) Strongly Disagree, allowed the teachers to

respond to the 40 items related to the food and fiber system. This instrument was distributed for the posttest after one full year of the Food and Fiber Systems Literacy Project. The data collection instrument is available in Appendix A.

The second section of the data instrument was also developed with the assistance of a committee of agricultural educators and statisticians at two land grant institutions in the United States. This section consisted of questions directed to the respondents in an attempt to collect personal and situational demographic information. These questions were related to age, gender, size of town in which they live, history of agriculture background, teaching experience and education level. Demographic information was collected only in the pretest. The demographic portion of the instrument is available in Appendix B.

Instrument Validation

A teacher pilot test was conducted with 35 elementary level student teachers at Montana State University. The pilot test was validated after a review of clarity, readability, and relevance to the objectives of the research project. The respondents said it was well written and easily understood. Minor corrections were made, and the instrument was deemed ready for the population group.

The Cronbach's alpha reliability coefficient computed for the pilot test was .78. According to the experts on the panel, this instrument was considered a valid tool for assessing the Food and Fiber literacy of this project.

Focus Group Interview Question Development

Focus group interview questions were developed by project staff from Montana State University and Oklahoma State University. Focus group interviews were conducted during mid-year and at the end of the Food and Fiber Literacy project.

Data Collection

Pretest surveys were distributed at the inservice training sessions, and were completed by the teachers before the training began. The first inservice training was held on May 14, 1997 in Townsend, Montana. A total of 9 teachers responded to the questions on the instrument survey. The second inservice training was held at Yale, Oklahoma on May 24, 1997. A total of 16 teachers responded to the questions at the second training. The third training was held in Woodland, California, during the month of June, where 26 teachers attended the inservice training. Those teachers who attended more than one training took the pretest instrument only once.

All of the pretest surveys were returned since it was a captive audience. The instruments were all hand-scored by the researcher. All data was entered into a Microsoft Excel © spreadsheet.

Posttest surveys were distributed after the three schools had participated in the project for one full school year. All posttest instruments were hand-scored by the researcher and responses were entered into a Microsoft Excel © spreadsheet.

Project staff conducted focus group interviews at each of the three schools in the middle of the school year and again at the end of the school year. The interviews were videotaped and later reviewed and typed out by the researcher. The notes from each interview are available in Appendix C. The purpose of the focus group interviews was to obtain information about the Food and Fiber project that would reveal teacher reaction and sentiment toward the project (University of Texas, 1996). The following information could not be collected and synthesized through traditional survey methods; therefore, focus group interviews were used. The purpose of the mid-year and end of year interviews was different; therefore, a different set of questions was designed for each interview that included subsequent subcategories of questions.

The focus of the mid-year interview was to obtain factual information and teacher feelings toward the Food and Fiber Literacy project. The mid-year interview was conducted near the break between semesters at all three schools.

The focus of the end of year interviews was to collect information on teachers' perceptions of the effects of the Food and Fiber project on student engagement and achievement. The end-of-the-year interviews were conducted in mid to late May and early June.

Data Analysis

The data were entered into Microsoft Excel © spreadsheets as the instruments were mailed back to the researcher. During the input process on the teacher instruments, the researcher keyed in the numbered response they indicated for each item, (1) Strongly

Agree, (2) Agree, (3) Neutral, (4) Disagree, and (5) Strongly Disagree. After each item was entered into the spreadsheet, the items were then categorized into the five Food and Fiber literacy framework concepts. Means were computed for each of the framework concepts. Data was then transferred into SPSS-7.5 for Windows © for a one-way Analysis of Variance (ANOVA) analysis to determine differences among the three different schools and the five major Food and Fiber Literacy framework questions. The results were then compiled into comparative tables for more accurate reporting.

The selected demographic variables for the teacher instrument were entered into a Microsoft Excel © spreadsheet. The researcher sorted the data by assigning a number code to common responses. The data were compiled for analysis of significant differences among the schools and its teachers.

Information collected in the focus group interviews was compiled and a complete report is found in Appendix C. All responses that occurred at more than one of the schools were compiled and explained in Chapter Four.

CHAPTER FOUR

RESULTS OF THE STUDY

This chapter presents results to satisfy the objectives of the study. The results are based on data collected from a teacher Food and Fiber Systems survey and from focus group interviews conducted with Food and Fiber project teachers.

Data collected represent three different kinds of schools throughout the United States. The three schools represented in this study are (1) urban (Woodland, California) school, (2) suburban (Yale, Oklahoma) school, and (3) rural (Townsend, Montana) school. The results of this data are only generalizable to the teachers and students of the Food and Fiber Literacy project.

