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A Delphi Approach to the Preparation of Early–Career Agricultural Educators in the Curriculum Area of Agricultural Mechanics: Fully Qualified and Highly Motivated or Status Quo?

P. Ryan Saucier, Assistant Professor
Texas State University – San Marcos
Billy R. McKim, Assistant Professor and Extension Specialist
Texas A&M University
John D. Tummons, Instructor and Director of Teacher Certification
University of Missouri

According to the National Research Agenda for Agricultural Education and Communication, preservice agriculture teacher education programs should "prepare and provide an abundance of fully qualified and highly motivated agricultural educators at all levels" (Osborne, 2007, 8). The lack of preparation of entry career agricultural educators is no more apparent than in the curriculum area of agricultural mechanics. Saucier and McKim (2010) stated that all school–based agriculture educators who instruct agricultural mechanics must be technically competent and be able to safely manage the school laboratory for effective student instruction. The model for teacher preparation in agricultural education (Whittington, 2005) served as the conceptual framework. The study sought to determine the essential agricultural mechanics skill areas that Missouri agriculture educators must possess prior to beginning a career in agricultural education. Results of this study identified essential agricultural mechanics skill areas that range from laboratory management to soldering. Teacher educators and state supervisory staff should review these skill areas and plan professional development education for current Missouri agricultural educators who have in–service needs in these skill areas. In conclusion, preservice programs in Missouri should be evaluated to determine if they are indeed effectively preparing teachers in the curriculum area of agricultural mechanics.

Keywords: Delphi; agricultural mechanics; teacher preparation; preservice teachers; education; Missouri

Introduction

"Changes in the economy, work, and society demand that every high school student be prepared both for careers and post–secondary education" (Brand, 2003, p. 7). Establishing a connection between core subject matter and agriculture provides for *authentic learning* by establishing real–life applications to general or abstract principles (Parr, Edwards, & Leising, 2008). Agricultural education programs further allow students to develop both academic and vocational skills through hands–on learning opportunities (Hubert, Ullrich, Lindner, & Murphy, 2003) or meaningful application (Parr et al., 2008).

It is no longer appropriate to dichotomize secondary education into preparation tracks for college or for work (Brand, 2003). Thus, it is important for educators to find appropriate avenues to promote the evolution of secondary education from "…a narrowed discussion of a rigorous standard academic model targeted to higher achievement scores and a high school diploma to a model that encompasses rigor, relevance, and relationships targeted to meaningful postsecondary education and employment" (Guy, Sitlington, Larsen, & Frank, 2009, p. 39). One such proposed method of accommodating this transition has been the integration of science, technology, engineering, and mathematics (STEM) into agricultural mechanics curriculum (Parr et al., 2008).

Integration of mathematics or science into agriculture mechanics curriculum has been reported as a method of connecting core subject matter with meaningful application (Parr et al., 2008). Unfortunately, integration of current technological advances in agriculture has been identified as one of the highest–rated needs of preservice and in–service agriculture teachers (Duncan, Ricketts, Peak, & Uesseler, 2006). Integration of STEM into agriculture curriculum is beneficial and is already well noted in the literature (Kotrlik & Redmann, 2009; Myers, Dyer, & Washburn, 2005; Thoron & Myers, 2010; Warnick, Thompson, & Gummer, 2004). It is, however, unlikely that beginning teachers will succeed in integrating STEM into their courses without adequate preparation at the preservice level. Therefore, it is important to identify the needs of beginning agricultural educators, especially the relevant skills that link classroom/laboratory instruction to real–world application (Hubert et al., 2003; Parr et al., 2008)— these skills are included in agricultural mechanics curriculum.

Teachers who have completed no more than three years of teaching have been classified as beginning teachers (Huberman, 1989; Myers et al., 2005). Clearly identifying the in–service needs of beginning teachers has been difficult, even through the use of various instruments and designs (Birkenholz & Harbstreit, 1987; Joerger, 2002; Myers et al., 2005), and from various perspectives (Garton & Chung, 1996). Variation between individual programs has been purported as a possible cause of difficulty in identifying the in–service needs of beginning teachers (Birkenholz & Harbstreit, 1987; Myers et al., 2005). Nonetheless, the consequence of not understanding those needs is likely to be negative (Myers et al., 2005), possibly even contributing to higher rates of teacher attrition.

