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Secondary agricultural educators’ validation of selected agricultural mechanics objectives in Wisconsin

by

Richard Lee Bockhop

A dissertation submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Major: Agricultural Education

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2005
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For the Major Program
DEDICATION

For my wife and our girls, the dream makers, Cheryl Marie Bockhop, Tonya Marie Birkrem, Tracey Marie Bockhop, and Toni Marie Bockhop, I dedicate my doctoral dissertation.
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ABSTRACT

The purpose of this descriptive study was to validate selected agricultural mechanics objectives in Wisconsin. The population consisted of all secondary agricultural education teachers in Wisconsin. The survey instrument was pilot-tested using 47 educators that had experience in agricultural mechanics and/or agricultural education. The instrument was sent electronically to 286 agricultural teachers. Overall, 269 usable responses were received for this study. Wisconsin agriculture teachers validated 99 agricultural mechanics objectives for consideration in secondary agricultural education programs. Additionally, teachers indicated strong support for pre-service and in-service training for the 99 validated objectives. Teachers averaged 14.1 years of experience and their perceptions of agricultural mechanics objectives were favorable. This study will help teachers with the consideration of agricultural mechanics objectives to be used in agricultural education programs in Wisconsin.
CHAPTER I. INTRODUCTION

Introduction

The agricultural education field has witnessed many changes in the past two decades. The addition of new Career Development Events (CDE's) that were formally called FFA judging contests is one indication of change in agricultural education. Additionally new CDE's combined with classroom activities, FFA, and Supervised Agricultural Experiences (SAE's) are examples of the ever-changing experiential based curriculum within agricultural education programs. Currently, there are 25 CDE areas that are supportive of experiential learning activity options (Career Development Event, 2005, p. i).

Today with more than 300 agricultural related career opportunities available, it is vitally important for FFA members to participate in Career Development Events. The competitive nature of the events indeed lends itself to learning how to work within a competitive world. However, it is the very process of preparing for the events, which provides students an irreplaceable experience in developing their skills. We must challenge our common barriers of time constraints and resources, and work towards creating opportunities that our students can be involved in which will better prepare them for future employment. (Career Development Event, 2004, p. i)

The Wisconsin Department of Public Instruction (WDPI) surveys agricultural education programs each year. For the 2003–2004 school year, 265 questionnaires were collected. The teachers responding included 89 females and 176 males. The number of females teaching agricultural education in Wisconsin was 33.6%, using the data provided by the WDPI for 2003–2004 (WDPI, 2004). Further investigation indicated that 51.7% of the males taught at least one agricultural mechanics class, while 33.7% of the females taught at least one agricultural mechanics class.
Furthermore, it was determined eighty schools had available agricultural mechanics labs that were not offering agricultural mechanics classes in agricultural education programs. Information regarding agricultural mechanics objectives in local agricultural programs will be sought in this study. Learning objectives in agricultural mechanics may be reflective of current trends or needs as prescribed locally.

"The central problem of an education based upon experience is to select the kind of present experiences that live fruitfully and creatively in subsequent experiences" (Dewey, 1938, p. 28). That is, how can agricultural mechanics experiences in an agricultural education program lead to subsequent experiences in employment of life's experience? In addition, it may not be found directly in an occupational choice. It may be in a decision-making experience. Determining which agricultural mechanics objectives are of importance based upon current educators' perceptions was the foundation of this study.

The area of agricultural mechanics, which may be parallel with the physical science aspects of agriculture, has also undergone changes and continued evaluation. Agricultural mechanics objectives were important in developing agricultural education programs for the secondary level following the approval of the Smith Hughes Act in 1917. The values of agricultural education programs were being challenged as new laws were prescribed (Kean, 2003). Finding the means to effectively deliver the agricultural mechanics objectives within agricultural education was the goal of this author. The prioritization of agricultural mechanics objectives in Wisconsin was determined by this descriptive research study. Additionally, selected agricultural mechanics objectives corresponding with postsecondary agricultural
education programs were important as prospective teacher assessments are reviewed.

Content knowledge in the subject area that the prospective teachers were to teach was one of the five areas of assessment required by the Wisconsin Department of Public Instruction (WDPI) as indicated in Chapter PI 34 (Kean, 2003). Chapter PI 34 was the administrative code established to provide guidance to educator preparation institutions and programs as they prepared for initial and continuing program reviews under the standards, policies, and procedures established in Chapter PI 34 of the Wisconsin Administrative Code, also known as PI 34.

Knowing the content area is one standard in the teacher licensure process that is required in the Teacher Education Program Approval and Wisconsin License standards PI 34.01 in the Wisconsin statutes of April 2000.

According to Kean, there are two levels of content knowledge assessment. An institution of higher education must meet both of these requirements:

- Content knowledge assessment shall be developed according to standards adopted by the state superintendent or standards adopted by the State Educational Agency using national standards. Guidelines from learned societies or national organizations, or other recognized groups or organizations.
- Content knowledge shall be determined by passing scores on standardized tests, which shall include Wisconsin’s Model Academic Standards. (Kean, 2003)

Jack Kean, WDPI, Assistant State Superintendent, indicated using any of the previous choices to create the content area assessment was allowed. The assessment of contextual area testing needed to correspond with the teacher
licensure process. The WDPI Agricultural Education Consultants had identified a nationally developed test (PRAXIS II) to be used unless a qualified alternative was approved.

Dean Gagnon (personal communication, June 26, 2004), WDPI, Agricultural Education Consultant, recommended using a context test developed for Wisconsin agricultural educators. All subject areas were required to have a test in the context areas reflected on the new teacher license, which indicated minimum achievement levels expected for the initial teacher licensure in Wisconsin.

McMillan and Schumacher (1997) indicated that agriculture had led to increased food production. Educators must constantly understand educational processes and decisions that have immediate and long-range effects of objectives involved in agricultural education programs. According to Simonson and Thompson (1997), many experts in the field of education recognized technology as an essential component to assist in reforming education. Agricultural education adheres to the experiential and student-centered learning philosophy of John Dewey.

**Statement of the Problem**

From 1995 to 2005, there has been a shift in the focus, priorities, and tools used in teaching applications of power structure and technical systems (PSTS). The passing of the No Child Left Behind Act (NCLB) has caused a concern regarding the use of the PRAXIS test for new teacher licensure. As stated in the No Child Left Behind Act (NCLB), each context area shall be assessed by the state education agency (SEA), in this case the WDPI, using assessment of acceptable standards.
Knowledge assessment used in the PRAXIS test can be adopted by the WDPI using national standards or official personnel are allowed to seek and use guidelines from learned societies or national organizations, or other organized groups or organizations. The WDPI has adopted the national PRAXIS test, for agricultural education teachers, to meet the requirements for new teacher licensure. The United States Department of Education (USDE) has defined the context areas within agricultural education (Appendix E).

The national PRAXIS test used in Wisconsin for new agriculture teacher licensure includes seven areas of context assessment in agricultural education representing the areas described by the USDE. A panel of experts was appointed by WDPI to review the adopted PRAXIS test. Panel members determined nearly 50% of the PRAXIS test was based upon power structures and technical systems (PSTS) context assessments. Through further evaluation, the members of the panel determined there were context areas in addition to PSTS that were represented disproportionately in the assessment instrument. Additionally, the panel recommended a PRAXIS test be designed to be more reflective of agricultural education programs in Wisconsin. The results of this directive will require each context area (7) within agricultural education to validate objectives that may be included in the new teacher licensure assessment.

A study is needed to determine which objectives are important and how each will be used to adequately prepare new teachers for PRAXIS testing to meet the Wisconsin PI-34 standards as established in the NCLB act.
In order to adequately prepare new teachers for teacher licensure, research needs to be conducted to determine objectives used for assessment in the context area of power structural and technical systems. The first step needed in a sequence of steps is to determine which PSTS context objectives were important for learning in Wisconsin. Specific PSTS context area questions from the PRAXIS test were unavailable for review at the time of this study. Therefore, agricultural mechanics objectives from recent Delphi studies were sought for validation in this study.

Validated agricultural mechanics objectives in the context area of power structural and technical systems were needed to define needed secondary instruction, establish a level of preparation for teaching, and preparing new teachers for the PRAXIS test in agricultural education. The fact that teacher educators must continue to include agricultural mechanics in their teacher preparation programs as prescribed by Burris, Robinson, and Terry (2004) is underscored between importance and level of preparation needed. Further investigation is needed in teacher development (Shinn, 2001). Burris, Robinson, and Terry (2004) indicate research may uncover additional opportunities to further prepare teachers through in-service training, workshops, or possibly unique cooperative partnership opportunities.

Research is needed to determine needs in agricultural mechanics programs in Wisconsin. Determining which objectives are important for secondary agricultural education students was important. Which objectives teachers need pre-service training with to safely and effectively present were needed? Determining the objectives that should be included in the PRAXIS test including how new teachers
prepare for the assessment is needed. Additionally, how the context area of agricultural mechanics should be reviewed and updated to meet the needs of students while increasing the effectiveness of teachers. A review of literature indicated that agricultural mechanics programs in agricultural education would include objectives for employment, for participation in advanced or highly skilled secondary education, and for experiences that will prepare students in the application of practical life skills. (Harbstreit & Harris, 2003)

**Purposes and Objectives of the Study**

The purpose of this study was to develop and validate a list of agricultural mechanics learning objectives that may be used as benchmarks in the areas of secondary education and pre-service teacher education in postsecondary agricultural education programs in Wisconsin. The specific objectives of the study were to:

1. identify perceptions of teachers regarding the use of agricultural mechanics objectives;
2. identify selected agricultural mechanics objectives to be considered for use in secondary agricultural education programs;
3. identify the need of pre-service training in selected agricultural mechanics objectives;
4. determine the future role of agricultural mechanics objectives in the agricultural mechanics curriculum as perceived by secondary agricultural education teachers; and
5. describe and analyze teacher and program characteristics with selected agricultural mechanics variables in secondary agricultural education in Wisconsin.

Significance of the Problem

President George W. Bush secured passage of the landmark No Child Left Behind Act of 2001. "The new law reflects a remarkable consensus—first articulated in the President's 'No Child Left Behind' framework—on how to improve the performance of America's elementary and secondary schools while at the same time ensuring that no child is trapped in a failing school," according to the executive summary issued by Kean (2003).

President George W. Bush quoted at a ceremony introducing the No Child Left Behind legislation that, "These reforms express my deep belief in our public schools and their mission to build the mind and character of every child, from every background, in every part of America" (Bush, 2001).

Three days after taking office in January 2001, George W. Bush announced No Child Left Behind, his framework for bipartisan education reform that he described as "the cornerstone of my administration." President Bush emphasized his deep belief in our public schools, but an even greater concern that "too many of our neediest children are being left behind," despite the nearly 200 billion dollars in federal spending since the passage of the Elementary and Secondary Education Act of 1965. The President called for bipartisan solutions based on accountability, choice, and flexibility in federal education programs.
United States Department of Education (USDE) Deputy Secretary, Eugene W. Hickok, released the following information in September of 2003, "Legislation has imposed the use of context testing for each of the content areas" (Hickok, 2003). The content in agricultural education was large and diversely unique in different regions of the United States. Needs assessments may have been a good indicator of what context areas need evaluating, with regard to teacher licensure in each area of the United States.

Agriculture and Natural Resources career clusters were used to define content areas within agricultural education. A document on the National FFA Web site (Career Clusters, 2004) indicated seven different career clusters included in the agricultural educational programs throughout regions of the United States. These career clusters were used to define context areas within the Wisconsin area of agricultural education programs used for this study.

The evidence of needs addressed for this study was further defined by national congressional acts. Additional support of this study has been indicated by Dean Gagnon (personal communication, March 11, 2005), agricultural education consultant, Wisconsin Department of Public Instruction; Tim Buttles (personal communication, February 9, 2005), associate agricultural education professor, University of Wisconsin–River Falls; and Mark Zidon (personal communication, March 18, 2005), professor of agricultural education, director of the School of Agriculture, University of Wisconsin–Platteville. This research should benefit everyone involved with secondary agricultural education programs including those responsible for teacher licensure in the state of Wisconsin.
Information derived from related research was sought in refining a process to develop a survey for establishing agricultural mechanics objectives. The Career Cluster (2004), identified as Power Structural and Technical Systems, was used as the agricultural education context area.

**Definitions of Terms**

The following terms are defined to enhance clarity of meaning to the terms that were used in this study.

**Advanced program** – A professional education program leading to teacher licensure offered at the post-baccalaureate level.

**Agricultural Mechanics** -- The physical science segment of agriculture industry dealing with the selection, construction, operation, maintenance and repair or use of agricultural power, agricultural machinery and equipment, structures and utilities, and soil and water management practices.

**Consultant** – A specialist or resource person with the Wisconsin Department of Public Instruction with a position in the Agricultural Education Natural Resources Division, whose advice is used in improving an educational programs, facilities, or methods of cooperation, limited to a specified period less than a full-time appointment, for a specified purpose or program.

**Content knowledge** – Understanding the central concepts, tools of inquiry, and structures of a subject area.

**Context areas** – Areas indicated within a group of career clusters as indicated in Appendix E.
**Delphi Study** — A technique to arrive at a group position regarding an issue under investigation, the Delphi method consists of a series of repeated interrogations, usually by means of questionnaires, of a group of individuals whose opinions or judgments are of interest. After the initial interrogation of each individual, each subsequent interrogation is accompanied by information regarding the preceding round of replies, usually presented anonymously. The individual is thus encouraged to reconsider and, if appropriate, to change the previous reply in light of the replies of other members of the group. After two or three rounds, the group position is determined (Meijerink, n.d.).

**FFA** — Nationally recognized by the United States Department of Education as a student organization in secondary agricultural education program.

**Highly qualified teacher** — When the term "highly qualified teacher" is used, based upon the No Child Left Behind Act it means: The teacher has obtained full state certification as a teacher respective to any public elementary school or secondary school teacher teaching (including certification obtained through alternative routes to certification) or passed the state teacher licensing examination, and holds a license to teach in such state, except that when the term is used with respect to any teacher teaching in a public charter school. The term means that the teacher meets the certification or licensing requirements set forth in the state's public charter school law, and the teacher has not had certification or licensure requirements waived on an emergency, temporary, or provisional basis.

**HOUSSE** — High Objective Uniform State Standard of Evaluation.
IHE – Institution of Higher Education.

LEA – Local Education Agency.

Objectives – In this study, objectives will be used as something in mechanics toward which effort is directed: an aim, goal, or end in action, such as agricultural objectives associated with knowledge, skills, and activities. Objectives in this study could also be referred to as competencies of behavioral objectives.

PI 34 – Public instruction combining previous legislative acts 3 and 4 to create a current system to license teachers in Wisconsin authorized by the Department of Public Instruction as stated in the Wisconsin Administrative Code.

PRAXIS II – Context Assessment Test required for initial teacher licensure in accordance with the PI 34, Wisconsin Administrative Code, for teacher licensure in the State of Wisconsin.

SAE – Supervised Agricultural Experience, activities included with agricultural education programs to enhance placement and entrepreneurial knowledge and skills, usually in addition to the traditional classroom setting of students involved with the agricultural education program.

State Superintendent – Wisconsin State Superintendent of public instruction.
CHAPTER II. LITERATURE REVIEW

Introduction

This chapter is a review of literature associated with the context area of agricultural mechanics. This review of literature includes consideration of secondary agricultural education programs used in preparation of agricultural education teachers. The Academic Improvement and Teacher Quality Programs as related to the No Child Left Behind Act will be addressed in the first section. The No Child Left Behind Act has several implications that will need to be addressed in program design of future and existing agricultural educators in Wisconsin. Section one will also include current studies implementing the values of pre-service training challenges associated with correctly identifying contemporary objectives as related to teacher quality. General agricultural education objectives related to agricultural mechanics, which are intended to support teacher education programs, are of interest to this study.

Section two describes information related to context areas in agricultural education. The United States Department of Education (USDE) has defined seven career pathways that are currently used in agricultural education programs, which are based on career specialties and related occupations. Emphasis on power, structures, and technical systems objectives that were indicated by the USDE will be of primary use in this study.

Section three of the literature review describes literature related to agricultural education and/or agricultural mechanics in an effort to support the needs and
objectives of this study. This section reviews studies that are supportive of determining current and future objectives as indicated in power, structures, and technical systems defined in occupational clusters by the USDE.

The fourth area of the literature review will focus on Delphi studies related to education and agricultural education with specific studies in agricultural mechanics. The specific studies using Delphi techniques in agricultural mechanics are the foundation of the survey used in this study.

**No Child Left Behind**

The No Child Left Behind Act of 2001 (NCLB), which reauthorized the Elementary and Secondary Education Act of 1965, places a major emphasis on the importance of teacher quality in improving student achievement. This is to help ensure that all teachers of core academic subjects are highly qualified no later than the end of the 2005–2006 school year (Hickok, 2003).

Since January 2002, state and local educational agencies, along with state agencies for higher education, have been working to implement the Improve Teacher Quality State Grants program. States must use scientifically-based strategies that have been shown to increase student academic achievement while designing their teacher training, recruitment, and professional development activities. States are also required to develop annual measurable objectives to ensure that the state and its districts make progress each year in meeting the "highly qualified teacher" challenge.
States are encouraged to reassess and restructure their certification systems and streamline these processes. States may also use program funds to address challenges such as recruitment, retention, hiring, induction, professional development, and the need for more skilled principals and assistant principals to serve as effective school leaders (Bush, 2001).

Highly Qualified Teachers

To meet the requirements governed by WDPI, new teachers at the middle and high school levels must 1) hold at least a bachelor’s degree, 2) be licensed by the state, and 3) demonstrate their competence in each of the core academic subjects the teacher teaches, by:

1. Completing an academic major, a graduate degree, coursework equivalent to an academic major, or advanced certification or credentialing; or
2. passing a rigorous state academic subject test (PRAXIS II Test); and
3. receiving a license from the state.

While the USDE is always willing to respond to inquiries from states, it is the responsibility of the WDPI to identify and approve such tests. Current WDPI policy recommends that each WDPI use the guidelines below to evaluate any subject matter tests that it wishes to consider for use in its state.

The academic subject test may consist of a state-required certification or licensing test(s) in each of the academic subjects in which a teacher teaches. The content of the test should be rigorous and objective, focus on a specific academic content area, and have a high, objective, uniform standard that the candidate is
expected to meet or exceed. These standards must be applied to each candidate in the same way (Bush, 2001).

The purpose of the test, based upon NCLB's recommendations, is to establish the candidate's knowledge in a given subject matter. In addition, the test might be used to target the areas where additional coursework or staff development may be needed to help the teacher succeed at meeting the standard.

Studies have indicated viable agricultural mechanics objectives will need to be determined to be included in pre-service teacher training to meet industry recommendations. One such study by Waidelich and Hillison (1996) indicated prioritizing agricultural mechanics objectives is needed to increase potential for successful employment including advancement in agricultural occupations. Waidelich and Hillison (1996, p. 5) recommended "a) agricultural educators should concentrate on general safety instruction, b) the core should be the most sharply focused part of the curriculum, and c) all vocational service areas should use a similar approach to identify priorities for curriculum."

Roberts and Dyer (2004) have indicated it is necessary to provide experienced-based learning opportunities to nurture the development of some characteristics, or to use some of the characteristics as selection criteria for admitting students into teacher education programs. "Therefore, it is recommended that the agricultural teacher education programs assess current students to determine which characteristics are lacking and which already exist" (pp. 93–94).

Roberts and Dyer (2004) identified eight categories which are similar to the six programmatic areas in "A Guide to Local Program Success" (1997). The eight
categories are: Instruction, FFA/SAE, Community Relations, Marketing, Professionalism/Professional Growth, Program Planning/Management, and Personal Qualities (Roberts & Dyer, 2004). The category that had the greatest number of characteristics identified was instruction, which indicated agricultural educators first must master what guides instruction that is, teaching methods/techniques (p. 94). These similarities empirically verify that being an effective agriculture teacher goes beyond classroom teaching. Creating effective agriculture teachers is imperative for the long-term sustainability of agriculture education programs.

"Generally shop safety, welding, and project construction need to be included in agricultural education pre-service training programs" (Harbstreit & Harris, 2003). Harrison, Schumacher, and Birkenholz (1993) reported "declining agricultural engineering course requirements for undergraduate teacher education programs. "Many students must acquire needed skills during the student teaching portion of their pre-professional experience" (p. 165).

United States Department of Education (USDE) Agricultural Education Context Areas

The USDE has clearly defined the context areas of agricultural education within the Agriculture, Food, and Natural Resources career cluster document. Furthermore, the Food and Natural Resource division of the USDE clearly describes seven pathways within the context area of agricultural education: Food Products and Processing Systems; Plant Systems; Animal Systems; Power, Structural, and
Technical Systems; Natural Resources Systems; Environmental Service Systems; and Agribusiness Systems (Appendix E).

The area of primary concern for this study is the Power, Structural, and Technical Systems (PSTS) pathway, which is further defined with these included categories: power, structures, controls, geospatial technology, computer systems, electronics, hydraulics, and pneumatics.

The last component of the Agriculture, Food, and Natural Resources document focuses on cluster knowledge and skills. Ten areas of cluster knowledge and skills are identified in the document: Academic Foundations, Communications, Problem Solving and Critical Thinking, Information Technology, Systems, Safety, Health, and Environment, Leadership and Teamwork, Ethics and Legal Responsibilities, Employability and Career Development, and Technical Skills. Career specialties and occupations indicated in the pathway PSTS may be observed along with the other six in (Appendix E).

Burris, Robinson, and Terry (2004) indicated that future studies need to determine relevant content in agricultural mechanics in secondary programs. This research is supported by earlier studies by Osborne, 1992; Harrison, Schumacher, and Birkenholz 1993; Scanlon, Bruening, and Cordero, 1996, which sought to identify agricultural mechanic objectives that should be included in agricultural education programs. Harbstreit and Harris (2003) stated, “With a magnitude of change taking place, a different strategy was deemed necessary to establish needed outcomes in technical agriculture, agricultural mechanics, and professional
education," indicating a need for evaluation of the pre-service teaching content area in agricultural mechanics at Kansas State University.

**Agricultural Mechanics Trends**

Trends in the food, fiber, and natural resource industry as related to production agriculture are driven by technology (Case, 1995). Trends which impact the industry workforce include production changes, combined with increased farm size with an overall decline in farm operators, precision agriculture, and a decreasing economic base in rural communities (Case, 1995). In addition to changes in technology reflected by current trends, science and communications have caused changes to occur in agriculture and related industries (Scanlon, Bruening, & Cordero, 1996).

As technology impacts the agriculture industry, it is also affecting the daily routines of industry workers. The workers need to possess not only the skills that make them favorable to be employed, but they also need to perform at high levels of proficiency to maintain employment. Ruhland (1993) stated, "One of the most important goals in education in the high-tech, information-rich world is to teach students the survival skills and employability skills essential to obtain employment" (p. 4).

Many tangible skills are more readily observed such as the ability to operate a computer, weld a specific metal application, and measure the variance on engine rings for pistons. Potential workers who lack these basic skills will have difficulty with entry-level employment (Ruhland, 1993). However, the intangible skills, such as
problem solving, may be just as important. Problem solving and its in real-world application is a foundation of agricultural education programs (Case, 1995).