Demographics

Upon receiving the instruments, five pretest surveys were found to have limited use due to a missing page in the demographic section for a response rate of 51 (93%) out of 56. These five instruments were still used in the pretest data; however, with incomplete demographic information, they were not used for input on the demographic section. A total of 51 completed instruments were used for demographic data analysis.

The data presented in Table 1 provide an indication of the demographic characteristics of the respondent groups. The four subgroups reported in Table 1 consist of Rural-Montana, Suburban-Oklahoma, and Urban-California, and Total- all three

schools combined. The rural contingent of teachers had nine respondents who represented the rural school. The suburban group of teachers had sixteen respondents who represented the suburban school. The urban group of teachers had twenty-six respondents who represented the urban school.

From the total of 51 respondents, 38 (75%) indicated they were female, while 13 (25%) teachers responded their gender was male. Out of 51 total teachers, 14 (28%) of the teachers reported having grown up on a farm and/or ranch. Thirteen (25%) teachers responded having lived in a rural area (a population less than 2500 people). Another thirteen (25%) teachers indicated they grew up in a town or city (a population greater than 50,000 people). Eleven (22%) teachers said they grew up in a suburb (2500-50,000 people).

Out of fifty teachers, 33 (66%) said they had relatives who lived or worked on a farm and/or ranch. Seventeen (34%) reported they did not have any relatives who lived or worked on a farm and/or ranch. For this variable there was one non-respondent.

The majority of all the teachers, 32 (63%) of 51 teachers indicated they did not have any relatives who worked in a non-production agricultural business. Nineteen (37%) teachers reported that they did have relatives who worked in a non-production agricultural business.

Of 51 total teachers, 43 (84%) indicated they did not take any agricultural courses in either high school or college. Eight (16%) teachers said they did take at least one agricultural course in either high school or college.

The majority of all the teachers combined, 36 (71%) of 51 teachers said they had not been a member of FFA or 4-H. Fifteen (29%) teachers indicated they had been members of FFA and/or 4-H.

Table 1. Selected Demographics of the teachers in the Food and Fiber Literacy project.

Selected Demographics of the Teachers in the Food and Fiber Literacy Project.	Rural-Montana [b]	Suburban-Oklahoma	Urban-California	Total-all three schools
Total number of participants	n=9 No. (percentage)	n=16 No. (percentage)	n=26 No. (percentage)	N=51 No. (percentage)
Gender [a]				
Male	2 (22%)	3 (19%)	8 (31%)	13 (25%)
Female	7 (78%)	13 (81%)	18 (69%)	38 (75%)
Where did you grow up? [a]				
Town/City	2 (22%)	1 (6%)	10 (38%)	13 (25%)
Suburb	1 (11%)	1 (6%)	9 (35%)	11 (22%)
Rural Area	2 (22%)	9 (56%)	2 (8%)	13 (25%)
Farm/Ranch	4 (44%)	5 (32%)	5 (19%)	14 (28%)
Do you have relatives who live or work on a farm and/or ranch? [a]				
Yes	2 (22%)	15 (94%)	11 (44%)	33 (66%)
No	7 (78%)	1 (6%)	14 (56%)	17 (34%)
Do you have relatives who work in a non-production agricultural business? [a]				
Yes	4 (44%)	6 (37%)	9 (35%)	19 (37%)
No	5 (56%)	10 (63%)	17 (65%)	32 (63%)
Did you take agricultural courses in High School or College? [a]				
Yes	3 (33%)	2 (13%)	4 (15%)	8 (16%)
No	6 (67%)	14 (87%)	22 (85%)	43 (84%)
Were you a Member of FFA and/or 4-H? [a]				
Yes	3 (33%)	10 (63%)	2 (8%)	15 (29%)
No	6 (67%)	6 (37%)	24 (92%)	36 (71%)

[b] Schools were coded: Northwest (Rural); Midwest (Suburban); West (Urban)

Table 2 depicts the teachers' ratings of six issue areas. With a rating of (1) being most important through (6) being least important, the teachers rated the six most

important issues related to the Food and Fiber industry. The teachers involved with the Food and Fiber Literacy project believed that Natural Resource Base was the most important issue related to our Nation's Food and Fiber Literacy project, with a rating of 2.33. Food Safety, with a rating of 2.62 was the second most important issue related to the Food and Fiber industry for the teachers. The third most important issue related to the Food and Fiber industry at a rating of 2.74 was Agricultural practices that affect the environment. Current government economic policies that impact agricultural production was the fourth most important issue related to the Food and Fiber industry at a rating of 3.78. The teachers felt that the Viability of our rural economic base at a rating of 4.32 was the fifth most important issue related to the Food and Fiber system. The least important issue for the teachers involved with the Food and Fiber literacy project was Animal Welfare with a rating of 4.87.

