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Does Prior Experience in Secondary Agricultural Mechanics Affect Pre-service Agricultural Education Teachers' Intentions to Enroll in Post-secondary Agricultural Mechanics Coursework?

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Agricultural mechanics coursework has historically been considered an important and necessary construct of the secondary agricultural education curriculum (Burris, Robinson, & Terry, 2005). With expectations of offering secondary agricultural mechanics coursework apparent, it is vital that agricultural education teachers be prepared to address these curriculum needs. Recent evidence (Burris, McLaughlin, McCulloch, Brashears, & Fraze, 2010) indicated that many agricultural education teachers (particularly early-career teachers) felt less comfortable teaching agricultural mechanics than other agricultural content areas. Hubert and Leising (2000) indicated, on average, potential agriculture education teachers are only required to enroll in two (2) three-credit hour courses to meet certification requirements. The purpose of this study was to describe potential relationships between the quantity of agricultural mechanics training and skills received at the secondary and at the post-secondary levels. Correlations were calculated to determine the magnitude of these relationships. Statistically significant, positive correlations were found in each of the skill areas. The researchers recommend that agricultural mechanics coursework be increased and enhanced at teacher preparation institutions. Also, the modernization of secondary and post-secondary agricultural mechanics facilities and curricula to reflect increases in available technologies should be considered as a method to enhance students' interests in the content area.

Keywords: agricultural mechanics; agricultural education; secondary teachers; Iowa

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Agricultural mechanics coursework has historically been considered an important and necessary construct of the secondary agricultural education curriculum (Anderson, Velez, & Anderson, 2011; Burris et al., 2005). Agricultural mechanics content provides students with opportunities to engage in hands-on learning experiences that emphasize cognitive development, mechanical skill attainment, and academic concept application through a technology-rich context (Hubert & Leising, 2000; Parr, Edwards, & Leising, 2009). Further, the agricultural industry has indicated a desire for entry-level employees to possess basic mechanical skills (Ramsey & Edwards, 2011), demonstrating industry-led support for secondary mechanics education. As a result, these requests continue to drive enrollment in these courses (Burris et al., 2005; Hubert & Leising, 2000).

With the expectations of offering secondary agricultural mechanics coursework apparent, it is vital that agricultural education teachers be prepared to offer such courses. Recent evidence (Burris et al., 2010) indicated many agricultural education teachers (particularly early-career teachers) felt less comfortable teaching agricultural mechanics than other agricultural content areas. However, these comfort levels seemed to change over time. Burris et al. (2010) further explained this situation by stating that "[a] possible explanation… is that teachers are more confident in that subject as their time in agricultural mechanics lab increases" (p. 29). Perhaps agricultural mechanics training prior to the first-year teaching experience could increase comfort in teaching agricultural mechanics.

Research has indicated that previous experience in a particular content area (i.e., agricultural mechanics) creates higher self-confidence regarding the given subject (Burris et al., 2010; Stripling & Roberts, 2012). Experiential learning processes provide opportunities for personal development, increased comprehension of skills, and valuable educational opportunities that emphasize real-world learning, all of which are emphasized in the secondary agricultural education philosophy (Roberts, 2006). Thus, the establishment of a link between teachers' own experiences as secondary agricultural education students and the desire to teach the subject as teachers themselves becomes clearer. As agricultural education teachers engage in additional experiential learning activities (such as agricultural mechanics instruction) that result in positive experiences, it is reasonable to postulate that they will gravitate toward teaching additional levels of that particular content (Krysher, Robinson, Montgomery, & Edwards, 2012).

Reis and Kahler (1997) discovered that students who enrolled in secondary agricultural education programs in Iowa exhibited dissatisfaction with the agricultural mechanics coursework offered. However, these students expressed higher satisfaction with other laboratory facilities available to them. It is conceivable that students in other states could hold these views as well. Teachers can wield considerable influence on the achievement of students enrolled in agricultural education programs (Park & Osborne, 2007; Sankey & Foster, 2012). Perhaps teachers' preparation and experience in agricultural mechanics (or lack thereof) may have hindered the educational potential of the mechanics laboratory. As laboratories remain an important component of agricultural education programs (Phipps, Osborne, Dyer, & Ball, 2008; Shoulders & Myers, 2012), it is vital that quality learning experiences occur within those environments to provide students with high-quality agricultural education instruction. Robust secondary and post-secondary programs must be present to prepare the next generation of agricultural education teachers in a wide variety of ways (Phipps et al., 2008). Are agricultural mechanics teachers, laboratories, and curricula prepared to address the need for high-quality learning endeavors?