In agricultural education, numerous studies have been conducted that focus on student competencies within specific contexts. Lindner and Dooley (2001) found that students need to be able to think critically at higher levels of cognition. Dyer and Osborne (1996) found that problem solving skills were needed and could be taught to agricultural education students.

Students can benefit more from a contextual learning process rather than a directed teaching process (Berns & Erickson, 2001). Contextual learning refers to teaching and learning that helps teachers relate subject matter content to real world situations, and motivates students to link knowledge and apply it to their role as family members, citizens, and team members in a career setting (Buttles, Graham, & Hieronimczak, 2003).

Many models and methods can be used for collecting the information necessary to establish competency models in agriculture education programs. Alston, Miller, and Williams (2003) stated, “The profession of agricultural education has a clear philosophy with several distinguishing tenants. Emphasis is placed on solving problems in real-world settings, learning by doing, individualized learning, career guidance, leadership and citizenship development, and community-oriented programs” (Phipps & Osborne, 1988).

Models of measurement may focus on behavioral, cognitive, or constructive theory (Simonson & Thompson, 1997). The paradigm shift from a teacher-centered
to a learner-centered approach is aided by new research (Simonson & Thompson, 1997).

States are required to have a plan to address teacher quality, as indicated in previous areas of this review. The agricultural education community will need to keep pace with industry and develop needed instruction to meet expectations of future employers. This is based upon a review of a Delphi study conducted by Harper, Buriak, and Hitchings (2001), which focused on modernizing curriculum to establish the concepts, principles, applications, and competencies that should be included in future agricultural education programs. Steffen, Watson, and Harrison (2003) stated, "With the widespread adoption of computer and electronic technologies, as well as the advent of computer stimulation, an almost dizzying array of educational tools and materials are available for the classroom to utilize."

Students are more technologically oriented, which may require adjustments of teaching methods to meet industry needs in order to improve the curriculum. Therefore, more technologically oriented skills will need to be integrated throughout the curriculum. Adequate levels of pre-service teacher licensure knowledge assessment are a concern within the area of technology that may enhance teacher qualities.

In a comparison study by Lindner and Baker (2003), it was resolved that personal and professional goals will be achieved by using a variety of academic fields, knowledge bases, and context applications in agricultural education. As the challenge is ongoing of keeping the curriculum up to date with industry standards, socially responsive and pragmatic delivery has been researched more extensively
than the effectiveness of the generic objectives. Extensive lists of student competencies have been developed by various authors (Johnson & Schumacher, 1993; Ruhland, 1993; Harper, Buriak, & Hilton, 2003).

Graham and Garton (2003) have indicated the research from the 1970s and 1980s confirmed public perceptions. “Public perception indicated teachers lacked basic competency skills and the admission and certification standards for teacher educational programs” (p. 13). Graham and Garton additionally stated, “Increased requirements for admission and certification placed upon pre-service teachers are making it more difficult to recruit students” (p. 5).

Selecting and preparing qualified individuals to fill teaching vacancies has become a growing concern among the teacher preparation programs. The use of academic measures to select teacher candidates, while a convenient means of assessing cognitive ability, potentially does not address the broader concern of selecting effective teachers. Colleges of education continually work to improve the quality of students completing teacher preparation programs. The academic status in teacher education is a response to public and political pressures for more accountability in education. Standardized tests are a direct result of that pressure for accountability. This may cause a reverse effect by creating a relatively small homogeneous group of perspective teachers with good test-taking abilities, who may or may not be effective classroom teachers (Graham & Garton, 2003).

The validity of formative assessment as a teaching instrument was researched by Graham and Garton (2003). They concluded, “GPA in agricultural education coursework was the best predictor of teacher performance as assessed by
supervising administrators using performance based teaching evaluation." Further inquiry by Graham and Garton (2003) indicated contextual and cognitive knowledge assessment were not significant indicators of teacher effectiveness in agricultural education.

Wakeford (1988) indicated that little conclusive evidence has been found linking admission, retention, and certification measures to teacher performance. Although most research has been focused on admission and retention measures, there is little current evidence to support the value of first-year teacher performance based upon standardized testing scores (Daniel, 1993).

Kerka (1997) found research that supported the value of contextual learning through the opportunities it provides for the learner to construct knowledge and apply it in a natural setting such as school or the workplace.

Agricultural education strives to provide students with learning opportunities that will promote problem solving techniques, hands-on learning, and applicable skills. Agricultural education students are encouraged to advance from one point of prior knowledge to an expanded concept of how agriculture intertwines scientific, economical, and technical learning. Agricultural literacy is also a vital facet of agricultural education since students create an awareness of becoming will-informed consumers in the vast array of agricultural products. (Buttles, Graham, & Hieronimczak, 2003)
Delphi Study Component

Agricultural mechanization and agricultural education programs have a tradition of cooperation and integration. Agricultural mechanization was a driving force of agricultural education development during the middle part of the century (Cochrane, 1993). The Delphi method is suited for the discovery of selected agricultural mechanics objectives. The validity derived from using the Delphi method has improved the value of this study. Delphi results from several studies were used to create the questionnaire in this study. Understanding the process of the Delphi method adds to the unbiased validation of each selected agricultural mechanics objectives identified in this study.

Delphi studies using industrial and postsecondary experts have created standards for local agricultural education programs (Harper, Buriack, & Hitchings, 2001). Laird and Kahler (1995) have clearly stated there are many segments of agricultural curriculum, but when comparing curriculum, agricultural mechanics may hold the most potential for addressing a blend of literacy, vocational, applied science, and basic subject objectives. A new emphasis on science applications in agriculture will diversify agricultural mechanics instruction.

Several Delphi studies of agricultural education programs have considered the importance of agricultural mechanics in high school programs. The Delphi technique refers to a methodology developed at the Rand Corporation during the 1940s, designed to elicit expert opinion in a systematic manner (Sackman, 1975). Delphi's application moved from technological forecasting and expanded into the fields of science, business, medicine, and education during the 1950s and 1960s.
Sackman criticized the Delphi technique; however, his description of what he called “conventional Delphi” provided an excellent overview of the method (Martin & Frick, 1998). Martin and Frick listed the following characteristics of a conventional Delphi, which they obtained from Sackman (1975):

- The data collection is via a structured, formal questionnaire administered to a group of individuals identified as appropriate subject matter specialists. There is no definitive questionnaire kind or format.
- The Delphi director or the participants may generate the questionnaire items. In some cases, it may be a cooperative effort.
- The participants receive specific instructions to ensure the proper completion of the questionnaire.
- The questionnaire is administered to the participants on two or more occasions.
- All administrations of the questionnaire following the first one include statistical feedback from the previous round.
- The statistics are typically a measure of central tendency and one of variability.
- The Delphi director may solicit verbal feedback from some or all of the participants and publish that information on subsequent rounds.
- Individual responses are kept anonymous during all administrations of the questionnaire.
- The Delphi director generally requires written justification for extreme responses.
• The cycle of iteration and feedback continues until the Delphi director determines that a sufficient convergence of opinion is reached.

Martin and Frick (1998) suggested that Delphi's methodology should be researched as to continued use within the agricultural education discipline. Traditionally, consensus by a group of experts has been obtained through meetings and conferences by bringing experts together with collaborative discussions. Experts exchange opinions as they draw from their experiences and cognitive knowledge and the effectiveness of this procedure is seriously being questioned (Jones & Twiss, 1978).

Rather than meeting directly in person after arranging travel, calendars, and funding, the Delphi may be used as a mailed questionnaire approach with restricted feedback among anonymous panel members (Jones & Twiss, 1978). Delphi allows experts to act anonymously, which reduces the likelihood of a dominant person surfacing and causing potential regression (Porter, Roper, Mason, Rossini, & Banks, 1991). McMillan (1971) stated that anonymity can make group estimates more precise.

Diversity with a Delphi is easier to obtain using a panel of experts. Panel members both in geography and industry segment would have challenges in meeting face-to-face. Delphi has eliminated the need for meeting as a group. Delphi technique allows for interaction among members of a group without some of the shortcomings. “Delphi technique uses a panel of experts within a field to generate agreement on future alternatives, expected breakthroughs, future opportunities, and value judgments” (Hecht, 1979).
Delphi techniques are used to progress through a series of systematic rounds. The first round seeks to shed light on the issues and assembles information for the following rounds (Jones & Twiss, 1978). The responses from the panel members in round one are used to create statements used in successive rounds (Jones & Twiss, 1978).

The next rounds progress toward consensus in the given situation. These rounds are in direct response to the original first round open-ended questions. These rounds provide a mode of communication among panel members along with permitted supplementary information to be obtained (Jones & Twiss, 1978). Among the steps of Delphi include collection of ranking of needs and calculations of rank by an importance/consensus method following the first round (Hecht, 1979).

The interaction among panel members is considered to be a non-issue. The usual problems of a group are thus completely bypassed. Fowles (1978) described the following ten steps for the Delphi method:

1. Formation of a team to undertake and monitor a Delphi on a given subject.
2. Selection of one or more panelists to participate in the exercise; customarily, the panelists are experts in the area to be investigated.
3. Development of the first round Delphi questionnaire.
4. Testing the questionnaire for proper wording.
5. Transmission of the first questionnaires to the panelists.
7. Preparation of the second-round questionnaires (and possible testing).
8. Transmission of the second-round questionnaires to the panelists.
9. Analysis of the second-round responses (Steps 7 to 9 are reiterated as long as desired or necessary to achieve stability in the results).

10. Preparation of a report by the analysis team to present the conclusions of the exercise.

The minimum number of participants to ensure a good group performance is somewhat dependent on the study design. An experiment by Brockhoff (1975) suggested that under ideal circumstances, groups as small as four can perform well.

Before deciding whether or not to use the Delphi method, Adler and Ziglio (1996) have indicated a number of considerations to use when making this decision. These considerations are listed below:

- What kind of group communication process is desirable in order to explore the problem at hand?
- Who are the people with expertise on the problem and where are they located?
- What are the alternative techniques available and what results can reasonably be expected from their application?

After consideration of these questions, a person can determine if the Delphi method is an appropriate method to use.

Goldschmidt (1975) agrees there have been many poorly conducted Delphi projects. However, he warns that fundamental mistakes equate to the application of the Delphi method itself. There is, in fact, an important conceptual distinction between evaluating a technique and evaluating an application of a technique. In
general, the Delphi method is useful in answering specific questions and single-dimension questions.

**Agricultural Mechanics Delphi Studies**

Lawver, Barton, Akers, Smith, and Fraze (2004) used a three-round Delphi study involving agricultural mechanics, which produced 97 validated competencies in four areas in agricultural mechanics. The four areas used by Lawver et al. (2004) were "Metal Fabrication," "Agriculture Structures," Agricultural Power and Machinery," and "Soil and Water Management." Lawver et al. concluded that the agricultural mechanics portion of the teacher certification curriculum needed to be updated and revised to reflect the information presented in their study.

A Delphi study conducted in Kansas was designed to develop a consensus regarding the major areas of agricultural mechanics instruction recommended for pre-service teacher education programs (Harbstreit & Harris, 2003). Harbstreit and Harris (2003) indicated general shop safety, welding, and project construction needed to be included in pre-service agricultural education pre-service training programs. Harbstreit and Harris (2003) indicated small manufacturing companies located in Kansas have requested similar agricultural mechanics skills for their future employees.

Wadelich and Hillison (1996) recommended using qualified industry individuals to help determine and prioritize competencies. Recommendations by Widely and Hillison (1996) from researching industry workers included "a) agricultural education should concentrate on general safety instruction, b) the core should be the most
sharply focused part of the curriculum, and c) all vocational service areas should use a similar approach to identify priorities for curriculum” (p. 5).

Delphi techniques have been used steadily in agricultural education over the course of time (Martin & Frick, 1998). Delphi appears to be a unique alternative to the more traditional kinds of evaluation and survey work, and will likely see continued use in the future of agricultural education research (p. 73).

**Summary**

This study was used to determine current teacher perceptions of selected agricultural mechanics objectives, while considering the need for pre-service teacher learning. Literature in agricultural education is supportive of reviewing current objectives as a method to improve overall agricultural education programs. Literature indicates support for the determination of objectives to be used as benchmarks to support current and future agricultural education curriculum, which should be used to enhance the hierarchy of learning outcomes.

The review of literature has indicated consideration to be addressed with the NCLB initiative by President George W. Bush, which indicated evidence of change is needed in education. State Education Agency considerations of NCLB efforts to increase basic skills that allow educators to improve effective methodology while addressing valid objectives were described in this review. As foundations of knowledge, skills, and abilities of academic preparation are obtained, WDPI must have systematic control of teacher quality as indicated by the system used to monitor and control teacher licensure. Each state has clear options.
The assemblage of new teacher licensure objectives could be best obtained by using current teachers' perceptions and a panel of experts in each context area. Utilizing the learning experiences currently used relative to objectives and those targeted for meeting the ongoing needs of students' learning is important. Objectives can be validated by consensus using an expert panel in creating predictive measures involved in teacher licensure as required by law.
CHAPTER III. METHODOLOGY

Introduction

A descriptive research design was used for this study. Ary, Jacobs, and Razavieh (2002) stated that descriptive research asks questions concerning the nature, incidence, or distribution of educational variables and relationships among these variables. Surveys are a system of collecting information by asking respondents questions. The use of the survey is one of the most frequently used methods of collecting data in research studies (Ary, Jacobs, & Razavieh, 2002).

Descriptive studies are primarily concerned with finding out what exists (Borg & Gall, 1989). Some descriptive research is intended to produce statistical information about aspects of education that interest policymakers and educators. The descriptive function of research is heavily dependent upon instrumentation for measurement and observation (Borg & Gall, 1989). The purpose of this descriptive study was to determine current trends and perceptions of Wisconsin agricultural educators regarding selected agricultural mechanics objectives at the secondary educational level. Specific objectives of the study were to:

1. identify perceptions of teachers regarding the use of agricultural mechanics objectives;
2. identify selected agricultural mechanics objectives to be considered for use in secondary agricultural education programs;
3. identify the need of pre-service training for selected agricultural mechanics objectives;
4. determine the future role of agricultural mechanics objectives in the agricultural mechanics curriculum as perceived by secondary agricultural education teachers; and

5. describe and analyze teacher and program characteristics with selected agricultural mechanics variables in secondary agricultural education in Wisconsin.

Population

The population for this study consisted of secondary agricultural education teachers in Wisconsin listed on the 2004–2005 Wisconsin Agricultural Education Directory (WDPI, 2005). This census study conducted in Wisconsin included all agricultural educators teaching secondary agricultural education that possessed a 200 Agriculture Teaching License issued by WDPI and were contracted for the fiscal 2004–2005 school year. According to Ary, Jacobs, and Razavieh (2002), a census study includes the entire population of interest.

A complete list of agricultural educators in Wisconsin was obtained from the WDPI, Agricultural and Natural Resources Education Division Web site on March 9, 2003 (WDPI, 2005). Dean Gagnon, Agricultural Education Consultant, reviewed the list with the researcher on March 9, 2005, to determine the exact population for this study. It was determined 286 agricultural educators were available to participate in this study for the 2004–2005 school year with a WDPI issued 200 Agriculture License. The Wisconsin Agricultural Education Directory was reviewed and agriculture teachers were not included if any of the following criteria was determined:
Current teachers not holding a 200 Agriculture License; teachers on maternity/paternity leave, and teachers that did not complete the entire year of their issued contract. Additionally, any teacher who worked in multiple schools was not duplicated in this study.

**Survey Design and Instrumentation**

At the time of this study, a survey form suitable to meet the objectives was not found. An instrument was developed by the researcher based upon the objectives of the study using information from several recent Delphi studies. These studies were in the context area of agricultural mechanics in agricultural education.

Dillman (2000, p. 50) stated, “Words are building blocks for all question structures, but deciding which words to use in what order is far from simple. The wrong choice of words can create any number of problems, from excessive vagueness to too much precision, from being misunderstood to not being understood at all, and from being too objectionable to being uninteresting and irrelevant.” Stanley Payne used 41 examples of one question to indicate these problems in *The Art of Asking Questions* (Payne, 1951). Payne’s rules for writing questions are referenced by Dillman (2000, p. 51) as a list of simple admonitions that were created on what to do and what not to do when questions are created for a survey. Additionally, Dillman (2000) placed much emphasis on the design of a questionnaire which includes details based upon the objectives indicated for specific studies.
Utilizing Dillman's (2000) and Payne's (1951) suggestions, a questionnaire was modified from studies by Lawver, Barton, Akers, Smith, and Fraze (2004); Harrison, Schumacher, and Birkenholz (1993); Burris, Robinson, and Terry (2004); Harbstreit and Harris (2003); and Buttles, Graham, and Hieronimczak (2003). The completed instrument consisted of two sections with section one having four subsections.

Section one used a Likert-type scale to determine perceptions of teachers regarding the consideration of objectives in secondary agricultural education programs. The Likert-type scale used: 1 = strongly oppose, 2 = somewhat oppose, 3 = somewhat favor, and 4 = strongly favor. Teachers were asked to indicate if they did or did not perceive a need for pre-service training for each of the listed objectives. Section one contained four constructs. These constructs were identified on the survey and grouped for ease of response. The constructs and number of objectives in each were: Agricultural Metals (25), Agricultural Structures (36), Agricultural Power and Machinery (21), and Agricultural Soils and Water Management (17).

Section two was primarily used to measure demographic variables including personal experience in the context area of agricultural mechanics. Included were measurements of learner experiences as well as measurable experiences as a teacher. Questions were designed to measure current and future perceived levels of agricultural mechanics objectives and the level expected in high school agricultural education programs.

Pilot Test
Face validity was established by a panel of experts with experience in secondary agricultural education and agricultural mechanics. Face validity according to Miller indicates that an instrument looks like it is measuring what it is supposed to measure. The three individuals used to validate the survey were: Dr. W. Wade Miller, professor at Iowa State University, who held a joint appointment in the Department of Agricultural Education and Studies and the Department of Curriculum and Instruction; Dr. Mark Zidon, director of the School of Agriculture and a professor of Agricultural Education at the University of Wisconsin–Platteville who also serves as the advisor for the Agricultural Mechanization Club; and Dr. Mike Retallick, academic advisor and coordinator of undergraduate advising for the Department of Agricultural Education and Studies with an emphasis in pre-service training at Iowa State University.

This panel of experts indicated the response times ranged from 12–15 minutes. They responded to the entire survey and then were interviewed on an individual basis. The experts expressed their concerns regarding specific items. Considerations were addressed by each independently and revisions were made based upon suggestions indicated by the expert panel.

Agricultural Mechanics in Wisconsin pilot survey was electronically sent to 46 professionals who had previously agreed to pilot the survey. Professional experts used in the pilot study were: fourteen current university professors with postsecondary teaching experience in agricultural mechanics, eight recently retired Wisconsin agricultural educators, seventeen individuals who currently teach in the Wisconsin Technical College system in the area of agriculture mechanics, and
seven past secondary agricultural educators in Wisconsin who have changed professions. None of the individuals participating in the pilot program was used as respondents in this study. Many comments were reviewed and these comments are listed in Appendix C.

Completed electronic questionnaires were recorded from 34 of the 46 invited respondents for a 73.9% response rate. Cronbach’s alpha was calculated for reliability with each construct. Cronbach’s alpha is appropriate for estimating internal consistency reliability within a scale in Likert-type format (Borg & Gall, 1989). Cronbach’s alpha for each construct area were: Agricultural Metals α=.97, Agricultural Structures α=.96, Agricultural Powers and Machinery α=.95, and Agricultural Soils and Water α=.92. According to Davis (1971), all of these correlation coefficients have a very high magnitude of association. Davis (1971) utilized the following scale in describing measures of association: .00−.09 = negligible association, .10−.29 = low association, .30−.49 = moderate association, .50−.69 = substantial association, .70−.99 = very strong association, and 1.0 perfect association. Miller (1994, p. 6) indicated that magnitudes of .9 or above are not very common in research in agricultural education.

**Data Collection**

The data collection process for this study was approved and given Exempt Status on September 24, 2004, by the Office of Research Compliance, Institutional Review Board. Dillman’s (2000) suggested method of using electronic surveys was utilized to achieve optimal return rates. On March 7, 2005, electronic mailings were
sent to 286 teachers, using Eudora®. Teachers were to be informed they would be receiving an e-mail in a few days with instructions on how to complete an important questionnaire titled “Agricultural Mechanics in WI,” which was offered online for their convenience. There were seven electronic addresses that were indicated as Subject: Undeliverable: Ag Mechanics in WI. These were assessed and all corrections were resolved either via an adjusted e-mail address or by U.S. mail.

The first personalized e-mail letter (Appendix C) sent to the 286 Wisconsin agricultural educators with directions for accessing a Web site to complete the “Agricultural Mechanics in WI” questionnaire was electronically sent on March 10, 2005. Personalized thank yous were e-mailed to all respondents as responses were received every 2–5 days, based on the volume of responses. Follow-up notifications were e-mailed to non-respondents on March 17, March 22, March 29, April 2, April 7, and April 15, 2005. Copies of the aforementioned notifications may be reviewed in Appendix C. As responses were received, thank you e-mails were electronically sent and the respondent was removed from the send list. On April 8, the researcher contacted non-respondents via telephone. Personal contacts were made and, in some cases, phone messages were left on answering services. The researcher discovered through personal communication that many of the individuals were not responding because a firewall was in use at their computer site. The firewalls at many schools were diverting e-mails into the files, where they were not accessed daily. These non-response issues were overcome by sending a single location e-mail addressed letter with directions for completing the questionnaire. Additionally, twelve individuals requested a hard copy of the survey. Those requesting surveys
were mailed a survey with a pre-addressed stamped envelope including a cover letter. The cover letter can be reviewed in Appendix D, and a copy of the instrument used may be reviewed in Appendix B.

Ten questionnaires were received via U.S. mail. These combined with the 263 responses received electronically totaled 271 responses. The response rate was 94.8%; 271 of 286 as defined in the population responded. Two respondents submitted responses with unusable data. The data were deemed unusable based upon limited responses to the questionnaire. The responses were unusable due to these facts: One respondent submitted responses to four questions, another respondent submitted a survey with three completed answers. This reduced the total usable data to 94.1%. Based upon research indicated by Linder, Murphy, and Briers (2001), additional control of non-response error is not necessary when a response rate of 85% or higher is achieved. Therefore, based upon the usable response rate of 94.1%, it was determined by the researcher that a non-response rate of less than 6% does not indicate the need for additional non-response error control.

**Data Analysis**

The data collected from the participants were coded, entered, and analyzed using a computer. Data were analyzed using the Statistical Package for Social Science (SPSS), version 10.0. Analysis of data included frequencies, percentages, means, standard deviations, and correlations.
Limitations of this Study

1. This study was limited to Wisconsin secondary agricultural educators possessing a 200 Agriculture License.

2. The agricultural educators in this study were contracted for the entire 2004--2005 school year with one employer.

3. The results of this study can only be generalized to the secondary agricultural teachers included in the census from Wisconsin.

