

AN ASSESSMENT OF THE KNOWLEDGE AND PERCEPTIONS
OF AGRICULTURE BY SELECTED FOURTH
GRADE TEACHERS IN OKLAHOMA

By

CHARLES BRYAN COX

Bachelor of Science
Oklahoma State University
Stillwater, Oklahoma
1979

Master of Science
Oklahoma State University
Stillwater, Oklahoma
1988

Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
DOCTOR OF EDUCATION
May, 1994

AN ASSESSMENT OF THE KNOWLEDGE AND PERCEPTIONS
OF AGRICULTURE BY SELECTED FOURTH
GRADE TEACHERS IN OKLAHOMA

Thesis Approved:

Oddie Finley

Thesis Adviser
Robert Terry

James P. Key

James A. Rutledge

Arnold K. Bass

Thomas C. Collins

Dean of the Graduate College

ACKNOWLEDGMENTS

I wish to express my sincere appreciation to my thesis advisor, Dr. Eddy Finley for his supervision, guidance, constant encouragement, and mostly for his friendship. My appreciation is also extended to Dr. Robert Terry, my major advisor, for his direction, leadership, and ability to ask questions that often inspired me to consider perspectives greater than my own. Additionally, I wish to thank Dr. Gerald Bass who brought new perspectives to the committee and to the study, and to Dr. James Key who shared his research knowledge and expertise. Finally, I thank Dr. James Rutledge, who not only encouraged me professionally but also personally to conduct this study.

I wish to express my appreciation to my co-workers in the State 4-H Office who often provided suggestions or who simply listened when I complained. To my co-workers and friends across Oklahoma, I say thanks for being understanding when I missed your calls because I was in class and to the administration of the Oklahoma Cooperative Extension Service and the Division of Agricultural Sciences and Natural Resources, for allowing me the opportunity to seek an advanced degree and complete this study.

To my wife, Natalie, and to my daughters, Rebekah, Faith, and Hope, I can never adequately express my appreciation for the unselfish love and support you have given me, along with the many hours of "our time" you gave up throughout this entire process. Thanks also go to my

parents, sisters, and other relatives and friends who have encouraged me through this process. Finally, I say thank you to my grandmother who looked forward with me to the completion of this goal. Granmurr, while we didn't get to celebrate it here on Earth, I look forward to one day being with you again and getting a kiss for completing this task.

In closing, I would like to thank all of the organizations, groups, departments, agencies, and individuals who have supported Oklahoma Ag in the Classroom and literacy education efforts. Most of all, I thank the fourth grade teachers who completed and return the questionnaires that made the collection of data for this study possible. You have an awesome responsibility in shaping the lives of children and in helping to direct the future of the world in which we live. I encourage you to continue approaching that task with all the zeal possible. The capacity for children to make wise and informed decisions in the future is in your hands today.

TABLE OF CONTENTS

Chapter	Page
I. INTRODUCTION.....	1
Rationale for the Study.....	2
Statement of the Problem.....	3
Purpose of the Study.....	3
Objectives of the Study.....	3
Scope of the Study.....	4
Assumptions.....	4
Definitions and Terms.....	5
II. REVIEW OF LITERATURE.....	6
Early Sources of Agricultural Education.....	6
Land-grant Youth Development Efforts.....	8
Agricultural Literacy.....	10
Agricultural Education Reform.....	12
Ag in the Classroom.....	14
Summary	16
III. DESIGNS AND PROCEDURES.....	18
Institutional Review Board.....	18
The Population.....	19
The Instrument.....	20
Conduct of the Study.....	22
Analysis of the Data.....	22
IV. PRESENTATION AND ANALYSIS OF DATA.....	24
The Population.....	24
Findings of the Study.....	25
School Type.....	28
Classroom Type.....	28
Definitions of Agriculture Held by Selected Fourth Grade Teachers.....	31
Frequency Distribution of Teacher Knowledge Assessment of Questions Relating to Agricultural Topics.....	31
Items Answered Correctly by the Majority of the Teachers.....	41
Items Answered Incorrectly by the Majority of the Teachers.....	43

Identification of Teaching Units or Topics	
Used in the Classroom.....	45
Identification of Sources Used to Obtain	
Educational Materials.....	48
Identification of Projects Completed	
by Fourth Grade Classes.....	50
Distribution of Hours of Science Concepts Taught.....	52
Preferred Methods of Receiving Information	
About Agriculture.....	54
Requests for Follow-up.....	56
V. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS.....	57
Summary of the Study.....	57
Purpose of the Study.....	57
Rationale for the Study.....	57
Objectives of the Study.....	58
Design and Procedures.....	58
Major Findings of the Study.....	60
Profile of the Teachers.....	60
Classroom and School Type.....	61
Definitions of Agriculture.....	62
Agriculture Knowledge.....	62
Types of Agricultural Concepts Currently Taught.....	64
Hours of Agricultural Science Concepts Taught.....	65
Types of Assistance Teachers Might Use to Integrate	
Agricultural Concepts into the Classroom.....	66
Follow-up to Teachers.....	67
Conclusions.....	67
Recommendations.....	69
Recommendations for Additional Research.....	71
Implications of the Study.....	72
BIBLIOGRAPHY.....	75
APPENDICES	78
APPENDIX A - COVER LETTER.....	79
APPENDIX B - FOLLOW-UP LETTER.....	81
APPENDIX C - QUESTIONNAIRE.....	85
APPENDIX D - DEFINITIONS OF AGRICULTURE.....	88

LIST OF TABLES

Table	Page
I. Distribution of Teacher Responses.....	26
II. Demographic Characteristics of Teachers in the Study.....	27
III. Distribution of Teachers by School Type.....	29
IV. Distribution of Teachers by Classroom Type.....	30
V. Frequency Distributions of Teacher Knowledge Assessment.....	32
VI. Identification of Teaching Units or Topics Used.....	46
VII. Indication of Sources Used to Obtain Educational Materials..	49
VIII. Projects Normally Completed by Teachers.....	51
IX. Hours Taught Using Agricultural Science Concepts.....	53
X. Preferred Methods of Receiving Information About Agriculture.....	55

CHAPTER I

INTRODUCTION

During the late 1900's many forces impacted American education and agriculture. Forces like world politics, global economics and technology, domestic farm and trade policies, increased biotechnology, urbanization, demographics, along with public opinion and expectations about education and agriculture have all challenged the agricultural community to evaluate the level of knowledge held by Americans regarding agricultural sciences, agri-business, land resources, nutrition and the environment.

Only a few generations ago nearly everyone was involved in agriculture. In many cases, the whole family--men, women, and children--was involved on the farm or ranch. Even in recent times many youth who lived in cities had grandparents or other relatives who lived on a farm or had other rural ties. By 1992 less than two percent of the United States' population was involved in production agriculture. Fewer and fewer people had ties to the land, and fewer students were pursuing careers in agriculture (Cox and Rutledge, 1993).

In the National Research Council report, Understanding Agriculture (1988), the Committee on Agricultural Education in Secondary Schools, envisioned an agriculturally literate person as one who had an understanding of the food and fiber system, including its significance upon history and its current economic, social and

environmental significance to all Americans. The research committee, in the same study (1988), stressed that by achieving agricultural literacy, citizens will be able to participate in establishing the policies that will support a competitive agricultural industry in both the United States and abroad.

While programs designed to increase agricultural literacy seem to be abundant and of high quality, the level of agricultural literacy remains low. The success of current programs may largely be dependent upon the ability of teachers to use them. Studies by Swan and Donaldson (1970), Everett (1985), and Terry, et.al. (1990) concluded classroom teachers have little technical knowledge of agriculture. These studies suggest teachers may be apprehensive in teaching agricultural concepts because of their lack of personal and professional knowledge about agriculture.

The Oklahoma Ag in the Classroom curriculum was developed with these findings in mind. In order to help teachers feel better informed, background information was developed to support lessons that use agricultural concepts to teach other core subjects such as mathematics, language arts, social studies, visual arts, information skills, and science.

Rationale for the Study

The first of the Oklahoma Ag in the Classroom curricula was introduced in the spring of 1993. The curriculum was designed for learners in kindergarten through grade two.

The second level of the curriculum, which was designed for third and fourth graders, was scheduled for release during the 1993-94 school

term. By collecting benchmark data from teachers prior to introducing the third and fourth grade curriculum, future evaluative research could be conducted. This future research might, in part, help determine the impact of the Ag in the Classroom program in Oklahoma. Specifically, future study might help determine if the curriculum content and delivery methods used in Oklahoma are effective in increasing agricultural literacy.

Statement of the Problem

The ability of students to learn agricultural concepts may depend in part upon the knowledge and perceptions held by those who teach them. For this reason it was considered to be potentially beneficial to determine the level of knowledge and perceptions held by selected fourth grade public school teachers in Oklahoma regarding agriculture. For all practical purposes this information was unknown and undocumented.

Purpose of the Study

The purpose of the study was to conduct a baseline assessment of the knowledge and perceptions of selected fourth grade public school teachers regarding agriculture.

Objectives of the Study

In order to accomplish the purpose of the study, the investigation was directed toward the following specific research objectives:

1. Identify selected demographic characteristics about fourth grade teachers.
2. Determine the perceptions of selected fourth grade public school teachers about agriculture.
3. Determine the level of knowledge of selected fourth grade public school teachers about agriculture.
4. Identify the types of agricultural education concepts currently being taught in fourth grade classrooms in Oklahoma.
5. Identify the types of assistance fourth grade teachers might utilize in increasing the level of integration of agricultural concepts into the classroom.

Scope of the Study

The scope of this study included a sample of 340 fourth grade teachers from a population of 1,894 teachers employed by public school districts in Oklahoma during the fall of 1993. The population of fourth grade teachers was obtained from the Oklahoma State Department of Education.

Assumptions

The following assumptions were made in conducting this study:

1. The teachers selected did in fact represent the population from which they were randomly selected.
2. The instrument used, adequately assessed the participant's perceptions and knowledge of agriculture.
3. The responses of the teachers surveyed did in fact represent their honest expressions and perceptions.

Definitions of Terms

The following definitions are furnished to provide clear and concise meanings to the terms in this study.

Agriculture: the science dealing with the production of agricultural commodities, including food, fiber, wood products, horticultural crops, and other plant and animal products. The field also includes financing, processing, marketing, and distribution of those products, plus the economic, sociological, political, environmental and cultural characteristics of the food and fiber system. The term "ag" is also used synonymously.

Agricultural Literacy Education: The education about the food and fiber system including its history and current economic, social and environmental significance (National Research Council, 1988).

Cooperative Extension Service: The organization was created in 1914 with the passage of the Smith-Lever Act. Extension work is cooperatively conducted in all counties or parishes through a cooperative agreement or partnership of the United States Department of Agriculture, the land-grant institutions of the state, and the state and local county governments. Such terms as "Extension Service," "CES," "Extension System," and "Extension" may be used for and are thought to be synonymous with the defined term.

Ag in the Classroom: A program for children in kindergarten through twelfth grade begun in 1981 by the United States Department of Agriculture through the state departments of agriculture or state Farm Bureau organizations. This term is used to describe the national or state program. When the term is underlined in the text, it is describing the printed curriculum.

CHAPTER II

REVIEW OF LITERATURE

This chapter presents a summary of the background information that was reviewed in preparation for research. In the review of related literature particular emphasis was given to the following: (1) early sources of agricultural education, (2) land-grant youth development efforts, (3) agricultural literacy, (4) agricultural education reform, (5) Ag in the Classroom and a (6) summary.

While there was an abundant supply of available information on the history, mission, and philosophy of the land-grant institution and early agricultural education programs including the 4-H and FFA youth programs, there were very few references related to the relationship between these organizations and the Ag in the Classroom program, or other agricultural literacy programs.

Early Sources of Agricultural Education

For over 100 years the primary means of passing on information about agriculture and most other topics in the United States was from parent to child. Fathers taught their sons the skills they would need in order to provide for their families by working side by side in the fields. At the same time private schools began teaching agriculture as a part of the daily curriculum (Moore, 1987).

In 1862 the federal government became involved with the dissemination of agricultural education with the passage of the Morrill Act. The Morrill Land-grant Act of 1862 created a system of colleges in every state, with the purpose of providing education to the common citizen (Bliss, 1952; Sanders 1966). Each state that accepted the grant of land was required to provide certain conditions, without excluding scientific and classic studies; including the support of learning of military tactics and agriculture and mechanical arts, in order to promote liberal and practical education (Caldwell, 1976).

Over time the colleges undertook research, which was encouraged by the passage of the 1887 Hatch Act which established the agricultural experiment stations. Inevitably, the philosophy that knowledge from the university should be shared, led to the deliberate transmission of information to people who needed it in their current lives. These events led to the development of the "extension" concept (Caldwell, 1976).

As the land-grant philosophy continued with the passage of the Hatch Act creating the experiment stations, eventually the Smith-Lever Act in 1914 created the Cooperative Extension Service. The Extension Service became the third partner in the land-grant university triad of teaching, research and extension (Caul and Miller 1976). This partnership has continued with research being conducted on the university campus and in the field through the experiment station concept, and teaching is done in classrooms on both the campus and extended locations across the state via the Cooperative Extension Service.

Another piece of significant legislation involving agricultural education in American schools was the Smith-Hughes Vocational Education Act of 1917. It established the vocational education system in agriculture which is common in secondary schools across the United States. The act provided a program which was federally funded that essentially replaced the agricultural education classes that had begun in the early 1900's. The concept was expanded by the passage of the Vocational Education Act of 1963. This legislation broadened the mission of the program to include training beyond the farm. While the program has remained vocational in nature, it has expanded to various other agri-business programs (Moore and Bourne, 1986).

Land-grant Youth Development Efforts

Through the years the land-grant system, through the extension component, has continued to address local needs. Some of the early efforts of providing information for adults were made via their children.

Even before the formal Cooperative Extension program, there were numerous programs for boys and girls to learn the practical skills in home economics and agriculture. From the early days following the passage of the Smith-Lever Act, the boys and girls' club program was to improve the quality of life in rural communities by teaching children skills that they would then share with their parents. Specific examples of this practice were the early corn and tomato clubs that taught crop production and canning (Boyce, 1988; Reck, 1951).

Through the years the projects have changed, but the mission has remained the same. In a recent history of the 4-H program, the authors

of 4-H: An American Idea 1900 - 1980, emphasized an ability to adjust programs to the changing needs of people as the key that has helped 4-H remain dynamic and current for each new generation (Wessel & Wessel, 1982).

The Cooperative Extension Service has continued to provide current educational information for children regarding agriculture. According to current United States Department of Agriculture 4-H enrollment data some 5.7 million young people were involved in nonformal educational programs in 1992. Of the projects offered, nearly 90 percent of the projects were scientific in content and over 50 percent of the total were based in the biological sciences (USDA, 1993).