Fraze, Wingenbach, Rutherford, and Wolfskill (2011) concluded that secondary students' perceptions of agricultural content can be positively impacted through engaging and interesting education activities. Agricultural education coursework (such as agricultural mechanics courses) utilizes a broad spectrum of experiences and activities to engage students through emphasis on critical-thinking skills, competence development, and hands-on learning (Baker, Robinson, & Kolb, 2012; Phipps et al., 2008). The possibility exists that because secondary students base educational pursuits on previous experiences and perceptions in a content area (Fraze et al., 2011; Sutphin & Newsom-Stewart, 1995), post-secondary students may do the same. Could this be true for pre-service agricultural education teachers as well? Ultimately, the question becomes whether or not prior experience in secondary agricultural mechanics coursework affects pre-service agricultural education teachers' intentions to enroll in post-secondary agricultural mechanics courses.

Theoretical Framework

The fundamental theory that guided this study was grounded in the Theory of Reasoned Action as framed by Fishbein and Ajzen (1975) (see Figure 1). This theory was selected based on the researchers' initial posit that perhaps previous experience in secondary agricultural mechanics coursework was relative to pre-service teachers' intentions to pursue enrollment in post-secondary agricultural mechanics coursework. As adapted to this study, the Theory of Reasoned Action suggests those current agricultural education teachers' personal experiences, observations, knowledge, and values about agricultural mechanics were gained while they were at the secondary level, which affected their willingness to pursue agricultural mechanics classes at the post-secondary level. In turn, this also affected their beliefs, intentions, and decisions to teach agricultural mechanics as secondary teachers. Thus, pre-service agricultural education teachers' attitudes about agricultural mechanics in secondary agricultural education are a likely determinant of the extent to which agricultural education teachers pursue agricultural mechanics courses at the post-secondary level.

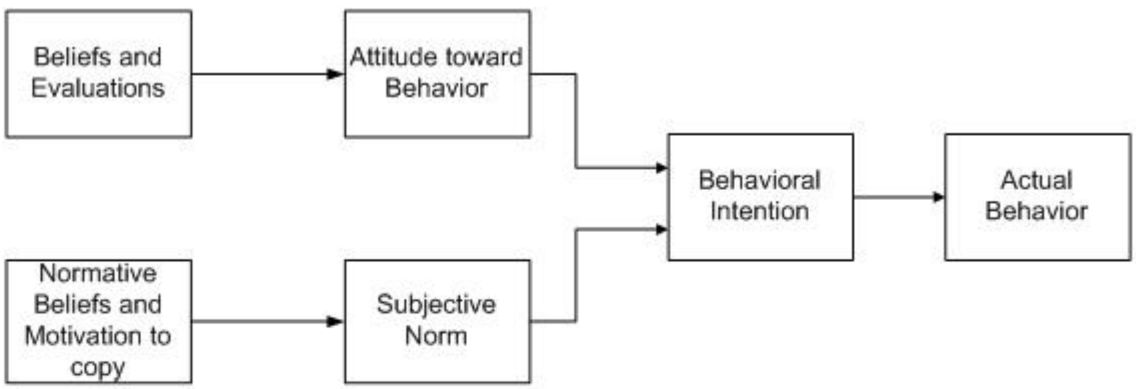

Figure 1. Theory of Reasoned Action (Adopted from Fishbein & Ajzen, 1975).

When considering the Theory of Reasoned Action, the researchers postulated that pre-service teachers' prior experiences with secondary agricultural mechanics held influence over their intentions to enroll in post-secondary agricultural mechanics coursework. The pre-service teachers' exposure to secondary agricultural mechanics helped to develop their *Beliefs and Evaluations* based on their perceptions of their experiences (i.e., positive or negative) and that their *Attitude[s] toward Behavior* were thus affected. Further, these pre-service teachers' enrollment choices could have resulted from *Normative Beliefs and Motivation to copy* (e.g., pressures based on the actions and beliefs of peers, teachers in the profession, and teacher educators), as these parties could have held influence over decisions to enroll in post-secondary agricultural mechanics coursework. Pre-service teachers' enrollment choices could further have been based around *Subjective Norm[s]* (i.e., pressures, beliefs, and philosophies from others in the profession). As a result of these four primary factors, pre-service teachers' *Behavioral Intention[s]* (e.g., intended course enrollment) could have been shaped into the final *Actual Behavior* (i.e., choice of enrollment in post-secondary agricultural mechanics coursework).