4. The survey used to collect data from this population for this study was designed for this study.

5. This study was limited to one context area in agricultural education titled Power, Structural, and Technical Systems.

Assumptions

1. The addresses were updated and complete; this includes e-mail and regular mail.

2. The agricultural educators' answers reflect their honest opinion.

3. Agricultural educators who responded with electronic mail were confident with using a Web-based survey or they used the option of requesting a hard copy via U.S. mail.

4. Agricultural educators knew definitions of the stated objectives in the context area of agricultural mechanics.
5. The researcher assumed the objectives in the instrument were representative of various agricultural mechanics objectives in the State of Wisconsin.

6. The survey methods used were a valuable means to collect such data.

7. Agricultural mechanics objectives perceptions can be measured.

Summary

The purpose of this descriptive study was to validate secondary agricultural educators' perceptions of agricultural mechanics objectives. The population of this study consisted of 286 Wisconsin agricultural educators. A survey instrument was developed by the researcher using previous agricultural mechanics related Delphi studies. Content was accomplished with experts associated with this context. The reliability was established in the pilot study with the use of Cronbach’s alpha. Response to the survey was over 94%; therefore, the data can be generalized to the overall population. Analysis of the data included frequencies, percentages, means, standard deviations, and correlations.
CHAPTER IV. FINDINGS

Findings of the Study

The purpose of this study was to determine the perceptions of secondary agricultural educators in Wisconsin. This study sought to determine the degree to which teachers perceive objectives to be important in agricultural mechanics, and whether they should be included in pre-service learning. Additionally, the study was used to determine the need for pre-service and in-service education regarding agricultural mechanics objectives. Several demographic factors were used to compare teacher responses in this study. The study identified teacher perceptions of 99 agricultural mechanics objectives.

The agricultural mechanics objectives were divided into four constructs: agricultural metals, agricultural structures, agricultural power and machinery, and agricultural soil and water management. Objectives in each construct were validated for use at the secondary level. Additionally, teachers indicated the need for pre-service training for teaching each objective.

Teachers in this study provided demographic information including years of teaching, amount of agricultural education received in high school and at the post-secondary level. Respondents also indicated hours of production experience, recommendations for teacher training, experience with CDE agricultural mechanics teams, teaching experience with agriculture mechanics activities, and perceived level of qualification in agricultural mechanics teaching. Additionally, statements indicated the availability of an agricultural mechanics lab in schools, the effects of
technology education classes, teachers' choices of available lesson plans, the future and preferred use of agricultural mechanics objectives in agricultural education programs, along with indicating their gender.

The findings were based upon the objectives in this study. The five objectives of the study were to:

1. identify perceptions of teachers regarding the use of agricultural mechanics objectives;
2. identify selected agricultural mechanics objectives to be considered for use in secondary agricultural education programs;
3. identify the need of pre-service training for selected agricultural mechanics objectives;
4. determine the future role of agricultural mechanics objectives in the agricultural mechanics curriculum as perceived by secondary agricultural education teachers; and
5. describe and analyze teacher and program characteristics with selected agricultural mechanics variables in secondary agricultural education in Wisconsin.

The findings of this study are under the following subheadings:

1. Demographic Characteristics: Descriptive characteristics regarding participants as related to programs and activities sought in agricultural education programs.

3. Teacher Training Recommendations: Wisconsin agricultural educators indicated responses regarding the need for pre-service training regarding each agricultural mechanics objective.

4. The Future of Agricultural Mechanics Objectives: Wisconsin agricultural educators indicated values of teaching prescribed agricultural mechanics objectives for high school students in agricultural education programs.

5. Teacher and Program Characteristics: Comparison of selected demographic data with perceptions and program characteristics sought in this study from Wisconsin high school agricultural educators during the 2004–2005 school year.

Chapter IV includes the data collected with the survey instrument designed for this study. This chapter also includes descriptive statistics used to classify and summarize the data collected in this study.

**Demographic Characteristics**

Two hundred eighty-six agricultural educators were contacted for this study. The response rate was 94.7%, although data from two respondents were unusable. As indicated in Figure 1, there were 269 participants responding with usable data. The usable response rate in this study was 94.1%. The number of males (187) teaching agricultural education in Wisconsin was nearly double that of
Figure 1. Distribution of agricultural educations teachers based upon gender (n=269)

females (87). A total of 67.7% or 182 of the teachers in this study indicated they were male, and 32.3% or 87 teachers indicated they were female (Figure 1).

The average years of experience of the secondary agricultural education teachers in Wisconsin were 14.1 years. Listed in Table 1 are the genders of teachers along with the teachers’ indicated years of experience. Responses were combined in Table 1 indicating 66.9% had 18 years or less of teaching experience in Wisconsin. The data further indicate 44.6% had ten years or less with 24.5% having five years or less experience teaching in agricultural education. Additionally, the largest percent of female agricultural educators had less than ten years of experience. A total of 59 of the 87 female agricultural teachers in Wisconsin during the 2004–2005 school year indicated having less than ten years of teaching experience.
Table 1. Indicated total years of teaching experience in agricultural education of each teacher in this study listed by gender (n=269)

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<th>Male</th>
<th>Total</th>
<th>%</th>
<th>Cumulative %</th>
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</tr>
<tr>
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</tr>
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<td>7</td>
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<td>7</td>
<td>2.6</td>
<td>87.7</td>
</tr>
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<td>8</td>
<td>9</td>
<td>3.3</td>
<td>91.1</td>
</tr>
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<td>29</td>
<td>1</td>
<td>4</td>
<td>5</td>
<td>1.9</td>
<td>92.9</td>
</tr>
<tr>
<td>30</td>
<td>0</td>
<td>5</td>
<td>5</td>
<td>1.9</td>
<td>94.8</td>
</tr>
<tr>
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<td>5</td>
<td>5</td>
<td>1.9</td>
<td>96.7</td>
</tr>
<tr>
<td>32</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>1.5</td>
<td>98.1</td>
</tr>
<tr>
<td>33</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>1.1</td>
<td>99.3</td>
</tr>
<tr>
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<td>37</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>.4</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>87</td>
<td>182</td>
<td>269</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>
Figure 2 shows the distribution of agricultural education instructors in Wisconsin who were teaching that had completed one or more agricultural education courses as a high school student. More than 89% of teachers, or 241 of the 269 teachers in this study, had experienced an agricultural education course as a high school student.

Figure 2. Teachers' indication of completing one or more agricultural education courses as a high school student (n=269)

Figure 3 shows the distribution of agricultural education instructors with or without six or more credits of pre-service learning in agricultural mechanics classes in college. Over 61% (166) of the teachers indicated they had taken at least six or more credit hours of agricultural mechanics in college.
Teachers were asked to describe their formal education as well as their experiences. One question asked if the teacher had at least 200 hours of work experience in production agriculture. Teachers responded with 263 out of 269 respondents (97.7%) indicating they had more than 200 hours of work experience in production agriculture.

Figure 3. Teachers' indication of completing six or more credit hours of agricultural mechanics classes in college (n=269)
Agricultural Mechanics Objectives

Teachers' perceptions regarding agricultural mechanics objectives in Wisconsin were sought in this study. Teachers were asked to indicate their level of consideration relative to each identified agricultural mechanics objective on a Likert-type scale. The scale, 1=strongly oppose; 2=somewhat oppose; 3=somewhat favor; 4=strongly favor, was used to measure teachers' responses in this study. The objectives are listed in groups associated with the following constructs: agricultural metals, agricultural structures, agricultural power and machinery, and agricultural soil and water management.

Table 2 contains the frequencies and percentages of each objective in agricultural metals. All teachers viewed agricultural mechanics objectives as favorable. The two columns of somewhat favorable and strongly favorable were combined to determine the total favorable response to each objective. After doing
so, the highest scoring objectives as perceived by the teachers were shielded metal arc welding (SMAW) safety procedures and oxyfuel cutting and welding with a favorable score of 91.2%. The lowest rated objective was explaining robotics fabrication. Seventy-four percent of the teachers rated this objective as somewhat favorable or strongly favorable. Oxyfuel safety procedures had 67.6% of the teachers indicating they strongly favored that objective. No objectives were strongly opposed by more than 4.6% of the teachers. Overall, the majority of teachers in Wisconsin indicated they favored all of the agricultural metals objectives in the agricultural metals construct.

Table 3 contains the frequencies and percentages of each objective in agricultural structures. Six of the 36 objectives in the agricultural structures construct scored higher than 97.7% when combing the percentages of somewhat favor and strongly favor. The agricultural structures construct components identified were: Identify agricultural structures safety, use measuring devices, utilize math with structures, identify hand and power tools, utilize hand and power tools safety, and use hand and power tools. The effects of temperature on paint had the lowest favorable score of 73.5%. The percentages when combining the two favorable columns indicated only three combined scores below 80.2% from the group of 36 objectives in the agricultural structures construct.
Table 2. Frequencies and percentages of responses regarding teachers' perceptions of agricultural mechanics objectives in the construct area of agricultural metals

<table>
<thead>
<tr>
<th>Agricultural metals objective*</th>
<th>Strongly oppose</th>
<th>Somewhat oppose</th>
<th>Somewhat favor</th>
<th>Strongly favor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(f)</td>
<td>(%)</td>
<td>(f)</td>
<td>(%)</td>
</tr>
<tr>
<td>Identify types of metal</td>
<td>7</td>
<td>2.7</td>
<td>11</td>
<td>4.2</td>
</tr>
<tr>
<td>Id MIG &amp; TIG safety</td>
<td>6</td>
<td>2.3</td>
<td>15</td>
<td>5.8</td>
</tr>
<tr>
<td>Metal fabrication safety</td>
<td>10</td>
<td>3.8</td>
<td>15</td>
<td>5.7</td>
</tr>
<tr>
<td>Oxyfuel safety procedures</td>
<td>7</td>
<td>2.7</td>
<td>18</td>
<td>6.9</td>
</tr>
<tr>
<td>Oxyfuel cutting &amp; welding</td>
<td>7</td>
<td>2.7</td>
<td>16</td>
<td>6.2</td>
</tr>
<tr>
<td>SMAW safety procedures</td>
<td>8</td>
<td>3.1</td>
<td>15</td>
<td>5.8</td>
</tr>
<tr>
<td>Perform MIG &amp; TIG skills</td>
<td>7</td>
<td>2.7</td>
<td>17</td>
<td>6.6</td>
</tr>
<tr>
<td>Perform soldering skills</td>
<td>7</td>
<td>2.7</td>
<td>20</td>
<td>7.7</td>
</tr>
<tr>
<td>Setup oxyfuel equipment</td>
<td>7</td>
<td>2.7</td>
<td>21</td>
<td>8.1</td>
</tr>
<tr>
<td>Perform metal fabrication</td>
<td>11</td>
<td>4.2</td>
<td>19</td>
<td>7.3</td>
</tr>
<tr>
<td>Read measuring devices</td>
<td>8</td>
<td>3.1</td>
<td>22</td>
<td>8.5</td>
</tr>
<tr>
<td>Weld in multiple positions</td>
<td>5</td>
<td>2.0</td>
<td>22</td>
<td>8.6</td>
</tr>
<tr>
<td>Drill, tap, and thread metal</td>
<td>7</td>
<td>2.7</td>
<td>23</td>
<td>8.9</td>
</tr>
<tr>
<td>Cut, shape, and file metal</td>
<td>7</td>
<td>2.7</td>
<td>26</td>
<td>10.0</td>
</tr>
<tr>
<td>Selection of oxyfuel equip.</td>
<td>8</td>
<td>3.1</td>
<td>24</td>
<td>9.3</td>
</tr>
<tr>
<td>Perform SMAW skills</td>
<td>8</td>
<td>3.1</td>
<td>23</td>
<td>8.9</td>
</tr>
<tr>
<td>Layout metal projects</td>
<td>8</td>
<td>3.1</td>
<td>26</td>
<td>10.0</td>
</tr>
<tr>
<td>Adjust amperage of SMAW</td>
<td>8</td>
<td>3.1</td>
<td>24</td>
<td>9.4</td>
</tr>
<tr>
<td>Select SMAW electrodes</td>
<td>8</td>
<td>3.1</td>
<td>28</td>
<td>10.9</td>
</tr>
<tr>
<td>Perform plasma arc cutting</td>
<td>7</td>
<td>2.7</td>
<td>32</td>
<td>12.3</td>
</tr>
<tr>
<td>Select metal fab. fasteners</td>
<td>8</td>
<td>3.1</td>
<td>31</td>
<td>12.0</td>
</tr>
<tr>
<td>Draw metal projects plans</td>
<td>8</td>
<td>3.1</td>
<td>35</td>
<td>13.6</td>
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<tr>
<td>Use computer aided drafting</td>
<td>9</td>
<td>3.5</td>
<td>41</td>
<td>15.9</td>
</tr>
<tr>
<td>Operate bending/shaping</td>
<td>8</td>
<td>3.1</td>
<td>45</td>
<td>17.4</td>
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<tr>
<td>Explain robotics fabrication</td>
<td>12</td>
<td>4.6</td>
<td>55</td>
<td>21.2</td>
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</tbody>
</table>

*Agricultural mechanics objectives are ranked based upon the sum of somewhat favor and strongly favor
Table 3. Frequencies and percentages of responses regarding teachers’ perceptions of agricultural mechanics objectives in the construct area of agricultural structures

<table>
<thead>
<tr>
<th>Agricultural structures Objective*</th>
<th>Strongly oppose</th>
<th>Somewhat oppose</th>
<th>Somewhat favor</th>
<th>Strongly favor</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>( f )</td>
<td>( % )</td>
<td>( f )</td>
<td>( % )</td>
</tr>
<tr>
<td>ID ag. structure safety</td>
<td>1</td>
<td>.4</td>
<td>6</td>
<td>2.3</td>
</tr>
<tr>
<td>Perform lab mgt. skills</td>
<td>2</td>
<td>.8</td>
<td>9</td>
<td>3.4</td>
</tr>
<tr>
<td>Use measuring devices</td>
<td>1</td>
<td>.4</td>
<td>2</td>
<td>.8</td>
</tr>
<tr>
<td>Utilize math with structures</td>
<td>1</td>
<td>.4</td>
<td>1</td>
<td>.4</td>
</tr>
<tr>
<td>ID hand and power tools</td>
<td>1</td>
<td>.4</td>
<td>5</td>
<td>1.9</td>
</tr>
<tr>
<td>Utilize hand &amp; power safety</td>
<td>1</td>
<td>.4</td>
<td>5</td>
<td>1.9</td>
</tr>
<tr>
<td>Use hand and power tools</td>
<td>1</td>
<td>.4</td>
<td>5</td>
<td>1.9</td>
</tr>
<tr>
<td>ID and select fasteners</td>
<td>2</td>
<td>.8</td>
<td>13</td>
<td>5.0</td>
</tr>
<tr>
<td>Identify types of lumber</td>
<td>2</td>
<td>.8</td>
<td>14</td>
<td>5.4</td>
</tr>
<tr>
<td>Utilize framing and roofing</td>
<td>5</td>
<td>1.9</td>
<td>20</td>
<td>7.7</td>
</tr>
<tr>
<td>ID electrical safety needs</td>
<td>2</td>
<td>.8</td>
<td>16</td>
<td>6.1</td>
</tr>
<tr>
<td>Discuss principles of electr.</td>
<td>2</td>
<td>.8</td>
<td>19</td>
<td>7.3</td>
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<tr>
<td>Wire electrical circuits</td>
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<tr>
<td>Operate multimeters</td>
<td>4</td>
<td>1.5</td>
<td>32</td>
<td>12.3</td>
</tr>
<tr>
<td>Discuss ventilation theory</td>
<td>2</td>
<td>.8</td>
<td>28</td>
<td>10.8</td>
</tr>
<tr>
<td>Prepare sites for concrete</td>
<td>3</td>
<td>1.1</td>
<td>34</td>
<td>13.0</td>
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<tr>
<td>Form, finish/cure concrete</td>
<td>3</td>
<td>1.1</td>
<td>35</td>
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<tr>
<td>Estimate concrete material</td>
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<td>.8</td>
<td>27</td>
<td>10.3</td>
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<tr>
<td>Select and apply paints</td>
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<td>1.5</td>
<td>44</td>
<td>16.9</td>
</tr>
<tr>
<td>Demonstrate paint skills</td>
<td>6</td>
<td>2.3</td>
<td>40</td>
<td>15.4</td>
</tr>
<tr>
<td>Prepare surfaces for paint</td>
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<td>1.1</td>
<td>39</td>
<td>14.9</td>
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<tr>
<td>Install PVC plumbing</td>
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<td>1.9</td>
<td>31</td>
<td>11.9</td>
</tr>
<tr>
<td>Identify plumbing tools</td>
<td>3</td>
<td>1.2</td>
<td>29</td>
<td>11.2</td>
</tr>
<tr>
<td>Plan and construct</td>
<td>6</td>
<td>2.3</td>
<td>26</td>
<td>10.0</td>
</tr>
<tr>
<td>Prepare bill of materials</td>
<td>4</td>
<td>1.5</td>
<td>14</td>
<td>5.3</td>
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<tr>
<td>Construct ag. fences</td>
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<td>51</td>
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Table 3. Continued

<table>
<thead>
<tr>
<th>Agricultural structures objective</th>
<th>Strongly oppose</th>
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<th>Somewhat favor</th>
<th>Strongly favor</th>
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<tr>
<td></td>
<td>( f )</td>
<td>%</td>
<td>( f )</td>
<td>%</td>
</tr>
<tr>
<td>Draw building plans</td>
<td>6</td>
<td>2.3</td>
<td>22</td>
<td>8.4</td>
</tr>
<tr>
<td>Select insulation</td>
<td>6</td>
<td>2.3</td>
<td>40</td>
<td>15.4</td>
</tr>
<tr>
<td>Service/repair elec. motors</td>
<td>9</td>
<td>3.4</td>
<td>53</td>
<td>20.2</td>
</tr>
<tr>
<td>Proportion/mix concrete</td>
<td>6</td>
<td>2.3</td>
<td>41</td>
<td>15.6</td>
</tr>
<tr>
<td>Effect temperature on paint</td>
<td>10</td>
<td>3.9</td>
<td>58</td>
<td>22.6</td>
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<tr>
<td>Use computer aid drafting</td>
<td>8</td>
<td>3.1</td>
<td>44</td>
<td>16.8</td>
</tr>
<tr>
<td>Safe use of paint chemicals</td>
<td>5</td>
<td>1.9</td>
<td>32</td>
<td>12.2</td>
</tr>
<tr>
<td>Layout/cutting angles</td>
<td>6</td>
<td>2.3</td>
<td>24</td>
<td>9.2</td>
</tr>
<tr>
<td>Wind and snow loads</td>
<td>7</td>
<td>2.7</td>
<td>29</td>
<td>11.2</td>
</tr>
<tr>
<td>Layout batter boards</td>
<td>9</td>
<td>3.5</td>
<td>55</td>
<td>21.4</td>
</tr>
</tbody>
</table>

*Agricultural mechanics objectives are ranked based upon the sum of somewhat favor and strongly favor*
Table 4 contains the frequencies and percentages of each objective in agricultural power and machinery. In general, the overall scores of agricultural power and machinery that favored using the objectives at the secondary level were slightly lower in this construct compared to agricultural metals and agricultural structures objectives. The lowest scoring objective combined the two favorable columns overall, and in this construct is repairing transmission at 61.8%. Identification of agricultural power and machinery safety received the highest favorable percentage of 98.5% for this construct. There were five objectives with an overall combined favorable percentage of 90. These were: Identification of power and machinery safety, perform power and machinery laboratory management skills, discuss principles of engines, small engine safety, and fix or repair bearings, seals, and hoses.