"The shortage of qualified agriculture teachers is the greatest challenge facing FFA and agricultural education" (National FFA Organization, 2010, para. 2), and is well noted in the literature (Camp, Broyles, & Skelton, 2002; Connors, 1998; Myers et al., 2005). Furthermore, the *No Child Left Behind Act* additionally mandates highly qualified teachers—without limitation to classroom instruction—for good reason: More than 11,000 school–based agriculture teachers deliver "innovative, cutting–edge and integrated curriculum to students…" of which, 59% offer agricultural mechanics courses (National FFA Organization, 2010, para. 2). Much of the instruction of agricultural mechanics information takes place in the laboratory setting (Johnson & Schumacher, 1989) and relies on teachers proficient in agricultural mechanics skill areas (Saucier & McKim, 2010).

Literature Review

According to Zull (2002), true comprehension and understanding emerges from sensing, integrating, and acting—essentially learning through application or *experiential learning*. Agricultural education laboratories allow students to actively engage in scientific inquiry and application (Osborne & Dyer, 2000). Beyond application, agricultural mechanics laboratories provide teachers a venue to connect application to theory (Parr, Edwards, & Leising, 2008), which is arguably essential and applicable in STEM areas. Knowledge and skills associated with agricultural mechanics education are essential for agricultural educators who intend to provide a safe and efficient laboratory learning environment for agricultural mechanics students (Saucier, Terry, & Schumacher, 2009). Administrators rely on the knowledge and expertise of agriculture teachers to provide high–quality instruction in a safe environment for school age students (Dyer & Andreasen, 1999; Gliem & Miller, 1993; McKim, Saucier, & Reynolds, 2010). Furthermore, parents demand that their children receive safe and proper instruction with adequate supervision from qualified individuals (Dyer & Andreasen, 1999). Therefore, safety is the single most important consideration when teaching in a laboratory environment (Dyer & Andreasen, 1999) and is the primary responsibility of the teacher (Gliem & Miller, 1993).

Agricultural mechanics courses continue to be one of the most popular course options for Missouri agricultural education students (T. Heiman, personal communication, September 2, 2008). In fact, students list agricultural mechanics and technology as their most popular future career choice (Missouri Department of

Elementary and Secondary Education, 2010). Unfortunately, if the supply of highly qualified, agriculture teachers is diminishing (National FFA Organization, 2010), then it is also likely that the supply of highly qualified agriculture teachers with adequate agricultural mechanics education is diminishing as well.

In a 2009 study by Saucier, Terry, & Schumacher, it was found that Missouri agriculture teachers had an average of 11 college credit hours of agricultural mechanics education. In a similar study of the same population conducted in 1990, Missouri teachers had an average of over 17 college credit hours in agricultural mechanics education (Johnson, Schumacher, & Stewart, 1990). Currently, agricultural teacher education degree programs from the various institutions within the state of Missouri, on average, only require graduates to possess slightly over eight credit hours of agricultural mechanics education (College of the Ozarks, 2010; Missouri State University, 2010; Northwest Missouri State University, 2010; University of Missouri, 2010; University of Central Missouri, 2010). Although this statistic may seem isolated to the state of Missouri, past national studies have found even less stringent standards. In a national study of 59 universities that educate new agriculture teachers, Hubert and Leising (2000) found that the majority of preservice programs required three hours of agricultural mechanics coursework for teacher certification.

Researchers in several states have reported that school–based agriculture teachers had professional development needs in the area of agricultural mechanics: Kansas (Washburn, King, Garton, & Harbstreit, 2001), Louisiana (Fletcher & Miller, 1995), Missouri (Johnson, Schumacher, & Stewart, 1990; Johnson & Schumacher, 1989; Saucier, Terry, & Schumacher, 2009), Nebraska (Schlautman & Silletto, 1992), Texas (Saucier & McKim, 2010) and Wyoming (McKim, Saucier, & Reynolds, 2010). Researchers have also concluded that recent graduates of agricultural teacher preparation programs were deficient in aspects related to agricultural mechanics instruction (Barrick & Powell, 1986; Birkenholz & Harbstreit, 1986; Dyer & Andreasen, 1999; Swan, 1992). Following a review of the literature, it can be posited that agriculture teachers, at all career levels, have professional development education needs in the area of agricultural mechanics.