In addition to the Theory of Reasoned Action, Nora's (2003) Student/Institution Engagement Model emphasized the unique interaction between the student and the institution as well as prior research around students' interests in and decisions to pursue a STEM major which could include agricultural education. Students bring pre-college characteristics to college, such as high school experiences and prior academic achievement. These characteristics can influence their college experiences and subsequent connection to the institution, their chosen degree and the courses selected. The prior experiences and pre-college characteristics described by Nora's (2003) Student/Institution Engagement

Model (e.g., secondary school experiences) are congruent with the *Beliefs and Evaluations*, *Attitude toward Behavior*, *Behavioral Intentions* and *Actual Behavior* portions of Fishbein and Ajzen's Theory of Reasoned Action (1975). These notions would indicate that students have already developed an intention to enroll in agricultural mechanics courses prior to entering a post-secondary institution. A possible implication is that enrollment in post-secondary agricultural mechanics coursework could further guide pre-service teachers' intentions to teach agricultural mechanics curricula within their own secondary agricultural education programs in the future.

Purpose and Objectives

The purpose of this study was to describe potential relationships between the quantity of agricultural mechanics training and skills received at the secondary and at the post-secondary levels. This study aligns with the American Association for Agricultural Education's National Research Agenda (Doerfert, 2011) Research Priority Area 3: Sufficient Scientific and Professional Workforce That Addresses the Challenges of the 21st Century. As agricultural education students and the agricultural industry desire basic education in the principles of agricultural mechanics (Ramsey & Edwards, 2011), agricultural education teachers are primarily responsible for providing the training in the content area. Training in a technologically-rich field, such as agricultural mechanics, can help to prepare secondary students for the rigors, needs, and challenges of the real world (Doerfert, 2011).

This research purpose also aligns with the National Career and Technical Education Research Agenda (Lambeth, Elliot, & Joerger, 2008) research problem area (RPA) 5: Program Relevance and Effectiveness, specifically relating to research activity (RA) 5.1.3: Professional Development of Teachers; with secondary implications in RA 1.2.2: CTE Teacher Education. As agricultural mechanics coursework is limited at many teacher preparation programs (Hubert & Leising, 2000), it is imperative that agricultural education teachers become skilled in agricultural mechanics coursework to better prepare the future teachers currently enrolled in secondary programs (Burris et al., 2005). The following research objectives were identified to accomplish this study's purpose:

1. Describe selected personal and professional characteristics of Iowa secondary agricultural education instructors.

2. Examine the relationship between the amount of agricultural mechanics training received at the secondary and post-secondary levels.

Methods and Procedures

This descriptive study used survey research methods to summarize characteristics, attitudes, and opinions to accurately describe a norm (Ary, Jacobs, Razavieh, & Sorensen, 2006). A researcher-modified, paper based questionnaire was used to address the objectives of the study. The instrument contained three sections. Section one included 54 skills related to agricultural mechanics. Skills were separated into five domains, including: Mechanic Skills, Structures/Construction, Electrification, Power and Machinery, and Soil and Water. Respondents were asked to use a five-point Likert-type scale to indicate the amount of agricultural mechanics training and skills they received at both the secondary and post-secondary levels. Section two consisted of 15 demographic questions relating to the teacher, and section three included nine questions about program and school characteristics. Content validity was reviewed by a team of five university faculty members with expertise in the fields of agricultural mechanics and agricultural education.

Following suggestions of Dillman, Smyth, and Christian (2009), the initial electronic version of the instrument was pretested through a pilot study with a group of twelve agricultural education teachers in a nearby state. Suggestions from this pilot study led researchers to adopt a paper-based, rather than electronic, instrument. Post-hoc reliability analysis was used to determine a Cronbach's alpha coefficient. The portion of the instrument that addressed agricultural mechanics training and skills received at the secondary level indicated a reliability consistency at the .976 level (α = .976). The portion of the instrument that addressed agricultural mechanics training and skills received at the post-secondary level indicated a reliability consistency at the .980 level (α = .980). George and Mallery (2003) determined that reliability coefficients above the .9 level were "excellent" (p. 231).