Likewise, vocational education has changed over the past 75 plus years since the passage of the Smith-Hughes Act. However, over time fewer and fewer members of the population have received training in basic agricultural education. In 1987, only 4.5 percent of all secondary students were enrolled in agricultural education programs offered by vocational agriculture (National Research Council, 1988).

In 1985, the National Research Council of the National Academy of Sciences commissioned a research effort to first study and evaluate the current delivery systems of agricultural education and then to make recommendations on ways to update and improve existing programs (National Research Council, 1988).

A major finding and concern addressed by the Committee was that agricultural education must become more than vocational agriculture. The Committee recommended study in "agricultural literacy" be taught to all students at all grade levels from kindergarten through twelfth

grade (National Research Council, 1988). This study has been frequently cited by recent researchers as helping to bring about agricultural education reform; however, this was not the first study that called for increased teaching of agricultural concepts. Frick, et.al. (1991) cited earlier studies by Mayer and Mayer (1974) and Little (1987) that called for secondary schools and liberal arts colleges to teach agricultural education, in order to avoid having even well-educated Americans that were totally ignorant of an area of knowledge basic to daily life and survival.

Agricultural Literacy

Literacy usually refers to some minimal level of reading and writing skills. The level of skill (knowledge) one needs to be literate changes over time and it is a relative measure without absolute standards (Frick and Spotanski, 1990). Thus, determining the threshold level required for a person to be agriculturally literate is not an exact science, but rather a judgment by experts.

In the National Research Council report, Understanding Agriculture (1988), the research committee envisioned an agriculturally literate person as one who had an understanding of the food and fiber system, including its significance upon history and its current economic, social and environmental significance to all Americans. The Committee on Agriculture Education in Secondary Schools, in the same study, defined agricultural literacy as the goal of education *about* agriculture. The committee stressed that by achieving agricultural literacy, citizens will be able to participate in establishing the

policies that support a competitive agricultural industry in both the United States and abroad.

Currently, the knowledge held by the average American about agriculture is very low. Several recent studies have found Americans, both adults and children have little understanding about agriculture.

In Oklahoma's neighboring state of Kansas, a study of 2000 elementary, junior and senior high students, found fewer than 30 percent of the students gave correct answers to relatively basic questions about agriculture (Horn and (Vining) Koch, 1986). In another neighboring state, Texas, over 90 percent of the fourth grade teachers responded that agriculture is farming and ranching only (Terry, et.al., 1990). Finally, an Oklahoma study of students in grades five, eight and eleven, reported a combined mean correct score of 32.62 percent, which indicated they too lacked a basic understanding of agriculture (Williams, 1990).

Russell, McCracken and Miller (1990) found similarly as they reported the role agriculture plays in the United States is poorly understood by youth and the public as a whole. They wrote in spite of the educational programs in public schools, universities, the Cooperative Extension Service and other agencies, most people still seem to perceive "agriculture" as synonymous with "farming" (Russell, 1990 pp 13-14).

These and other studies show that even with model programs like Ag in the Classroom, FFA, and 4-H, most students and teachers did not appear to be literate when it comes to agriculture and how the food and fiber system impacts us all. More alarmingly, model programs like 4-H and FFA may not be making an adequate impact on agricultural literacy.

In a comparison of youth who participated in 4-H and FFA versus those who did not, it was found at the fifth and eighth grade level youth with 4-H experiences were slightly more literate than those who had not participated. However, at the eleventh grade level, non-participants actually averaged higher correct scores than did participants in 4-H and/or FFA (Williams and White, 1991).

Law and Pepple (1990) pointed out two critical consequences of having citizens who were ignorant of the role of agriculture in their lives. They pointed out the importance for citizens to have a basic knowledge of agriculture in making policy decisions concerning the food and fiber system. Secondly, there will continue to be a need for high school and college graduates to assume careers in agriculture.

Agricultural Education Reform

The early 1980's marked a period of national educational reform. One theme that ran through this movement was that every school program should have contributed to and reinforced the students' basic academic literacy. This movement brought about the discovery that current basic academic education was leaving graduates agriculturally illiterate (Reed, 1990).

In the National Research Council report, Understanding Agriculture (1988), the Committee on Agriculture Education in Secondary Schools concluded agriculture has played and will continue to play too vital a role in society to be taught to only a relatively few students who are considering careers in agriculture. The report also criticized the instruction being given at the time in vocational agriculture. The report called for flexibility in the curriculum and expansion of the

program to go well beyond its traditional curriculum of production and vocational agriculture.

With the publishing of A Nation At Risk (National Commission on Excellence in Education, 1984), and other reports, the need for increased educational quality was emphasized. Across the United States, agricultural education was affected by these reports and reforms in the curriculum followed.

Russell, et.al. (1990) emphasized the need for development and implementation of agricultural literacy programs which included principles of basic understanding of agriculture, citizenry about agriculture, and literacy incorporated into existing subjects. Likewise some scientist and science educators believe the most effective strategy for raising science literacy among future workers and voters is to focus on the youngest members of the public (O'Connell, 1988).

In new Oklahoma Department of Vocational and Technical Education curricula, students were introduced to the wide variety of technologies and fields found in agriculture and gave the student a comprehensive overview of the world of agriculture (Smith, 1992).

In a study conducted by Hall (1991), among state FFA supervisors to see how states were responding to the National Research Council's report, the researcher found thirty-two (64 percent) of the states were providing organized programs dealing with consumer education for students in kindergarten through grade eight. Hall (1991) also found twenty-six states (52 percent) reported having organized programs relating to career education for seventh and/or eighth grade classrooms and twenty-three (46 percent) of the states offer FFA participation for

seventh and/or eighth grade students. Another program that had the capacity to address agricultural illiteracy, Ag in the Classroom, emerged in the early 1980's.

Ag in the Classroom

In the 1920's, 30's, and 40's much of the education about agriculture was limited to those few students who wanted to make farming their career (Traxler, 1990). While most educators were becoming further removed from agriculture there was a small group who persisted in teaching agricultural and environmental issues. It was from this group that the demands for educational materials grew and in the 1960's and 70's foundations, businesses, non-profit groups, associations, and state and federal agencies responded by producing various curricula regarding forestry, agriculture and the environment. However, there was no coordination, so there was little exchange of ideas among the groups.

Recognizing the importance of agriculture in the well being of the nation, the United States Department of Agriculture (USDA) invited representatives to meet to formulate a plan of action. This meeting marked the beginning of the Ag in the Classroom program in 1981 (Traxler, 1990).

The program was primarily facilitated by the state departments of agriculture and the state Farm Bureau organizations. While the program sought grass-roots support, in the beginning, efforts were made to not directly include 4-H and FFA in the Ag in the Classroom program (Traxler, 1993). According to Traxler (1993) this decision was made for several reasons. The organizing group did not want to infringe

upon already successful programs, and there was a desire to maintain a separate identity for Ag in the Classroom.

Over the years the exclusion of 4-H and FFA has been overcome by attempts to include all groups who desire to spread the word about the importance of agriculture. According to Traxler, over time, the fear of groups not wanting to share audiences has not generally proven to be true. Traxler (1992) cites situations such as the Oklahoma Ag in the Classroom program where the State Department of Vocational and Technical Education, Vocational Agriculture Teachers Association and the Cooperative Extension Service have all been key players in supporting Ag in the Classroom. In Oklahoma, the 4-H program has provided leadership to curriculum development and facilitates the program (Traxler, 1992).

In 1992, the USDA reported authorities in every state had established some level of curriculum coordination and those in most states have developed curriculum materials as part of the Ag in the Classroom program. In most cases, those materials span several grade levels. The consistent concept behind the program is the incorporation of agricultural concepts into other classroom subjects. In some states Ag in the Classroom serves as a clearinghouse for other agricultural curricula provided by various foundations, boards, or educational group (USDA 1992).

In Oklahoma, Ag in the Classroom materials have been written and distributed to approximately 1300 elementary schools where grades kindergarten through two are housed. During the spring of 1993 a group of pilot teachers began testing curriculum for grades three and four.

The Oklahoma Ag in the Classroom curriculum was written by volunteers from various commodity groups and academic departments, graduate students, and staff in the Oklahoma Cooperative Extension Service 4-H Department. Each lesson not only utilized learner outcomes as provided by the Oklahoma State Department of Education but also provided technical background information to support the lesson, that was validated by State Extension Specialists at Oklahoma State University.

Summary

As society has changed, people have become removed from the farm. While agriculture and the process of disseminating agricultural information has played a major role in the development of the United States, current generations may lack the information and skills needed to make informed decisions about agriculture.

Early federal legislation was driven by the need to provide agricultural training to citizens that would improve their quality of life. Over time, the needs of Americans have changed. Agricultural education including secondary and higher education, programs such as 4-H and FFA, and agricultural organizations have made changes too. However, some of the changes appear to have either been too slow in coming or the educational strategies have not been successful, as recent studies have shown both students and teachers in the public school have a very limited perception of agriculture and its role in their lives.

As research was conducted and considered, existing agricultural education delivery programs were evaluated. The evaluations identified

a need for reform. While current programs were generally successful, they were not reaching enough children and those being reached were not connecting the programs with the actual concepts that were being taught.

In order to better inform decision makers and the citizens of the United States, efforts were begun to increase the agricultural literacy levels of teachers and students. One method to do this was the further expansion of the Ag in the Classroom program. While this program was begun by the United States Department of Agriculture in 1981, the program was relatively non-existent in Oklahoma prior to 1993.

CHAPTER III

DESIGN AND PROCEDURES

This chapter was designed to describe the methodology used in conducting the study. The procedures were largely prescribed by the intent and purpose of the study, which was to assess the knowledge and perceptions of agriculture by selected fourth grade public school teachers in Oklahoma. The specific objectives utilized to provide direction for conducting the investigation were to:

1. Identify selected demographic characteristics about selected fourth grade public school teachers in Oklahoma.
2. Determine the perceptions of selected fourth grade public school teachers about agriculture.
3. Determine the level of knowledge of selected by fourth grade teachers about agriculture.
4. Identify the types of agricultural education concepts currently being taught in fourth grade classrooms in Oklahoma.
5. Identify the types of assistance fourth grade teachers might utilize in increasing the level of integration of agricultural concepts into the classroom.

Institutional Review Board (IRB)

Federal regulations and Oklahoma State University policy require review and approval of all research studies involving human subjects

before investigators can begin their research. The Oklahoma State University Research Services and IRB conduct this review to protect the rights and welfare of human subjects involved in biomedical and behavioral research. In compliance with the aforementioned policy, this study received the proper review and was approved for completion. Furthermore, this research was assigned the following research number: AG-94-007. A copy of the IRB approval documentation is provided as the last printed page of this study, following the Appendices.

The Population

The population of this study included fourth grade teachers in Oklahoma during the fall of 1993. Because a new Ag in the Classroom curriculum for grades three and four was being introduced during the spring of the 1993-94 school year, it was decided to study fourth grade teachers. The collection of benchmark data from this group prior to their exposure to the curriculum would provide data for future study.

To construct a sample representative of the population of 1,894 fourth grade teachers in Oklahoma during the fall of 1993, a random sample of teachers was selected to participate in the study. The sample size of 340 was selected based upon a table value yielding a 95 percent level of confidence (Krejcie and Morgan, 1970). The population consisted of a list of fourth grade teachers, obtained from the Oklahoma State Department of Education. Using a table of random numbers, a random sample of 340 teachers was selected from the population to receive the first questionnaire in late October, 1993.

As reported in Chapter IV, of those who received the initial mailing, 124 responded. A second mailing was completed in early

December. The second mailing yielded an additional 54 usable responses for a total of 178 returned questionnaires. The total response was slightly over 52 percent of the sample in the combined mailings.

The Instrument

The survey instrument used to collect data in this study was a "mailed questionnaire" containing 72 items divided into five parts (Appendix C). In composing the questionnaire, related studies by Terry, et.al. (1990) and Williams (1990) were utilized as well as suggestions from committee members and comments from two graduate level classes in the Agricultural Education Department at Oklahoma State University in the fall of 1993.

The validity and reliability of the instrument were determined through a pilot test conducted among a group of 23 graduate students in fields related to both agriculture and education. The instrument was also reviewed by faculty and staff in the State 4-H Office. A group of teachers was asked to test the instrument because the technical questions in Part III of the instrument came from background information provided in the Ag in the Classroom curriculum for grades three and four. As a result of having pilot-tested the materials from which the technical questions were taken, it was hoped the teachers would have gained insight in these three dimensions of agricultural literacy: (1) an understanding of the applied processes or methods of agriculture; (2) a basic vocabulary of agricultural terms; and (3) an insight as to the impact of agriculture on society (Frick and Spotanski, 1990).

The pilot groups were asked to evaluate the instrument, considering the general objectives of the study and clarity and readability of the instrument. The groups were also asked to make suggestions for improving or enhancing the instrument.

Major areas of the questionnaire included the following. Part I of the instrument was composed of factual questions used to collect demographic information pertaining to the teacher's personal and professional characteristics. Part II of the instrument was used to determine the perceptions of fourth grade teachers about agriculture. An open-ended question was used to collect these data. In Part III of the study, data were collected using multiple choice items to identify the knowledge held by teachers about agriculture. Part IV sought to determine the agricultural concepts taught in the fourth grade classrooms and the sources of that information. Teachers were asked to indicate either (yes) or (no) to each response in this section. The items selected for inclusion in Part IV were selected based upon similar studies, types of enrichment programs frequently offered in Oklahoma schools, and from topics referenced in the Oklahoma Ag in the Classroom curriculum.

The final part of the instrument, Part V, sought to identify types of assistance teachers might utilize in increasing the level of integration of agricultural concepts into the classroom. A five-part typal scale (Warde, 1990) was used, asking teachers to indicate to what degree they might use various methods to increase their knowledge of agriculture so they might better incorporate agricultural concepts into their classroom. The instrument included a statement insuring confidentiality, an offer to provide a list of the correct answers for

the knowledge assessment, and a summary of the study for those who made a request. A code number was used to assist in follow-up mailings.

Conduct of the Study

Classroom teachers who were selected through the random sample were asked to complete and return the questionnaire. A cover letter (Appendix A) accompanied the "mail questionnaire" along with a stamped, self-addressed return envelope. The cover letter was revised prior to the second mailing (Appendix B). Participation in the study was voluntary, and it was assumed those who did not wish to be included in the study did not complete and return the questionnaire.

Analysis of the Data

Because this was a descriptive study to assess the knowledge and perceptions of agriculture by selected fourth grade public school teachers in Oklahoma, the data were described by utilizing frequency distributions, percentages and mean scores. This method was most appropriate as numerical values were used to describe characteristics, information or data (Key, 1993). Responses to the items were assigned numerical values to assist in reporting purposes. To permit a more accurate description and an analysis of data, numerical and real limits were established for each of the items in Part V as follows:

<u>Numerical Value</u>	<u>Range of Real Limits</u>	<u>Degree of Interest</u>
5	4.50 - 5.00	Very Interested
4	3.50 - 4.49	Interested
3	2.50 - 3.49	Somewhat Interested
2	1.50 - 2.49	Not Interested
1	1.00 - 1.49	Definitely Not Interested

Within the knowledge assessment section of the instrument, Part III, the average score along with the frequency was listed for each multiple choice item. In addition, the frequency distribution of "guessed" answers was also provided.

CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

The major intent of this study was to assess the knowledge and perceptions of agriculture by selected fourth grade public school teachers in Oklahoma.

Data were collected during the fall of 1993 and consisted of responses from 178 fourth grade school teachers from public schools in Oklahoma. The objective of this chapter was to present a report of the reliable information by analysis of data compiled.

Population

The sample of the study consisted of 340 individuals selected to represent the 1,894 fourth grade public school teachers in Oklahoma during the fall of 1993. The sample consisted of teachers with varying years of experience and from a variety of school districts and classroom designs.

Each of the teachers selected in the random sample was mailed a questionnaire and self-addressed, stamped envelope. A follow-up letter, an additional survey, and stamped envelope were mailed to non-respondents approximately one and one-half months after the first mailing. The mail questionnaire was selected as the instrument as it offered both a practical and feasible method of data collection. Special consideration was given to holidays when mailing the

instruments. Attempts were made to send the instrument before fall holidays and just before the winter holiday break. It was assumed the follow-up might be completed during a time of the academic year when students might be out of the classroom working on seasonal programs or perhaps the teachers would complete the instrument while at home on break. This philosophy seemed valid as most of the replies on the second mailing came while teachers were on break.

Findings of the Study

Table I contains an analysis of teachers who responded to each mailing and those who did not respond. Of the 340 teachers who were surveyed, 124 responded to the first mailing and 54 responded to the second mailing. While a total of 178 (52.4 percent) of the teachers did reply, 162 (47.6 percent) did not reply after two mailings.

Table II is intended to provide a summary of demographic characteristics of those teachers who chose to participate in the study. Of the 178 teachers who responded, it was found, as a group, the mean number of years of teaching experience was 13.08 years including the current year. It was also revealed 86 (48.3 percent) of the teachers had lived on a farm or ranch at some time during their lifetime and, of those, the mean number of years of residence on a farm or ranch was 18.35 years.

The teachers were asked if they had been members of 4-H and/or FFA agricultural youth organizations. It was found 12 (6.7 percent) of the teachers had been members of FFA, and, they had participated an average of 2.50 years. Additionally, 80 (44.9 percent) of the teachers had been 4-H members, having a mean value of 4.13 years.

TABLE I
DISTRIBUTION OF RESPONDENTS

Number of Respondents	<u>Frequency Distribution</u>	
	n	%
Responses to the first mailing.....	124	36.5
Responses to the second mailing.....	54	15.9
Total Responses.....	178	52.4
Non-response.....	162	47.6
Total.....	340	100.0

N=340, n=178

TABLE II
DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

Characteristic	N = 178	Mean	Std Dev	
Years of teaching experience, including the current year (n=178).....		13.08	7.99	
Years lived on a farm or ranch during lifetime (n=86)*.....		18.35	12.40	
Years of vocational or agricultural education (FFA) (n=12)*.....		2.50	1.24	
Years of 4-H Club membership (n=80)*.....		4.13	2.53	
Number of semester credit hours of agriculture in college (n=3)*.....		4.00	3.61	
Agricultural organizations with which associated				
4-H Leaders (6), FFA Booster (4), FFA (2), Cub Scouts (1), Milk Producers (1), Young Farmers (1), Farmer's Coop (1)				
Respondents with families who have or do rely on agriculture as a major source of income.....	<u>YES</u>		<u>NO</u>	
	n	%	n	%
	55	30.9	123	69.1

*Only those respondents with a positive response to the characteristics is reported.

It was revealed three (1.7 percent) of the 178 teachers had taken college-level courses for credit in agriculture. The three had a mean value of 4.00 credit hours of agriculture credit, with a standard deviation of 3.61. Table II also provides a list of agricultural organizations with which the teachers were currently associated. It was found the groups and frequencies of responses were as follows: 4-H Leaders (6), FFA Boosters (4), FFA (2), Cub Scouts (1), Milk Producers (1), Young Farmers (1), and Farmer's Cooperative (1).

The final personal demographic item to which the teachers were asked to respond related to agricultural income. It was found 55 (30.9 percent) of those responding had at some time relied on agriculture as a major source of income.

School Type

The data in Table III describes the types of schools in which teachers were employed. Of the 174 teachers who responded to this question, it was found 23 (13.2 percent) of the teachers classified their school as being metropolitan, 51 (29.3 percent) were suburban, 62 (35.6 percent) of the teachers classified their schools as being in a small town, and 38 (21.9 percent) considered their schools to be rural.

Classroom Type

Teachers were asked to classify their classrooms. There were 177 responses to this item and, as revealed in Table IV, 152 (85.9 percent) of the teachers considered their rooms to be self-contained, 20 (11.3 percent) classified their rooms as departmental, and five (2.8 percent) classified their setting as being neither departmental nor

TABLE III
 DISTRIBUTION OF TEACHERS BY CLASSIFICATION OF SCHOOL

N = 178

Classification of school:	<u>Frequency Distribution</u>	
	n	%
Metropolitan.....	23	13.2
Suburban.....	51	29.3
Small Town.....	62	35.6
Rural.....	38	21.9
Total ¹	174	100.0

¹ Four persons did not respond to this item.

TABLE IV
 DISTRIBUTION OF PARTICIPANTS BY CLASSIFICATION OF CLASSROOM

N = 178

Classification of classroom	Frequency Distribution	
	n	%
Self-contained.....	152	85.9
Departmental.....	20	11.3
Other ¹	5	2.8
Total ²	177	100.0

¹ Other = special education (2), gifted (1), multi-level (1), or undesignated (1)

² One person did not answer this item.

self-contained, but, as special education (2), gifted, (1), multi-level (1), or not designated (1).

Definitions of Agriculture Held by Selected Fourth Grade Teachers

Teachers were asked to define agriculture based upon their own perceptions. The verbatim responses are listed in Appendix D. Of the definitions given, the term "crop" appeared 87 times and "animals" appeared 83 times. The words "producing, produce, and production" collectively appeared 81 times. The words "farm and farming" appeared 75 times. "Business and industry" terms appeared 35 times and the word "food" appeared 60 times. Finally, only 13 teachers used the term "science" as part of the definition of agriculture.

Frequency Distribution of Teacher Knowledge

Assessment to Questions Relating to Agricultural Topics

Data in Table V were derived from a series of 25 items designed to assess the level of knowledge held by the fourth grade teachers in the study. Teachers were asked to select from a list of multiple choice answers, the correct answer for each of the items. After selecting the item they felt best answered the question, the teachers were asked to indicate if they did or did not guess at the answer. Data in Table V were presented according to the frequency of correct responses given for the items. The item most frequently answered correctly appears first through the item most often answered incorrectly. For the group, 15 (60 percent) of questions were answered correctly by the majority of those responding.

TABLE V

FREQUENCY DISTRIBUTION OF TEACHER RESPONSES TO
QUESTIONS RELATED TO AGRICULTURAL TOPICS

AGRICULTURE KNOWLEDGE ASSESSMENT STATEMENT	FREQUENCY DISTRIBUTION							
	RESPONSE		GUESSED AT ANSWER					
	n	%	(NO) n	%	(YES) n	%	(NON RESPONSE) n	%
(N = 178) ¹								
Milk is an important source of -								
a. carbohydrates	0	.0						
b. iron	0	.0						
c. calcium *	175	99.4						
d. vitamin C	1	.6						
e. vitamin B-12	0	.0						
Total	176	100.0	100	56.2	15	8.4	63	35.4
The term used to describe the sprouting of a seed?								
a. hybridization	0	.0						
b. germination *	173	97.2						
c. propagation	3	1.7						
d. inoculation	0	.0						
e. fertilization	2	1.1						
Total	178	100.0	93	52.2	23	13.0	62	34.8
Who is most often credited for the invention of the cotton gin?								
a. John Deere	0	.0						
b. Eli Whitney *	171	96.6						
c. Benjamin Franklin	0	.0						
d. Cyrus McCormick	5	2.8						
e. George Washington Carver	1	.6						
Total	177	100.0	105	59.0	12	6.7	61	34.3

TABLE V (Continued)

AGRICULTURE KNOWLEDGE ASSESSMENT STATEMENT	FREQUENCY DISTRIBUTION							
	RESPONSE		GUESSED AT ANSWER					
	n	%	(NO)	(YES)	(NON RESPONSE)			
(N = 178) ¹	n	%	n	%	n	%	n	%
What process kills bacteria in liquids such as milk with heat?								
a. homogenization	9	5.0						
b. gelatinization	0	.0						
c. evaporation	0	.0						
d. pasteurization *	168	94.4						
e. germination	1	.6						
Total	178	100.0	94	52.8	26	14.6	58	32.6
Which of these natural resources would least influence agricultural crops?								
a. sunshine	0	.0						
b. soil	0	.0						
c. natural gas *	166	93.3						
d. air	10	5.6						
e. water	2	1.1						
Total	178	100.0	74	41.6	47	26.4	57	32.0
The hard bottom layer that underlies the earth's surface?								
a. topsoil	0	.0						
b. mineral	1	.6						
c. clay	4	2.3						
d. bedrock *	157	88.6						
e. subsoil	15	8.5						
Total	177	100.0	60	33.7	69	38.8	49	27.5

TABLE V (Continued)

AGRICULTURE KNOWLEDGE ASSESSMENT STATEMENT	FREQUENCY DISTRIBUTION							
	RESPONSE		GUESSED AT ANSWER					
	n	%	(NO)	(YES)		(NON RESPONSE)		
n			%	n	%	n	%	
(N = 178) ¹								
The protective case surrounding a new plant?								
a. wrapper	3	1.7						
b. embryo	8	4.5						
c. seed coat *	155	87.0						
d. germ	1	.6						
e. endosperm	11	6.2						
Total	178	100.0	68	38.2	63	35.4	47	26.4
In which state did the term "maverick" likely originate?								
a. California	0	.0						
b. Michigan	2	1.1						
c. Tennessee	2	1.1						
d. Oklahoma	20	11.4						
e. Texas *	153	86.4						
Total	177	100.0	23	12.9	121	68.0	34	19.1
What trait makes a heifer different from a cow? Heifers...								
a. are old cows	6	3.4						
b. are red and white	4	2.3						
c. are male cattle	1	.6						
d. have not borne a calf *	148	85.1						
e. are raised for meat, not milk	15	8.6						
Total	174	100.0	74	41.6	54	30.3	50	28.1

TABLE V (Continued)

AGRICULTURE KNOWLEDGE ASSESSMENT STATEMENT	FREQUENCY DISTRIBUTION							
	RESPONSE		GUESSED AT ANSWER					
	n	%	(NO)	(YES)	(NON RESPONSE)		n	%
(N = 178) ¹								
Which of these animals isn't an insect?								
a. butterfly	21	11.9						
b. spider *	148	83.6						
c. beetle	5	2.8						
d. grasshopper	1	.6						
e. wasp	2	1.1						
Total	177	100.0	78	43.8	45	25.3	55	30.9
What is Oklahoma's number one agricultural crop?								
a. soybeans	25	14.1						
b. cotton	0	.0						
c. hardwood forests	0	.0						
d. peanuts	7	4.0						
e. wheat *	145	81.9						
Total	177	100.0	51	28.6	84	47.2	43	24.2
Which ingredient is listed first on the manufacture's label?								
a. the most expensive item	1	.6						
b. the vitamins	23	13.0						
c. the cereals and fillers	6	3.4						
d. the item w/ the largest volume *	144	81.4						
e. the item with the most flavor	3	1.6						
Total	177	100.0	78	43.8	39	21.9	61	34.3

TABLE V (Continued)

AGRICULTURE KNOWLEDGE ASSESSMENT STATEMENT	FREQUENCY DISTRIBUTION							
	RESPONSE		GUESSED AT ANSWER					
	n	%	(NO)		(YES)		(NON RESPONSE)	
(N = 178) ¹			n	%	n	%	n	%
What mineral found in Oklahoma's soil gives it a red color?								
a. lead	5	2.9						
b. cobalt	11	6.3						
c. iron *	139	79.4						
d. mercury	8	4.5						
e. nitrogen	12	6.9						
Total	175	100.0	38	21.3	98	55.1	42	23.6
Early plains settlers had to rely on this as their primary heating source.								
a. fallen trees	16	9.1						
b. native forests	18	10.1						
c. coal	7	3.9						
d. animal manure *	135	75.8						
e. oil	2	1.1						
Total	178	100.0	70	39.3	56	31.5	52	29.2
The agency where county, state and federal governments together fund agriculture, home economics, rural development and youth programs?								
a. Dept. of Human Services	2	1.1						
b. Soil Conservation Service	13	7.4						
c. Farm Bureau	27	15.3						
d. Cooperative Extension Service *	116	66.0						
e. Farmer's Home Administration	18	10.2						
Total	176	100.0	43	24.2	95	53.3	40	22.5

TABLE V (Continued)

AGRICULTURE KNOWLEDGE ASSESSMENT STATEMENT	FREQUENCY DISTRIBUTION							
	RESPONSE		GUESSED AT ANSWER					
	n	%	(NO)	(YES)	(NON RESPONSE)			
(N = 178) ¹	n	%	n	%	n	%	n	%
Why do bees fan the nectar in their hives?								
a. to attract a queen	15	8.6						
b. to keep it cool	65	37.4						
c. to evaporate the water *	79	45.4						
d. to keep other bees away	4	2.3						
e. to keep it from sticking to them	11	6.3						
Total	174	100.0	25	14.0	118	66.3	35	19.7
The average American eats about how many pounds of beef per year?								
a. 5 - 10 pounds	1	.6						
b. 15 - 30 pounds	10	5.7						
c. 35 - 45 pounds	29	16.4						
d. 50 - 55 pounds	57	32.4						
e. 60 - 75 pounds *	79	44.9						
Total	176	100.0	6	3.3	158	88.8	14	7.9
What is the primary source of irrigation water used in western Oklahoma?								
a. rainfall	35	19.7						
b. ponds and lakes	17	9.6						
c. underground aquifers *	75	42.1						
d. rivers and streams	20	11.2						
e. rural water districts	31	17.4						
Total	178	100.0	21	11.8	120	67.4	37	20.8

TABLE V (Continued)