In 1938, Dewey further defined the characteristics of experiential learning as *hands–on, contextual, problem–solving, and project–based*, which is noted as one of the "philosophical foundations of agricultural education teacher preparation" (Whittington, 2005, p. 92). Without proper preservice preparation in agricultural mechanics, it is unlikely that beginning teachers will be able to effectively use the agricultural mechanics laboratory as a mode of experiential learning and a tool to provide rigorous and relevant instruction to prepare students for meaningful postsecondary education and employment. Moreover, effectively using the agricultural mechanics laboratory to apply and reinforce theory, rather than dividing curriculum instruction into classroom instruction and laboratory activities, (i.e. simple sending students to the shop unsupervised) is essential to providing high quality agricultural mechanics instruction.

Conceptual Framework

The model for teacher preparation in agricultural education (Whittington, 2005) served as the conceptual framework for this study and is based upon the philosophical foundations of agricultural teacher education: experiential learning – Dewey, Lewin, and Piaget (Kolb, 1984), problem–based teaching (Lancelot, 1944), social cognition (Bandura, 1986), and reflective practice (Schön, 1983). Course work aligned with the National Council for Accreditation of Teacher Education (NCATE) standards, Interstate New Teachers Assessment and Support Consortium (INTASC) principles, Praxis criteria for licensure, and the American Association for Agricultural Education (AAAE) standards, guides preservice teachers to the goal, which includes the necessary knowledge, skills, and disposition for entry into the teaching profession (see Figure 1).

Because many preservice programs required only three hours of agricultural mechanics coursework for teacher certification (Hubert & Leising, 2000), it is important to establish the most appropriate and necessary agricultural mechanics knowledge and skills needed by beginning teachers. Thus, it is important to accurately identify the essential agricultural mechanics skill areas needed by beginning agriculture educators.

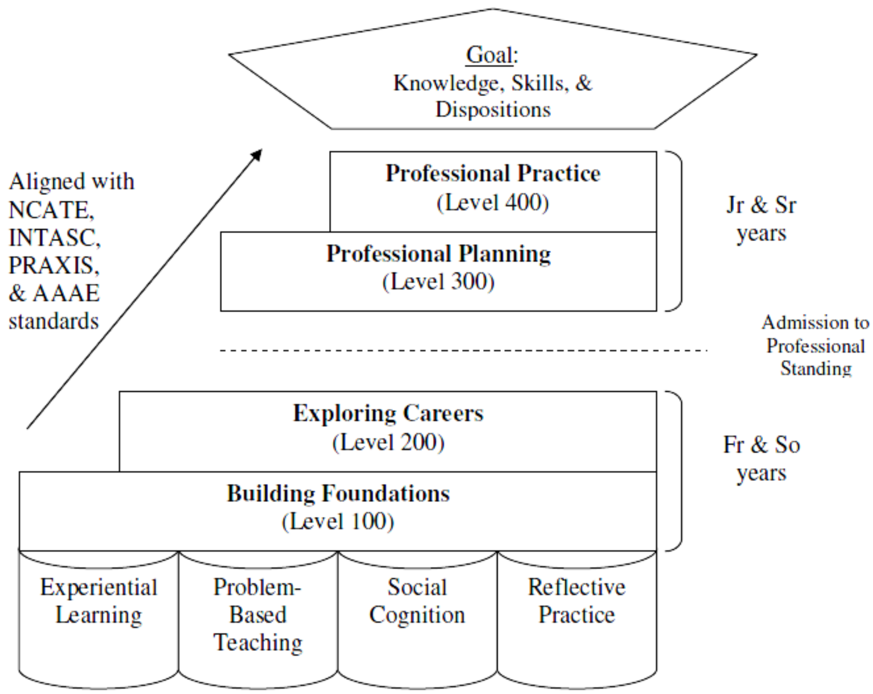

Figure 1. The model for teacher preparation in agricultural education (Whittington, 2005, p. 94).