Data were collected through a census study conducted during the 2011 Iowa agricultural education teachers' conference. This population was purposively targeted because of the teachers' likelihood to be involved in additional professional development activities. Researchers distributed a questionnaire to each secondary instructor (N = 130) in attendance and asked that it be completed by the end of the conference. Each participant was offered a power tool institute safety curriculum as an incentive for completing and returning the questionnaire. These efforts yielded a sample of 103 useable instruments for a 79.2% response rate. No further effort was made to obtain data from non-respondents. As a result, non-response error was addressed following the suggestions of Miller and Smith (1983) by comparing respondents' personal and program demographic data to data from the Iowa Department of Education (2010). A Pearson's χ^2 analysis yielded no significant differences ($p > .05$) for gender, age, highest degrees held, years of teaching experience, or size of school community between respondents and the general population of agricultural education teachers in Iowa. However, due to the purposively selected sample, data from this study should be interpreted with care so as not to extrapolate beyond the target population. Data were coded and analyzed using JMP Pro Version 9.0.0.

According to Lehman, O'Rourke, Hatcher, and Stepanski (2005), Spearman correlations can be used "when both variables are numeric and have an ordinal modeling type (level of measurement)" (p. 123). The variables within this study (i.e., teacher/program demographics and agricultural mechanics training and skills received at the secondary and post-secondary levels) were quantitative in nature and had distinct levels of measurement. Therefore, Spearman correlations were used in this study to examine potential relationships between the amount of agricultural mechanics training and skills respondents indicated receiving at the secondary and post-secondary levels. Magnitude of the correlations was interpreted using the Davis Convention (1971) and are as follows: those between .01 and .09 were determined negligible, those between .10 and .29 were determined low, those between .30 and .49 were determined moderate, those between .50 and .69 were determined to be substantial, and those .70 or higher were determined to be very strong.

Results

Research Objective 1

The first research objective sought to describe the demographic characteristics of Iowa agricultural education teachers who participated in the study. The typical respondent was male (n = 69, 67.0%), employed by a rural school district (n = 80, 79.2%), in a single-teacher department (n = 91, 90.0%) and reported 10 or fewer years of teaching experience (n = 54, 52.4%). The highest frequency of teachers reported less than five years of teaching experience (n = 32, 31.1%). Conversely, slightly more than one quarter (n = 26, 25.2%) of the respondents indicated having more than 25 years of teaching experience. Most (n = 64, 62.1%) indicated their highest level of education was a bachelor's degree while over a third (n = 39, 37.9%) reported that they held a master's degree.

Table 1

Summary of Respondents' Demographic Characteristics

	f	%
Gender		
Male	69	67.0
Female	34	33.0
Highest Level of Education		
Bachelor's Degree	64	62.1
Master's Degree	39	37.9
Years of Teaching Experience		
0-5	32	31.1
6-10	22	21.4
11-15	11	10.7
16-20	7	6.8
21-25	5	4.8
26-30	10	9.7
More than 30	16	15.5
Campus Location Designation		
Rural (population less than 5,000)	80	79.2
Small Urban (population between 5,000 and 20,000)	19	18.8
Urban (population greater than 20,000)	2	2.0
Number of Agricultural Science Teachers in Department		
1 Teacher	91	90.0
2 Teachers	7	7.0
3 Teachers	3	3.0

Research Objective 2

Research objective two, examine the relationship between the amount of agricultural mechanics training received at the secondary and post-secondary levels, utilized Spearman Rho correlations to determine significant ($p < .05$) relationships (see Table 2 through Table 6). It should be noted that each skill area is correlated within the respective area and not representative of a composite of all sub-constructs. For example, *Electrical Safety* received at the secondary level is correlated to *Electrical Safety* received at the post-secondary level.

Relationships between the quantity of mechanics training and skills received at the secondary and post-secondary levels are displayed in Table 2. Results indicated significant positive correlations in all of the mechanics skill areas. The skills representing the strongest correlations were oxy-propylene cutting ($r_s = .659$) and computer aided design (CNC) ($r_s = .629$). The skills with the weakest correlations were oxy-acetylene cutting ($r_s = .338$) and shielded metal arc welding (SMAW) ($r_s = .367$).