AGRICULTURE KNOWLEDGE ASSESSMENT STATEMENT	FREQUENCY DISTRIBUTION							
	RESPONSE		GUESSED AT ANSWER					
	n	%	(NO)	(YES)	(NON RESPONSE)		n	%
(N = 178) ¹								
How many calories are there in a three-ounce, cooked, closely trimmed serving of beef sirloin? ²								
a. 75 - 150	48	27.1						
b. 175 - 250 *	57	32.2						
c. 275 - 350	51	28.8						
d. 375 - 450	13	7.3						
e. 500 - 575	8	4.6						
Total	177	100.0	9	5.1	141	79.2	28	15.7
How does Oklahoma rank among the 42 major hard red winter wheat producing states?								
a. first	13	7.3						
b. second *	47	26.4						
c. sixth	80	44.9						
d. ninth	20	11.2						
e. eleventh	18	10.2						
Total	178	100.0	3	1.7	161	90.4	14	7.9
Which of the following plants is not a member of the grass family?								
a. wheat	1	.6						
b. sugarcane	94	53.4						
c. oats	2	1.1						
d. rice	37	21.0						
e. clover *	42	23.9						
Total	176	100.0	28	15.7	123	69.1	27	15.2

TABLE V (Continued)

AGRICULTURE KNOWLEDGE ASSESSMENT STATEMENT	FREQUENCY DISTRIBUTION							
	RESPONSE		GUESSED AT ANSWER					
	n	%	(NO)	(YES)		(NON RESPONSE)		
n			%	n	%	n	%	
(N = 178) ¹								
Of the three soil particles - sand, silt, and clay; which is the smallest?								
a. sand	27	15.3						
b. silt	112	63.7						
c. clay *	37	21.0						
Total	176	100.0	33	18.5	105	59.0	40	22.5
Which of the following vegetables and fruits is the best source of vitamin C?								
a. green pepper *	28	16.1						
b. tomato	105	60.3						
c. onion	1	.6						
d. carrot	34	19.5						
e. potato	6	3.5						
Total	174	100.0	36	20.2	103	57.9	39	21.9
The number of daily servings from the cereal group recommended by the U.S. Department of Agriculture? ³								
a. 1 - 2	24	13.7						
b. 3 - 4	107	61.1						
c. 5 - 6 *	23	13.2						
d. 7 - 8	14	8.0						
e. 9 - 10	7	4.0						
Total	175	100.0	41	23.0	76	42.7	61	34.3

TABLE V (Continued)

AGRICULTURE KNOWLEDGE ASSESSMENT STATEMENT	FREQUENCY DISTRIBUTION							
	RESPONSE		GUESSED AT ANSWER					
			(NO)		(YES)		(NON RESPONSE)	
(N = 178) ¹	n	%	n	%	n	%	n	%
Oklahoma's average farm size is?								
a. 400 - 450 acres *	21	11.8						
b. 500 - 550 acres	26	14.6						
c. 600 - 650 acres	30	16.8						
d. 300 - 350 acres	84	47.2						
e. 700 - 750 acres	17	9.6						
Total	178	100.0	1	.5	155	87.1	22	12.4

The asterisk (*) and the bold face type denote the correct response.

¹ While N=178, (n) varies as not all teachers chose to respond to all questions.

² The National Livestock and Meat Board revised their data from 220 calories to 165 calories in 1992, this test was based on the 220 calorie data.

³ The USDA recommendations were increased from 4 - 6 serving to 6 - 11 serving in 1992, this test was based on the old 4 food group design rather than the food pyramid.

Items Answered Correctly by the Majority of the Teachers

On an item that asked the teachers to select the answer to best complete a phrase about milk, 175 (99.4 percent) of the teachers knew milk was a good source of calcium. Furthermore, only 15 teachers (8.4 percent) said they guessed at this item.

The teachers were asked to select the term used to describe the sprouting of a seed. All but five of the teachers selected the correct answer to this item. Of the total group, 173 (97.2 percent) of the teachers made the correct selection and only 23 (13.0 percent) guessed on this item.

Most of the teachers, 171 (96.6 percent) selected Eli Whitney as the individual most often credited with the invention of the cotton gin. Only 12 (6.7 percent) of the teachers who responded said they guessed in answering this question.

On an item related to milk, 168 (94.4 percent) of the teachers knew pasteurization is a process that kills bacteria in liquids such as milk. Twenty-six (14.6 percent) of the teachers who responded said they guessed at this item.

From a list including sunshine, soil, natural gas, air, and water; 166 (93.3 percent) of the teachers knew natural gas was the least likely natural resource to influence agricultural crops. On this item, 47 (26.4 percent) of the teachers registered a guess.

A large number, 157 (88.6 percent) of the teachers also selected the correct response of, bedrock, as being the hard bottom layer that underlies the earth's surface. Sixty-nine (38.8 percent) of the teachers guessed when responding to this question.

Regarding plant growth, teachers were asked to select the term used to describe the protective coat surrounding a new plant. Again, a fairly high number, 155 (87.0 percent) listed the seed coat as the correct response. Of those responding, 63 (38.2 percent) reported guessing at the answer.

The teachers were asked to select the state where the term "maverick" likely originated. Of the 177 teachers who answered this question, 153 (86.4 percent) selected, Texas, the correct answer to the question. While most of the teachers got the correct answer, 121 (68.0 percent) of the teachers indicated they had guessed at the item.

When asked what trait makes a heifer different from a cow, 148 (85.1 percent) of the teachers indicated heifers have not borne a calf. Of the teachers responding, 54 (30.3 percent) of the teachers guessed when answering this question.

Teachers were also asked to select from a list of animals, the one that was not an insect. A relatively high number of the teachers, 148 (83.6 percent), knew a spider was not an insect. Also, of the teachers responding, only 45 (25.3 percent) guessed at the answer.

Of the 177 teachers who answered the question regarding Oklahoma's number one agricultural crop, 145 (81.9 percent) of the teachers listed wheat as the number one crop. Eighty-four (47.2 percent) of the teachers who responded, guessed at the answer.

Regarding food manufactures' labels, 144 (81.4 percent) of the 177 teachers answering, selected the correct answer when asked which ingredients were listed first on the label. Those who answered correctly said the item with the largest volume is listed first on the

manufactures' label. Only 39 (21.9 percent) of the teachers indicated a guessed answer on this item.

When asked what mineral gives Oklahoma's soils a red color, 139 (79.4 percent) of the teachers selected iron as being the mineral found in Oklahoma's soils that yields a red color. Ninety-eight (55.1 percent) of the teachers responded they guessed on this item.

When asked the primary source of fuel relied upon by early plains settlers, 135 (75.8 percent) of the teachers recorded animal manure as the primary fuel source. Of the teachers responding to the question, 56 (31.5 percent) guessed at the answer.

The teachers were asked to indicate the agency where federal, state and county governments together fund programs to help people with agriculture, home economics, rural development, and youth programs. Of the 176 teachers who answered this question, 116 (65.9 percent) knew the Cooperative Extension Service was the correct response. Even though the majority of the teachers selected the correct response, 95 (53.3 percent) of those indicated they guessed in answering the question.

Items Answered Incorrectly by the Majority of Teachers

The data in Table V also indicate the majority of the teachers failed to select the correct response to ten (40 percent) of the items in the knowledge assessment section of the questionnaire.

When asked why bees fan the nectar in their hives, 79 (45.4 percent) of the teachers selected the answer of "to evaporate the water" as being the correct answer. Of the group, 118 (66.3 percent) also indicated they guessed when answering this question.

Likewise, the same number, 79 (44.9 percent) of the teachers knew the average American eats between 60 and 75 pounds of beef per year. Of those who responded, 158 (88.8 percent) guessed at the answer they listed for the item.

The teachers were asked the primary source of water used to irrigate crops in western Oklahoma. Of the 178 teachers responding, 75 (42.1 percent) knew the primary source of irrigation water was underground aquifers. The majority of the teachers, 120 (67.4 percent) also guessed at this item.

A question was asked regarding the number of calories in a three-ounce, cooked, closely trimmed serving of beef sirloin. Of the teachers, 57 (32.2 percent) selected the correct choice based upon National Livestock and Meat Board publications dated before 1992, which was contained within the range of 175 - 250 calories. It should be noted the caloric data was revised to 165 calories in 1992, and this range was not represented in the assessment instrument. Of the group, 141 (79.2 percent) guessed at this response.

While the vast majority of the teachers knew wheat was Oklahoma's number one crop, only 47 (26.4 percent) knew Oklahoma normally ranks second among the 42 major hard red winter wheat producing states. Of the 177 teachers who responded to this question, 161 (90.4 percent) indicated a guessed answer.

The teachers were asked to select from a list of five plants, which one was not a member of the grass family. Forty-two (23.9 percent) of the teachers indicated clover was not a member of the grass family. However, 123 (69.1 percent), of the teachers guessed on the question.

When asked to select the smallest soil particle among sand, silt or clay, 37 (21.0 percent) of the teachers chose the correct response. Of the total group, 105 (59.0 percent) guessed at the answer.

When asked to select the best source of vitamin C from a list of five vegetables, only 28 (16.1 percent) of the teachers selected green peppers as the best source from the list. Of the group who indicated if they guessed, 103 (57.9 percent) did so.

When asked the number of daily servings from the cereal group recommended by the US Department of Agriculture, it was found 23 (13.1 percent) of the teachers selected the answer of 5 - 6 serving which was considered to be correct until the recommendations were increased to 6-11 servings in 1993. It should be noted 131 (75.0 percent) of the teachers indicated a value below the USDA recommendations outlined in either the "Basic-4" or "Food Pyramid" plans. Additionally, 76 (42.7 percent) of the teachers indicated they guessed at the answer they listed.

Most of the teachers missed a question regarding the average farm size in Oklahoma. Only 21 (11.8 percent) of the teachers selected the size range of 400 - 450 acres as being the correct answer. Most of the teachers selected a value indicating a smaller than average farm size. Additionally, only one teacher indicated they did not guess when answering the question. Of the remainder who responded, 155 (87.1 percent) said they guessed at the answer.

Identification of Teaching Units or Topics Used in the Classroom

The data reported in Table VI contains a list of the various agricultural science topics teachers might use in their fourth grade

TABLE VI
IDENTIFICATION AND DISTRIBUTION OF TEACHING UNITS OR TOPICS USED

Unit or topic used:	Frequency Distribution					
	(YES)		(NO)		(TOTAL)	
	n	%	n	%	n	%
Plant growth & development..	157	89.2	19	10.8	176	100.0
Ecology and environment.....	154	88.5	20	11.5	174	100.0
Nutrition & food selection..	136	78.2	38	21.8	174	100.0
Sources of our food.....	131	75.7	42	24.3	173	100.0
Insects.....	118	68.2	55	31.8	173	100.0
Role of agric. in economy...	66	40.2	98	59.8	164	100.0
Composition of soils.....	58	34.7	109	65.3	167	100.0
Role of agric. in history...	49	30.1	114	69.9	163	100.0
Farm animals.....	39	23.9	124	76.1	163	100.0
History and origin of cloth and clothing.....	38	23.3	125	76.7	163	100.0
Gardening.....	28	17.5	132	82.5	160	100.0
Agricultural careers.....	24	15.0	136	85.0	160	100.0
Other ¹	6	24.0	19	76.0	25	100.0

¹ Other topics listed: wheat and bread, animal behavior, agriculture in other countries, comparison of USA and USSR agriculture.

classrooms. Teachers were asked to indicate if they did (yes) or if they did not (no) use the topics listed. The data in Table VI are listed by the topics most used by the teachers responding for each topic listed. The value of (n) varies as not all teachers answered all of the topics listed. The most often used topic from the list provided was plant growth and development, which was used by 157 (89.2 percent) of the teachers. Nearly as many, 154 (88.5 percent) of the teachers also taught units related to ecology and the environment. Nutrition and food selection units were listed by 136 (78.2 percent) of the teachers, and 131 (75.7 percent) of the teachers responded they used units on sources of our food.

Of the teachers responding, 118 (68.2 percent) reported using units on insects. Fewer of the teachers, 66 (40.2 percent) used units on the role of agriculture in the economy. Fewer still taught units on the composition of soils with only 58 (34.7 percent) of the teachers indicating they taught regarding this topic. Forty-nine (30.1 percent) of the teachers indicated they taught about the role of agriculture in history and 39 (23.9 percent) taught units relating to the history and origin of cloth and clothing.

Finishing the list of topics used by fourth grade teachers was gardening and agricultural careers, with 28 (17.5 percent) and 24 (15.0 percent) teachers using these units respectively. Teachers were also able to list other units that were not included in the list. Six teachers reported using other topics, including, wheat and bread, animal behavior, agriculture in other countries, and a comparison of agriculture in the USA and the former USSR.

Identification of Sources Used to Obtain Educational Materials

The data in Table VII provides a summary of the various sources teachers use to obtain educational materials for their fourth grade classrooms. Teachers were asked to indicate if they did (yes) or if they did not (no) use the source listed. The data in Table VII is listed by the sources most used by the teachers responding for each item listed. The value of (n) varies as not all teachers answered all of the topics listed. The most often used source for educational materials was textbooks and periodicals, with 154 (88.0 percent) of the teachers responding listing this as a source used to obtain classroom materials. Seventy-five (45.2 percent) of the teachers indicated they used Project Wild, a natural resource curriculum, primarily coordinated by the Oklahoma Department of Wildlife Conservation.

When asked about councils and associations, such as the Dairy Council, 59 (35.1 percent) of the teachers indicated that they used councils as a source. Similarly, 58 (35.6 percent) of the teachers listed local science or agricultural education teachers as a source of educational materials. Thirty-three (20.2 percent) of the teachers listed the U.S. Department of Agriculture as a source of information used in their classrooms.

Another natural resource education curriculum, Project Learning Tree, coordinated by the Oklahoma Conservation Commission, was also listed as a source of educational materials by 31 (18.7 percent) of the teachers responding. The same number of teachers, 31 (18.9 percent) of those responding to the question, identified the State Department of Agriculture as an educational source.

TABLE VII
 INDICATION AND DISTRIBUTION OF SOURCES
 USED TO OBTAIN EDUCATIONAL MATERIALS

Source of information:	Frequency Distribution					
	(YES)		(NO)		(TOTAL)	
	n	%	n	%	n	%
Text books, periodicals.....	154	88.0	21	12.0	175	100.0
Project Wild.....	75	45.2	91	54.8	166	100.0
Dairy Council, Assns., etc...	59	35.1	109	64.9	168	100.0
Materials from local science or agric. educ. teachers..	58	35.6	105	64.4	163	100.0
U.S. Dept. of Agriculture...	33	20.2	130	79.8	163	100.0
Project Learning Tree.....	31	18.7	135	81.3	166	100.0
State Dept. of Agriculture..	31	18.9	133	81.1	164	100.0
4-H School Enrichment.....	24	14.6	140	85.4	164	100.0
Meat Councils, Assns., etc...	20	12.2	144	87.8	164	100.0
Ag in the Classroom.....	13	7.9	152	92.1	165	100.0
Farm Groups (Farm Bureau, Farmer's Union, etc.).....	9	5.6	151	94.4	160	100.0
Seed and Grain Assns.....	5	3.1	156	96.9	161	100.0
Other ¹	5	12.2	36	87.8	41	100.0
Food For America.....	4	2.5	158	97.5	162	100.0
National FFA Organization...	1	.6	161	99.4	162	100.0

¹ Other sources listed: Soil Conservation Service(2), Oklahoma Dept. of Wildlife(2), OSU Extension Agent(2), what farmers grow in Oklahoma, commercial packets (Iron Kids), classroom speakers, and self-developed units.