Table 2. Ratings of issues related to the food and fiber industry.

ISSUE	RATING
Natural Resource Base	2.33
Food Safety	2.62
Agricultural Practices That Affect the Environment	2.74
Current Government Policies That Impact Agricultural Production	3.78
Viability of Our Rural Economic Base	4.32
Animal Welfare	4.87

Attitudes and Perceptions

The teachers at each school responded to a series of items that were related to the Food and Fiber Framework. There were five major Framework categories:

Understanding Agriculture; Historical, Geographical, and Cultural significance; Science: Food and Fiber Environmental Interdependence; Business and Economics; and Food, Health, and Nutrition. The teachers were asked to respond on a 5 point Likert-type scale. Response values were as follows: (1) strongly agree, (2) agree, (3) neutral, (4) disagree and (5) strongly disagree. Therefore, the lower the value, the more they agreed with the item. This survey was given before the project began, hereafter referred to as the pretest, and administered again after the project had run for a full school year, hereafter referred to as the posttest.

The items were separated out into the five major categories mentioned above. Tables 3 through 22 depict t-test results comparing teacher responses in the pretest and posttest. The first column, labeled "No." corresponds to the item number (1-40) as that item appeared on the survey. The actual text of the item as it appeared on the survey appears in the second column. The fourth and fifth columns show the means and standard deviations of the responses in accordance with the 5-point Likert-type scale. The number before the slash is from the pretest, and the number after the slash is from the posttest. The column labeled "T" gives the t statistic for each of the items, and the column labeled "Df" indicates the degrees of freedom associated with each t-test. The last column gives the two-tailed significance for each t-statistic. Each item in the significance column that is followed by an asterisk (*) is significant at an alpha level of .05.

Tables 3 through 6 show the t-tests for items that related to "Understanding Agriculture". Table 3 contains only data from Yale, Table 4 presents data from

Woodland, Table 5 depicts data from Townsend, and Table 6 displays the culmination of data from all three schools. The data in these tables show that participants responded significantly different to item 1 (Agriculture involves the management of forests and their natural products) from pretest to posttest at Yale (.032), Woodland (.012), and in the three schools combined (.000).. Items 16 (Global market forces affect supply and demand for agricultural products), 21 (The food and fiber system does not constitute a significant number of jobs in the U.S.) and 36 (Agriculture is not a very large industry in America.) were found significant with Yale (.001, .013,.033) and in the three schools combined (.004, .021, .004). Of the items that were found significant, items 1 and 16 had positive t-scores, indicating that respondents agreed more strongly with the item in the posttest than in the pretest. The remaining two items, 21 and 36 had negative t-scores, which would indicate that respondents disagreed more with those items in the posttest than in the pretest.

Tables 7 through 10 show the t-tests for items that related to "Historical, Geographical and Cultural Significance" of food and fiber. Table 7 contains only data from Yale, Table 8 shows data from Woodland, Table 9 displays data from Townsend, and Table 10 presents a composite of data from all three schools. The data in these tables show that item 7 (Many important historical figures, inventions and events have emerged as a result of our constant search for the certainty of food) was answered significantly different in the pretest and posttest at Yale (.047). Item 12 (Civilization's advancements have nothing to do with agricultural development) shows significance at Yale (.013) and in the three schools combined (.004). Item 32 (Historically, climate and geography have

determined the plants and animals that grow best in a certain region) was significant in the three schools combined data (.012). Item 7 and item 32 produced positive t-scores, indicating that respondents agreed more strongly with the item in the posttest than in the pretest, while item 12 had negative t-scores, which would indicate that respondents disagreed more with those items in the posttest than in the pretest.

Table 3. T tests for Yale, subcategory 1, Understanding Agriculture.

No.	Item	Mean (pretest/ posttest)	Standard Deviation (pre Post)	T	Df	Significance (two-tailed)
1	Agriculture involves the management of forests and their natural products.	1.48/1.07	.75/.27	2.268	26.852	.032 *
6	Human ingenuity has solved numerous problems involved in the production, storage and preparation of food.	1.38/1.21	.59/.43	.909	33	.370
11	The Food and Fiber system is not an integral part of most states' economies.	3.95/3.79	.86/1.19	.481	33	.634
16	Global market forces affect supply and demand for agricultural products.	1.95/1.14	.74/.36	3.787	33	.001 *
21	The food and fiber system does not constitute a significant number of jobs in the U.S.	4.33/4.86	.80/.36	-2.633	29.949	.013 *
26	A larger world population has no effect on the demand for agricultural products.	4.71/4.43	.56/1.16	.977	33	.336
31	Agricultural production has kept pace with our world population growth.	3.00/2.71	.84/1.07	.886	33	.382
36	Agriculture is not a very large industry in America.	4.24/4.86	1.09/.53	-2.229	30.842	.033 *

Table 4. T tests for Woodland, subcategory 1, Understanding Agriculture.