Purpose and Research Question

With a shortage of highly qualified and motivated agriculture teachers across the U.S., the continuous need for ongoing evaluations of teacher education programs (Osborne, 2007), and the continued popularity of agricultural mechanics courses in secondary agricultural education programs (T. Heiman, personal communication, September 2, 2008), warranted a need to determine the essential agricultural mechanics skills that a new agricultural educator in Missouri should possess upon the completion of a preservice agricultural education program. Therefore, the purpose of this Delphi study was to determine the essential agricultural mechanics skill areas that beginning Missouri agricultural educators should possess prior to teaching school–based agricultural education.

1. What are the essential agricultural mechanics skills for beginning Missouri agricultural educators?

Methods

For this descriptive study, the Delphi technique was used to determine the essential agricultural mechanics skill areas needed for beginning Missouri school–based agricultural educators. The Delphi technique is a "group process technique for eliciting, collating, and generally directing informed judgment towards a consensus on a particular topic" (Delp, Thesen, Motiwalla & Seshadri 1977, p. 168). Additionally, the Delphi technique is a widely accepted method for achieving convergence of opinion concerning real–world knowledge solicited from experts in various areas (Hsu & Sandford, 2007; Ramsey & Edwards, 2010.) Stitt–Gohdes and Crews (2004) noted that the purpose of the Delphi technique is used to gather responses from an expert panel or panels, and combine the responses into one useful statement. Furthermore, in agricultural education, Martin and Frick (1998) noted that the Delphi technique was practical in planning curriculum and the development of personal qualities of student leaders.

An advantage of this technique is that it helps minimize the typical disadvantages of a traditional round table discussion. These disadvantages include: bandwagon effect of a majority opinion, the power of persuasiveness of an individual, the vulnerability of group dynamics to manipulation, and the unwillingness of individuals to abandon publicly stated opinions (Issac & Michael, 1987).

The data collection process for a Delphi study consists of a series of four questionnaires (Isaac & Michael, 1987). The Delphi technique begins with the identification of group members whose consensus opinions are sought. These group members are commonly known as a panel of experts. Additionally, these group members were identified due to their expert knowledge in the subject matter being explored. For this study, purposeful sampling was used to select members for the panel of experts. According to Creswell (2005), purposeful sampling can be defined as "a qualitative sampling procedure in which researchers intentionally select individuals and sites to learn or understand the central phenomenon" (p. 359).

Instrumentation and Expert Panelists

According to Dalkey (1969), one of the original researchers of the Delphi technique, for a Delphi instrument to be reliable (.7 or greater), a panel of experts must consist of 11 members or more. Furthermore, Dalkey, Rourke, Lewis, and Snyder (1972) later found that a panel size of 13 was needed in order for an instrument to be reliable with a correlation coefficient of .9. To ensure the reliability of this instrument, 24 panelists were selected to serve on the panel for this study.

The 24 panelists for this study were Missouri school–based agricultural educators with expertise in teaching agricultural mechanics courses and related curriculum. To ensure a representative sample from each of the six agricultural education districts in Missouri, four teachers were identified from each district by agricultural education district supervisors and the professional development specialist from the Missouri Department of Elementary and Secondary Education. Contact information was attained from the *2008–2009 Missouri Agricultural Education Directory* (Missouri Department of Elementary and Secondary Education, 2008). All panelists were proficient with the entry level agricultural mechanics related technical skill areas needed by early career teachers.

Before the questionnaire was distributed to panelists, face and content validity were assessed by seven individuals with expertise in agricultural education, agricultural mechanics, and research methods and design.

Procedures

In the first round of the Delphi technique, the group members generate a list of goals, concerns, or issues toward which group consensus opinions are desired. The first questionnaire contained an open ended question that asked the respondents to list all agricultural mechanics skills that an entry–level Missouri agriculture teacher should be proficient in prior to starting a career in secondary agricultural education. Validity content analysis was conducted by experts including a teacher educator, three agricultural education graduate students with prior school–based agricultural education teaching experience, an agricultural systems management professor, and a professional development specialist for the Missouri Department of Elementary and Secondary Education. The content analysis resulted in 23 skill areas representative of common agricultural mechanics skills taught by Missouri school–based agricultural educators. These skill areas were then used to develop the second questionnaire.