School enrichment projects provided by 4-H were listed as a source by 24 (14.6 percent) of the teachers. While 59 teachers listed the Dairy Council as a source, only 20 (12.2 percent) of the 164 responding, listed Meat Councils as a source of educational materials. A relatively low number of teachers, 13 (7.9 percent), listed Ag in the Classroom as a source. Other sources, with less than ten responses each, included, farm groups, seed and grain associations, Food for America, and the national FFA. These items were used by nine (5.6 percent), five (3.1 percent), four (2.5 percent) and one (.6 percent) respectively. Six teachers listed other sources which included: Soil Conservation Service, the Oklahoma Department of Wildlife, OSU Extension agents, commercial sources, and self-developed units.

Identification of Projects Completed by Fourth Grade Classes

Table VIII was developed to outline various agricultural science projects or activities teachers used in their fourth grade classrooms. Teachers were asked to indicate if they did (yes) or if they did not (no) routinely complete the project or activity listed. The data in Table VIII are ranked by the projects most used by the teachers responding for each topic listed. The value of (n) varies as not all teachers answered all of the topics listed. The most often completed project or activity was plant growth and development, which was used by 140 (79.5 percent) of the teachers.

Of the 172 teachers responding, 86 (50.0 percent) listed fish or aquarium life as a project completed in their fourth grade classrooms.

TABLE VIII
DISTRIBUTION OF PROJECTS NORMALLY COMPLETED BY FOURTH GRADE CLASS

Types of projects:	Frequency Distribution					
	(YES)		(NO)		(TOTAL)	
	n	%	n	%	n	%
Growing plants.....	140	79.5	36	20.5	176	100.0
Fish, aquarium life.....	86	50.0	86	50.0	172	100.0
Insect habitats.....	81	48.2	87	51.8	168	100.0
Terrariums.....	58	34.5	110	65.5	168	100.0
Hatch chicks/other poultry..	43	25.9	123	74.1	166	100.0
Greenhouse plants.....	35	21.2	130	78.8	165	100.0
Garden plot.....	13	7.9	151	92.1	164	100.0
Other ¹	7	17.5	33	82.5	40	100.0

¹ Other projects listed: recycling, rodents, gerbils, and guinea pigs, wheat and bread unit, cotton unit, and birds.

A nearly equal group of 81 teachers (48.2 percent) listed insect topics as a project completed.

Fifty-eight (34.5 percent) of the teachers indicated they had completed terrariums as a project and 43 (25.9 percent) of the teachers said they hatch chicks or other poultry as a class project.

Greenhouse plant projects were listed by 35 (21.1 percent) of the teachers, while 13 (7.9 percent) listed garden plots as a class projects. Seven teachers added other projects to the list, including, recycling, rodents, gerbils, guinea pigs, wheat and bread units, cotton units, and birds.

Distribution of Hours of Science Concepts Taught

After indicating the various topics covered, the sources used, and the projects completed, the teachers were asked to indicate the number of hours of science concepts related to agriculture that were taught during the school year in their classroom. The hours taught were listed by ranges and these data are revealed in Table IX. A total of 174 teachers answered this question and of the group, 108 (62.1 percent) indicated they taught 50 or fewer hours of agricultural science concepts during the year. Forty-three of the teachers (24.7 percent) said they taught between 51 and 100 hours; and 12 (6.9 percent) selected the range of 101 to 150 hours. Nine teachers (5.2 percent) said they taught between 151 and 200 hours per year and two teachers said they taught between 201 and 250 hours.

It should be noted several of the teachers who reported over 100 hours also characterized their classrooms as departmentalized. Just as some of those teachers primarily taught science, other teachers

TABLE IX
DISTRIBUTION OF HOURS TAUGHT USING AGRICULTURAL SCIENCE CONCEPTS

Hours taught	<u>Frequency Distribution</u>	
	n	%
50 and under.....	108	62.1
51 - 100.....	43	24.7
101 - 150.....	12	6.9
151 - 200.....	9	5.2
201 - 250.....	2	1.1
Total ¹	174	100.0

¹ Four persons did not answer this item.

surveyed indicated they did not teach science, but did cover some of the topics in social studies.

Preferred Methods of Receiving Information About Agriculture

In order to determine which methods teachers might use in integrating agriculture into fourth grade teaching programs, teachers were asked to respond to eight methods of gaining information. A typical scale was used and teachers were asked to indicate if they would likely be "very interested (5), interested (4), somewhat interested (3), not interested (2), or definitely not interested (1)" in each of the methods.

The data in Table X are listed by mean value and, as with other sections, the value of (n) varies as not all teachers responded to each of the eight items on the list. Of 171 teachers responding, most were interested in receiving a list of available teaching aids. This item had a mean value of 4.40 with a standard deviation of .94. This mean fell within the "interested" range on the typical scale; however it was listed as being a method in which the teachers were "very interested" by 108 of the respondents.

Teachers were also asked to respond regarding activities for which staff development points would be awarded. This was listed as the second most preferred method for receiving information, with a mean of 3.87 and a standard deviation of 1.20.

With a mean value of 3.70 and standard deviation of 1.14, teachers listed a reference list for personal reading as their third choice. Consultation with agricultural education teachers or county

TABLE X
PREFERRED METHODS OF RECEIVING INFORMATION ABOUT AGRICULTURE

Characteristic:	5		4		3		2		1		Total		Mean	Sd	Interpretation
	Very Interested		Interested		Somewhat Interested		Not Interested		Definitely Not Interested		n	%			
	n	%	n	%	n	%	n	%	n	%					
List of teaching aids available	108	63.2	16	9.4	7	4.1	37	21.6	3	1.8	171	100.0	4.40	.94	Interested
Staff development points	68	40.5	27	16.1	21	12.5	45	26.8	7	4.2	168	100.0	3.87	1.20	Interested
Reference lists for personal use	48	29.6	37	22.8	19	11.7	51	31.5	7	4.3	162	100.0	3.70	1.14	Interested
Consult w/ ag. education personnel (high school ag. education teacher/ county Cooperative Extension agent)	38	23.8	40	25.0	30	18.8	44	27.5	8	5.0	160	100.0	3.46	1.19	Interested
One or two day non-credit workshop	14	8.6	41	25.2	42	25.8	30	18.4	36	22.1	163	100.0	2.66	1.25	Somewhat Interested
Graduated credit for two hours	19	12.2	23	14.7	57	36.5	21	13.5	36	23.1	156	100.0	2.55	1.31	Somewhat Interested
Graduate credit for one hour	14	8.9	29	18.4	55	34.8	23	14.6	37	23.4	158	100.0	2.51	1.25	Somewhat Interested
One week non-credit workshop	5	3.2	23	14.6	64	40.5	9	5.7	57	36.1	158	100.0	1.99	1.01	Not Interested

Extension agents was listed next with a mean of 3.46 and a standard deviation of 1.19.

The next four items by mean values listed by teachers were, one or two day non-credit workshops, two hours of graduate credit, one hour of graduate credit, and one week non-credit workshops. These items had means of 2.66 (1.25 standard deviation), 2.55 (1.31 standard deviation), 2.51 (1.25 standard deviation) and 1.99 (1.01 standard deviation) respectively.

Requests for Follow-up

After completing the questionnaire, teachers were given the opportunity to request a copy of the answers to the knowledge assessment and a summary of the study. Of the total sample involved in the study, 119 (66.9 percent) of the teachers asked for a follow-up report.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The purpose of this chapter was to present a summary of the study problem, methodology, and major findings. Conclusions and recommendations were presented based upon summarization, analysis of data collected, and interpretation resulting from the design and procedures used in conducting the study.

Summary of the Study

Purpose of the Study

The purpose of this study was to conduct a baseline assessment of the knowledge and perceptions of selected fourth grade public school teachers regarding agriculture.

Rationale for the Study

The first of the Oklahoma Ag in the Classroom curricula was introduced in the spring of 1993. The curriculum was designed for learners in kindergarten through grade two.

The second level of the curriculum, which was designed for third and fourth graders, was scheduled for release during the 1993-94 school term. By collecting benchmark data from teachers prior to introducing the third and fourth grade curriculum, future evaluative research could

be conducted. This future research might, in part, help determine the impact of the Ag in the Classroom program in Oklahoma. Specifically, future study might help determine if the curriculum content and delivery methods used in Oklahoma is effective in increasing agricultural literacy.

Objectives of the Study

In order to accomplish the purpose of the study, the investigation was directed toward the following specific research objectives:

1. Identify selected demographic characteristics about fourth grade teachers in Oklahoma.
2. Determine the perceptions of selected fourth grade public school teachers about agriculture.
3. Determine the level of knowledge of selected fourth grade public school teachers about agriculture.
4. Identify the types of agricultural education concepts currently being taught in fourth grade classrooms in Oklahoma.
5. Identify the types of assistance teachers might utilize in increasing the level of integration of agricultural concepts into the classroom.

Design and Procedures

Following a review of the literature related to the problem and the determination of need, the major tasks in the design of the study were: (1) determination of the population and sample for the study,

(2) development of the survey instrument, (3) collection of data, and (4) analysis of the data.

The population for this study included 1,894 fourth grade teachers employed by public schools in Oklahoma during the fall of 1993. To develop a sample representative of the population, a random sample of 340 teachers was selected from a list of fourth grade teachers, obtained from the Oklahoma State Department of Education. Mail questionnaires were used to secure teacher responses to selected items in the study. Of the 340 teachers surveyed, 178 (52.4 percent) of the sample completed and returned usable surveys after two mailings.

Survey items and areas of consideration were determined through a review of literature and by input from committee members, along with comments from two graduate level classes in Agricultural Education. The instrument was also reviewed by faculty and staff in the State 4-H Office. A group of teachers who served as curriculum pilot teachers was asked to review the instrument because the technical questions in Part III of the instrument came from background information provided in the Ag in the Classroom curriculum for grades three and four. As a result of having pilot tested the materials from which the technical questions were taken, it was hoped the teachers would have gained insight in these three dimensions of agricultural literacy, (1) an understanding of the applied processes or methods of agriculture, (2) a basic vocabulary of agricultural terms, and (3) an insight as to the impact of agriculture on society (Frick and Spotanski, 1990).

Upon collection of the data, descriptive methods were used to analyze and describe the information. The data were presented using

frequency distributions, percentages, and means. Chapter IV presents the findings of that data shown in the tables.

Major Findings of the Study

The purpose of this study was to conduct a baseline assessment of the knowledge and perceptions of selected fourth grade public school teachers in Oklahoma regarding agriculture. Objectives of the study were used as a basis for the organization of the major findings, these findings are presented in the following discussion.

Profile of the Teachers

A sample of 178 teachers responded to the mail questionnaire used in the study. It was discovered the overall mean number of years of teaching experience for those responding was 13.08 years with a standard deviation of 7.99. Additionally, 86 (48.3 percent) of the teachers had resided on a farm or ranch during their lifetime. Of those teachers who had lived on a farm or ranch, they reported a mean value of 18.35 years of agricultural residence. A standard deviation of 12.40 was also reported among this group, for this factor.

Because FFA and 4-H are the major youth agricultural organizations, the teachers were asked to indicate if they had been members of each of these organizations. It was revealed 12 (6.7 percent) of the teachers had been FFA members and 80 (44.9 percent) of the teachers had been in 4-H. The mean number of years of membership by those teachers who indicated membership was 2.50 in FFA and 4.13 years in 4-H, with standard deviations of 1.24 and 2.53 respectively. It was also found three (1.7 percent) of the teachers had taken college

credits in agriculture. Among those three, the mean value was 4.00 credit hours, with a standard deviation of 3.61.

The teachers also indicated 55 (30.9 percent) of their families do, or have at some time in the past, relied on agriculture as a major source of income.

Finally, it was found six of the teachers were currently 4-H Volunteer Leaders, four were involved in FFA Booster Clubs, two had other FFA affiliations, and one each indicated membership in the following groups: Cub Scouts, Milk Producers, and Farmer's Cooperative.

Classroom and School Type

To add understanding to the profile of the teachers, it was necessary to determine the classification of the school in relationship to the community where the school was located.

Of the 174 teachers who responded to the question, 23 (13.2 percent) were from metropolitan schools, 51 (29.3 percent) were from suburban schools, 62 (35.6 percent) were from small towns, and 38 (21.9 percent) were from rural schools.

The majority, 152 (85.9 percent) of the teachers taught in self-contained classrooms. Twenty of the teachers, (11.3 percent) were in departmental settings, and five (2.8 percent) were in other settings such as special education classrooms, gifted settings or multi-level classrooms.

Definitions of Agriculture

To help determine the perceptions of fourth grade teachers about agriculture, each respondent was asked to define the term, "agriculture." Fourth grade teachers involved in the study tended to define agriculture most often with the use of terms such as "crops," "animals," "food," "producing, produce, and production," and "farm and farming." "Business and industry" terms were used with reference to agriculture only 35 times, and only 13 teachers used the term "science" in defining agriculture.

Agricultural Knowledge

A series of 25 test items was used to determine teachers' understanding of the applied processes or methods of agriculture, their basic vocabulary of agricultural terms, and their insight as to the impact of agriculture on society.

Teachers were asked to select from a list of multiple choice answers, the correct answer for each of the items. After selecting the item they felt best answered the question the teachers were also asked to indicate if they did or did not guess at the answer.

The data in Table V of Chapter IV provide detailed frequency distributions for each of the 25 items. The items are listed in order, according to the number of correct responses given for each item included in the knowledge assessment.

Of the 25 items, the majority of the teachers selected the correct response for 15 of the items, and the majority failed to select

the correct response for ten items. The items missed related to a variety of topics.

While the group average score on the knowledge assessment was only 60 percent correct, the group did very well on several items. For example, over 90 percent of the teachers knew; milk was a good source of calcium, the sprouting of a seed is called germination, and Eli Whitney is credited for the invention of the cotton gin. They also knew pasteurization is a process that kills bacteria, and natural gas is less important to plant growth than is sunshine, soil, air, and water.

Over 80 percent of the teachers knew bedrock is the hard bottom layer that underlies the earth's crust, the seed coat is a protective layer that protects a new plant, and Texas is the state that gave birth to the term "maverick." Likewise, over 80 percent of the teachers knew a heifer had not yet borne a calf, a spider was not an insect, wheat is Oklahoma's number one agricultural crop, and the item with the greatest volume is listed first on the manufactures' label of ingredients.

Additionally, over 75 percent of the teachers knew iron is the mineral responsible for Oklahoma's red soil color, and animal manure was the primary source of fuel for early plains settlers.