No.	Item	Mean (pretest/ posttest)	Standard Deviation (pre Post)	T	Df	Significance (two-tailed)
1	Agriculture involves the management of forests and their natural products.	2.27/1.45	.96/.52	2.636	35	.012 *
6	Human ingenuity has solved numerous problems involved in the production, storage and preparation of food.	1.42/1.55	.50/.69	-.605	35	.549
11	The Food and Fiber system is not an integral part of most states' economies.	3.85/4.36	1.22/1.03	-1.229	35	.227
16	Global market forces affect supply and demand for agricultural products.	1.62/1.36	.64/.67	1.080	35	.288
21	The food and fiber system does not constitute a significant number of jobs in the U.S.	4.15/4.36	.83/1.21	-.611	35	.545
26	A larger world population has no effect on the demand for agricultural products.	4.50/4.64	.71/.50	-.578	35	.567
31	Agricultural production has kept pace with our world population growth.	3.00/2.91	1.30/1.22	.198	35	.844
36	Agriculture is not a very large industry in America.	4.31/4.82	1.26/.40	-1.309	35	.199

Table 5. T tests for Townsend, subcategory 1, Understanding Agriculture

No.	Item	Mean (pretest/ posttest)	Standard Deviation (pre Post)	T	Df	Significance (two-tailed)
1	Agriculture involves the management of forests and their natural products.	1.56/1.44	1.01/.53	.292	16	.774
6	Human ingenuity has solved numerous problems involved in the production, storage and preparation of food.	1.11/1.22	.33/.44	-.603	16	.555
11	The Food and Fiber system is not an integral part of most states' economies.	4.00/4.67	1.22/.50	-1.512	16	.150
16	Global market forces affect supply and demand for agricultural products.	1.33/1.44	.50/.53	-.459	16	.653
21	The food and fiber system does not constitute a significant number of jobs in the U.S.	4.44/4.78	.88/.44	-1.014	11.765	.331
26	A larger world population has no effect on the demand for agricultural products.	4.78/4.78	.44/.44	.000	16	1.000
31	Agricultural production has kept pace with our world population growth.	3.00/2.78	1.00/1.20	.426	16	.675
36	Agriculture is not a very large industry in America.	4.11/4.56	1.05/.53	-1.131	16	.275

Table 6. T tests for three schools combined, subcategory 1, Understanding Agriculture.

No.	Item	Mean (pretest/ posttest)	Standard Deviation (pre Post)	T	Df	Significance (two-tailed)
1	Agriculture involves the management of forests and their natural products.	1.86/1.29	.96/.46	3.728	84.460	.000 *
6	Human ingenuity has solved numerous problems involved in the production, storage and preparation of food.	1.36/1.32	.52/.53	.294	88	.769
11	The Food and Fiber system is not an integral part of most states' economies.	3.91/4.21	1.08/1.04	-.1273	88	.206
16	Global market forces affect supply and demand for agricultural products.	1.70/1.29	.69/.52	2.938	88	.004 *
21	The food and fiber system does not constitute a significant number of jobs in the U.S.	4.27/4.68	.82/.77	-2.347	88	.021 *
26	A larger world population has no effect on the demand for agricultural products.	4.63/4.59	.62/.82	.241	88	.810
31	Agricultural production has kept pace with our world population growth.	3.00/2.79	1.08/1.12	.865	88	.390
36	Agriculture is not a very large industry in America.	4.25/4.76	1.15/.50	-.2.934	81.218	.004 *

Table 7. T tests for Yale, subcategory 2, Historical Geographical and Cultural Significance.