For round two, the members of the group ranked each of the 23 skill areas, that resulted from round one, from 1 (most important skill) to 23 (least important skill) on questionnaire two. Respondents were instructed that no skill area may share the same ranking and that each skill area must be ranked. The responses were then combined to provide a mean group ranking for each skill area. The researchers then compiled the results of round two and created a new instrument for use in round 3.

Questionnaire three contained the same 23 skill areas and listed the mean group ranking for each skill area and the individual respondents ranking for each skill area. The respondent again ranked each skill area now knowing the mean group ranking and their previous ranking for each skill area. They were also asked to provide comments if their ranking of a particular skill area differed greatly from the mean group ranking for each skill area.

After the results of questionnaire three were collected, the researchers developed a new instrument for round four. The fourth questionnaire included all 23 skill areas, the mean group rankings for each skill area, the most recent individual respondents ranking for each skill area, and any comments that the respondents supplied concerning their dissent from group ranking for each skill area. The respondents ranked each skill area for the last time knowing the mean group ranking and their previous ranking for each skill area. The final contact with the group members was a summary of their ranking of the 23 agricultural mechanics skill areas that a beginning Missouri agricultural educator should be proficient in prior to teaching school–based agricultural education.

Data Analysis

Data relative to the research question were analyzed utilizing Microsoft Excel®. For the research question, the researchers determined the mean ranking, standard deviation, and rank for each agricultural mechanics skill area.

Results

Round One

A 75% response rate was achieved throughout all four rounds of the Delphi study. The response rate for the round 1 questionnaire was 95.83% (n = 23). The 23 respondents identified 180 essential agricultural mechanics skills that a beginning Missouri agricultural educator should be proficient in prior to teaching school–based agricultural education. Similar or duplicated statements (i.e. skills) were combined or eliminated while compound statements were separated (Shinn, Wingenbach, Briers, Lindner, & Baker, 2009). These skills were analyzed by a panel of experts, grouped into 23 skill areas, and were used to develop the round 2 questionnaire (see Table 1).

Table 1
Essential Agricultural Mechanics Skill Areas Identified in Round One

Skill Area(s)
Building material management
Carpentry
Cold metal work
Concrete
Electricity
Gas Metal Arc Welding (GMAW)
Gas Tungsten Arc Welding (GTAW)
Hand tools
Handheld power tools
Laboratory management
Laboratory safety
Measurement tools
Methods used to teach agricultural mechanics
Oxygen/ Acetylene Cutting (OAC)
Oxygen/ Acetylene Welding (OAW)
Plasma Arc Cutting (PAC)
Plumbing
Project management
Shielded Metal Arc Welding (SMAW)
Small gas engines
Soldering
Stationary power tools
Surveying

Round Two

In round two, respondents ranked the 23 agricultural mechanics skill areas, from 1 (most important skill) to 23 (least important skill), as they pertain to the skill areas needed by beginning Missouri agriculture teachers. These skill areas were then used to develop the questionnaire for round three of the study. The response rate for round two of the study was 83.33% (n = 20). Panel members identified laboratory safety as the top needed agricultural mechanics skill area (M = 2.25; SD = 1.62) for beginning Missouri agriculture teachers. Furthermore, panel members also identified the skill area of soldering (M = 21.60; SD = 2.14) as the least essential agricultural mechanics skill area for teachers. The remaining results of round two are displayed in Table 2.

Table 2
Ranking of Essential Agricultural Mechanics Skill Areas Identified in Round Two

Skill Area(s)	Mean Rank	*SD*	Overall Rank
Laboratory safety	2.25	1.62	1
Methods used to teach agricultural mechanics	3.50	4.55	2
Laboratory management	4.60	5.35	3
Shielded Metal Arc Welding (SMAW)	7.10	2.36	4
Measurement tools	7.80	4.90	5
Handheld power tools	7.90	3.31	6
Project management	8.50	5.25	7
Oxygen/ Acetylene Cutting (OAC)	8.60	3.41	8
Stationary power tools	9.10	3.54	9
Gas Metal Arc Welding (GMAW)	9.60	3.55	10
Building material management	9.75	6.02	11
Hand tools	11.15	4.94	12
Carpentry	12.80	3.71	13
Electricity	13.80	3.22	14
Plasma Arc Cutting (PAC)	13.80	3.83	15
Oxygen/ Acetylene Welding (OAW)	15.95	5.93	16
Small gas engines	16.50	3.62	17
Cold metal work	16.50	4.81	18
Plumbing	16.95	3.22	19
Concrete	16.95	3.27	20
Gas Tungsten Arc Welding (GTAW)	18.80	3.89	21
Surveying	21.05	1.67	22
Soldering	21.60	2.14	23