Of the ten items the majority of the teachers failed to answer correctly, between 40 and 45 percent of the teachers knew bees use their wings to evaporate the water from the nectar in the hive, Americans eat about 65 pounds of beef annually, and underground aquifers are the major source of irrigation water in western Oklahoma.

Also related to beef consumption, only 32.2 percent of the teachers knew the caloric value of beef sirloin based upon National

Livestock and Meat Board publicity prior to 1992 was 220 calories per three ounce serving. Only 26.4 percent of the teachers knew Oklahoma ranks second among hard red winter wheat producing states, 23.9 percent knew clover was not a member of the grass family, and 21.0 percent knew clay is a smaller particle than is silt or sand. Only 16.1 percent of the teachers selected green peppers as the best source of vitamin C from a list of five common vegetables, and only 13.2 percent of the teachers knew the USDA recommendations regarding the number of daily servings from the cereal food group as based upon either the old "basic 4" (4-6 servings) or new "food pyramid" (6-11 servings) plans. Finally, all but 11.8 percent (21 teachers) selected average farm sizes greater than the actual Oklahoma farm size of 449 acres.

Types of Agricultural Concepts Currently Taught

The data in Table VI of Chapter IV provide detailed frequency distributions for each of 13 topics to which teachers were asked to indicate if they taught the topic in their fourth grade classroom. There were five topics or units used by the majority of the teachers. The top five topics, listed by ranking of frequencies are as follows: plant growth and development (157), ecology and environment (154), nutrition and food selection (136), sources of food (131), and insects (118). The remaining topics were taught by 40 percent or less of the respondents.

Teachers were also asked to indicate the sources used to obtain information needed to teach the topics or units they used in their fourth grade classrooms. The data in Table VII provide a detailed

listing by frequency distribution for 14 sources of educational materials along with others that were added by the teachers.

The primary source used by fourth grade teachers responding to this study was textbooks and periodicals. Of the 175 teachers who responded to the question, 154 (88.0 percent) listed textbooks as an information source. Of the remaining items on the list there was no other single item listed by a simple majority of the teachers responding.

Three items were listed as being used by 50 or more teachers. Those three items listed by frequency of use were: Project Wild, an environmental education curriculum coordinated by the Department of Wildlife Conservation (75), dairy councils and associations (59), and local science and agricultural education teachers (58).

The final series of items related to curriculum taught, was a list of projects or activities frequently completed by fourth grade teachers. Teacher responses for the seven items listed, along with items added are detailed in Table VIII in Chapter IV.

Once again, the data revealed only one project or activity was widely completed in the fourth grade classrooms represented by this study. Of those responding, 140 (79.5 percent) reported growing plants in the classroom. Three other projects were completed by at least fifty teachers, those being: fish or aquarium life (86), insect habitats (81), and terrariums (58).

Hours of Agricultural Science Concepts Taught

After indicating the topics taught, the sources used, and the projects completed, the teachers were asked to indicate how many hours

of agricultural science concepts they taught during the course of one school year.

The data in Table IX in Chapter IV provides a complete listing by frequency distribution for five ranges of time committed to teaching agricultural science concepts. The data revealed 108 (62.1 percent) of the teachers spent 50 or fewer hours per school year teaching science concepts related to agriculture.

Types of Assistance Teachers Might Use
to Integrate Agricultural Concepts into the Classroom

On a typal scale, with five levels of interests, teachers were asked to respond to eight possible sources or methods to receive information they might use to integrate agricultural concepts into their classrooms.

The data in Table X of Chapter IV are ranked by frequency and mean value by the most positive category on the typal scale. The data revealed teachers were most interested in receiving a list of teaching aids available. This item had a mean value of 4.40 on a five point scale and had a standard deviation of .94.

The second ranking item was workshops offering staff development points with a mean value of 3.87 and a standard deviation for 1.20. Closely behind was a reference list to use in personal reading with a mean value of 3.70 and standard deviation of 1.14.

Consultation with agricultural education teachers and county Cooperative Extension Service agents was the fourth ranked item with a mean value of 3.46 and standard deviation of 1.19.

The last four items all related to more formal educational opportunities. Of the bottom four items, three had means that fell within the range between "somewhat interested and not interested" with means from 2.66 to 2.51. The only item that fell within the range of "not interested and definitely not interested" was a one week non-credit workshop with a mean of 1.99 and standard deviation of 1.99.

Follow-up to Teachers

An offer to provide the correct answers for the knowledge assessment and a summary of the study was provided in the questionnaire. Of the total sample involved in the study, 119 (66.9 percent) of the teachers asked for a follow-up from the study.

Conclusions

The major findings presented in the study support the following conclusions.

1. Based upon the demographic data collected, it was found the teachers in this study have an average tenure of slightly over 13 years, indicating a well established and mature work force.
2. Slightly less than one-half of the teachers involved in the study had personal ties to agriculture, as 86 (48.3 percent) have resided on a farm or ranch at some point during their lifetime and 12 (6.7 percent) had been FFA members and 80 (44.9 percent) were 4-H members.
3. The majority of the teachers in the study do not associate agriculture with science even though the majority did indicate teaching topics that were directly related to agriculture. Furthermore, as

revealed in their definitions of the term "agriculture," most perceive agriculture as being the production of animals, plants, or food and most do not see agriculture in a larger global sense. Additionally, only 13 teachers used science as part of the definition.

4. While the majority of the teachers listed topics on plant growth and development, ecology and environment, nutrition and sources of food, and entomology as those most regularly presented; the majority failed to select the correct multiple choice answer for ten items in a knowledge assessment that were directly related to these topics.

5. Teachers rely primarily on textbooks and periodicals as the sources of information they present in the classroom; however, they use other sources of free or low cost materials when they are readily available.

6. Of enrichment activities or projects that teachers might complete in the classroom, plant science activities were the most widely completed by the fourth grade teachers in the study.

7. Over 62 percent of the teachers who participated in this study teach 50 or fewer hours of science related to the combined areas or concepts of agriculture, including plant and soil science, animals, crops, nutrition, environment, and other related areas.

8. Of the various sources that might be used to provide teaching aids to teachers, those teachers participating in the study were most interested in receiving lists of resources available. They were less interested in formal instruction opportunities.

Recommendations

As a result of the major findings and conclusions, the following recommendations were made.

1. There is a wide level of deviation among the years of teaching experience even though the mean number of years was slightly over 13 years of service. An emphasis should be made to provide appropriate staff development which match both the needs and levels of knowledge held by fourth grade teachers.

2. As facilitators of Ag in the Classroom, Extension agents and curriculum writers should recognize that some teachers have a wealth of experience regarding agricultural life. Teachers might be encouraged to share their experiences with their students in order to relate the curriculum to real-life experiences and people. Teachers with agriculture experience might also be used in developing additional curriculum, or in marketing efforts to other teachers who may have less knowledge or agriculture.

3. Nearly half of the fourth grade teachers in Oklahoma who participated in the study have been members of 4-H or FFA. Recognizing past ties to programs that promote agricultural education, Extension agents should emphasize the positive role youth education, including Ag in the Classroom, can play in developing citizens capable of making informed decisions regarding agriculture.

4. The majority of the teachers did not readily associate the term "science" with the definition of agriculture. Agricultural educators, producers, and communicators should recognize this fact and concentrate on increased education and marketing which emphasizes the relationship of agriculture and other various fields of science.

5. Because most of the teachers closely associate agriculture with animal and plant production, an emphasis should be placed on broadening the perceptions of agriculture.

6. Recognizing teachers routinely teach topics on plant growth and development, ecology and environment, nutrition and sources of food, and entomology; those providing curriculum should strive to provide usable and accurate information that will increase the knowledge of both students and teachers.

7. Since most teachers rely on textbooks or similar items that are generally accepted as being accurate, or, that are readily available, Extension agents and specialists should strive to make curricula readily available for classroom instruction.

8. To Part IV of the questionnaire, the majority of the teachers indicated five major topics (plant growth and development, ecology and environment, nutrition, sources of food, and entomology) as topics that they routinely teach; yet, the majority of the teachers missed ten questions in the knowledge assessment that were directly related to these topics. It would, therefore, seem appropriate to determine if the materials being taught are in fact current and accurate.

9. Currently over 62 percent of the teachers who participated in this study teach 50 or fewer hours of science related to the combined areas or concepts of agriculture, including plant and soil science, animals, crops, nutrition, environment, and other related areas. Efforts should be made to work with administrators, staff development coordinators and other appropriate persons to increase the integration of science concepts across the curriculum. Attempts should

be made to provide educational opportunities for students to connect or apply science to daily living.

10. Of the various methods that might be used to provide teaching resources to teachers, those in the study were most interested in receiving lists of resources available. They were less interested in formal professional development opportunities. For these reasons, agents should strive to conduct short-term staff development experiences in local settings for teachers that include printed resource lists. Staff development opportunities should also be coordinated with the local school district to ensure the availability of staff development points for teachers. Finally, more formal offerings should be considered on a more limited basis.

Recommendations for Additional Research

The following recommendations are made based on the findings of this study and are the personal judgment of the author.

1. Because this was a benchmark study to determine current perceptions and knowledge of fourth grade teachers, a follow-up study should be conducted to determine if the perceptions and knowledge are impacted by the use of Ag in the Classroom.

2. A study, including qualitative methods, of teachers who are actually using Ag in the Classroom or other curricula related to agricultural literacy might be conducted. Such a study might effectively show the effectiveness of a curriculum that uses agricultural concept to teach a variety of core subjects.

3. A study might be conducted to compare teachers and/or students who have been exposed to the Oklahoma Ag in the Classroom

curriculum with those who have not, attempting to show the impact of the curriculum in increasing agricultural literacy. A similar study might also consider the influence of the demographic characteristics that were identified in this study.

4. The majority of the teachers indicated five major topics (plant growth and development, ecology and environment, nutrition, sources of food, and entomology) as topics they routinely teach; yet, the majority of the teachers missed questions in the knowledge assessment that were directly related to these topics. It would, therefore, seem appropriate analyze and validate the curricula in use to determine if it is in fact current and accurate.

Implications of the Study

This study sought to collect benchmark data concerning the knowledge and perceptions of selected fourth grade public school teachers regarding agriculture. The data revealed most of the teachers had a limited perception of agriculture, as most did not readily define agriculture as being a science. The majority of the teachers in the study, based upon their definitions, considered it to only be food production. Very few of the teachers mentioned the role of agriculture in history, its impact on the economy of the world, or its environmental significance. A basic understanding of these factors is considered necessary in order to be agriculturally literate according to the National Research Council Report, Understanding Agriculture (1988).

While the study did not attempt to determine if the teachers were literate regarding agriculture through the establishment of absolute

standards, it did provide a series of knowledge assessment items that were pre-tested for validity and reliability. Whereas, the knowledge one needs to be literate changes over time, absolute standards could not be defined (Frick and Spotanski, 1990). However, consideration should be given to the fact that, as a group, the level of correct responses on the Knowledge assessment was only 60 percent.

As revealed in the statement of the problem for this study, the ability of students to learn agricultural concepts may depend in part upon the knowledge and perceptions held by those who teach them. The overall analysis of the study lead the author to conclude teachers have a limited knowledge of agriculture and their perception of agriculture is, for the most part, limited to food production alone.

If teachers are to play a role in increasing the agricultural literacy level of the students in Oklahoma, they need to be better informed of the role of agriculture in our history, in daily life, and in the future of the world. The National Research Council Report, Understanding Agriculture (1988), made several recommendations regarding teacher education that are still needed. Some of those included courses in agriculture as part of the teacher education programs, in-service and summer programs for teachers that focus on using agricultural curricula, marketing and public service announcements in teacher education publications and journals, departmental interaction between education and agricultural colleges, and the use of applied research at the local level by Cooperative Extension Service agents and vocational educators, specifically agricultural education teachers. Additionally, attempts should be made to incorporate basic agricultural concepts into other basic core

subjects so students will understand the role agriculture has played, impacting our culture and economy.

Agricultural educators, agencies, and commodity groups must take an active role in telling the story of agriculture. Scientifically based educational materials must be developed and they must be readily available for teachers to use. Extension agents, agricultural education teachers, agricultural agencies and local commodity groups must work together to facilitate programs such as Ag in the Classroom, 4-H, and FFA, making resources available locally for all teachers and students.

The challenge to increase agricultural literacy is great, as revealed by this study and the literature, but the need is even greater if we are to avoid having even well-educated citizens who lack the skills needed to make informed decisions about an area of knowledge basic to daily life and survival.

BIBLIOGRAPHY

- Bliss, R. K. (1952). The spirit and philosophy of Extension work. Washington, D.C.: Graduate School, United State Department of Agriculture and Epsilon Sigma Phi, National Honorary Extension Fraternity.
- Boyce, V. M. (1988). Experiential education and legal justification for Cooperative Extension, 4-H. Washington, DC: Extension Service.
- Caldwell, J. T. (1976). What a document...that Land Grant Act! In C.A. Vines and M.A. Anderson (Eds.), Heritage horizons: Extension's commitment to people. Madison: Extension Journal. (pp. 12-16).
- Caul, D. A., and Miller, H. L. (1976). Where the action is. In C. A. Vines and M. A. Anderson (Eds.), Heritage horizons: Extension's commitment to people. Madison: Extension Journal. (pp. 25-31).
- Cox, C. B. and Rutledge, J. A. (1993). Oklahoma Ag in the Classroom. A curriculum guide for grades K-2. (p iii). Oklahoma Cooperative Extension Service, 4-H Department, Oklahoma State University, Stillwater, Oklahoma.
- Everett, S. F. (1985). The prologue to vocational agriculture. The Agricultural Education Magazine, 58, (4), 5-8.
- Frick, M. and Spotanski, D. (1990). Coming to grips with agricultural literacy. The Agricultural Education Magazine, 62, (8), 6-7.
- Frick, M. J., Kahler, A. A., and Miller, W. W. (1991). A definition and the concepts of agricultural literacy. Journal of Agricultural Education, 32, (2), 49-57.
- Hall, D. E. (1991). Agricultural literacy programs: current status. The Agricultural Education Magazine, 63, (8), 6-7.
- Horn, J. and (Vining) Koch, B. (1986). An assessment of student's knowledge of agriculture. Center for Extended Studies, Kansas State University, Manhattan, Kansas.
- Key, J. P. (1993). Research Design. Agricultural Education Department, Oklahoma State University, Stillwater, OK.
- Krejcie, R.V. and Morgan, D.W. (1970). Determining sample size for research activities, Educational and Psychological Measurement, 30, 607-610.