Table 5 contains the frequencies and percentages of each objective in agricultural soils and water management. Totals in the favorable columns for all objectives in the agricultural soil and water management construct yielded four objectives with percentages more than 97%. These were: Identification of soil and water management issues, describe soil and water management principles, use land measuring equipment, and identification of soil textures. The objectives including irrigation in the description were comparably lower.
<table>
<thead>
<tr>
<th>Agricultural power and machinery objective*</th>
<th>Strongly oppose</th>
<th>Somewhat oppose</th>
<th>Somewhat favor</th>
<th>Strongly favor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>f</td>
<td>%</td>
<td>f</td>
<td>%</td>
</tr>
<tr>
<td>ID power/machinery safety</td>
<td>1</td>
<td>.4</td>
<td>3</td>
<td>1.2</td>
</tr>
<tr>
<td>Safe operation of tractors</td>
<td>1</td>
<td>.4</td>
<td>8</td>
<td>3.1</td>
</tr>
<tr>
<td>Perform p/m lab mgt skills</td>
<td>1</td>
<td>.4</td>
<td>13</td>
<td>5.0</td>
</tr>
<tr>
<td>ID tractor/equip component</td>
<td>3</td>
<td>1.1</td>
<td>12</td>
<td>4.6</td>
</tr>
<tr>
<td>Small engine safety</td>
<td>2</td>
<td>.8</td>
<td>13</td>
<td>5.0</td>
</tr>
<tr>
<td>Discuss principles engines</td>
<td>2</td>
<td>.8</td>
<td>16</td>
<td>6.2</td>
</tr>
<tr>
<td>Fix bearings/seals/hoses</td>
<td>3</td>
<td>1.2</td>
<td>20</td>
<td>7.7</td>
</tr>
<tr>
<td>Small engine theory</td>
<td>4</td>
<td>1.5</td>
<td>23</td>
<td>8.8</td>
</tr>
<tr>
<td>Engine diagnostic skills</td>
<td>2</td>
<td>0.8</td>
<td>25</td>
<td>9.7</td>
</tr>
<tr>
<td>Select tract/equip fastener</td>
<td>6</td>
<td>2.3</td>
<td>22</td>
<td>8.5</td>
</tr>
<tr>
<td>Use engine test equipment</td>
<td>3</td>
<td>1.2</td>
<td>24</td>
<td>9.3</td>
</tr>
<tr>
<td>Engine heating and cooling</td>
<td>3</td>
<td>1.2</td>
<td>24</td>
<td>9.3</td>
</tr>
<tr>
<td>Ignition and electrical skills</td>
<td>5</td>
<td>1.9</td>
<td>30</td>
<td>11.4</td>
</tr>
<tr>
<td>Explain hydraulic systems</td>
<td>2</td>
<td>.8</td>
<td>33</td>
<td>12.6</td>
</tr>
<tr>
<td>Calibrate tract/equip</td>
<td>4</td>
<td>1.5</td>
<td>38</td>
<td>14.4</td>
</tr>
<tr>
<td>Discuss pneumatic system</td>
<td>3</td>
<td>1.1</td>
<td>41</td>
<td>15.6</td>
</tr>
<tr>
<td>Computers and tract repair</td>
<td>4</td>
<td>1.5</td>
<td>55</td>
<td>20.9</td>
</tr>
<tr>
<td>Repair fuel/intake systems</td>
<td>6</td>
<td>2.3</td>
<td>52</td>
<td>19.8</td>
</tr>
<tr>
<td>Repair/replace U-joints</td>
<td>11</td>
<td>4.2</td>
<td>57</td>
<td>21.7</td>
</tr>
<tr>
<td>Repair hydraulic pumps</td>
<td>8</td>
<td>3.1</td>
<td>63</td>
<td>24.0</td>
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<tr>
<td>Repair transmissions</td>
<td>18</td>
<td>6.9</td>
<td>82</td>
<td>31.3</td>
</tr>
</tbody>
</table>

*Agricultural mechanics objectives are ranked based upon the sum of somewhat favor and strongly favor
Table 5. Frequencies and percentages of responses regarding teachers' perceptions of agricultural mechanics objectives in the construct area of agricultural soil and water management

<table>
<thead>
<tr>
<th>Agricultural soil and water management objective*</th>
<th>Strongly oppose</th>
<th>Somewhat oppose</th>
<th>Somewhat favor</th>
<th>Strongly favor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explain irrigation principles</td>
<td>3 1.1</td>
<td>22 8.3</td>
<td>109 41.3</td>
<td>130 49.2</td>
</tr>
<tr>
<td>Use land measurement equi</td>
<td>1 0.4</td>
<td>7 2.7</td>
<td>96 36.4</td>
<td>160 60.6</td>
</tr>
<tr>
<td>Identify soil texture</td>
<td>2 0.8</td>
<td>6 2.3</td>
<td>66 25.0</td>
<td>190 72.0</td>
</tr>
<tr>
<td>Perform s/w lab mgt skills</td>
<td>1 0.4</td>
<td>8 3.0</td>
<td>81 30.7</td>
<td>174 65.9</td>
</tr>
<tr>
<td>Identify s/w mgt. issues</td>
<td>1 0.4</td>
<td>6 2.3</td>
<td>61 23.3</td>
<td>194 74.0</td>
</tr>
<tr>
<td>Explain soil erosion prin.</td>
<td>2 0.8</td>
<td>8 3.0</td>
<td>55 20.8</td>
<td>199 75.4</td>
</tr>
<tr>
<td>Calculate acreage</td>
<td>2 0.8</td>
<td>11 4.2</td>
<td>77 29.2</td>
<td>174 65.9</td>
</tr>
<tr>
<td>Classify land</td>
<td>2 0.8</td>
<td>13 4.9</td>
<td>95 36.0</td>
<td>154 58.3</td>
</tr>
<tr>
<td>Explain irrigation principles</td>
<td>3 1.1</td>
<td>22 8.3</td>
<td>109 41.3</td>
<td>130 49.2</td>
</tr>
<tr>
<td>Conduct soil percolation test</td>
<td>5 1.9</td>
<td>24 9.1</td>
<td>121 45.8</td>
<td>114 43.2</td>
</tr>
<tr>
<td>Manage water systems</td>
<td>2 0.8</td>
<td>25 9.5</td>
<td>106 40.5</td>
<td>129 49.2</td>
</tr>
<tr>
<td>Draw s/w mgt. plans</td>
<td>4 1.5</td>
<td>32 12.2</td>
<td>111 42.4</td>
<td>115 43.9</td>
</tr>
<tr>
<td>Perform differential leveling</td>
<td>3 1.1</td>
<td>41 15.6</td>
<td>108 41.1</td>
<td>111 42.2</td>
</tr>
<tr>
<td>Use computer aided drafting</td>
<td>8 3.1</td>
<td>45 17.2</td>
<td>121 46.2</td>
<td>88 33.6</td>
</tr>
<tr>
<td>Repair/maintain irrigation</td>
<td>9 3.4</td>
<td>64 24.2</td>
<td>109 41.3</td>
<td>82 32.1</td>
</tr>
<tr>
<td>Install waste water plumb</td>
<td>14 5.3</td>
<td>63 24.0</td>
<td>119 45.4</td>
<td>66 25.2</td>
</tr>
<tr>
<td>Install irrigation sys/timers</td>
<td>17 6.5</td>
<td>69 26.2</td>
<td>118 44.9</td>
<td>59 22.4</td>
</tr>
</tbody>
</table>

*Agricultural mechanics objectives are ranked based upon the sum of somewhat favor and strongly favor
Teacher Training Recommendations

Wisconsin agricultural educators’ perceptions were sought regarding the need for pre-service training with each selected agricultural mechanics objective in this section. Table 6 lists the responses to the question: Which type of teacher training would you recommend regarding agricultural mechanics? This question was followed by these choices: 1) Pre-service teacher preparation (prior to initial teacher licensure); 2) In-service for existing teachers (fall, spring, or summer conference); 3) Both pre-service and in-service are needed; or 4) Other, followed by an area to describe the specific type of training. Overall 73.2% of the teachers responded to having both pre-service and in-service teacher training for agricultural mechanics objectives. The responses to “other” may be seen in Appendix F, where the responses are listed from the fourteen teachers who chose the last response on the instrument for question number five. In addition to teachers who chose both pre-service and in-service, 21.6% indicated they preferred either pre-service (7.8%) or in-service (13.8%) as their choice for teacher training.

Table 6. Teachers’ indicated teacher-training recommendations regarding agricultural mechanics objectives (n=269)

<table>
<thead>
<tr>
<th>Teacher training method</th>
<th>f</th>
<th>%</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-service teacher preparation</td>
<td>21</td>
<td>7.8</td>
<td>7.8</td>
</tr>
<tr>
<td>In-service for existing teachers</td>
<td>37</td>
<td>13.8</td>
<td>21.6</td>
</tr>
<tr>
<td>Both pre-service and in-service</td>
<td>197</td>
<td>73.2</td>
<td>94.8</td>
</tr>
<tr>
<td>Other — See Appendix F</td>
<td>14</td>
<td>5.2</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Teachers were asked the importance of pre-service training to be able to teach each objective to high school agricultural students. The response requested was either yes or no. Tables in this section show the number of responses including percentages for each objective listed within four constructs of this study. Table 7 contains the construct area of agricultural metals. This table contains a range of responses indicating yes to pre-service learning from the low of 66.4% to the high of 91.4%. The lowest response indicating pre-service training was needed for the objectives in this construct was explaining robotic fabrication; the objective indicated the highest need for pre-service training was oxyfuel cutting and welding. There were three combined favorable scores indicating the need for pre-service teacher training with a response percentage of more than 90%. These three objectives were identified from the favorable scores column: Oxyfuel cutting and welding identification of MIG and TIG welding safety, and perform MIG and TIG welding skills. Six objectives with less than 196 teachers in favor of pre-service training were in the area of cold metal and cold metal fabrication. These objectives were: Drill, tap and thread metal, operate bending and shaping equipment, select metal fabrication fasteners, layout metal projects, draw metal project plans, and cut, shape, and file metal. The six objectives with less than 196 teachers in favor were indicated as needed with at least a 62.4% favorable response rate for this study.

Table 8 contains the construct area of agricultural structures, which lists a range of responses indicating yes to pre-service learning from the low of 58.8% to the high of 86.7%. The lowest response indicating pre-service training needed for the objectives in this construct was temperatures and paint. The objective indicated
Table 7. Frequencies and percentages of responses regarding teachers' preservice training perceptions of agricultural mechanics objectives in the construct area of agricultural metals

<table>
<thead>
<tr>
<th>Agricultural metals objective</th>
<th>No</th>
<th>%</th>
<th>Yes</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxyfuel cutting and welding</td>
<td>22</td>
<td>8.6</td>
<td>235</td>
<td>91.4</td>
</tr>
<tr>
<td>ID MIG and TIG safety</td>
<td>23</td>
<td>9.0</td>
<td>232</td>
<td>91.0</td>
</tr>
<tr>
<td>Perform MIG and TIG skills</td>
<td>24</td>
<td>9.3</td>
<td>233</td>
<td>90.7</td>
</tr>
<tr>
<td>Oxyfuel safety procedures</td>
<td>30</td>
<td>11.6</td>
<td>228</td>
<td>88.4</td>
</tr>
<tr>
<td>SMAW safety procedures</td>
<td>32</td>
<td>12.5</td>
<td>224</td>
<td>87.5</td>
</tr>
<tr>
<td>Perform SMAW skills</td>
<td>33</td>
<td>12.9</td>
<td>223</td>
<td>87.1</td>
</tr>
<tr>
<td>Setup oxyfuel equipment</td>
<td>36</td>
<td>14.0</td>
<td>221</td>
<td>86.0</td>
</tr>
<tr>
<td>Perform plasma arc cutting</td>
<td>36</td>
<td>14.1</td>
<td>219</td>
<td>85.9</td>
</tr>
<tr>
<td>Metal fabrication safety</td>
<td>37</td>
<td>14.4</td>
<td>220</td>
<td>85.6</td>
</tr>
<tr>
<td>Read measuring devices</td>
<td>40</td>
<td>15.5</td>
<td>218</td>
<td>84.5</td>
</tr>
<tr>
<td>Weld in multiple positions</td>
<td>42</td>
<td>16.5</td>
<td>213</td>
<td>83.5</td>
</tr>
<tr>
<td>Adjust amperage of SMAW</td>
<td>43</td>
<td>16.9</td>
<td>211</td>
<td>83.1</td>
</tr>
<tr>
<td>Perform metal fabrication</td>
<td>44</td>
<td>17.1</td>
<td>214</td>
<td>82.9</td>
</tr>
<tr>
<td>Identify types of metal</td>
<td>46</td>
<td>18.0</td>
<td>210</td>
<td>82.0</td>
</tr>
<tr>
<td>Select SMAW electrodes</td>
<td>53</td>
<td>20.9</td>
<td>200</td>
<td>79.1</td>
</tr>
<tr>
<td>Use computer aided drafting</td>
<td>53</td>
<td>20.9</td>
<td>201</td>
<td>79.1</td>
</tr>
<tr>
<td>Selection of oxyfuel equip.</td>
<td>56</td>
<td>21.8</td>
<td>201</td>
<td>78.2</td>
</tr>
<tr>
<td>Perform soldering skills</td>
<td>56</td>
<td>21.8</td>
<td>201</td>
<td>78.2</td>
</tr>
<tr>
<td>Drill, tap, and thread metal</td>
<td>57</td>
<td>22.5</td>
<td>196</td>
<td>77.5</td>
</tr>
<tr>
<td>Cut, shape, and file metal</td>
<td>65</td>
<td>25.4</td>
<td>191</td>
<td>74.6</td>
</tr>
<tr>
<td>Layout metal projects</td>
<td>65</td>
<td>25.5</td>
<td>190</td>
<td>74.5</td>
</tr>
<tr>
<td>Draw metal projects plans</td>
<td>69</td>
<td>27.1</td>
<td>186</td>
<td>72.9</td>
</tr>
<tr>
<td>Operate bending/shaping</td>
<td>71</td>
<td>28.1</td>
<td>182</td>
<td>71.9</td>
</tr>
<tr>
<td>Select metal fab. fasteners</td>
<td>84</td>
<td>32.9</td>
<td>171</td>
<td>67.1</td>
</tr>
<tr>
<td>Explain robotics fabrication</td>
<td>86</td>
<td>33.6</td>
<td>170</td>
<td>66.4</td>
</tr>
</tbody>
</table>
Table 8. Frequencies and percentages of responses regarding teachers’ pre-service training perceptions of agricultural mechanics objectives in the construct area of agricultural structures

<table>
<thead>
<tr>
<th>Agricultural structures objective</th>
<th>No</th>
<th></th>
<th>Yes</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>f</td>
<td>%</td>
<td>f</td>
<td>%</td>
</tr>
<tr>
<td>ID ag. structure safety</td>
<td>34</td>
<td>13.3</td>
<td>221</td>
<td>86.7</td>
</tr>
<tr>
<td>ID electrical safety needs</td>
<td>35</td>
<td>13.6</td>
<td>222</td>
<td>86.4</td>
</tr>
<tr>
<td>Wire electrical circuits</td>
<td>37</td>
<td>14.3</td>
<td>221</td>
<td>85.7</td>
</tr>
<tr>
<td>Use measuring devices</td>
<td>38</td>
<td>14.8</td>
<td>219</td>
<td>85.2</td>
</tr>
<tr>
<td>Utilize math with structures</td>
<td>39</td>
<td>15.2</td>
<td>218</td>
<td>84.8</td>
</tr>
<tr>
<td>Discuss principles of electr.</td>
<td>40</td>
<td>15.6</td>
<td>217</td>
<td>84.4</td>
</tr>
<tr>
<td>Plan and construct</td>
<td>44</td>
<td>17.5</td>
<td>208</td>
<td>82.5</td>
</tr>
<tr>
<td>Use computer aided drafting</td>
<td>45</td>
<td>17.6</td>
<td>211</td>
<td>82.4</td>
</tr>
<tr>
<td>Operate multimeters</td>
<td>45</td>
<td>17.7</td>
<td>209</td>
<td>82.3</td>
</tr>
<tr>
<td>Utilize hand and power safety</td>
<td>47</td>
<td>18.2</td>
<td>211</td>
<td>81.8</td>
</tr>
<tr>
<td>Utilize framing and roofing</td>
<td>49</td>
<td>19.0</td>
<td>209</td>
<td>81.0</td>
</tr>
<tr>
<td>Perform lab mgt. skills</td>
<td>51</td>
<td>20.0</td>
<td>204</td>
<td>80.0</td>
</tr>
<tr>
<td>Use hand and power tools</td>
<td>52</td>
<td>20.4</td>
<td>203</td>
<td>79.6</td>
</tr>
<tr>
<td>Layout/cutting angles</td>
<td>52</td>
<td>20.8</td>
<td>198</td>
<td>79.2</td>
</tr>
<tr>
<td>Draw building plans</td>
<td>54</td>
<td>21.2</td>
<td>201</td>
<td>78.8</td>
</tr>
<tr>
<td>Estimate concrete material</td>
<td>55</td>
<td>21.7</td>
<td>199</td>
<td>78.3</td>
</tr>
<tr>
<td>Identify types of lumber</td>
<td>57</td>
<td>22.2</td>
<td>200</td>
<td>77.8</td>
</tr>
<tr>
<td>Install PVC plumbing</td>
<td>58</td>
<td>22.8</td>
<td>196</td>
<td>77.2</td>
</tr>
<tr>
<td>Wind and snow loads</td>
<td>60</td>
<td>23.3</td>
<td>197</td>
<td>76.7</td>
</tr>
<tr>
<td>Discuss ventilation theory</td>
<td>60</td>
<td>23.4</td>
<td>196</td>
<td>76.6</td>
</tr>
<tr>
<td>Prepare bill of materials</td>
<td>60</td>
<td>23.7</td>
<td>193</td>
<td>76.3</td>
</tr>
<tr>
<td>Identify plumbing tools</td>
<td>63</td>
<td>24.5</td>
<td>194</td>
<td>75.5</td>
</tr>
<tr>
<td>Form, finish/cure concrete</td>
<td>63</td>
<td>24.7</td>
<td>192</td>
<td>75.3</td>
</tr>
<tr>
<td>Safe use of paint chemicals</td>
<td>63</td>
<td>24.7</td>
<td>192</td>
<td>75.3</td>
</tr>
<tr>
<td>ID and select fasteners</td>
<td>65</td>
<td>25.3</td>
<td>192</td>
<td>74.7</td>
</tr>
<tr>
<td>Prepare sites for concrete</td>
<td>66</td>
<td>25.8</td>
<td>190</td>
<td>74.2</td>
</tr>
<tr>
<td>Service/repair elec. motors</td>
<td>67</td>
<td>26.2</td>
<td>189</td>
<td>73.8</td>
</tr>
</tbody>
</table>
Table 8. Continued

<table>
<thead>
<tr>
<th>Agricultural structures objective</th>
<th>No</th>
<th>%</th>
<th>Yes</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion/mix concrete</td>
<td>68</td>
<td>26.7</td>
<td>187</td>
<td>73.3</td>
</tr>
<tr>
<td>ID hand and power tools</td>
<td>72</td>
<td>27.9</td>
<td>186</td>
<td>72.1</td>
</tr>
<tr>
<td>Prepare surfaces for paint</td>
<td>81</td>
<td>31.9</td>
<td>173</td>
<td>68.1</td>
</tr>
<tr>
<td>Demonstrate paint skills</td>
<td>86</td>
<td>34.1</td>
<td>166</td>
<td>65.9</td>
</tr>
<tr>
<td>Layout batter boards</td>
<td>87</td>
<td>34.3</td>
<td>167</td>
<td>65.7</td>
</tr>
<tr>
<td>Construct ag. fences</td>
<td>88</td>
<td>34.6</td>
<td>166</td>
<td>65.4</td>
</tr>
<tr>
<td>Select insulation</td>
<td>90</td>
<td>35.2</td>
<td>166</td>
<td>64.8</td>
</tr>
<tr>
<td>Select and apply paints</td>
<td>91</td>
<td>35.8</td>
<td>163</td>
<td>64.2</td>
</tr>
<tr>
<td>Effects of temperatures on paint</td>
<td>103</td>
<td>41.2</td>
<td>147</td>
<td>58.8</td>
</tr>
</tbody>
</table>
the highest need of pre-service training was identification of agricultural structures safety. Constructing agricultural fences was indicated as having a low rating in addition to the selection and application of paints. More than 34.6% of the teachers have indicated constructing agricultural fences is not a high priority for pre-service learning. Overall 33% of the objectives (12) were rated as important by 80% of the teachers in this construct.

Table 9 contains the construct area of agricultural power and machinery, which lists a range of responses indicating yes to pre-service learning from the low of 65.4% to the high of 88.0%. The lowest response indicating pre-service training was needed for the objectives in this construct was repair transmissions; the objective indicated the highest need of pre-service training was identification of power and machinery safety. Overall, 11 out of 21 objectives in this construct, agricultural power and machinery, have at least 80% of the teachers indicating the need for pre-service training. Additionally, only one objective, repair transmissions, was below 70.6% favorable rate in this construct.

Table 10 contains the construct area of agricultural soil and water management, which lists a range of responses indicating yes to pre-service learning from the low of 65.7% to the high of 89.1%. The lowest response indicating pre-service training was needed for the objectives in this construct was installing irrigation systems and timers; the objective indicated the highest need of pre-service training was using land measurement equipment. Three of the objectives addressing water were the lower favorable response rate for pre-service teacher training.
Table 9. Frequencies and percentages of responses regarding teachers' pre-service training perceptions of agricultural mechanics objectives in the construct area of agricultural power and machinery

<table>
<thead>
<tr>
<th>Agricultural power and machinery objective</th>
<th>No</th>
<th>%</th>
<th>Yes</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID power/machinery safety</td>
<td>31</td>
<td>12.0</td>
<td>227</td>
<td>88.0</td>
</tr>
<tr>
<td>Perform p/m lab mgt skills</td>
<td>42</td>
<td>16.5</td>
<td>212</td>
<td>83.5</td>
</tr>
<tr>
<td>Discuss principles engines</td>
<td>35</td>
<td>13.7</td>
<td>222</td>
<td>86.3</td>
</tr>
<tr>
<td>Small engine safety</td>
<td>36</td>
<td>14.0</td>
<td>221</td>
<td>86.0</td>
</tr>
<tr>
<td>Engine diagnostic skills</td>
<td>41</td>
<td>15.9</td>
<td>217</td>
<td>84.1</td>
</tr>
<tr>
<td>Use engine test equipment</td>
<td>38</td>
<td>14.9</td>
<td>217</td>
<td>85.1</td>
</tr>
<tr>
<td>Safe operation of tractors</td>
<td>45</td>
<td>17.4</td>
<td>213</td>
<td>82.6</td>
</tr>
<tr>
<td>ID tractor/equip component</td>
<td>50</td>
<td>19.5</td>
<td>206</td>
<td>80.5</td>
</tr>
<tr>
<td>Select tract/equip fastener</td>
<td>70</td>
<td>27.3</td>
<td>186</td>
<td>72.7</td>
</tr>
<tr>
<td>Fix bearings/seals/hoses</td>
<td>41</td>
<td>15.9</td>
<td>217</td>
<td>84.1</td>
</tr>
<tr>
<td>Calibrate tract/equip</td>
<td>54</td>
<td>21.3</td>
<td>200</td>
<td>78.7</td>
</tr>
<tr>
<td>Computers and tract repair</td>
<td>64</td>
<td>25.3</td>
<td>189</td>
<td>74.7</td>
</tr>
<tr>
<td>Discuss pneumatic system</td>
<td>56</td>
<td>22.1</td>
<td>197</td>
<td>77.9</td>
</tr>
<tr>
<td>Repair fuel/intake systems</td>
<td>63</td>
<td>24.9</td>
<td>190</td>
<td>75.1</td>
</tr>
<tr>
<td>Ignition and electrical skills</td>
<td>44</td>
<td>17.3</td>
<td>211</td>
<td>82.7</td>
</tr>
<tr>
<td>Engine heating and cooling</td>
<td>50</td>
<td>19.5</td>
<td>207</td>
<td>80.5</td>
</tr>
<tr>
<td>Small engine theory</td>
<td>53</td>
<td>20.7</td>
<td>203</td>
<td>79.3</td>
</tr>
<tr>
<td>Explain hydraulic systems</td>
<td>55</td>
<td>21.5</td>
<td>201</td>
<td>78.5</td>
</tr>
<tr>
<td>Repair hydraulic pumps</td>
<td>71</td>
<td>27.7</td>
<td>185</td>
<td>72.3</td>
</tr>
<tr>
<td>Repair/replace U-joints</td>
<td>75</td>
<td>29.4</td>
<td>180</td>
<td>70.6</td>
</tr>
<tr>
<td>Repair transmissions</td>
<td>88</td>
<td>34.6</td>
<td>166</td>
<td>65.4</td>
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</tbody>
</table>
Table 10. Frequencies and percentages of responses regarding teachers' pre-service training perceptions of agricultural mechanics objectives in the construct area of agricultural soil and water management

<table>
<thead>
<tr>
<th>Agricultural soil and water management objective</th>
<th>No</th>
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<th></th>
<th>Yes</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>f</td>
<td>%</td>
<td></td>
<td>f</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Use land measurement equip.</td>
<td>28</td>
<td>10.9</td>
<td></td>
<td>230</td>
<td>89.1</td>
<td></td>
</tr>
<tr>
<td>Identify soil texture</td>
<td>33</td>
<td>13.0</td>
<td></td>
<td>221</td>
<td>87.0</td>
<td></td>
</tr>
<tr>
<td>Perform s/w lab mgt skills</td>
<td>34</td>
<td>13.5</td>
<td></td>
<td>218</td>
<td>86.5</td>
<td></td>
</tr>
<tr>
<td>Identify s/w mgt. issues</td>
<td>37</td>
<td>15.1</td>
<td></td>
<td>208</td>
<td>84.9</td>
<td></td>
</tr>
<tr>
<td>Explain soil erosion prin.</td>
<td>40</td>
<td>15.5</td>
<td></td>
<td>218</td>
<td>84.5</td>
<td></td>
</tr>
<tr>
<td>Classify land</td>
<td>41</td>
<td>16.1</td>
<td></td>
<td>214</td>
<td>83.9</td>
<td></td>
</tr>
<tr>
<td>Describe s/w mgt. principles</td>
<td>42</td>
<td>16.3</td>
<td></td>
<td>216</td>
<td>83.7</td>
<td></td>
</tr>
<tr>
<td>Draw s/w mgt. plans</td>
<td>45</td>
<td>17.4</td>
<td></td>
<td>213</td>
<td>82.6</td>
<td></td>
</tr>
<tr>
<td>Conduct soil percolation test</td>
<td>46</td>
<td>17.9</td>
<td></td>
<td>211</td>
<td>82.1</td>
<td></td>
</tr>
<tr>
<td>Calculate acreage</td>
<td>52</td>
<td>20.1</td>
<td></td>
<td>207</td>
<td>79.9</td>
<td></td>
</tr>
<tr>
<td>Perform differential leveling</td>
<td>52</td>
<td>20.4</td>
<td></td>
<td>203</td>
<td>79.6</td>
<td></td>
</tr>
<tr>
<td>Manage water systems</td>
<td>53</td>
<td>20.7</td>
<td></td>
<td>203</td>
<td>79.3</td>
<td></td>
</tr>
<tr>
<td>Explain irrigation principles</td>
<td>54</td>
<td>21.0</td>
<td></td>
<td>203</td>
<td>79.0</td>
<td></td>
</tr>
<tr>
<td>Use computer aided drafting</td>
<td>58</td>
<td>22.4</td>
<td></td>
<td>201</td>
<td>77.6</td>
<td></td>
</tr>
<tr>
<td>Install waste water plumb</td>
<td>83</td>
<td>32.3</td>
<td></td>
<td>174</td>
<td>67.7</td>
<td></td>
</tr>
<tr>
<td>Repair/maintain irrigation</td>
<td>84</td>
<td>32.8</td>
<td></td>
<td>172</td>
<td>67.2</td>
<td></td>
</tr>
<tr>
<td>Install irrigation sys/timers</td>
<td>87</td>
<td>34.3</td>
<td></td>
<td>167</td>
<td>65.7</td>
<td></td>
</tr>
</tbody>
</table>

Response rates for the three lowest were 65.7 to 67.7%, which were for the following objectives: Install irrigation systems and timers (65.7%), repair and maintain irrigation (67.2%), and install wastewater plumbing (67.7%). In addition to the highest indicated item, the identification of soil texture was rated second in this construct, as pre-service training is needed with an indicated 87% response rate.
The Future of Agricultural Mechanics Objectives

Wisconsin agricultural educators' indicated the level of qualifications for teaching agricultural mechanics objectives to meet the needs of high school students in agricultural education programs are addressed in this section. Several descriptive statistics from the respondents are identified in this section. Teachers were directed to respond to the following question: *To what extent do you feel qualified to facilitate agricultural mechanics objectives for high school students?* The Likert-type scale response choices were: 1) very well qualified; 2) fairly well qualified; 3) somewhat qualified; 4) not well qualified; and 5) not at all qualified. The majority of teachers, 64.7%, indicated they were at least somewhat qualified, while 15.2% described themselves as not at all qualified to facilitate agricultural mechanics objectives for high school students (Table 11).