No.	Item	Mean (pretest/ posttest)	Standard Deviation (pre Post)	T	Df	Significance (two-tailed)
2	Food availability plays a key role in contemporary civilization.	1.24/1.07	.44/.27	1.400	32.842	.171
7	Many important historical figures, inventions and events have emerged as a result of our constant search for the certainty of food.	1.57/1.21	.60/.43	2.036	32.798	.047 *
12	Civilization's advancements have nothing to do with agricultural development.	4.43/4.86	.60/.36	-2.636	32.807	.013 *
17	Agricultural trade stimulated the development of measurement, accounting and written communication.	1.95/1.57	.80/.51	1.567	33	.127
22	Agriculture's use of natural resources and it's effect on the environment draws concern from people in every society.	2.29/1.86	1.01/.36	1.784	26.983	.086
27	Historically, climate and geography have determined the plants and animals that grow best in a certain region.	1.71/1.50	.64/.52	1.039	33	.306
32	Historically, climate and geography have determined the plants and animals that grow best in a certain region.	2.33/1.86	1.11/.66	1.586	32.715	.122
37	Some societal issues are directly related to the food and fiber system.	2.00/1.64	.71/.50	1.636	33	.111

Table 8. T tests for Woodland, subcategory 2, Historical Geographical and Cultural Significance.

No.	Item	Mean (pretest/ posttest)	Standard Deviation (pre Post)	T	Df	Significance (two-tailed)
2	Food availability plays a key role in contemporary civilization.	1.27/1.27	.45/.47	-.021	35	.983
7	Many important historical figures, inventions and events have emerged as a result of our constant search for the certainty of food.	1.54/1.36	.71/.50	.742	35	.463
12	Civilization's advancements have nothing to do with agricultural development.	4.58/4.82	.70/.40	-1.061	35	.296
17	Agricultural trade stimulated the development of measurement, accounting and written communication.	1.73/1.36	.72/.67	1.437	35	.160
22	Agriculture's use of natural resources and it's effect on the environment draws concern from people in every society.	2.27/2.18	1.04/1.17	.225	35	.823
27	Historically, climate and geography have determined the plants and animals that grow best in a certain region.	1.50/1.55	.58/.52	-.223	35	.825
32	Historically, climate and geography have determined the plants and animals that grow best in a certain region.	2.19/1.64	.94/.50	1.844	35	.074
37	Some societal issues are directly related to the food and fiber system.	1.65/1.73	.69/.79	-.284	35	.778

Table 9. T tests for Townsend, subcategory 2, Historical Geographical and Cultural Significance.

No.	Item	Mean (pretest/ posttest)	Standard Deviation (pre Post)	T	Df	Significance (two-tailed)
2	Food availability plays a key role in contemporary civilization.	1.22/1.22	.44/.67	.000	16	1.000
7	Many important historical figures, inventions and events have emerged as a result of our constant search for the certainty of food.	1.44/1.44	.53/.73	.000	16	1.000
12	Civilization's advancements have nothing to do with agricultural development.	4.44/4.78	.73/.44	-1.77	16	.257
17	Agricultural trade stimulated the development of measurement, accounting and written communication.	1.78/1.78	.44/.97	000	11.160	1.000
22	Agriculture's use of natural resources and it's effect on the environment draws concern from people in every society.	2.44/1.78	1.33/.97	1.212	16	.243
27	Historically, climate and geography have determined the plants and animals that grow best in a certain region.	1.33/1.22	.50/.44	.500	16	.624
32	Historically, climate and geography have determined the plants and animals that grow best in a certain region.	2.56/2.11	1.01/.78	1.042	16	.313
37	Some societal issues are directly related to the food and fiber system.	1.78/1.89	.67/.33	-.447	16	.661

Table 10. T tests for three schools combined, subcategory 2, Historical Geographical and Cultural Significance.

No.	Item	Mean (pretest/ posttest)	Standard Deviation (pre Post)	T	Df	Significance (two-tailed)
2	Food availability plays a key role in contemporary civilization.	1.25/1.18	.44/.46	.760	88	.449
7	Many important historical figures, inventions and events have emerged as a result of our constant search for the certainty of food.	1.54/1.32	.63/.53	1.702	78.674	.093
12	Civilization's advancements have nothing to do with agricultural development.	4.50/4.82	.66/.39	-2.930	87.927	.004 *
17	Agricultural trade stimulated the development of measurement, accounting and written communication.	1.82/1.56	.72/.70	1.697	88	.093
22	Agriculture's use of natural resources and it's effect on the environment draws concern from people in every society.	2.30/1.94	1.06/.85	1.782	81.245	.079
27	Historically, climate and geography have determined the plants and animals that grow best in a certain region.	1.55/1.44	.60/.50	.913	88	.364
32	Historically, climate and geography have determined the plants and animals that grow best in a certain region.	2.30/1.85	1.01/.66	2.566	87.483	.012 *
37	Some societal issues are directly related to the food and fiber system.	1.80/1.74	.70/.57	.481	88	.631