- Law, D. A. and Pepple, J.D. (1990). A state plan for agricultural literacy. The Agricultural Education Magazine, 58, (4), 17-18.
- Little, C. E. (1987). Green fields forever. Washington, DC.: Island Press, as cited by Frick, M. J., Kahler, A. A., and Miller, W. W. (1991). A definition and the concepts of agricultural literacy. Journal of Agricultural Education, 32, (2), 49-57.
- Mayer, A. and Mayer, J. (1974, Summer) Agriculture, the island empire. DAEDELUS. 103(3), as cited by Frick, M. J., Kahler, A. A., and Miller, W. W. (1991). A definition and the concepts of agricultural literacy. Journal of Agricultural Education, 32, (2), 49-57.
- Moore, G. E., and Bourne, C. (1986). The secondary vocational agriculture curriculum from 1890 to 1980. The Journal of the Association of Teacher Educators in Agriculture, 27 (3), 8-19.
- Moore, J. A. (1987). Old wine in new bottles? The Agricultural Education Magazine, 60 (4), 5-6.
- National Commission on Excellence in Education. (1984). A nation at risk: The full account. Cambridge, MA: USA Research.
- National Research Council, Board of Agriculture, Committee on Agricultural Education in Secondary Schools, (1988). Understanding agriculture: New directions for education. Washington, D.C. National Academy Press.
- O'Connell, S. M. (ed and others) (1988). The best science books and audio visual materials for children. American Association for the Advancement of Science, Washington, DC.: AAAS Books
- Reck, F. M. (1951). The 4-H story: A history of 4-H club work. Ames, Iowa: The Iowa State University Press.
- Reed, W. D. (1990). Incorporating agricultural literacy in a state program of agricultural education. The Agricultural Education Magazine, 62 (9), 15.
- Russell, E. B., Miller, W. W., and McCracken, D. (1990). Position statement on agricultural literacy. The Agricultural Education Magazine, 62 (9), 13-14.
- Sanders, H. C. (ed.), (1966). The Cooperative Extension Service. Englewood Cliffs, California: Printice-Hall.
- Smith, E. (1992). Eighth grade agricultural orientation. (p v). Agricultural Education, Oklahoma Department of Vocational and Technical Education, Stillwater, Oklahoma.
- Swam, M. D. and Donaldson, G. W. (1970). The agricultural educators role in helping elementary pupils learn about agriculture. The Agricultural Education Magazine, 42, (7), 149-150, 153.

- Terry, Robert, Jr., Don R. Herring, Alvin Larke, Jr. (1990). Assistance needed for elementary school teachers in Texas to implement programs of agricultural literacy. Texas A&M University, College Station, Texas.
- Traxler, S. (1990). Why "Ag in the Classroom". The Agricultural Education Magazine, 62, (8), 9-10.
- Traxler, S. (1992). Ag in the Classroom has an agricultural education connection. The Agricultural Education Magazine, 64, (11), 14-15.
- Traxler, S. (1993). Telephone interview regarding Ag in the Classroom research and the history of the program. 2/93.
- U.S. Department of Agriculture (USDA). (1993). Annual 4-H Youth Development Enrollment Report. Washington DC.: U.S. Department of Agriculture.
- U.S. Department of Agriculture (USDA). (1992). State updates: Ag in the Classroom. Washington DC.: U.S. Department of Agriculture.
- Warde, W.D. (1990). Sampling Methods. Statistics Department, Oklahoma State University, Stillwater, OK. 221-226.
- Wessel, T., and Wessel, M. (1982). 4-H: An American idea 1900 - 1980 a history of 4-H. Chevy Chase, Maryland: National 4-H Council.
- Williams, Georgeanne, (1990). An assessment of agricultural literacy among students in Luther, Oklahoma. Master's thesis, Oklahoma State University, Stillwater, Oklahoma.
- Williams, G. and White, J, (1991). Agricultural Literacy in Agriculture's Heartland. The Agricultural Education Magazine, 63, (8), 9-10.

APPENDICES

APPENDIX A

COVER LETTER



Oklahoma Cooperative Extension Service

Division of Agricultural Sciences and Natural Resources
Oklahoma State University

4-H and Youth Development Programs • 205 Poultry • (405) 744-5390
Monroe and Hall of Fame • Stillwater, Oklahoma 74078-0330

October 14, 1993

Dear Fourth Grade Teacher,

I am contacting you today asking for your assistance as I conduct a study concerning the teaching of agricultural concepts in elementary schools. You have been randomly selected from a list of all fourth grade teachers in confined classrooms in Oklahoma to participate in this study. If you are no longer teaching fourth graders and do not plan to return to that grade level within the next three years, please pass this survey on to another fourth grade teacher in your school. I would greatly appreciate your cooperation in the data collection portion of this study.

This survey is not a test. Your survey form has been coded with a number to assist in data collection; however, your name will not be associated with that number as your survey is returned. Your individual answers will not be reported to anyone, so your score will not reflect upon you personally or professionally.


While your many responsibilities keep you very busy, the few minutes you spend in completing and mailing this survey may help direct future curriculum development efforts in the area of agricultural literacy for elementary students. It will take about five to ten minutes to complete the survey. Once you have completed the survey, please return it in the envelope provided. Thank you very much for your cooperation!

Sincerely,

Charles B. Cox, Project Supervisor
Oklahoma Ag in the Classroom

APPENDIX B

FOLLOW-UP LETTER



Oklahoma Cooperative Extension Service
Division of Agricultural Sciences and Natural Resources
Oklahoma State University
 4-H and Youth Development Programs • 205 Poultry • (405) 744-5390
 Monroe and Hall of Fame • Stillwater, Oklahoma 74078-0330

December 7, 1993

Dear Fourth Grade Teacher,

Several weeks ago you should have received a letter and survey asking for your assistance in a study concerning the teaching of agricultural concepts in elementary schools. You are one of 300 fourth grade teachers randomly selected from the nearly 1900 fourth grade teachers in confined classrooms in Oklahoma to participate in this study.

As of this date I have not received your completed survey. Perhaps it has been misdirected in the mail or perhaps it has simply been laid aside due to your busy schedule. In either case, I have provided a second survey and reply envelope for your convenience in completing this survey.

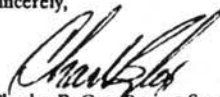
If you have replied in the last three to four days and the surveys have passed in the mail, please make a note of that on this survey and return it in the reply envelop.

If you are no longer teaching fourth graders and do not plan to return to that grade level within the next three years, please pass this survey on to another fourth grade teacher in your school. I would greatly appreciate your cooperation in the data collection portion of this study.

This survey is not a test. Your survey form has been coded with a number to assist in data collection; however, your name will not be associated with that number as your survey is returned. Your individual answers will not be reported to anyone, so your score will not reflect upon you personally or professionally.

While your many responsibilities keep you very busy, the few minutes you spend in completing and mailing this survey may help direct future curriculum development efforts in the area of agricultural literacy for elementary students. It will take about five to ten minutes to complete the survey. Once you have completed the survey, please return it in the envelope provided. Thank you for your cooperation!

Sincerely,



Charles B. Cox, Project Supervisor
 Oklahoma Ag in the Classroom

APPENDIX C
QUESTIONNAIRE

FOURTH GRADE TEACHER QUESTIONNAIRE

PART I

This part of the survey is designed to gather information about you. Please complete the following items and print your response following the question.

- A. How many years of teaching experience have you had including this current year? _____
- B. How many years have you lived on a farm or ranch in your lifetime? _____
- C. Has agricultural production or an agricultural business ever been the major source of income for you and or your family? _____ yes, _____ no
- D. How many years of vocational or agricultural education (FFA) did you complete in high school? _____
- E. How many years were you a member of a 4-H Club? _____
- F. How many semester credit hours of agriculture did you complete in college? _____
- G. What, if any, agricultural organizations are you currently involved with (e.g., 4-H Leader, FFA Alumni, Young Farmers, farmers cooperative, parents or booster clubs)? _____
- H. How do you classify your school? Metropolitan _____, Suburban _____, Small Town _____, Rural _____
- H. How do you classify your classroom? Self-contained _____, Departmental _____, Other (specify) _____

PART II

Please complete this section of the survey before reading any of the questions in PART III. Do not research your answer, just answer based upon your perception. Please do not return to the question or change your answer.

In your own words define *agriculture*?

STOP. DO NOT BEGIN THE NEXT SECTION UNTIL YOU HAVE COMPLETED PART II.

PART III

This section of the survey is intended to determine your knowledge of some of the topics covered by Oklahoma's *Ag in the Classroom* curriculum. The results of this questionnaire will not reflect upon you personally or professionally! Simply circle the letter for the response that you believe best answers the question. *Also indicate if your response is based upon a guess.*

1. How many daily servings from the cereal group are recommended by the U.S. Department of Agriculture?
 - a. 1 - 2
 - b. 3 - 4
 - c. 5 - 6
 - d. 7 - 8
 - e. 9 - 10
 - f. I guessed at this answer ___ yes, ___ no
2. Of the three soil particles - sand, silt, and clay; which is the smallest?
 - a. sand
 - b. silt
 - c. clay
 - d. I guessed at this answer ___ yes, ___ no
3. The average American eats about how many pounds of beef per year?
 - a. 5 - 10 pounds
 - b. 15 - 30 pounds
 - c. 35 - 45 pounds
 - d. 50 - 55 pounds
 - e. 60 - 70 pounds
 - f. I guessed at this answer ___ yes, ___ no
4. Early plains settlers had to rely on this as their primary heating source.
 - a. fallen trees
 - b. native forests
 - c. coal
 - d. animal manure
 - e. oil
 - f. I guessed at this answer ___ yes, ___ no
5. Which of the following plants is not a member of the grass family?
 - a. wheat
 - b. sugarcane
 - c. oats
 - d. rice
 - e. clover
 - f. I guessed at this answer ___ yes, ___ no
6. Which of these animals is not an insect?
 - a. butterfly
 - b. spider
 - c. beetle
 - d. grasshopper
 - e. wasp
 - f. I guessed at this answer ___ yes, ___ no
7. The hard bottom layer that underlies the earth's surface?
 - a. topsoil
 - b. mineral
 - c. clay
 - d. bedrock
 - e. subsoil
 - f. I guessed at this answer ___ yes, ___ no
8. The term used to describe the sprouting of a seed?
 - a. hybridization
 - b. germination
 - c. propagation
 - d. inoculation
 - e. fertilization
 - f. I guessed at this answer ___ yes, ___ no
9. The protective case surrounding a new plant?
 - a. wrapper
 - b. embryo
 - c. seed coat
 - d. germ
 - e. endosperm
 - f. I guessed at this answer ___ yes, ___ no
10. What is the agency where federal, state and county governments together fund programs to help people with agriculture, home economics, rural development and youth programs?
 - a. Dept. of Human Services
 - b. Soil Conservation Service
 - c. Farm Bureau
 - d. Cooperative Extension Service
 - e. Farmer's Home Administration
 - f. I guessed at this answer ___ yes, ___ no

23. What mineral found in Oklahoma's soil gives it a red color?
 a. lead d. mercury
 b. cobalt e. nitrogen
 c. iron f. I guessed at this answer ___ yes, ___ no
24. The average size of a farm in Oklahoma is?
 a. 400 - 450 acres d. 300 - 350 acres
 b. 500 - 550 acres e. 700 - 750 acres
 c. 600 - 650 acres f. I guessed at this answer ___ yes, ___ no
25. What trait makes a heifer different from a cow?
 a. heifers are old cows d. heifers have not borne a calf
 b. heifers are red and white e. heifers are raised only for their meat, not milk
 c. heifers are male cattle f. I guessed at this answer ___ yes, ___ no

PART IV

This part of the survey is designed to identify units that you teach in your classroom. Please answer the question by circling the correct response for each item.

YES, I teach this topic.
 NO, I do not teach this topic.

- | | | | | | | | |
|-----|----|-----|--------------------------------|-----|----|-----|---|
| YES | NO | 26. | sources of our food | YES | NO | 33. | farm animals |
| YES | NO | 27. | ecology and environment | YES | NO | 34. | plant growth and development |
| YES | NO | 28. | insects | YES | NO | 35. | composition of soils |
| YES | NO | 29. | gardening | YES | NO | 36. | nutrition and food selection |
| YES | NO | 30. | role of agriculture in history | YES | NO | 37. | role of agriculture in economy |
| YES | NO | 31. | agricultural careers | YES | NO | 38. | history and origin of cloth or clothing |
| YES | NO | 32. | other _____ | | | | |

The following items represent various sources of agricultural teaching materials. Please indicate if you use the source listed.

YES, I USE the materials from this source.
 NO, I DO NOT use materials from this source.

- | | | | | | | | |
|-----|----|-----|---|-----|----|-----|---|
| YES | NO | 39. | Ag in the Classroom | YES | NO | 47. | 4-H School Enrichment |
| YES | NO | 40. | The National FFA Organization | YES | NO | 48. | U. S. Department of Agriculture |
| YES | NO | 49. | Meat Councils, Assns., groups | YES | NO | 49. | Dairy Councils, Assns., or groups |
| YES | NO | 42. | Food For America | YES | NO | 50. | Farm Groups (Farm Bureau, Farmer's Union) |
| YES | NO | 43. | State Department of Agriculture | YES | NO | 51. | Seed and Grain Associations |
| YES | NO | 44. | Text books, newspapers, magazines | YES | NO | 52. | Project Learning Tree |
| YES | NO | 45. | Project Wild | YES | NO | 53. | other _____ |
| YES | NO | 46. | Materials from local science or agricultural education teachers | | | | |

Indicate if your fourth grade class normally completes each project listed, using the following:

YES, My classes do have this type of project.
 NO, My classes do not have this type of project.

- | | | | | | | | |
|-----|----|-----|------------------------------------|-----|----|-----|-----------------------------------|
| YES | NO | 54. | growing plants | YES | NO | 58. | insect habitats (e.g. ants, bees) |
| YES | NO | 55. | greenhouse plants | YES | NO | 59. | garden plot |
| YES | NO | 56. | hatching chickens or other poultry | YES | NO | 60. | fish, aquarium animals, or plants |
| YES | NO | 57. | terrariums | YES | NO | 61. | other _____ |

62. Circle the response that most closely represents the number of hours you teach science concepts that relate to agriculture in your fourth grade class each year?

(i.e., concepts or topics related to items 26 - 61 in PART IV)

- | | |
|-----------------|--------------|
| a. 50 and under | d. 151 - 200 |
| b. 51 - 100 | e. 201 - 250 |
| c. 101 - 150 | f. over 251 |

PART V

This part of the survey is to find out how you might best be assisted in integrating agriculture into your teaching programs. For each of the types of assistance, indicate your interest using the following responses:

- VI. Very Interested
 I. Interested
 SI. Somewhat Interested
 NI. Not Interested
 DN. Definitely Not Interested

63. One or two day non-credit workshop.....VI. I. SI. NI. DN.
 64. One week non-credit workshopVI. I. SI. NI. DN.
 65. Graduate credit for one hour.....VI. I. SI. NI. DN.
 66. Graduated credit for two hoursVI. I. SI. NI. DN.
 67. List of teaching aids currently available.....VI. I. SI. NI. DN.
 68. Reference lists for personal reading and research.....VI. I. SI. NI. DN.
 69. Consultation with local agricultural education personnel
 (e.g., local high school agricultural education teacher
 or county cooperative extension agent)VI. I. SI. NI. DN.
 70. Local staff development workshops with pointsVI. I. SI. NI. DN.
 71. Other _____

Thank you for taking time to complete this survey. Please use the envelope provided to return the survey. If you would like to have a copy of the correct answers to the questions in PART III, along with a summary of the study results, please circle below:

72. YES, When the study is finished, please send a copy of the answers and results.

NO, I am not interested in receiving a copy.