Table 11. Teachers' self-perceived qualification for teaching agricultural mechanics objectives to high school students (n=269)

<table>
<thead>
<tr>
<th>Extent of qualifications</th>
<th>f</th>
<th>%</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very well qualified</td>
<td>35</td>
<td>13.0</td>
<td>13.0</td>
</tr>
<tr>
<td>Fairly well qualified</td>
<td>69</td>
<td>25.7</td>
<td>38.7</td>
</tr>
<tr>
<td>Somewhat qualified</td>
<td>70</td>
<td>26.0</td>
<td>64.7</td>
</tr>
<tr>
<td>Not well qualified</td>
<td>54</td>
<td>20.1</td>
<td>84.8</td>
</tr>
<tr>
<td>Not at all qualified</td>
<td>41</td>
<td>15.2</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Table 12 was created with data used from two statements in the questionnaire. Data collected from teachers indicated whether they did or did not have six or more credit hours of agricultural mechanics in pre-service learning. The response from the aforementioned question was analyzed using Crosstabs with the answers to the following question: *What extent do you feel qualified to facilitate agricultural mechanics objectives for high school students?* The response choices were: 1) very well qualified; 2) fairly well qualified; 3) somewhat qualified; 4) not well qualified; and 5) not at all qualified. Overall, the highest response rate was indicated by somewhat qualified with 70 teachers indicating their self-perceived qualification. Furthermore, teachers who did not take six or more credits of pre-service agricultural mechanics classes outnumbered the teachers that took classes in the extent of qualification areas of not well qualified and not at all qualified.

**Table 12. Teachers' self-perceived qualifications for teaching agricultural mechanics objectives to high school students with or without 6 or more credits of pre-service learning (n=269)**

<table>
<thead>
<tr>
<th>Extent of qualifications</th>
<th>Received 6+ credits of pre-service learning</th>
<th>Did not receive 6+ credits of pre-service</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very well qualified</td>
<td>30</td>
<td>5</td>
<td>35</td>
</tr>
<tr>
<td>Fairly well qualified</td>
<td>58</td>
<td>11</td>
<td>69</td>
</tr>
<tr>
<td>Somewhat qualified</td>
<td>44</td>
<td>26</td>
<td>70</td>
</tr>
<tr>
<td>Not well qualified</td>
<td>23</td>
<td>31</td>
<td>54</td>
</tr>
<tr>
<td>Not at all qualified</td>
<td>11</td>
<td>30</td>
<td>41</td>
</tr>
</tbody>
</table>
Career Development Events (CDE's) are integrated within the agricultural education curriculum to enhance learning objectives in agricultural education. Agricultural mechanics CDE's are utilized within the context area of power structures and technical systems in agricultural education programs. The competitive nature of the events lends itself to learning how to work within a competitive world (National FFA, 2003). The data collected from agricultural educators in Wisconsin indicate 53.9%; 145 teachers have coached an FFA agricultural mechanics CDE team at some level of competition in the FFA (Figure 5).

The number of schools with facilities designed for some type of agricultural mechanics laboratory activities was sought in this study. The following question was asked: Does your school have an agricultural mechanics lab/shop where students can experience hands-on activities? The teachers were to respond with yes or no.

![Bar chart showing the number of teachers in Wisconsin who have coached an agricultural mechanics CDE team at any level of competition affiliated with the FFA.](image)

**Figure 5.** Teachers indicating they have coached an agricultural mechanics CDE team at any level of competition affiliated with the FFA
Figure 6 provides the results of this question, indicating 64.7% or 174 of the teachers indicated the school where they were employed had agricultural mechanics lab/shop facilities.

Figure 6. Teachers that indicated agricultural mechanics laboratory or shop facilities were available to use for agricultural education programs

Many educational disciplines have the potential for duplication of activities with similar context objectives within school districts. These disciplines oftentimes share resources and work collaboratively to facilitate learning activities within schools. Technology education in Wisconsin was an educational discipline that affects enrollment in some agricultural mechanics program classes. Figure 7 shows the results of the information sought in this study to determine if technology education classes were perceived to effectively reduce agricultural mechanics class enrollment due to duplication. Overall, 142 or 52.8% of the teachers indicated that technology
Figure 7. Do technology education classes reduce agricultural mechanics class enrollment due to duplication in your school?

education classes did effectively reduce enrollment in agricultural mechanics classes in their school districts.

Teachers and Program Characteristics

This section contains comparisons of selected demographic data with perceptions and program characteristics identified in this study from Wisconsin high school agricultural educators during the 2004–2005 school year. Planning lessons with good meaningful learning objectives for curriculums are very important in designing effective agricultural education programs (Shinn, 2001). The desire of teachers to obtain classroom-ready lesson plans using agricultural mechanics objectives was focus of this study. Over 70 percent or 189 of the teachers in this study indicated an interest in obtaining inexpensive classroom-ready lesson plans involving agricultural mechanics objectives that could be used in the agricultural shop (Figure 8).
Figure 9 indicates 192 teachers or 71.4% had an interest in obtaining lesson plans that could be used in classroom settings.

Figure 8. Teachers' indication of interest in inexpensive classroom-ready lesson plans using agricultural mechanics learning objectives that could be used in the agricultural laboratory or shop

Figure 9. Teachers' indication of interest in inexpensive classroom-ready lesson plans using agricultural mechanics learning objectives that could be used in the classroom without the need for an agricultural laboratory or shop
Table 13 contains data indicating teacher's planned use of agricultural mechanics objectives. The teachers were presented three choices: 1) Greater use of agricultural mechanics objectives; 2) Same use of agricultural mechanics objectives; and 3) Less use of agricultural mechanics objectives. The area receiving the highest percent was less use of agricultural mechanics objectives, with a 41.6% response rate. The categories described as the same or greater received 58.4% of the selected response.

Table 13. Indicated responses from teachers regarding how they perceive agricultural mechanics objectives will be presented to high school students in agricultural education programs in the future (n=269)

<table>
<thead>
<tr>
<th>Use of agricultural mechanics objectives</th>
<th>( f )</th>
<th>%</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater use of agricultural mechanics objectives</td>
<td>48</td>
<td>17.8</td>
<td>17.8</td>
</tr>
<tr>
<td>Same use of agricultural mechanics objectives</td>
<td>109</td>
<td>40.5</td>
<td>58.4</td>
</tr>
<tr>
<td>Less use of agricultural mechanics objectives</td>
<td>112</td>
<td>41.6</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 14 indicates the perceptions of teachers regarding how agricultural mechanics should be presented in agricultural education programs in the future. Teachers were presented with three choices: 1) Greater use of agricultural mechanics objectives; 2) same use of agricultural mechanics objectives; and 3) less use of agricultural mechanics objectives. The area receiving the most responses was same use of agricultural objectives with a 43.5% response rate. Greater use of
agricultural objectives or the same use of agricultural mechanics objectives totaled 79.2% of all responses as indicated from the data collected in Table 13.

Table 14. Indicated responses from teachers regarding how they perceive agricultural mechanics objectives should be presented to high school students in agricultural education programs in the future (n=269)

<table>
<thead>
<tr>
<th>Use of agricultural mechanics objectives</th>
<th>f</th>
<th>%</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater use of agricultural mechanics objectives</td>
<td>96</td>
<td>35.7</td>
<td>35.7</td>
</tr>
<tr>
<td>Same use of agricultural mechanics objectives</td>
<td>117</td>
<td>43.5</td>
<td>79.2</td>
</tr>
<tr>
<td>Less use of agricultural mechanics objectives</td>
<td>56</td>
<td>20.8</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Agricultural mechanics has traditionally been a cornerstone in secondary school agriculture programs (Burris, Robinson, & Terry, 2004). “Recent changes in the direction of agricultural education have forced teacher educators to evaluate the role of agricultural mechanics in a new light” (p. 53). The descriptive statistics in this study indicated differences in many areas as shown.

Table 15 shows the responses of teachers by gender indicating 20 or more hours of experience per agricultural mechanics area. A response area identified as other was provided and each individual responding to this choice with described areas were recorded in Appendix G. The highest area of experience indicated by teachers was general shop safety with 73.2%. The lowest agricultural mechanics area that teachers had 20 or more hours of teaching, experience was computer aided drafting.
The percent of teachers within teaching experience groups are presented in Table 16. In general, teachers with less teaching experience have less indicated experience with agricultural mechanics activities. Comparing the first three groups based on years of experience—teachers 1–5 years, teachers 6–10 years, and teachers with 11–15 years of experience—in all but four of the 19 activities, the percent of participation increases with teachers’ experience. The four areas that did not reflect an increased percentage for the first three groups by years were: Hot and cold metal working, a decrease from the first year to the second year of six tenths of a percent; agricultural structures, a decrease from the first year to the second year by 3.6%; soil and water survey, a decrease in percentage from the second group to
Table 15. Agricultural mechanics areas in which agricultural education teachers indicated having at least 20 or more hours of teaching experience at any educational level listed by gender (Female, n=87; Male, n=182)

<table>
<thead>
<tr>
<th>Teaching experience areas</th>
<th>Female n / %</th>
<th>Male n / %</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm machinery repair</td>
<td>17 / 19.5</td>
<td>110 / 60.4</td>
<td>127</td>
<td>47.2</td>
</tr>
<tr>
<td>Farm machinery maintenance</td>
<td>19 / 21.8</td>
<td>117 / 64.3</td>
<td>136</td>
<td>50.6</td>
</tr>
<tr>
<td>Welder/welding</td>
<td>37 / 42.5</td>
<td>131 / 72.0</td>
<td>168</td>
<td>62.5</td>
</tr>
<tr>
<td>Plumbing</td>
<td>5 / 5.7</td>
<td>57 / 31.3</td>
<td>62</td>
<td>23.0</td>
</tr>
<tr>
<td>Basic electrical wiring</td>
<td>16 / 18.4</td>
<td>93 / 51.0</td>
<td>109</td>
<td>40.5</td>
</tr>
<tr>
<td>General shop safety</td>
<td>45 / 51.7</td>
<td>152 / 83.5</td>
<td>197</td>
<td>73.2</td>
</tr>
<tr>
<td>Agricultural woodworking and carpentry</td>
<td>30 / 34.5</td>
<td>118 / 64.8</td>
<td>148</td>
<td>55.0</td>
</tr>
<tr>
<td>General measurements wood and metal</td>
<td>31 / 35.6</td>
<td>127 / 69.8</td>
<td>158</td>
<td>58.7</td>
</tr>
<tr>
<td>Computer aided drafting</td>
<td>5 / 5.7</td>
<td>15 / 8.2</td>
<td>20</td>
<td>7.4</td>
</tr>
<tr>
<td>Small engine repair</td>
<td>25 / 28.7</td>
<td>114 / 62.6</td>
<td>139</td>
<td>51.7</td>
</tr>
<tr>
<td>Small engine maintenance</td>
<td>22 / 25.3</td>
<td>115 / 63.2</td>
<td>137</td>
<td>50.9</td>
</tr>
<tr>
<td>Hot and cold metal working</td>
<td>8 / 9.2</td>
<td>79 / 43.4</td>
<td>87</td>
<td>32.3</td>
</tr>
<tr>
<td>Agricultural structures</td>
<td>15 / 17.2</td>
<td>91 / 50.0</td>
<td>106</td>
<td>39.4</td>
</tr>
<tr>
<td>Engine overhaul</td>
<td>2 / 2.3</td>
<td>66 / 36.3</td>
<td>68</td>
<td>25.3</td>
</tr>
<tr>
<td>Blueprint reading</td>
<td>5 / 5.7</td>
<td>39 / 21.4</td>
<td>44</td>
<td>16.4</td>
</tr>
<tr>
<td>Soil and water survey</td>
<td>29 / 33.3</td>
<td>82 / 45.0</td>
<td>111</td>
<td>41.3</td>
</tr>
<tr>
<td>Fluid power hydraulic/water</td>
<td>3 / 3.4</td>
<td>44 / 24.2</td>
<td>47</td>
<td>17.5</td>
</tr>
<tr>
<td>GIS/GPS</td>
<td>24 / 27.6</td>
<td>54 / 29.7</td>
<td>78</td>
<td>29.0</td>
</tr>
<tr>
<td>Other — Please see Appendix G</td>
<td>6 / 6.9</td>
<td>4 / 2.2</td>
<td>10</td>
<td>3.7</td>
</tr>
</tbody>
</table>
Table 16. Agricultural mechanics areas in which agricultural education teachers indicated having at least 20 or more hours of teaching experience at any educational level listed within groups based on years of experience

<table>
<thead>
<tr>
<th>Area with 20+ hours of teaching experience</th>
<th>Experience in years with indicated % response</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1-5 %</td>
</tr>
<tr>
<td></td>
<td>n=66</td>
</tr>
<tr>
<td>Farm machinery repair</td>
<td>18.2</td>
</tr>
<tr>
<td>Farm machinery maintenance</td>
<td>16.7</td>
</tr>
<tr>
<td>Welder/welding</td>
<td>36.4</td>
</tr>
<tr>
<td>Plumbing</td>
<td>6.1</td>
</tr>
<tr>
<td>Basic electrical wiring</td>
<td>21.2</td>
</tr>
<tr>
<td>General shop safety</td>
<td>48.5</td>
</tr>
<tr>
<td>Agricultural woodworking and carpentry</td>
<td>33.3</td>
</tr>
<tr>
<td>General measurements wood and metal</td>
<td>34.8</td>
</tr>
<tr>
<td>Computer aided drafting</td>
<td>7.6</td>
</tr>
<tr>
<td>Small engine repair</td>
<td>36.4</td>
</tr>
<tr>
<td>Small engine maintenance</td>
<td>33.3</td>
</tr>
<tr>
<td>Hot and cold metal working</td>
<td>13.6</td>
</tr>
<tr>
<td>Agricultural structures</td>
<td>25.8</td>
</tr>
<tr>
<td>Engine overhaul</td>
<td>9.1</td>
</tr>
<tr>
<td>Blueprint reading</td>
<td>4.5</td>
</tr>
<tr>
<td>Soil and water survey</td>
<td>36.4</td>
</tr>
<tr>
<td>Fluid power hydraulic/water</td>
<td>6.1</td>
</tr>
<tr>
<td>GIS/GPS</td>
<td>27.3</td>
</tr>
<tr>
<td>Other — See Appendix G</td>
<td>3.0</td>
</tr>
<tr>
<td>Total average percent without other</td>
<td>23.0</td>
</tr>
</tbody>
</table>
the third by 11.1%; and, fluid power hydraulics and water, a decrease from the first to the second group by .5 of a percent.

Table 17 shows the means and standard deviations by gender of teachers regarding the four constructs used in this study. The total mean scores range from 3.19 for structures to 3.31 in agricultural soil and water management. The total mean score combines the weighted average of male and female teachers in Wisconsin. The range of mean scores for the female teachers was 2.96 in agricultural metals and 3.33 in agricultural soil and water management. Whereas, the mean score range for male teachers in this study was 3.28 with agricultural structures and 3.31 with agricultural metals.

Table 17. Composite means and standard deviations of agricultural teachers regarding the constructs used in this study that classify agricultural mechanics objectives

<table>
<thead>
<tr>
<th>Agricultural mechanics constructs*</th>
<th>Female (n=87)</th>
<th></th>
<th></th>
<th>Male (n=182)</th>
<th></th>
<th></th>
<th>Total (n=269)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agricultural metals</td>
<td>2.96</td>
<td>.87</td>
<td>3.31</td>
<td>.75</td>
<td>3.21</td>
<td>.80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agricultural structures</td>
<td>3.00</td>
<td>.72</td>
<td>3.28</td>
<td>.71</td>
<td>3.19</td>
<td>.72</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agricultural power and machinery</td>
<td>3.07</td>
<td>.76</td>
<td>3.30</td>
<td>.63</td>
<td>3.25</td>
<td>.68</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agricultural soil and water management</td>
<td>3.33</td>
<td>.74</td>
<td>3.30</td>
<td>.65</td>
<td>3.31</td>
<td>.68</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Lickert-type scale: 1 – strongly oppose, 2 – somewhat oppose, 3 – somewhat favor, 4 – strongly favor
Summary

Descriptive indicators for agricultural mechanics objectives were utilized to indicate the needs of secondary agricultural education programs in Wisconsin. Chapter IV presented the data collected with the aid of the survey instrument using SPSS to analyze the data.

1. The average teacher had 14.1 years of experience. Over 67% of the teachers were male and 89% of all teachers had experienced high school agricultural classes as a student. The usable response rate was 94.1%, and 97.7% of the teachers indicated having over 200 hours of production agriculture work experience. Over sixty-one percent (61.7%) teachers indicated having taken at least six credits of pre-service learning in an agricultural mechanics class.

2. The majority of the agricultural mechanics objectives were approved by more than 85% of the respondents.

3. The majority of the teachers indicated pre-service training was needed for agricultural mechanics objectives.

4. Eighty-seven percent of the teachers indicated they were at least fairly well qualified to teach agricultural mechanics to high school students. Teachers indicating they had coached an agricultural mechanics team were 53.9%. Most schools (64.7%) had agricultural mechanics lab/shop facilities available for use in agricultural education programs. Additionally, 52.8% of the teachers indicated technology education classes reduced agricultural mechanic class enrollments in their schools.
5. Teachers indicated their desire to obtain classroom-ready lesson plans for agricultural mechanics. More than 73% indicated they were interested in lesson plans that may be used in the agricultural shop, while 71.4% indicated their desire for agricultural mechanics lessons that were designed for the classroom only. The majority of respondents supported teacher experience and the need for the use of agricultural mechanics objectives. Means and standard deviations were listed from the four construct areas indicating variances in male and female responses.
CHAPTER V. DISCUSSION

Introduction

The purpose of this study was to develop and validate a list of agricultural mechanics objectives that may be used in secondary agricultural education and for pre-service teacher education programs in Wisconsin. Five specific objectives of this study are listed below:

1. Identify perceptions of teachers regarding the use of agricultural mechanics objectives;
2. identify selected agricultural mechanics objectives to be considered for use in secondary agricultural education programs;
3. identify the need of pre-service training for selected agricultural mechanics objectives;
4. determine the future role of agricultural mechanics objectives in the agricultural mechanics curriculum as perceived by secondary agricultural education teachers; and
5. describe and analyze teacher and program characteristics with selected agricultural mechanics variables for agricultural education in Wisconsin.

Findings in this research were consistent with the literature review. Each identified objective represents the perceptions of teachers concerning the skills needed for secondary agricultural mechanics programs in Wisconsin. The discussion will occur in this chapter for each objective.
Objective One

The first objective was to identify perceptions of teachers regarding the use of agricultural mechanics objectives.

Discussion

Waidelich and Hillison (1996) indicated all agricultural education students in a program should receive a basic core of agricultural and employment competencies for each program regardless of the student's occupational goals. Teachers in this study indicated support of agricultural mechanics objectives. The overall majority of the teachers (79.2%) in Wisconsin indicated they would either like the use of agricultural objectives to remain constant, or be used to a greater extent.

Teachers indicated they would consider either inexpensive classroom-ready lesson plans for use in agricultural mechanics shop or in the classroom with or without the use of an agricultural mechanics shop. More than 70% of the teachers would consider using agricultural mechanics lesson plans. This indicates general support for teaching basic agricultural mechanics concepts in secondary programs. Johnson and Schumacher (1993) support teaching identified objectives and have stated teacher educators should provide present and prospective agricultural teachers with experiences to enhance these skills. This is supported by the teachers' indications of needed pre-service and in-service training for the context area of agricultural mechanics.

Teacher perceptions of agricultural mechanics are generally positive. Nearly 98% of the teachers have more than 200 hours of production experience in
agriculture. Production agriculture includes concepts and objectives relating to the context area of agricultural mechanics.

Further support of agricultural mechanics objectives may be associated with knowledge of the context. The context area of agricultural mechanics is supported in part by the teachers' ability to teach agricultural mechanics skills and concepts. Teachers teach context areas they have experience with using the knowledge they have acquired from past experiences to enhance their abilities that they, in turn, use to provide learning activities for students. Teachers with six or more college credits during pre-service training in agricultural mechanics have beneficial experiences that may be used for learning activities.