Round Three

Respondents again ranked the 23 agricultural mechanics skill areas, from 1 (most important skill) to 23 (least important skill), in round 3 of the study. The response rate for round three of the study was 79.16% (n = 19). Panel members again identified laboratory safety as the top needed agricultural mechanics skill area (M = 1.35; SD = 0.77) for beginning Missouri agriculture teachers. Additionally, panel members further identified the skill area of soldering (M = 21.74; SD = 2.08) as the least essential agricultural mechanics skill area for teachers. The remaining results of round three are displayed in Table 3. The results of this round were used to develop the questionnaire for round four of the study.

Table 3
Ranking of Essential Agricultural Mechanics Skill Areas Identified in Round Three

Skill Area(s)	Mean Rank	*SD*	Overall Rank
Laboratory safety	1.35	0.77	1
Methods used to teach agricultural mechanics	2.32	1.42	2
Laboratory management	3.42	1.98	3
Project management	6.00	2.16	4
Measurement tools	6.05	3.98	5
Shielded Metal Arc Welding (SMAW)	6.53	2.20	6
Handheld power tools	7.89	2.66	7
Oxygen/ Acetylene Cutting (OAC)	8.21	2.86	8
Stationary power tools	9.05	2.17	9
Gas Metal Arc Welding (GMAW)	10.00	3.06	10
Building material management	10.37	4.71	11
Hand tools	11.89	4.76	12
Carpentry	12.63	2.65	13
Electricity	14.11	2.47	14
Plasma Arc Cutting (PAC)	14.68	3.73	15
Oxygen/ Acetylene Welding (OAW)	16.58	3.29	16
Cold metalwork	16.68	3.56	17
Small gas engines	17.21	3.17	18
Concrete	17.95	3.06	19
Plumbing	18.05	2.39	20
Gas Tungsten Arc Welding (GTAW)	20.21	2.88	21
Surveying	21.16	1.61	22
Soldering	21.74	2.08	23

Round Four

In the final round respondents ranked the 23 agricultural mechanics skill areas, from 1 (most important skill) to 23 (least important skill), as they pertain to the skill areas that beginning Missouri agriculture teachers should be proficient in, for the last time. The response rate for round four of the study was 75.00% (n = 18). Panel members continued to identify laboratory safety as the top needed agricultural mechanics skill area (M = 1.50; SD = 0.79) for beginning Missouri agriculture teachers. Furthermore, panel members also identified the skill area of soldering (M = 22.17; SD = 2.15) as the least essential agricultural mechanics skill area for teachers. The remaining results of round four are displayed in Table 4.

Table 4
Ranking of Essential Agricultural Mechanics Skill Areas Identified in Round Four

Skill Area(s)	Mean Rank	*SD*	Overall Rank
Laboratory safety	1.50	0.79	1
Methods used to teach agricultural mechanics	2.28	1.36	2
Laboratory management	3.33	2.03	3
Measurement tools	5.06	2.78	4
Project management	5.39	2.03	5
Shielded Metal Arc Welding (SMAW)	6.83	1.86	6
Handheld power tools	7.61	2.33	7
Oxygen/ Acetylene Cutting (OAC)	8.33	2.89	8
Stationary power tools	8.83	2.73	9
Gas Metal Arc Welding (GMAW)	10.39	2.79	10
Building material management	11.22	4.23	11
Carpentry	12.44	2.15	12
Hand tools	12.72	3.63	13
Electricity	13.61	2.30	14
Plasma Arc Cutting (PAC)	15.06	3.35	15
Oxygen/ Acetylene Welding (OAW)	16.83	2.20	16
Cold metalwork	16.89	3.38	17
Small gas engines	17.00	3.11	18
Concrete	18.00	3.07	19
Plumbing	18.11	2.49	20
Gas Tungsten Arc Welding (GTAW)	20.50	2.57	21
Surveying	21.00	1.46	22
Soldering	22.17	2.15	23

Conclusions, Implications, and Recommendations

A panel of experts identified 23 essential agricultural mechanics skill areas that beginning Missouri agriculture teachers should be proficient in prior to starting a career as a school–based agricultural educator. These skill areas ranged from highly technical (Gas Tungsten Arc Welding) to simple (hand tools). Laboratory safety was consistently the highest ranked skill area.