Code No. _____ Your survey form has been coded with a number to assist in data collection; however, your name will not be associated with that number as your survey is returned. Your individual answers will not be reported to anyone, so your score will not reflect upon you personally or professionally. You are completing this survey on behalf of a teacher who is no longer teaching the fourth grade, please check here () and add your name if you wish to receive a copy of the knowledge assessment section of this instrument.

APPENDIX D

DEFINITIONS OF AGRICULTURE

VERBATIM DEFINITIONS OF
"AGRICULTURE" GIVEN BY FOURTH GRADE TEACHERS

In your own words define agriculture?

Agriculture is raising crops and/or animals for food or for sale.

Growing crops or raising animals.

The science of growing plants and raising animals to sell for food.

To me agriculture is the heartbeat of American. I feel every child needs to know that agriculture touches every persons life. They need to know from the food they eat, to the clothes on their back, and the homes in which they live are all made possible by agriculture. I want them to have a pride in things which are grown and made in the U.S.A.

Farm products you sale to make money. Anything having to do with farming, animals, land, equipment.

Growing or producing food for human consumption.

The "science" of working the soil to provide results such as farming, growing crops.

The study of the land for purposes of raising crops and how to better raise crops and/or other food sources such as beef cattle.

Agriculture, is the production of farming products that are necessary for survival.

Farming.

Agriculture is the dealing with land and animals of a farm.

Agriculture is the method(s) by which food (both vegetable, fruits, & meats) are provided (produced) by farmers and ranchers to the general public, while at the same time attempting to make a profit.

The raising of crops or animals for sale or consumption.

Farming.

The study of plants and animals as pertains to food stuffs.

The business of growing vegetables and/or fruit, and the raising of livestock for food.

Having to do with all aspects of "farm life," such as crops, livestock, money management, ecology, etc.

production of products for consumption by living animals.

Agriculture is an industry that provides us with almost all our food. It also supplies materials for basic human needs, such as clothing and shelter. In addition it provides materials used in making paints and medicines.

Ag is Farming whether you are growing crops or raising animals. Most everyone is involved in agriculture each day because you eat products or use products made on a farm. Ag means many different things and includes everyone directly or indirectly. I lived and worked on a farm all my life and I love it and that's why I teach it.

Agriculture is the study of earth and growing plants to provide food.

Farming lifestyle.

Agriculture is the process of cultivating the harvesting crops, and raising livestock.

Raising crops or animals for food.

Agriculture is the raising of grain and or garden products or the raising/breeding of animals for food or clothing purposes.

Agriculture is the study of farm animals/farm management/home-making. It can incorporate the development of domestic animals, care of animals, milk production, aids to fight diseases of animals or crops, etc.

The production of crops for food and animals.

I define agriculture as anything pertaining to raising animals or growing any type of food source.

Agriculture is the production of food, both plant and animal.

Having to do with life science. How animals and plants grow and reproduce.

Farming and its role in society, including crops, animals for food, economic effects, etc.

Agriculture deals with the growing of plants, insects, food-producing animals, soils.

A component of; or anything to do with - farming and ranching in order to make a living.

Agriculture is the growing of crops and animals raised for human consumption.

Raising of livestock; farming and cultivating the crops.

Agriculture is farming, the raising of crops and animals. It involves the different aspects that go with it.

Agriculture is the study or producing crops and the raising of livestock.

Agriculture is the raising of crops and livestock for food.

Farming and growing needed things.

Agriculture to me means growing different crops and raising livestock such as dairy cows.

Farming.

Farming; work with the land or soil in some manner. The most wonderful experience anyone can imagine.

Agriculture is the farming business. The business of raising crops and animals that are sold to others.

Using land to produce consumable, salable products.

Agriculture is any industry or task related to the production of plants and animals, particularly those needed for human consumption.

Agriculture is the production of food.

Farming and raising livestock.

Agriculture involves growing or raising food.

Farming.

The growing of and the usefulness of plants for the nourishment of a civilization.

Agriculture is planting, raising, and harvesting all varieties of crops. It includes dry land and irrigated farming. Agriculture is also raising poultry, dairy cattle and livestock whether it's for personnel use or to sell the products commercially.

The farming industry.

The business of growing food and/or raising animals.

Agriculture is the study of the land, crops, livestock - ways of making them more productive, useful, and economical for the people.

Agriculture to me is a farming culture of growing crops such as, wheat, corn, other grains and raising cattle for beef and hogs, chickens and all of the above is the base of our country on which all other needs are satisfied.

Farming. Raising livestock.

The act of producing farm products, such as: livestock, wheat, cotton, etc., for ones own use or for a major source of income.

Farming, animals.

The use of the land to produce food.

Agriculture is the industry that produces food, both plant and animal, for society.

Agriculture is the involvement in growing and harvesting crops and the raising and caring of animals.

That which has to do with working with soil and farming.

Agriculture is the producing of crops and animals whether it is for food or money.

The production of food for mass consumption - producer needing a profit to continue - food as being animals or crops.

Agriculture in providing a business by raising animals and crops for food.

In fourth grade Social Studies, we define agriculture as a business of growing crops and raising livestock.

The business of growing crops and raising animals.

Agriculture is the growing of crops and raising of animals to provide food for our country. It also includes research and development in the area of grains, wheat, animals, etc.- as well as hobbies and professions for a variety of people.

The business of growing crops and raising animals.

The study of land and animals as they pertain to the use and productivity for man.

Agriculture has taken on a whole new meaning today. It has become a major enterprise. The time of small family farms is almost gone. Agriculture takes in many different fields including economics, agronomy, crop rotation, the use of pesticides and fertilizers are all important today. The use of these fields is important to a successful farming industry.

The business of growing crops and raising animals.

A science dealing with crop and livestock production.

My perception of agriculture is anything having to do with the land, raising crops, fish or livestock. I associate agriculture with being a producer whether on a big scale or little scale.

Agriculture is using the land to farm, be it crops or livestock as a source of income.

Involves raising livestock, or crops; as in farming and/or ranching.

Agriculture is a business of growing crops, food and raising animals.

The taking care and growing crops on land. Also the taking care of farm animals.

Agriculture is a term given for any concepts. Some of those include our nation's food and the many processes it takes for that food to eventually be consumed by us. These foods include both plant and animal source.

The study of using the land to produce food and other products useful to man.

Agriculture is the production of crops grown to meet the needs of others. It is an economy based on fertile soil, paper climate and adequate growing season.

Agriculture is the studying farming - soil, animals, crops and how to market there products.

Agriculture is the business of producing food and/or food crops. It ranges from family owned to corporate owned.

Agriculture is the business of production and merchandising agricultural products - crops and animals.

The cultivation of soil and production of plants and livestock is my definition of agriculture.

Agriculture involves farming or the efficient management of a farm.

The growing of food crops for animal or human consumption.

Agriculture is a term which means using land in a way which will produce the most and best products.

Agriculture is a field of study that deals with farming and ranching. Plants grown as crops and animals raised for a variety of purposes.

All things having to do with food production.

Relates to production of food. Food for families, animals, etc. Food from animals - (milk, cheese, etc.) Related to skills needed to run farms, machinery, dairies, ranches, etc.

First of all it is the caring for our land. The use of the land for food growth and animal production. I wish I had lived on a farm.

The science of growing and producing food for the world. A farm of income.

It's farming. Working with the soil, machinery, animals, raising crops, and the environment.

Agriculture is the production of plants and livestock.

The business of growing and selling food for income and the use of animals in the same fashion.

When I hear the word agriculture I think of growing crops and also raising animals.

The practice of producing crops and raising livestock.

Agriculture is anything to do with planting and growing crops, raising and breeding livestock or poultry.

Agriculture is the business of raising raw materials which can be used in the production of food, clothing, and various products. Used to benefit humankind.

Agriculture is a science. It involves working the soil to produce crops and raising animals.

The raising of farm products and animals for profit or food and clothing.

Agriculture-is how people use the land and resources provided from the land.

Farming - Working with the land. Studying soil, water, plants, climate, animals and how they affect the land.

The raising of farm animals and products for sale in our economy, and aspects relating to the farming community.

The growing of plants or raising of cattle/animals for monetary reimbursement.

Having to do with farming, growing of crops, conservation of soil, animal raising.

Agriculture concerns goods raised on farms, such as crops and livestock, that are used to supply the needs of the populace.

Growing crops, farming, raising animals.

Farm products, livestock, orchards, vegetables and garden items.

It deals with growing and nurturing plants and animals. Taking care of soils.

Agriculture is a field dealing with animals, plants and soils.

Anything having to do with farming and ranching. This includes production, storage, processing, transporting and sale of food items.

Cultivation of the soil to produce crops, grow animals, and balance of the two to preserve the soils ability to produce.

Agriculture is the use of the land to produce food goods such as crops, fruits and vegetables, as well as, domestic animals.

Agriculture is using the land in order to raise crops or livestock for a profit.

Agriculture is the raising of crops or livestock for food.

The study of plants and raising of animals.

A type of science and work of raising crops and animals.

A type of raising food, textile and cattle.

Agriculture involves many different concepts. Besides the tilling of land and growing of crops, it involves environmental science, animal husbandry, business management, computer science, horticulture, agronomy, etc. It involves various and sundry activities, abilities, and concerns. Those involved in agriculture have always held my respect and admiration.

The area of producing farm products for marketing and consumer use.

The growth and production of crops and goods.

Agriculture is the business of raising crops and cattle or other animals as a source of income and for food production.

Agriculture is the business of growing crops or raising animals for food.

Agriculture is the growing of cereals for the purpose of production and consumption. Each day we use agricultural products for food, clothing and things to write on.

Agriculture is the growing and raising of crops and animals.

Agriculture - business of growing crops and raising animals.

Farming and ranching.

The study or science pertaining to the land or animals. The process of getting food (plant and animal) from the farm to the table.

Agriculture is working to sustain life by means of the ground.

Agriculture is growing crops and raising animals. The sale of these products produces income for farm families.

Agriculture is using the soil to grow crops to be used by people and animals. It is also the raising of animals for food.

The science of growing crops.

Agriculture has to do with land, crops, and livestock that provide a source of income.

Agriculture refers to the development and production of farm goods or crops.

Agriculture - the business of producing crops or dairy products or meat.

The growing of farm crops and animals for human consumption.

Farming of all kinds - food and animals. Taking care of our soils, and utilizing natural resources.

The study of betterment toward the growth and use of animals and plants.

Agriculture - any business or activity which is related to the day-to-day operation of a farm or ranch.

Agriculture is the business of raising crops or livestock for a profit.

Agriculture deals with family and the farm- animals, gardens, wheat, corn, and peanut crops.

Using the land to produce food (both plant and animal) as well as producing raw materials from which other goods are made.

Agriculture is the science of raising livestock or producing crops.

Agriculture is the business of growing crops and raising animals.

The growing, cultivating, and harvesting of crops.

I think of farming - growing crops and raising farm animals.

The growing of some type of food product or the raising of livestock.

Agriculture deals with food production.

The taking care of and producing of crops, livestock and soil.

Farm life, crops and cows, pigs, and horses. Taking care of the farm and producing products for consumers.

The growing of crops and animals, is what I first think of. I also know that it involves all of the mechanics that is involved with the growing of those crops, and all the information you'd need to produce crops and raise animals.

Farming: raising livestock (cows, chickens, geese, sheep, etc.) and raising crops, sometimes some of the processing of materials that were produced.

Where our food comes from. Everything we consume depends on the farmer's dairymen, etc.

The planning farming and raising of farm animals for food.

Civilization.

business related to farm, farm product, farm animals or the study of these.

The science, people, and process necessary to produce crops and care for animals.

The practice of raising crops and animals for human consumption to satisfy the basic needs.

Agriculture is the process dealing with soil, the growing of crops and the raising of farm animals for the intent of selling.

The study of land, plants, and animals as they relate to food production.

Agriculture is growing crops, raising animals (livestock) as part of one's livelihood, and learning how to support one's self.

The raising of animals/livestock or crops.

Agriculture is the business of growing crops and raising animals for food.

VITA ²

Charles B. Cox

Candidate for the Degree of
Doctor of Education

Thesis: AN ASSESSMENT OF THE KNOWLEDGE AND PERCEPTIONS OF AGRICULTURE
BY SELECTED FOURTH GRADE TEACHERS IN OKLAHOMA

Major Field: Agricultural Education

Biographical:

Personal Data: Born in Eureka, Kansas, March 28, 1957, the son of
George B. and Billie L. Cox. Husband of Natalie G. Cox, and
father of three children, Rebekah Nicole, Charla Faith, and
Hope Noel.

Education: Received Bachelor of Science Degree in Agronomy from Oklahoma
State University in 1979; received Master of Science Degree from
Oklahoma State University in Agricultural Education in 1988;
completed the requirements for the Doctor of Education Degree at
Oklahoma State University in May, 1994.

Professional Experience: Oklahoma Cooperative Extension Service, County
Extension Agent, Woods County, 1979 to 1981; Oklahoma Cooperative
Extension Service, County Extension Agent, Logan County, 1981 to
1988; Oklahoma Cooperative Extension Service, Extension Specialist,
4-H Youth Development, 1988 to present.

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD
FOR HUMAN SUBJECTS RESEARCH

Date: 08-31-93

IRB#: AG-94-007

Proposal Title: AN ASSESSMENT OF THE KNOWLEDGE AND PERCEPTIONS OF
AGRICULTURE HELD BY FOURTH GRADE TEACHERS IN
OKLAHOMA

Principal Investigator(s): Dr. Eddy Finley, Charles B. Cox

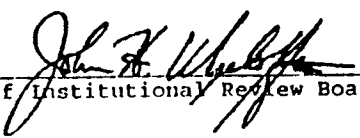
Reviewed and Processed as: Exempt

Approval Status Recommended by Reviewer(s): Approved

APPROVAL STATUS SUBJECT TO REVIEW BY FULL INSTITUTIONAL REVIEW
BOARD AT NEXT MEETING.
APPROVAL STATUS PERIOD VALID FOR ONE CALENDAR YEAR AFTER WHICH A
CONTINUATION OR RENEWAL REQUEST IS REQUIRED TO BE SUBMITTED FOR
BOARD APPROVAL. ANY MODIFICATIONS TO APPROVED PROJECT MUST ALSO
BE SUBMITTED FOR APPROVAL.

Comments, Modifications/Conditions for Approval or Reasons for
Deferral or Disapproval are as follows:

Signature:


Chair of Institutional Review Board

Date: September 2, 1993