Teachers (< 3%) that indicated little or no interest in agricultural mechanics objectives were also important in this study. Appendix F contains teachers' responses indicating agricultural mechanics was not an important context area and the need for pre-service and in-service training were not necessary. These responses may be the result of limited knowledge or the combined lack of knowledge and experience with agricultural mechanics.

Generally the perceptions of teachers in Wisconsin are reflective of statements in the literature reviewed in this study. Teachers have indicated needs of agricultural mechanics objectives that Roberts and Dyer (2004) identified as experience-based lessons used to nurture learning. Tangible skills were supported in this study by a majority of the teachers. Ruhland (1993) maintains that basic tangible skills in agricultural mechanics are needed for entry-level employment.
Agricultural mechanics is a highly visible component of the agricultural education program. The quality of the agricultural mechanics activities, including laboratory management, affects the image of the program (Johnson & Schumacher, 1993). Teacher perceptions in Wisconsin support agricultural mechanics as described in this study.

**Objective Two**

The second objective was to identify agricultural mechanics objectives to be used for learning in secondary agricultural education programs in Wisconsin.

**Discussion**

The most recent research in the area of agricultural mechanics has been directed toward identifying objectives that are needed for pre-service learning. Harbstreit and Harris (2003), Lawver, Barton, Akers, Smith, and Fraze (2004), and Burris, Robinson, and Terry (2004) used studies to help define objectives that should be considered in pre-service learning. The objectives indicated in pre-service learning are perceived as needed in secondary agricultural programs. Additional studies by Waidelich and Hillison (1996) and Johnson and Schumacher (1993) identified agricultural mechanics competencies that were considered to be essential in secondary agricultural programs.

Agricultural mechanics is a very important part of the agricultural industry and agricultural education (Lawver et al., 2004). There are varying degrees of agricultural mechanics within agricultural education programs in Wisconsin. This study
determined which selected objectives should be considered at the secondary level. However, the percentage that each program devotes to agricultural mechanics content was not obtained in this study.

Shinn (2001) acknowledges the importance of reviewing objectives and determining current needs. This supported the importance of agricultural mechanics objectives for programs in Wisconsin. Overall, information collected from 269 agricultural educators in Wisconsin support all 99 learning objectives listed in this study. The instrument used to conclude these findings was created from objectives reviewed in several Delphi studies as stated in Chapter III. The 99 objectives were presented in section one of the instrument where the objectives were divided into four sub-sections, which are referred to as constructs. These constructs classified objectives in categories used in secondary agricultural mechanics programs. The constructs with an indicated number of objectives listed after each are listed: agricultural metals (25), agricultural structures (36), agricultural power and machinery (21), and agricultural soil and water management (17).

The first construct, agricultural metals, contains 25 objectives. All 25 objectives were considered to be important by at least two-thirds of the teachers. The percentages ranged from 67.6% to 91.2%. The construct agricultural structure had percentages for each of the 36 objectives with favorable results ranging from 73.5% to 99.2%. All objectives in the agricultural structures construct should be used in secondary agricultural education programs. Agricultural power and machinery contained 21 selected objectives that were considered in this study. In comparison to all of the constructs, agricultural power and machinery had the largest range of
scores. The range 61.8% to 98.5% in favor indicated all 21 objectives need to be considered in secondary agricultural mechanic programs. The soil and water management construct with 17 objectives had an indicated favorable range of 67.3% to 97.3%. These objectives should all be included in secondary agricultural mechanics programs.

All 99 objectives reviewed for secondary agriculture mechanics programs were indicated as needed by teachers in Wisconsin. A balance is needed in agricultural programs among the seven context areas as defined in Appendix E by USDE. Therefore, each of the 99 objectives indicated in this study should be considered as agricultural mechanics programs are updated throughout Wisconsin.

**Objective Three**

The third objective was to identify the need for pre-service training for selected agricultural mechanics objectives.

**Discussion**

Delphi studies were included in the literature review that was specifically designed to determine pre-service training needed for the context area of agricultural mechanics. Harbstreit and Harris (2003) indicated the importance of keeping pre-service education current to help ensure the success of teachers entering the profession.

Burris, Robinson, and Terry (2004) described the inclusion of needed objectives as one of the myriad of challenges when preparing teachers for entering
the profession. Lawver, Barton, Akers, Smith, and Fraze (2004) identified topics and competencies that should be included in teacher certification curriculum. Each of these aforementioned studies used a three-round Delphi technique with a panel of experts to determine objectives for pre-service training. The results of these studies were used as a foundation in creating the instrument for this study. Therefore, this study is supported by previous studies with similar objectives. The 99 objectives were presented within four constructs. These constructs classified objectives regarding categories used in agricultural mechanics. The constructs with the number of objectives following each are listed as: agricultural metals (25), agricultural structures (36), agricultural power and machinery (21), and agricultural soil and water management (17).

Teachers indicated whether each objective would or would not need pre-service training or would not need pre-service training in each area. The findings indicate all objectives need to be considered for pre-service training for future teachers. The construct labeled agricultural metals included a range of 66.4% to 91.4% for teachers who indicated pre-service teacher training was needed. Data collected regarding agricultural structures ranged from 58.8% to 86.7% of the teachers indicating the need for pre-service learning. The range for agricultural power and machinery was from 65.4% to 88.0% in favor of pre-service learning. The construct of agricultural soil and water management range was 65.7% to 89.1% for those teachers indicating the objectives should be included in pre-service training.

Furthermore, data collected indicated both pre-service and in-service training is needed for agricultural mechanics objectives. Overall, 94.8% of the teachers
indicated a need for pre-service, in-service training, or both, in this study. Therefore, all the objectives (99) should be included in pre-service training in Wisconsin. As supported by Lawver et al. (2004), where they concluded the agricultural mechanics portion of the teacher certification needs to be updated and revised.

**Objective Four**

The fourth objective was to determine the future role of agricultural mechanics objectives as perceived by teachers in secondary agricultural education curriculum.

**Discussion**

The design of this study was partially based upon what is known as time-bound association (Borg & Gall, 1989). What should happen in the future with selected agricultural mechanics objectives was indicated in this study. Two questions were asked in order to determine if there was a difference in teachers' perception. One question asked how teachers anticipate agricultural mechanics would be used in 10 years. Another question asked teachers to indicate how they would prefer agricultural mechanics be used at the secondary level in ten years.

Teachers indicated how they perceived agricultural mechanics would be addressed in 10 years. Overall, 58.4% of the teachers indicated objectives would be used in the curriculum at the same or at a greater rate in ten years. The remaining 41.6% of the teachers indicated there would be less use of agricultural mechanics in 10 years.
Teachers indicated perceptions of the future use of objectives were different from what teachers indicated should be presented in the future. A majority of teachers (79.2%) have indicated agricultural objectives should be used at the same rate or more in the future. Comparing the data to what teachers perceived may happen in the future clearly indicate the role of agricultural mechanics has strong support for future use. One-fifth of the teachers (20.8%) indicated agricultural mechanics objectives would be used less in ten years.

The qualifications of teachers show that 64.8% of the teachers considered themselves at least somewhat qualified to teach agricultural mechanics. A portion of the teachers (15.2%) indicated they were not at all qualified to teach agricultural mechanics.

The majority of schools (64.7%) have available agricultural mechanics facilities for agricultural education programs. Overall, the data are supportive of agricultural mechanics in secondary programs. Agricultural mechanics facilities are available; teachers have indicated their qualifications for teaching agricultural mechanics, and teachers want these objectives to be used more in the future. The combination of the aforementioned is an indication that agricultural mechanics objectives are important and will be included as programs are reviewed and updated.

Objective Five

The fifth objective was to describe and analyze teacher and program characteristics with selected agricultural mechanics variables in secondary agricultural education programs in Wisconsin.
Discussion

Dewey (1938) stated, "The central problem of an education based upon experience is to select the kind of present experiences that live fruitfully and creatively in subsequent experiences" (p. 28). Teachers who have experienced agricultural mechanics activities are likely to use subsequent objectives with students.

Whether or not the curriculum in agricultural education programs has agricultural mechanics objectives and the subject matter content is appropriate for the school, safety needs must be addressed. It is critical, especially when unmastered knowledge can lead to injury, that teachers have knowledge and experiences for teaching agricultural mechanics objectives. Using agricultural mechanics facilities may be a risk to the inexperienced educator and their students. Therefore, teachers need to have pre-service training prior to teaching agricultural mechanics due to potential risks involved with learning. Agricultural mechanics risks do need to be considered as subsequent experiences could limit accidents. These experiences may or may not be directly related to an occupation, but will enhance decision making related to life's experiences.

Teachers in agricultural education continually ask the question of how to prepare students in response to occupational needs and life experiences for tomorrow. "The discrepancy between importance and level of preparation underscores the fact teachers need to be prepared for teaching agricultural mechanic objectives" (Burris, Robinson, & Terry, 2004, p. 61).
Two-thirds (67.7%) of Wisconsin teachers were male and 32.3% were female. Nearly one-half (44.6%) had 10 years or less teaching experience, and the majority of females (67.8%) have 10 years or less teaching experience.

When comparing the number of male to the number of female teachers with 10 years or less experience, there are two more males than females. This is a trend differing from previous years regarding the female/male ratio. Additionally, 26 female teachers have three years or less experience, which compares to 17 male teachers that have indicated their experience in agricultural education for the same period. Females have indicated fewer areas that they had 20 or more hours of teaching experience in as compared to the males.

The teacher responses for all 99 objectives were similar regardless of years of experience. A Likert-type scale was used ranging from 1=strongly oppose to 4=strongly favor. The total mean score for each construct ranged from 3.19 for agricultural structures to 3.31 for agricultural soil and water management. Agricultural metals were 3.21 with agricultural power and machinery having a mean score of 3.25.

Teachers were supportive of pre-service and in-service training. This may or may not be a result of the number of pre-service credits each has taken in the area of agricultural mechanics. This research was concerned with the number of teachers who have indicated they have not taken at least six credits of agricultural mechanics. This may or may not be the teacher’s choice. The programs designed for teacher licensure may be why teachers do not have six or more credits in the agricultural mechanics area; agricultural mechanics may not be offered. The question may be
asked, are there risks involved, if these teachers are directed to teach agricultural mechanics, for teachers without experience in agriculture mechanics. Data indicated teachers want agricultural mechanics and teacher preparation should be reflective of the teachers' needs. Agriculture mechanics programs should remain as major providers of real life learning experience for students.

Data from 174 schools in Wisconsin show they have facilities which allow students to experience some type of hands-on learning with agricultural objectives. The number of schools using these facilities is unknown. A question regarding the use of facilities should be included in future studies. Another important consideration would be how these facilities are used. An important issue may be how these facilities are going to be used in the future. The data in this study clearly define the importance of agricultural mechanics. The importance of agricultural mechanics and the benefits of integrated hands-on learning support further use of the validated objectives in this study.

Summary

Teachers that connect objectives with real life meaningful events have a gift that continues to give. Teacher dialogue with students goes far beyond words; a great deal of what is learned is due to personal interchange between the teacher and the student. Teachers' perceptions are important regarding these experiences.

The conclusions in this chapter have been discussed regarding each of the five objectives in this study as identified by teachers. The validation of agricultural mechanics objectives has occurred. Teachers' perceptions of agricultural mechanics
were favorable overall. Using agricultural mechanics was supported by teachers. Teachers desire lesson plans and want the number of agricultural mechanics objectives to be used more frequently. All 99 selected objectives were validated as needed in secondary education in Wisconsin. Each of the objectives defining agricultural mechanics objectives were rated by teachers. Teachers' ratings determined that all 99 objectives should be considered. The majority of teachers indicated the need for pre-service training, necessary for teaching, for each of the 99 selected objectives.

The future roles of agricultural mechanics were perceived as important by the teachers. Demographic trends are differing in agricultural education programs. The male/female ratio for all teachers was approximately two-thirds male and one-third female. Analyses of data for the first three years, by gender based upon experience, yield a 1.5 to 1 female to male ratio. Further analyses of the data show the percentage of female teachers with 20 or more hours of teaching experience regarding selected agricultural mechanics objectives was generally less than 50% of that compared to males. Nearly two-thirds of the schools have available agricultural mechanics facilities. Nearly 40% of the teachers did not have six or more credits of pre-service training in the context area of agricultural mechanics. Thus, it is necessary to consider the trends of the teachers' variables along with program needs, because agricultural mechanics objectives will be used to support the science and practices of teaching in Wisconsin.
CHAPTER VI. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The primary purpose of this study was to develop and validate a list of agricultural mechanics objectives that may be used in secondary agricultural education and for pre-service teacher education programs in Wisconsin. Harbstreit and Harris (2003) concluded in a study involving secondary agricultural mechanics curriculum, conducted in Kansas, that teachers' perceptions of the use of agricultural mechanics objectives indicated no change with the curriculum. Simon, Haygood, Akers, Doerfert, Davis, and Bullock (2004) stated, “Curriculum at any level should be reviewed and revised every year to keep up with current changes in technology” (p. 129). There were five primary objectives in this study:

1. Identify perceptions of teachers regarding the use of agricultural mechanics objectives;
2. identify selected agricultural mechanics objectives to be considered for use in secondary agricultural education programs;
3. identify the need of pre-service training for selected agricultural mechanics objectives;
4. determine the future role of agricultural mechanics objectives in the agricultural mechanics curriculum as perceived by secondary agricultural education teachers; and
5. describe and analyze teacher and program characteristics with selected agricultural mechanics variables for secondary agricultural education in Wisconsin.

This census study was conducted in Wisconsin and included 286 secondary agricultural educators. The questionnaire had a 94.1% usable response rate, and the findings of this study were based upon 269 completed questionnaires. The information was collected from teachers through an electronically mailed questionnaire. There were two main sections in the instrument, which sought responses for the specific objectives in this study.

Validity and reliability of the instrument relating to the specific objectives were established by conducting a pilot study. The pilot study was completed by a group of qualified agricultural educators as defined in Chapter III. The Cronbach's reliability coefficient for the instrument ranged from 0.92 to 0.97, which indicated the items on the instrument, had a very strong association (Davis, 1971).

The SPSS computer package was used to analyze data. Frequencies, percentages, means, standard deviations, and correlation analysis were compiled to meet the objectives in this study.

Demographic data indicated that 67.7% of the Wisconsin agriculture teachers were male. The average number of years that agricultural educators taught was 14.1. Responses to the perception statements were generally favorable, as the agricultural mechanics objectives were evaluated by the teachers who participated in this study. Demographic and program information was sought to help establish the purpose of this study. Years of experience were indicated along with information
regarding high school experience with agriculture classes as a student. Information regarding pre-service training of six or more credit hours was sought, along with indicating having more than 200 hours of agricultural production experience.

Teacher perceptions regarding pre-service and in-service teaching were sought with additional statements indicating their experiences as a coach of an agricultural mechanics CDE's team. Teachers were asked to indicate their overall self-perceived qualifications to teach high school agricultural mechanics. Teachers were asked to identify any of the 19 areas listed on the survey involving agricultural mechanics activities they had 20 or more hours of experience teaching high school students.

Questions were used to determine if the school at which each teacher was teaching had an agricultural mechanics shop, and if technology education classes effectively reduced their enrollment. The consideration of classroom-ready lesson plans were asked with statements regarding the teachers' perceptions of either using available inexpensive lesson plans in the classroom, or using available lesson plans that were created for use in conjunction with the agricultural shop.

Questions were used to determine teachers' perceptions of current and future use of agricultural mechanics objectives in secondary agricultural education programs. Demographic information and agricultural education program characteristics were used to generate the conclusions in this study.
Conclusions

Therefore, the findings of this study led to the following conclusions:

1. A majority of secondary agricultural educators in Wisconsin were somewhat in favor or strongly in favor of including the selected 99 agricultural mechanics objectives in the high school curriculum.

2. When the two categories “somewhat favor” and “strongly favor” are combined, two-thirds or more of the teachers favored all but one of the objectives. The objective was repairing transmissions and was favored by 61.4% of the teachers. It was concluded that all 99 objectives should be considered for high school agricultural education programs.

3. The majority of teachers (70%) stipulated pre-service training was needed for 93 of validated agricultural education objectives. The additional six objectives were indicated by 58.8% or more of the teachers as needing pre-service training. Therefore, each objective should be included in pre-service training programs for new teachers.

4. Teacher educators should use these data to create agricultural mechanics pre-service learning curriculum for the context area of power structural and technical systems in Wisconsin.

5. Officials at the WDPI should consider each objective listed as teacher licensure testing is evaluated and reviewed for new Wisconsin agriculture 200 licenses.

6. In Wisconsin the majority of teachers (67.4%) are qualified to teach high school agricultural mechanics objectives. The number of teachers in
Wisconsin qualified to teach agricultural mechanics should increase to meet the future indicated use of agricultural mechanics objectives indicated in these data.

7. In Wisconsin 53.9% of the teachers have coached a FFA agricultural mechanics team. Agricultural mechanics CDE’s sponsored by the FFA are supportive of experiential learning activities that can be shared above the local chapter level. Objectives may be developed and used as real life experiences are shared with students from multiple locations. These multiple locations combined with experiences can add to the diversity of students’ life experiences while enhancing their communication skills. These events should be supported and promoted by stakeholders to further develop student learning activities.

8. A number (52.8%) of high schools in Wisconsin with agricultural education programs that have indicated technology education classes affect enrollment in their agricultural mechanics programs. The potential for shared learning activities should be explored in an effort to maximize effectiveness and productivity for all students.

9. Teachers were interested in classroom-ready lesson plans that could be used in the agricultural shop. Teachers were interested in classroom-ready lesson plans that could be used in the classroom without the need for agricultural mechanics facilities. This may be reflective of the teachers in school without agricultural mechanics shops. Teachers want agricultural mechanics objectives to be used more in the future. Resources should be
developed and provided to teachers on a Web site to maximize the potential for learning activities involving the 99 validated agricultural mechanics objectives. This Web site should be supported by the WDPI, WAAE, and teacher educators in Wisconsin.

10. The mean score for male teachers compared to female teacher differed for each construct. Each construct listed agricultural mechanic objectives and each teacher scored the Likert-type scale using a range 1–4, 1=strongly oppose to 4=strongly favor. The total number of teachers responding to each was compared by gender and it was determined that each of the four constructs differed between males and females.

11. Teachers' perceptions regarding the future use of agricultural mechanics objectives in secondary programs were different from what they have indicated should happen in 10 years. Teachers (58.4%) indicated objectives would be used the same or at an increased rate of use in 10 years. This is different from what teachers indicated should happen with objectives in 10 years. Teachers indicated they would like to have objectives used the same rate (43.5%) or at a greater rate (35.7%) for a total of 79.2% of the teachers indicating use of objectives in 10 years. These data show a favorable increase in the use of objectives. Considerations for pre-service training and in-service programs are supported with these data. Agricultural mechanics should be supported by all stakeholders based on the data from this study.
Recommendations

Based on the conclusions, the following recommendations were concluded:

1. All 99 selected agricultural mechanics objectives in this study need to be considered for secondary agricultural education programs in Wisconsin.

2. In order to implement agricultural mechanics objectives in secondary agricultural education programs in Wisconsin, adequate support is needed. The WDPI and teacher preparation institutions for agricultural education should be available and supportive of agricultural mechanics. This support may be actual on-site visits, telephone, e-mail, or through other valued means of communication.

3. Pre-service training should include all 99 objectives indicated in this study in preparation for initial teacher licensure. By implementing agricultural mechanics objectives in pre-service training, teachers will be competent and have skills needed to provide students with safe agricultural mechanics learning activities with the validated objectives. The standard for the PSTS context area should be developed using the NCLB guide to insure compliance for licensure. Standards established in Wisconsin PI-34 were supportive of highly qualified teachers. A rigorous state academic context PRAXIS test needs to be reflective of the 99 validated objectives from this study used for new teacher licensure.

4. In-service programs should be provided as agricultural mechanics objectives are updated and reviewed in local agricultural education programs. In-services should be designed by members of the Wisconsin
Association of Agricultural Educators (WAAE) with support from WDPI and the universities' personnel involved in preparing teachers for agricultural education licensure in Wisconsin.

5. Wisconsin universities need to offer agricultural mechanics in-service programs for university graduate credit.

6. Leaders in WAAE need to encourage members of the Wisconsin association to design and use in-service programs for agricultural mechanics activities objectives to enhance local program learning for students as they prepare for occupations, further education, or for life experiences.

7. Agricultural education leaders need to assist in organizing methods to develop resources that will allow teachers to focus more on the presentation of objectives than preparing lessons for each objective. A Web site should be developed, updated as needed and managed for educators, by appointed educators to share valuable agricultural mechanics lesson plans that have been successfully used for learning in secondary agricultural education programs.

8. The results of this study should be shared with WDPI, WAAE, teachers of teachers in agricultural education, and all other stakeholders to help manage the secondary agricultural mechanics curriculum.

9. The 99 objectives from this study should be used in the revised PRAXIS test for new teachers in Wisconsin. After the seven context areas of agricultural education have been validated, the percentage of each context area should
be determined and questions should be randomly selected to equal the percentage determined for each context area from a group of questions. Questions used on the PRAXIS test should be randomly selected from groups of questions derived from validated objectives in each context area.

10. Wisconsin universities need to require a minimum of six college credits in agricultural mechanics for pre-service learning. Teachers need to be prepared to teach agricultural mechanics objectives at the secondary level. Each new teacher may or may not have a choice of which classes they will be required to teach in chosen schools. The importance of classroom management and safety in the context area of agricultural mechanics underscores the need for these pre-service experiences with agricultural mechanics. The value of agricultural mechanics objectives may be used to increase the physical science learning in high schools. Teachers possessing agricultural mechanics knowledge and skills may increase their employability.

**Recommendations for Further Research**

"Additional research will lead to a deepening in understanding that will add to the current and related disciplines" (McGregor, Fraze, Baker, Burley, & Byrd, 2004, p. 23). Further research should be considered in the following areas:

1. This study should be replicated to determine if the studies findings are consistent.
2. Studies should be conducted to determine the national scope of agricultural mechanics.

3. Further research is needed to determine what percentage of each local program is devoted to agricultural mechanics objectives.

4. Although the selected objectives validated in this study were reviewed and qualified in Delphi studies that used experts from related industries, the validation of the 99 objectives should be done by experts representing industries in Wisconsin.

5. A study should include questions to determine the knowledge, attitudes, and perceptions of secondary students in agricultural education. Additionally, these questions should be considered: How much or does any personal bias influence the reported data and is this a problem? Should schools be required to teach agricultural mechanics? Does pre-service educational experience predicate what is taught and how much of it is taught in high schools? Do teachers consider agricultural mechanics as a physical science? Do teachers' perceptions indicate a needed change, such as calling the agricultural mechanics objectives something different, possibly physical science objectives in agriculture? Should the consideration of physical science credit for secondary students be explored for the area of agricultural mechanics?

6. Future studies should determine if perceptions of male and female teachers are consistent in the context of agricultural mechanics.
7. Local school administrators should be questioned to determine their position regarding the use of agricultural mechanics objectives used in secondary programs.