As result of this study, several implicative questions arose: Are preservice institutions in Missouri preparing new agriculture teachers with the needed agricultural mechanics skill areas to successfully gain employment upon graduation and be retained in the teaching profession? If the answer to this question is no, then why are teacher educators not adequately preparing these new teachers? Furthermore, what professional development workshops are being provided to existing teachers in the area of agricultural mechanics skill acquisition? Future research will be necessary to answer these fore mentioned questions and others.

Additionally, are the current secondary agricultural mechanics curriculum and skills being taught in Missouri secondary agricultural education programs still viable for high school students who enter the workforce upon graduation? Are these graduates prepared for the modern workforce that emphasizes STEM integration and modern, technology–related skills? What are the current needs of the agricultural mechanics industry, in terms of post high school graduates and their knowledge and skill level? Should industry advisory groups be implemented to help modernize this state's agricultural mechanics curriculum and the employability skills of high school graduates?

Based upon the results of this study, the researchers recommend the following actions:

- Institutions from the state of Missouri should use this list of skill areas and determine if preservice students are being adequately educated in agricultural mechanics.

- Teacher educators and state professional development staff should conduct research to determine the professional development needs of existing agriculture teachers in the area of agricultural mechanics skill proficiency.
- Teacher educators and state professional development staff should provide professional development educational opportunities for teachers, based upon empirical research.
- Researchers should assess the agricultural mechanics technology currently located within preservice agricultural education programs and compare it to the curriculum taught at the secondary level.
- Industry advisory groups should be developed and utilized to review the secondary agricultural mechanics curriculum within the state of Missouri and to determine if the existing curriculum and subsequent skills meet the needs of employers of high school graduates.

A shortage of qualified agriculture teachers is an unfortunate reality facing FFA and agricultural education (National FFA Organization, 2010). The mandate requiring highly qualified teachers, indicated in the *No Child Left Behind Act*, further complicates the issue when considering what constitutes highly qualified—especially in the laboratory setting. Therefore, teachers who are responsible for providing laboratory instruction and management must be highly qualified in areas beyond classroom instruction.

It is imperative that teacher educators, cooperating teachers, preservice teachers, and university administrators (i.e. department heads, deans, etc.) develop and follow an agreed upon plan of field–based experiences, to provide preservice teachers an opportunity to develop or expand skills and knowledge that may not be adequately provided for in their respective teacher education programs (Findlay, 1992). Although the focus of this study was beginning teachers, it should also be noted that the voids in teacher preparation programs are not new (Dyer & Andreasen, 1999). Further research is necessary to determine agricultural mechanics skill area needs of in–service teachers across the nation. National in–service needs, agricultural mechanics or otherwise, must be clearly support experiential learning, problem–based learning, social cognition, and reflective practice (Whittington, 2005), to ensure preservice education programs are preparing highly qualified teachers.

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P. RYAN SAUCIER is an Assistant Professor of Agricultural Education and Agricultural Systems Management in the Department of Agriculture at Texas State University – San Marcos, 601 University Drive, San Marcos, TX 78666, ryansaucier@txstate.edu

BILLY R. MCKIM is an Assistant Professor in the Department of Agricultural Leadership, Education, and Communications at Texas A&M University, and an Extension Specialist for the Texas AgriLife Extension Service, 2116 TAMU, College Station, TX 77843–2116, brmckim@tamu.edu

JOHN D. TUMMONS is an Instructor and Director of Teacher Certification in the Department of Agricultural Education at the University of Missouri, 123 Gentry Hall, Columbia, MO 65211, tummonsj@missouri.edu