8. State education agencies should be surveyed to determine the level of competence each state agency expects new teachers to possess for teacher licensure. The survey should include all seven context areas in agricultural education as prescribed by the USDE.

9. Stakeholders should be asked questions to determine what resources are needed and how they should be offered to support all 99 objectives validated.

Implications and Educational Significance

In the field of agricultural education, the context area of agricultural mechanics has been evolving since the passing of the Smith Hughes Act in 1917. At that time vocational agricultural programs, now referred to as agricultural education programs, had a very strong component used for learning referred to as “farm shop.” As described in the literature review, many studies have been used to review, update, and revise agricultural mechanics.

In the literature review, Delphi studies were discussed. Delphi studies indicated the NCLB Act caused changes in teacher certification, which created a need for reviewing curriculum (Harbstreit & Harris, 2003). Delphi studies indicated the value of Delphi studies in agricultural education (Martin & Frick, 1998). Delphi studies identified competencies for teacher certification in the area of agricultural mechanics
The Delphi studies reviewed in the literature indicated the importance of keeping curriculum updated and applicable for industry needs (Shinn, 2001).

The aforementioned Delphi studies included experts from industry, state supervisors, postsecondary educators, secondary educators, and others that were nominated to evaluate selected objectives. The questionnaire for this study was designed based upon Delphi studies by Lawver, Barton Akers, Smith and Fraze (2004); Harrison, Schumacher, and Birkenholz (1993); Burris, Robinson, and Terry (2004); Harbstreit and Harris (2003); and Buttles, Graham, and Hieronimczak (2003). Objectives validated from these studies contribute to the overall validity to this study. The validated objectives in this study represent a diverse number of perceptions from a multitude of professionals.

The instrument in this study focused on teachers’ perceptions as they validated 99 objectives. Perceptions of teachers were considered and valued for this study. The perceptions of teachers, which are important for this study, need to be considered and compared to professionals in related industries.

Teachers in Wisconsin indicated the need for using the 99 objectives contained in this study. Teachers also indicated they were in favor of pre-service and in-service training as these objectives were implemented. Therefore, the agricultural mechanics objectives should be embraced in a systematic manner in order to effectively improve students’ learning.

Questions by teachers regarding the importance and the use of agricultural mechanics in agricultural education programs in Wisconsin were resolved.
Agricultural educators have indicated the need for objectives with pre-service and in-service training for implementation in their agricultural education programs. Implementing a “train the trainers” program could be utilized using the 99 validated objectives from this study to increase teachers’ abilities with agricultural mechanics objectives. Teachers’ adaptations of agricultural mechanics in local programs will potentially remove some uncertainty of increased use. Increasing the use of these objectives in secondary programs will increase student knowledge and skills and increase their overall comprehension in agricultural education. As additional teachers are exposed to agricultural mechanics objectives, implementing sound innovative methods will help ensure that the values gained by using agricultural mechanics objectives will continue.
APPENDIX A.
ISU NEW HUMAN SUBJECTS RESEARCH FORM
ISU NEW HUMAN SUBJECTS RESEARCH FORM

SECTION I: GENERAL INFORMATION

Principal Investigator (PI): Richard Bockhop
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Fax: 294-0838

Degrees: MSE
Correspondence Address: Curtiss Hall 217B

Department: Ag Ed & S
Email Address: bookhopa@iastate.edu

Center/Institute: College:
PI Level: Faculty □ Staff □ Postdoctoral □ Graduate Student □ Undergraduate Student

Title of Project: Secondary agricultural educator’s perceptions of agricultural mechanics objectives in Wisconsin

Project Period (Include Start and End Date): 10/01/2004 to 8/15/2005

FOR STUDENT PROJECTS

Name of Major Professor/Supervising Faculty: W. Wade Miller
Phone: 294-0896
Campus Address: Curtiss Hall 217E
Department: AgEd&S
Email Address: wwmiller@iastate.edu

Type of Project: (check all that apply)
☐ Research  ☐ Thesis  ☑ Dissertation  ☑ Class project
☐ Independent Study (490, 590, Honors project)  ☐ Other. Please specify:

KEY PERSONNEL

List all members of the research team including the principal investigator, his/her degrees, their position at ISU (or other organization) and role on the project, their training and most recent date of their training if known. Please use additional space as necessary. For projects involving animals, please include the veterinary, animal caretakers and technical staff. For projects involving human subjects, please include anyone who will have contact with the subjects.

<table>
<thead>
<tr>
<th>NAME &amp; DEGREE(S)</th>
<th>POSITION AT ISU &amp; ROLE/SPECIFIC DUTIES ON PROJECT</th>
<th>TRAINING &amp; DATE OF TRAINING</th>
</tr>
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<tbody>
<tr>
<td>e.g., John Jones, MD, PHD</td>
<td>M.D. at Mary Greeley Medical Center, Co-Principal Investigator. For animal studies please list specific duties, e.g., will perform surgery, will perform blood draws, responsible for animal care, will perform biopsies, daily monitoring, etc.</td>
<td>ISU Human Subject Training, 10/01/01; Radiation Safety Training, 10/01/01; Blood Borne Pathogen Training, 11/13/02; Eleven years of laboratory use of blood borne pathogens.</td>
</tr>
<tr>
<td>1. W. Wade Miller, PHD</td>
<td>AgEd&amp;S Major Professor</td>
<td>7/10/02</td>
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<tr>
<td>2. Richard Bockhop, MSE</td>
<td>Graduate Student</td>
<td>November 13, 2003</td>
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Research Compliance 04/10/03
FUNDING INFORMATION

| If internally funded, please provide account number: |
| If externally funded, please provide funding source and account number: |
| If funding is pending please provide OSPA Record ID on GoldSheet: |
| Title on GoldSheet if Different Than Above: |
| Other: e.g., funding will be applied for later. |

SCIENTIFIC REVIEW

Although the compliance committees are not intended to conduct peer review of research proposals, the federal regulations include language such as “consistent with sound research design,” “rationale for involving animals or humans” and “scientifically valuable research,” which requires that the committees consider in their review the general scientific relevance of a research study. Proposals that do not meet these basic tests are not justifiable and cannot be approved. If a compliance review committee(s) has concerns about the scientific merit of a project and the project was not competitively funded by peer review or was funded by corporate sponsors, the project may be referred to a scientific review committee. The scientific review committee will be ad hoc and will consist of your ISU peers and outside experts as needed. If this situation arises, the PI will be contacted and given the option of agreeing that a consultant may be contacted or withdrawing the proposal from consideration.

☐ Yes ☒ No Has or will this project receive peer review?

If the answer is “yes,” please indicate who did or will conduct the review:

If a review was conducted, please indicate the outcome of the review:

NOTE: RESPONSE CELLS WILL EXPAND AS YOU TYPE AND PROVIDE SUFFICIENT SPACE FOR YOUR RESPONSE.

COLLECTION OR RECEIPT OF SAMPLES

Will you be: (Please check all that apply.)

☐ Yes ☒ No Receiving samples from outside of ISU? See examples below.
☐ Yes ☒ No Sending samples outside of ISU? See examples below.

Examples include: genetically modified organisms, body fluids, tissue samples, blood samples, pathogens.

If you will be receiving samples from or sending samples outside of ISU, please identify the name of the outside organization(s) and the identity of the samples you will be sending or receiving outside of ISU:

Please note that some samples may require a USDA Animal Plant Health Inspection Service (APHIS) permit, a USPHS Centers for Disease Control and Prevention (CDC) Import Permit for Etiologic Agents, a Registration for Select Agents, High Consequence Livestock Pathogens and Toxins or Listed Plant Pathogens, or a Material Transfer Agreement (MTA) (http://www.ehs.iastate.edu/shipolno.htm).

STUDY OBJECTIVES

Briefly explain in language understandable to a layperson the specific aim(s) of the study.
The purpose of this study is to access the perceptions of agricultural mechanics objectives by secondary agricultural education teachers in the State of Wisconsin. The primary goal of this study is to determine which agricultural mechanics objectives are suggested for secondary Agricultural Education Programs in the State of Wisconsin. A secondary goal is to determine the level of pre-service training indicated by current secondary agricultural educators in the area of agricultural mechanics in the State of Wisconsin. A final goal will be to identify strategies by which agricultural mechanics could be integrated into secondary agricultural education programs in the State of Wisconsin. Demographics variables will be analyzed as well. A pilot will be conducted initially in October 2004, to determine the validity, reliability, usability, and objectivity of the instrument with a group of similar educators who will not participate in the study. Data will be recorded as responses are returned, then analyzed using the statistical program, SPSS. Descriptive statistics including frequency distributions, percentages, and means will be used to describe the research objectives. A cover letter will be e-mailed explaining the purpose of the research including directions for completion of the questionnaire. Included in the cover letter will be information regarding anonymity procedures. These e-mails will be sent to each secondary agricultural education program in the State of Wisconsin, beginning in October 2004. E-mails will be sent to remind non-respondents approximately two weeks after the initial notification. Final reminders will be sent out in November regarding final data collection.

**BENEFIT**

Explain in language understandable to a layperson how the information gained in this study will benefit participants or the advancement of knowledge, and/or serve the good of society.

The results of this study will be available to benefit secondary and post-secondary agricultural educational programs within the State of Wisconsin. Agricultural mechanics objectives will be renewed as indicated by secondary agricultural educators responses to enhance learner outcomes. This information will also be used to develop a portion of the Praxis II Exam required for new teachers as prescribed in the No Child Left Behind Act (2001).

**ASSURANCE**

- I certify that the information provided in this application is complete and accurate and consistent with any proposal(s) submitted to external funding agencies.
- I agree to provide proper surveillance of this project to ensure that the rights and welfare of the human subject or welfare of animal subjects are protected. I will report any problems to the appropriate compliance review committee(s).
- I agree that I will not begin this project until receipt of official approval from all appropriate committee(s).
- I agree that modifications to the originally approved project will not take place without prior review and approval by the appropriate committee(s), and that all activities will be performed in accordance with all applicable federal, state, local and Iowa State University policies.

**CONFLICT OF INTEREST**

A conflict of interest can be defined as a set of conditions in which an investigator's or key personnel's judgment regarding a project (including human or animal subject welfare, integrity of the research) may be influenced by a secondary interest (e.g., the proposed project and/or a relationship with the sponsor). ISU's Conflict of Interest Policy requires that investigators and key personnel disclose any significant financial interests or relationships that may present an actual or potential conflict of interest. By signing this form below, you are certifying that all members of the research team, including yourself, have read and understand ISU's Conflict of Interest policy as addressed by the ISU Faculty Handbook (http://www.provost.iastate.edu/faculty/) and have made all required disclosures.

☐ Yes ☒ No Do you or any member of your research team have an actual or potential conflict of interest?

Research Compliance 04/10/03
☐ Yes  ☐ No  If yes, have the appropriate disclosure form(s) been completed?

SIGNATURES

Name: Michael Cole  Date: 9/16/04
Signature of Principal Investigator  Date

Name:  Date: 9/20/04
Signature of Department Chair  Date

PLEASE NOTE: Any changes to an approved protocol must be submitted to the appropriate committee(s) before the changes may be implemented.

Please proceed to SECTION II.
Two sets of materials should be submitted for each project – the original signed copy of the application form, one copy and two sets of accompanying materials. Federal regulations require that one copy of the grant application or proposal must be submitted for comparison.

FOR IRB USE ONLY:

Initial action by the Institutional Review Board (IRB):

- Project approved. Date: 9/24/04 04-425
- Pending further review. Date: 
- Project not approved. Date: 

Follow-up action by the IRB:

[Signature] 9/24/04

IRB Approval Signature  Date

Research Compliance 04/10/03
APPENDIX B.
"AG MECHANICS IN WI" QUESTIONNAIRE
Ag Educator Instrument

Thank you for your help with this important information! The information collected will be used to help agricultural education programs in the State of Wisconsin.

PLEASE DO NOT USE THE RETURN OR ENTER KEY, USE THE MOUSE!

Please note: Responses to each item should be indicated by using the mouse. Clicking on the desired responses and then proceeding to the next statement or page with the use of the mouse is necessary!!!

If you have any questions or would like to discuss the results, please contact me via email. If for some reason you are not able to complete this process on-line please e-mail me at: bockhopr@uwplatt.edu. I will do my best to honor your request in a timely manner.

If you choose not to participate in this study, please enter your code and then proceed to the end of Section 2 and answer two questions, then submit your response on that page. Submitting your response will allow me to record your information and prevent additional reminders from being sent.

Your name will not be indicated in this study. Each response will be coded in order to monitor this process. All information collected will be combined in an aggregate report. Individual responses will be destroyed upon entry of data into an SPSS statistical database.

Please accept my thanks in advance!

Please enter your registration code to begin.

Note: You should have "Cookies" enabled on your web browser to complete this instrument.
Section 1

Introduction:
The following section is designed to gauge your opinions of agricultural mechanics objectives in two areas. Please consider each objective carefully. Part one responses will aid in the design of lesson plans for high school agriculture programs. Part two responses are intended to develop possible information that may be used for the new teacher licensure process in the State of Wisconsin. Additionally, part two will be used with curriculum reviews at the collegiate level in the State of Wisconsin. Your contributions to this process are very important! Thank you!

Part 1 - High School Ag Ed:
To what extent do you favor or oppose each objective for consideration in a high school agricultural education program. Your professional opinion is very important in this process! (Choose one response.)

1 = Strongly oppose
2 = Somewhat oppose
3 = Somewhat favor
4 = Strongly favor

Part 2 - Training:
State the importance of pre-teacher training to be able to facilitate lesson plans associated with each objective for a high school agricultural educator. Again this is your opinion and your opinion is very important. (Choose one.)

1 = No, Pre-service teacher training is not necessary to facilitate this objective.
2 = Yes, Pre-service teacher training is recommended for this objective.

If you wish to print out a hard copy to fill in and return by mail please click the "Print" button and then continue to the next page of the survey to print Section 2. Mailing address is in Section 2. Thank you.

Please select two items for each objective, one from the blue area and one from the green area.

<table>
<thead>
<tr>
<th>AG Metals</th>
<th>High School Ag Ed</th>
<th>Training</th>
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<tbody>
<tr>
<td>Objective</td>
<td>Strongly oppose</td>
<td>Somewhat oppose</td>
</tr>
<tr>
<td>1. Identify metal fabrication safety procedures.</td>
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<tr>
<td>2. Perform metal fabrication laboratory management skills.</td>
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<td>3. Read metal fabrication measuring equipment.</td>
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<tr>
<td>4. Identify oxyfuel cylinder safety procedures.</td>
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<tr>
<td>5. Perform oxyfuel cutting and welding.</td>
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<tr>
<td>6. Select oxyfuel cutting and welding equipment.</td>
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<tr>
<td>7. Setup oxyfuel cutting and welding equipment.</td>
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</tbody>
</table>
8. Perform plasma arc cutting.
9. Identify shielded metal arc welding (SMAW) safety procedures.
10. Perform SMAW skills.
11. Select SMAW electrodes.
12. Adjust amperage settings for SMAW.

AG Metals
Objective
13. Identify gas metal arc welding (MIG) and tungsten arc welding (TIG) safety procedures.
15. Drill, tap, and thread metal.
16. Operate hydraulic bending and shaping equipment.
17. Select metal fabrication fasteners.
18. Layout metal projects.
19. Draw metal project plans.
20. Use computer aided drafting for metal fabrication.
22. Discuss and explain robotics in metal fabrication.
23. Perform soldering skills.
24. Perform MIG and TIG skills.
25. Weld in multiple positions.

AG Structures
Objective
26. Identify ag. structures safety procedures.
27. Perform agricultural structures laboratory management skills.
28. Use measuring devices.
29. Utilize mathematics related to agricultural structures.
30. Identify hand and power tools.
31. Utilize hand and power tool safety.
32. Use hand and power tools.
33. Identify and select fasteners for agricultural structures.
34. Identify types of lumber.
35. Utilize framing and roofing skills.

AG Structures
Objective
36. Identify electrical safety procedures.
37. Discuss principles of electricity.
38. Wire electrical circuits.
39. Operate multimeters.
40. Discuss ventilation procedures.
41. Prepare site for concrete.
42. Construct forms, reinforce, finish, and cure concrete.
43. Estimate materials needed for concrete.
44. Select and apply paints.
45. Demonstrate painting techniques.
46. Prepare surfaces to be painted.
47. Install PVC plumbing.
48. Identify plumbing tools.

AG Structures
Objective
49. Plan and construct agricultural structures.
50. Prepare bill of materials.
51. Construct agricultural fences.
52. Draw building plans.
53. Select insulation.
54. Service and repair electric motors and controllers.
55. Proportion and mix concrete.
56. Discuss effects of temperature on paint.
57. Use computer aided drafting to design agricultural structures.
58. Demonstrate safety when using chemicals for painting.
59. Demonstrate procedure for laying out and cutting of angles.
60. Discuss effects of wind and snow loads.
61. Layout batter boards.

AG Power & Machinery

Objective
62. Identify agricultural power and machinery safety procedures.
63. Perform agricultural power and machinery laboratory management skills.
64. Discuss principles of engine operation.
65. Describe safety procedures associated with small engines.
66. Perform engine diagnostic procedures.
67. Use engine testing equipment.
68. Describe safe operation of tractors and equipment.
69. Identify tractor components and implements.
70. Select power and equipment fasteners.
71. Identify and repair bearings, seals, gaskets, tubing, and hoses.

High School Ag Ed Training

<table>
<thead>
<tr>
<th>Strongly oppose</th>
<th>Somewhat oppose</th>
<th>Somewhat favor</th>
<th>Strongly favor</th>
<th>No</th>
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<td>Objective</td>
<td>AG Power &amp; Machinery</td>
<td>Training</td>
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<td>72. Operate, calibrate, and adjust tractors and implements.</td>
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<td>73. Operate computers used with tractor repair and operations.</td>
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<td>74. Discuss pneumatic systems.</td>
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<td>75. Repair fuel and intake systems.</td>
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<td>76. Describe ignition, charging, starting, and other electrical components.</td>
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<td>77. Explain engine heating and cooling systems.</td>
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<td>78. Explain small engine theory.</td>
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<td>79. Explain hydraulic systems.</td>
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<td>80. Repair hydraulic cylinders, pumps, and motors.</td>
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<td>81. Repair/replace universal joints.</td>
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<td>82. Repair transmissions.</td>
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</table>

AG Soil & Water Management

<table>
<thead>
<tr>
<th>Objective</th>
<th>AG Soil &amp; Water Management</th>
<th>Training</th>
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</thead>
<tbody>
<tr>
<td>83. Identify soil and water management issues.</td>
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<td>84. Perform soil and water management laboratory skills.</td>
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<tr>
<td>85. Describe soil and water management principles.</td>
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<td>86. Read land measurement equipment.</td>
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<td>87. Classify land.</td>
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<td>88. Perform differential leveling.</td>
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<td>89. Calculate acreage.</td>
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<td>90. Explain soil erosion principles.</td>
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<td>91. Explain irrigation principles.</td>
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<td>92. Manage water systems.</td>
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<td>93. Repair and maintain irrigation systems.</td>
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</tbody>
</table>
94. Install waste water plumbing.
95. Draw soil and water management plans.
96. Utilize computer aided drafting for soil and water management.
97. Install irrigation systems and timers.
98. Conduct soil percolation test.
99. Identify soil textures.

Continued on the next page.
Section 2

If you wish to print out a hard copy to fill in and return by mail please click the "Print" button and mail both Section 1 and Section 2 to:
Rick Bockhop
Agricultural Education and Studies Department
Iowa State University
217B Curtiss Hall
Ames, IA 50011-1050

1. How many years including this year have you taught agricultural education?
   
   [ ] Years (please enter a number, please DO NOT hit your enter/return key)

2. Did you complete one or more agricultural education courses as a high school student?
   
   [ ] Yes
   [ ] No

3. Have you completed 6 or more credit hours of agricultural mechanics classes in college?
   
   [ ] Yes
   [ ] No

4. Do you have at least 200 hours of work experience in production agriculture?
   
   [ ] Yes
   [ ] No

5. Which type of teacher training would you recommend regarding agricultural mechanics?
   (choose one)
   
   [ ] Pre-service teacher preparation (prior to initial teacher licensure)
   [ ] In-service for existing teachers (fall, spring, or summer conference)
   [ ] Both pre-service and in-service are needed
   [ ] Other - Please describe ____________________________

6. Have you coached an agricultural mechanics CDE team at any level of competition affiliated with the FFA?
   
   [ ] Yes
   [ ] No
7. From the following list, indicate all agricultural mechanics areas you have at least 20 hours of teaching experience with at any educational level. (choose all that apply)

- Farm machinery repair
- Farm machinery maintenance
- Welder/welding
- Plumbing
- Basic electrical wiring
- General shop safety
- Agricultural woodworking and carpentry
- General measurements wood or metal
- Computer aided drafting
- Small engine repair
- Small engine maintenance
- Hot and cold metal-working
- Agricultural structures
- Engine overhaul
- Blueprint reading
- Soil and water surveying
- Fluid power (hydraulics/water)
- GIS/GPS
- Other - Please describe ________________ (please DO NOT hit your enter/return key)

8. To what extent do you feel qualified to facilitate agricultural mechanics objectives for high school students? (choose one)

- Very well qualified
- Fairly well qualified
- Somewhat qualified
- Not well qualified
- Not at all qualified
9. Does your school have an agricultural mechanics lab/shop where students can experience hands-on activities?

☐ Yes
☐ No

10. Do technology education classes in your school effectively reduce agricultural mechanics class enrollment due to duplication?

☐ Yes
☐ No

11. If inexpensive classroom-ready lesson plans were available that could be used in the "Ag Shop" would you be interested?

☐ Yes
☐ No

12. If inexpensive classroom-ready lesson plans were available that could be used in a classroom without the need for an "Ag Shop" would you be interested?

☐ Yes
☐ No

13. Ten years from now how do you perceive that agricultural mechanics objectives will be addressed to meet the needs of high school students in agricultural education programs?

☐ Greater use of agricultural mechanics objectives
☐ Same use of agricultural mechanics objectives
☐ Less use of agricultural mechanics objectives

14. In the future what do you prefer as a choice to address agricultural mechanics objectives to best meet the needs of high school students in agricultural education programs?

☐ Greater use of agricultural mechanics objectives
☐ Same use of agricultural mechanics objectives
☐ Less use of agricultural mechanics objectives

15. Please indicate your gender.

☐ Female
☐ Male
Thank you!

This area is for individuals who chose not to participate. If you completed the survey, thank you!

If you choose not to participate, it is important that you enter your registration code to avoid additional notification.

Enter code here:

Please state your reason for not participating (optional):

Submit (for non-participants)
APPENDIX C.
ELECTRONIC NOTIFICATION LETTERS VIA E-MAIL
March 7, 2005

Dear Recipient’s full name,

(Recipient’s first name), you will soon be receiving directions indicating how to complete a survey regarding the context area of agricultural mechanics titled "Ag Mechanics in Wisconsin." Please respond by completing the survey at your earliest convenience.

A descriptive correlational study is being conducted by Rick Bockhop under the direction of Dr. W. Wade Miller at Iowa State University.

The purpose of this study is to determine which agricultural mechanics objectives should be presented to secondary students in Wisconsin. A secondary purpose of this study is to determine which objectives should be considered in pre-service learning for teacher licensure.

These are the objectives of this study:
* To identify perceptions of teachers regarding teaching basic agricultural mechanics concepts
* To identify the extent to which pre-service training is required to be able to teach agricultural mechanics knowledge, skills, and practices
* To determine the degree of association between program characteristics/demographic variables and selected agricultural mechanics variables in secondary agricultural education curriculum in Wisconsin.

Please take the time to complete the questionnaire upon arrival of notification. If you have any questions or concerns contact me at (515) 294-0893 at ISU or by e-mail: bockhopr@iastate.edu.

Thank you in advance for you assistance,
Rick Bockhop
Iowa State Graduate Student
Subject Line: “Ag Mechanics in WI”

March 10, 2005

Dear Recipient’s name,

Please respond by completing the survey!

The survey should take approximately 10-15 minutes to complete. You will be directed to a Web site where you will record your responses on-line. Names will not be associated with this study in any way. Results of these questionnaires will be aggregate as the information is used to benefit agricultural education programs. Individual data sheets will be destroyed after the data is entered into SPSS 11.0 for analysis.

You access code is: XXX000 (code for each individual respondent)

Please proceed to this Web site and enter the above code and proceed with the questionnaire.


Your time and immediate attention is greatly appreciated and will contribute to our understanding of instructional agricultural mechanics in secondary agricultural education. If you have any question concerning this study, feel free to call me: 515/294-0893 (office) or by e-mail bockhop@uwplatteville.edu

A Sincere Thank You,

Rick Bockhop
Subject Line: “Ag Mechanics in WI”

March 17, 2005

Recipient’s name,

Please read and respond. This important information is needed from all Ag Educators in WI!!

All inputs regarding this survey are important. One of the purposes of this study is to determine the future role of agricultural mechanics in Wisconsin. Many times teachers in agriculture do not realize all of the areas we may associate with agricultural mechanics. Examples: Soil Conservation, terraces diversions, earthen dams, land measurement, soil classification. Horticulture: plumbing, heating, cooling, air exchange. Farm Management: Maintenance to machinery, building size, materials handling including all livestock and fencing to name a few.

This is a study that concerns all agricultural educators in the State of Wisconsin. The importance of Agricultural Educator’s perceptions will be used to help determine the future training recommended in pre-service teacher training along with determining which agricultural mechanics objectives are important in Wisconsin, Agricultural Education Programs. Especially in departments where limited agricultural mechanics objectives are presented. Please proceed to the site below…enter your code and complete the form regarding “Ag Mechanics in WI.”

Survey code: XXX000 (code for each individual respondent)


Thank you in advance for your response,
Rick Bockhop
Subject Line: “Ag Mechanics in WI”

March 22, 2005

Dear Recipient’s name,

Please read and respond. This important information is needed from all Ag Educators in WI!!

All inputs regarding this survey are important. One of the purposes of this study is to determine the future role of agricultural mechanics in Wisconsin. Many times teachers in agriculture do not realize all of the areas we may associate with agricultural mechanics. Examples: Soil Conservation, terraces diversions, earthen dams, land measurement, soil classification.

Horticulture: plumbing, heating, cooling, air exchange
Farm Management: Maintenance to machinery, building size, materials handling including all livestock and fencing to name a few.

This is a study that concerns all agricultural educators in the State of Wisconsin. The importance of Agricultural Educator's perceptions will be used to help determine the future training recommended in pre-service teacher training along with determining which agricultural mechanics objectives are important in Wisconsin, Agricultural Education Programs. Especially in departments where limited agricultural mechanics objectives are presented. Please proceed to the site below…enter your code and complete the form regarding “Ag Mechanics in WI.”

Survey code: XXX000 (code for each individual respondent)


Thank you in advance for your response,
Rick Bockhop
Subject Line: "Ag Mechanics in WI"

March 29, 2005

Recipient’s Name,

Please complete the Agricultural Mechanics in WI Survey


Your Access Code is: XXX000 (code for each individual respondent)

Agricultural Mechanics in WI

Attention: Please Complete This Activity Today!

Your input as an Agricultural Educator is very important in determining the value of agricultural mechanics objectives in the State of Wisconsin Agricultural Education Programs. You will be receiving notification regarding a survey indicating your perceived value(s) of agricultural mechanics objectives and perceived needs of potential pre-service and in-service training regarding agricultural mechanics objectives.

Regardless of how many Agricultural Mechanics classes you teach your input is very important. Please respond by completing the Agricultural Mechanics in WI survey.
If you have any questions, feel free to contact Rick Bockhop @ 515-294-0893 or by e-mail bockhopr@uwplatt.edu

The purpose of this survey is supported by many including these individuals we all recognize in Wisconsin Agricultural Educations Leadership Positions:
* Ron Von Glahn, Wisconsin Association of Agricultural Educators President
* Cheryl Zimmerman, Wisconsin Association of FF A Executive Director
* Dean Gagnon, Agriculture & Natural Resources Consultant, Wisconsin Department of Public Instruction, Wisconsin Association of FFA Advisor

Thank you in advance for your efforts and your continued support of Agricultural Education in the State of Wisconsin.

Sincerely, Rick Bockhop
Subject Line: “Ag Mechanics in WI”

April 2, 2005

Recipient’s Name,

Please, please, please respond by completing the survey indicated below.

Please complete the Agricultural Mechanics in WI Survey


Your Access Code is: XXX000 (code for each individual respondent)

Agricultural Mechanics in WI

Attention: Please Complete This Activity Today!

Your input as an Agricultural Educator is very important in determining the value of agricultural mechanics objectives in the State of Wisconsin Agricultural Education Programs. You will be receiving notification regarding a survey indicating your perceived value(s) of agricultural mechanics objectives and perceived needs of potential pre-service and in-service training regarding agricultural mechanics objectives.

Regardless of how many Agricultural Mechanics classes you teach your input is very important. Please respond by completing the Agricultural Mechanics in WI survey.

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* Ron Von Glahn, Wisconsin Association of Agricultural Educators President
* Cheryl Zimmerman, Wisconsin Association of FFA Executive Director
* Dean Gagnon, Agriculture & Natural Resources Consultant, Wisconsin Department of Public Instruction, Wisconsin Association of FFA Advisor

Thank you in advance for your efforts and your continued support of Agricultural Education in the State of Wisconsin.

Sincerely, Rick Bockhop
Subject line: WI AG Educators Please Read!

Recipient’s name,

Please read and respond. This important information is needed from all Ag Educators in WI!!

All inputs regarding this survey are important. One of the purposes of this study is to determine the future role of agricultural mechanics in Wisconsin. Many times teachers in agriculture do not realize all of the areas we may associate with agricultural mechanics. Examples: Soil Conservation, terraces diversions, earthen dams, land measurement, soil classification. Horticulture: plumbing, heating, cooling, air exchange Farm Management: Maintenance to machinery, building size, materials handling including all livestock and fencing to name a few.

This is a study that concerns all agricultural educators in Wisconsin. The importance of Agricultural Educator's perceptions will be used to help determine the future training recommended in pre-service teacher training along with determining which agricultural mechanics objectives are important in Wisconsin, Agricultural Education Programs. Especially in departments where limited agricultural mechanics objectives are presented. Please proceed to the site below enter your code and complete the form regarding Ag Mechanics in WI.

Survey code: XXX000 (code for each individual respondent)


Thank you in advance for your response,
Rick Bockhop
Recipient's first and last name,

Your time and immediate attention is greatly appreciated and will contribute to our understanding of instructional agricultural mechanics in the State of Wisconsin. Please complete by Friday, April 15th.

Please access the Web site by clicking on the site below and use your code to complete the questionnaire.


Survey code: XXX000 (code for each individual respondent)

A Sincere Thank You,
Rick Bockhop
April 15, 2005

Dear Recipient's name,

I don’t want to become more of a pest! Please respond, your input is needed!
Agricultural Mechanics in WI

Attention: Please Complete This Activity Today!
Your input as an Agricultural Educator is very important in determining the value of
agricultural mechanics objectives in the State of Wisconsin Agricultural Education
Programs.
Regardless of how many Agricultural Mechanics classes you teach your input is very
important. Please respond by completing the Agricultural Mechanics in WI survey. Please
proceed to the Web site below and enter the code and proceed with the questionnaire.

Survey Code: XXX000 (code for each individual respondent)

If you have any questions, feel free to contact Rick Bockhop @ 515-294-0893 or by e-mail
bockhopr@uwplatt.edu

Thank you in advance for your efforts and your continued support of Agricultural Education
in the State of Wisconsin.

Sincerely, Rick Bockhop
Subject Line: THANK YOU “Ag Mechanics in WI”

Date of response, 2005

Dear Recipient’s name,

Thank you very much for your prompt response to the “Ag Mechanics in WI” survey. You once again demonstrated your effectiveness in Agricultural Education.

If you have any questions or comments please forward them to me at: bockhopr@iastate.edu

A Very Sincere Thank You,

Rick Bockhop

PhD Candidate ISU
APPENDIX D.
U. S. MAIL SURVEY LETTERS, COVER LETTER, AND MEMORANDUM ANNOUNCED ON WDPI "AG ED WEDNESDAY WEEKLY" AND "WISCONSIN FFA UPDATE—NEWS IN BRIEF"
March 14, 2005

Dear Teacher of Agriculture,

I am pursuing a Ph.D. as a graduate student in Agricultural Education and Studies at Iowa State University. I am working with W. Wade Miller on this project. We are studying the needs of agricultural mechanics in secondary agricultural education curricula. The primary goal of this study is to assess the perceptions of current secondary agricultural educators regarding specific agricultural mechanics objectives needed in agricultural education programs in the State of Wisconsin. A secondary goal is to determine the benefits of pre-service and teacher in-service regarding the facilitation of agricultural mechanics objectives. A third goal is to identify ways to integrate agricultural mechanics within existing programs. Additionally results will be considered as the current Praxis II test is reviewed for important context related objectives in the State of Wisconsin for new teachers.

The survey should take approximately 10-15 minutes to complete. You will be directed to a web site where you will record your responses on-line. Names will not be associated with this study in any way. Results of these questionnaires will be aggregate, as the information is used to benefit agricultural education programs. Individual data sheets will be destroyed after the data is entered into a computer for analysis. Your participation in this study is voluntary. If you choose not to participate in this important study of agricultural education proceed to the survey and follow directions.

Your time and immediate attention is greatly appreciated and will contribute to our understanding of instructional agricultural mechanics in secondary agricultural education. If you have any question concerning this study, feel free to call us at 515/294-0893 or send either of an email bochkop@uwplatteville.edu Rick Bockhop or wwmiller@iastate.edu W. Wade Miller, Ph.D., AgEd&S Professor, ISU.

The web-site for the completion of this Agricultural education study for all agriculture teachers in the State of Wisconsin may be accessed by left clicking on this address site: The Web site is: http://www.dynamic-deployed.com/rb/rblogin.asp
Your Access Code is: XXX000

Sincerely,

Rick Bockhop, MSE. W. Wade Miller, Ph.D., AgEd&S
MEMORANDUM ANNOUNCED ON WDPI “AG ED WEDNESDAY WEEKLY” AND “WISCONSIN FFA UPDATE—NEWS IN BRIEF”

“Agricultural Mechanics in WI”

Attention: Please Complete This Activity Today!

Your input as an Agricultural Educator is very important in determining the value of agricultural mechanics objectives in the State of Wisconsin’s Agricultural Education Programs. You will be receiving notification regarding a survey indicating your perceived value(s) of agricultural mechanics objectives and perceived needs of potential pre-service and in-service training regarding agricultural mechanics objectives.

Regardless of how many “Agricultural Mechanics” classes you teach your input is very important. Please respond by completing the “Agricultural Mechanics in WI” survey.

If you have any questions, feel free to contact Rick Bockhop @ 515-294-0893 or by e-mail bockhopr@uwplatt.edu

The purpose of this survey is supported by many including these individuals we all recognize in Wisconsin Agricultural Educations Leadership Positions:

- **Ron Von Glahn**, Wisconsin Association of Agricultural Educators President
- **Cheryl Zimmerman**, Wisconsin Association of FFA Executive Director
- **Dean Gagnon**, Agriculture & Natural Resources Consultant, Wisconsin Department of Public Instruction, Wisconsin Association of FFA Advisor

Thank you in advance for your efforts and your continued support of Agricultural Education in the State of Wisconsin.

Sincerely,
Rick Bockhop
APPENDIX E.
CAREER CLUSTER: AGRICULTURE AND NATURAL RESOURCES
The production, processing, marketing, distribution, financing, and development of agricultural commodities and resources including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources.

<table>
<thead>
<tr>
<th>Sample Career Specialties / Occupations</th>
<th>Agricultural Sales • Agricultural Communications Specialists • Business Educators • Food Scientists • Meat Processors • Toxicologists • Biochemists • Nutritionists • Dieticians • Food Brokers • Food Inspectors • Meat Cutters • Meat Grades • Meat Science Researchers • Food Meal Supervisors • Cheese Makers • Microbiologists • Produce Buyers • Bacteriologists • Food &amp; Drug Inspectors • Biologists • Biochemists • Food &amp; Fiber Engineers • Food Processors • Storage Supervisors • Fieldman • Quality Control Specialists</th>
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<tbody>
<tr>
<td>Bioinformatics Specialists • Plant Breeders and Geneticists • Biotechnology Lab Technician • Soil &amp; Water Specialists • Crop Farm Managers • Agricultural Educators • Plant Pathologists • Aquaculturalists • Sales Representatives • Botanists • Tree Surgeons • Education &amp; Extension Specialists • Agricultural Journalists • Commodity Marketing Specialists • Grain Operations Superintendents • Custom Hay · Silage Operators • Forest Genetics • Golf Course Superintendents • Greenhouse Managers • Growers &amp; Farmers • Ranchers</td>
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<tr>
<td>Agricultural Educators • Livestock producers • AI Technicians • Aquaculturalists • Animal Caretakers · Poultry Managers • Equine Managers · Veterinarians • Veterinary Assistants · Feedlot Specialists • Animal Scientists • Embryo Technologists • Livestock Buyers • Feed Sales Representatives • V...</td>
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<tr>
<td>Machine Operators • Electronics Systems Technicians • Agricultural Engineers • Agricultural Extension Engineering Specialists • Heavy Equipment Maintenance Technicians • Recycling Technicians • Waste Water Treatment Plant Operators • Equipment · Parts Managers • Welders • Machinists • Communication Technicians • Agricultural Applications Software Developers / Programmers • Database Administrators • Computer Service Technical Support Technicians • Information Lab Specialists • GIS Technicians • Remote Sensing Specialists</td>
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<tr>
<td>Cartographers • Wildlife Managers • Range Technicians • Ecologists • Park Managers • Environmental Interpreters • Fish and Game Officers Loggers • Forest Technicians • Log Graders • Pulp and Paper Manager Soil Geology Technicians • Geologists • Mining Engineers • Fisheries Technicians • Water Monitoring Technician • Hydrologists • Fish Hatchery Manager • Commercial Fishermen • Fishing Vessel Operators • Vessel Crew</td>
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<tr>
<td>Pollution Prevention and Control Managers • Pollution Prevention and Control Technicians • Environmental Sampling and Analysis Scientists / Technicians • Health and Safety Sanitarians • Environmental Compliance Assurance Managers • Hazardous Materials Handlers • Hazardous Materials Technicians / Managers • Water Environment Managers • Water Quality Managers • Waste Water Managers • Toxicologists • Solid Waste Disposers / Recyclers • Solid Waste Technicians • Solid Waste Managers • Solid Waste Specialists</td>
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<tr>
<td>Salesperson • Sales Manager • Banker / Loan Officer • Field Representative for Bank, Insurance Company or Government Program • Farm Investment Manager • Agricultural Commodity Broker • Agricultural Economist • Farmer / Rancher / Feedlot Operator • Farm Manager • Livestock Rancher / Breeder • Dairy Herd Supervisor (DHA) • Agricultural Products Buyer • Animal Health Products Distributor • Livestock Seller • Feed Supply Store Manager • Produce Commission Agent • Ag Lender • Agricultural Chemical Dealer • Field Service Representative • Chemical Sales Representative</td>
<td></td>
</tr>
</tbody>
</table>


Cluster knowledge and skills
- Academic Foundations
- Communications
- Problem Solving and Critical Thinking
- Information Technology
- Systems
- Safety, Health and Environment
- Leadership and Teamwork
- Ethics and Legal Responsibilities
- Employability and Career Development
- Technical Skills
APPENDIX F.
RESPONSES TO QUESTION #5 IN SECTION #2
Question # 5 in Section 2 written exactly as received on responses.

What type of teacher training would you recommend regarding agricultural mechanics?

Pre-service teacher preparation (prior to initial teacher licensure)

In-service for existing teachers (fall, spring, or summer conference)

Both pre-service and in-service are needed

XX Other - Please describe ...

These are the responses listed after the choice ... Other – Please describe

should not be required, not a huge focus in current ag education.

work experiences in college

Training provided for those teachers that actually teach this in their programs. School districts that have a tech. ed. department do not have ag. departments that cover this material.

Basic information is needed pre-service, with specified content for in-service teachers, as it relates to their programs/communities

This area is dependant on the Tech ed dept of each school

It depends upon what type of ag. ed. program a person finds themselves employed in. My school district has no ag. mechanics pieces with the exception of soil science. Does that piece need to be listed as "Ag. Mechanics"?

Some teachers like me did not and do not want to have a mechanics part to their program and developed a completely applied science curriculum. I feel that pre-service is good but should not be required because all programs do not include this and in-ser

None

I have never been in an ag mechanics course nor have I ever taught one. I am probably a poor subject for this survey simply because I know nothing about this area.
None

Both pre-service & in-service. May need a certain amount of hours to meet needs.
does not matter. really not interested

summer college class for credit

This really depends on area and school programs teaching.

May not be applicable

Optional training by college course that teachers can sign up for. Most of this information is taught through our tech ed dept. Teaching this information would cause conflict with curriculum issues.

Apprentice job machine shop or implement
APPENDIX G.
RESPONSES TO QUESTION #7 IN SECTION #2
Question # 7 in Section 2 written exactly as received on responses.

From the following list, indicate all agricultural mechanics areas you have at least 20 hours of teaching experience with at any educational level. (Choose all that apply)

- Farm machinery Repair
- Farm machinery maintenance
- Welder/welding
- Plumbing
- Basic electrical wiring
- General shop safety
- Agricultural woodworking and carpentry
- General measurement wood or metal
- Computer aided drafting
- Small engine repair
- Small engine maintenance
- Hot and cold metal working
- Agricultural structures
- Engine overhaul
- Blueprint reading
- Soil and water survey
- Fluid power (hydraulics/water)
- GIS/GPS
- XX Other – Please describe

**These are the responses listed after the choice ... Other – Please describe**

I have no shop area to do any of these things listed

Taught Agricultural Construction

Soil texturing/structures as related to Plant & Earth Science courses

Machine tool skills, lathe/mill

None of the above

Concrete/masonry

Auto mechanics

Again, I have no experience in ag mechanics - my survey should probably be discarded. If anything, I would say that pre teacher in-service would be great as would be in-service for existing teachers. At the same time, attending in-service in these areas n
Lathe
Tractor safety certification

Only soil, GPS, etc last 8 years or so.

None
APPENDIX H.
INDIVIDUAL RESPONSES FROM THE PILOT STUDY
Pilot Study Comments

- I have completed the tests the last question on the second part, I found hard to answer. I actually do not perceive that the needs of ag ed students will be met, so I checked that they would be met by less instruction in ag mechanics. What I believe is that on average less ag mechanics will be included due to less and less preparation and more and more pressure to abandon laboratories in favor of basic skills emphasis and doing this virtually on computer. Hope this helps. Nice to hear from you and best wishes with the study.

- The survey looks good. Very easy to follow and complete. I would encourage you to examine if teachers consider any other objectives to be important in the future. This is really noticeable in your last question where you ask whether the objectives will be... what about a new set of ag mechanics objectives that are added to the current list, or in place of the list?

- The survey on Agricultural Mechanics was emailed and I have received it today. However, I do have two concerns. First, I did retire a one-and-a-half years ago. I don’t know if this changes things or not. I did notice that the Agriculture web site has me still listed as the instructor at Tomah High School and Jim Schmidt listed at the Tomah Middle School. Jim retired three-and-a-half years ago. Secondly, I did try to open the questionnaire and the program indicated that 902wol was invalid or the code had already been used. It also indicated that cookies was needed to open the questionnaire. I am not sure but I don’t believe I have that on
my computer. If you still want me to complete the questionnaire and have a means for me to do so I would do that if it is relevant since I am retired.

- I just finished the survey again. The only comment I have is that personally, I was a bit confused on those statements which asked about favoring performance of "lab management skills" by the high school student. Wasn't sure what a lab management skill was. Then I got to the Soil and Water Management Laboratory Skill and since I once taught a course named Soil and Water Management and it was associated with the lab and the skills that were being developed, I went back and changed the other "lab management" answers to strongly favor. If however, "lab management skills" in other areas actually refer to designing, organizing, conducting classes, in the wood shop, power equipment space, etc., I would not be as strongly in favor of requiring h.s. students to learn this. Thanks for checking on this. I really enjoy helping the "starving artists".

- Maybe set up the survey into the different areas of emphasis. ex. Engines, Structures, electricity, etc. This might eliminate some confusion with topic jumps.

Question 67. When you ask about engine test equipment. Could it be possible to add some examples or asking about spark testers and compression testers or computer testing systems?

Question 77. Heating and cooling systems—Is this in the area of engines and tractors or ag structures? Looks good to me.

- We no longer offer an Ag Mechanics program at CVTC.
There were a few items where I felt the wording needed work:

28. Seems too general. How is it different from #3? Either combine or clearly differentiate.

40. Does this refer to ventilation needs of different types of structures or to the ventilation requirements for specific procedures (ex. painting)?

71. Are you asking about repairing these problems (seals, gaskets...) or repairing the problem by replacing these items?

73. I think these 2 needs to be split out. To me there is a big difference in the computers used in operations v. repair.

78. Is there small engine theory? Or do we apply the same theory to different engine types?

92. What type of water systems? (Livestock water, residential water...)

94. What type of waste water? (Home, barn, food processing plant...)

Other questions:

Why is GIS/GPS included in Section 2 under areas taught but there are no objectives in this area in section 1?

I would also like to see one or more alternative energy objectives.

I personally don't think this is the best response scale for these objectives. The list seems pretty basic and I don't foresee too many people opposing many of these. I would predict very similar responses, making it difficult to prioritize (especially with the Yes/No for including items in our college programs). By this time of night I'm running low on suggestions, but some type of importance scale (little, somewhat,
moderate, very) would let the individual agree that the item is important yet have more choices that just somewhat/strongly or Yes.

Now you have my 2 cents. I look forward to the final results!

I mailed mine in today. Had to look at it the old fashioned way.

- The identification of constructs is needed with all groups not just at the beginning of the first objective in each area.

- Will there be an area for teachers to add a new set of objectives?
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