Table 2

Spearman Rho Correlational Relationships between the Quantity of Mechanics Training and Skills Received at the Secondary and Post-secondary Levels

Skill Area	*n*	Spearman Rho Correlation
Oxy-propylene Cutting	83	.659*
Computer Aided Design (CNC)	82	.629*
Metallurgy and Metal Work	84	.555*
Fencing	83	.554*
Pipe Cut. And Threading	83	.537*
Plumbing	85	.523*
Mechanical Safety	88	.492*
Hot Metal Work	83	.489*
Tool Conditioning	84	.482*
Plasma Cutting	91	.471*
Cold Metal Work	84	.445*
Soldering	89	.432*
Oxy-acetylene Brazing	91	.411*
Oxy-acetylene Welding	96	.389*
Welding Safety	96	.386*
GMAW Welding (MIG)	94	.385*
GTAW Welding (TIG)	84	.374*
SMAW Welding (Arc)	96	.367*
Oxy-acetylene Cutting	97	.338*

Note. *$p < .05$

Data concerning the relationship between the quantity of structure and construction training and skills received at the secondary and post-secondary levels can be viewed in Table 3. The results indicated significant positive correlations in all of the structure and construction skill areas. The skills with the strongest correlations were construction skills (carpentry) (r_s = .553) and fasteners (r_s = .535). Conversely, the skills with the weakest correlations were concrete (r_s = .420) and the selection of materials (r_s = .438).

Table 3

Spearman Rho Correlational Relationships between the Quantity of Structure and Construction Training and Skills Received at the Secondary and Post-secondary Levels

Skill Area	*n*	Spearman Rho Correlation
Construction Skills (Carpentry)	90	.553*
Fasteners	86	.535*
Construction and Shop Safety	91	.529*
Bill of Materials	88	.519*
Wood Working Hand Tools	92	.481*
Wood Working Power Tools	91	.476*
Drawing and Sketching	83	.447*
Selection of Materials	87	.438*
Concrete	85	.420*

Note. *p < .05

Table 4 reported data describing the relationship between the quantity of electrification training and skills received at the secondary and post-secondary levels. The results indicated significant positive correlations in all of the electrification skill areas. The skills with the strongest correlations were electrical safety (r_s = .641) and types of electric motors (r_s = .575). On the other hand, the skills with the weakest correlations were electricity controls (r_s = .466), wiring skills (switches and outlets) (r_s = .543), and cleaning motors (r_s = .543).

Table 4

Spearman Rho Correlational Relationships between the Quantity of Electrification Training and Skills Received at the Secondary and Post-secondary Levels

Skill Area	*n*	Spearman Rho Correlation
Electrical Safety	86	.641*
Types of Electrical Motors	84	.575*
Electrician Tools	89	.555*
Wiring Skills (Switches & Outlets)	89	.543*
Cleaning Motors	80	.543*
Electricity Controls	87	.466*

Note. *p < .05

Data exploring the relationship between the quantity of power and machinery training and skills received at the secondary and post-secondary levels are presented in Table 5. Results indicated significant positive correlations in all of the power and machinery skill areas. The skills with the strongest correlations were tractor selection (r_s = .758) and tractor overhaul (r_s = .707). In contrast, the skills with the weakest correlations were small engine services - 2 cycle (r_s = .337) and small engine services - 4 cycle (r_s = .478). Data pertinent to describing the relationship between the quantity of soil and water training and skills received at the secondary and post-secondary levels can be viewed in Table 6. Results indicated significant positive correlations in all of the soil and water skill areas. The skills with the strongest correlations were profile leveling (rs = .756) and differential leveling (rs = .714). The skills with the weakest correlations were use of survey equipment (rs = .543) and legal land descriptions (rs = .429).

Table 5

Spearman Rho Correlational Relationships between the Quantity of Power and Machinery Training and Skills Received at the Secondary and Post-secondary Levels

Skill Area	*n*	Spearman Rho Correlation
Tractor Selection	78	.758*
Tractor Overhaul	79	.707*
Machinery Operation	81	.696*
Power and Machinery Safety	83	.675*
Tractor Maintenance	80	.654*
Machinery Selection	80	.630*
Tractor Operation	79	.621*
Tractor Safety	82	.593*
Small Engine Safety	85	.592*
Service Machinery	79	.568*
Tractor Driving	80	.559*
Small Engine Overhaul	85	.551*
Tractor Service	81	.541*
Small Engine Services - 4 Cycle	85	.478*
Small Engine Services - 2 Cycle	83	.337*

Note. *p < .05

Table 6

Spearman Rho Correlational Relationships between the Quantity of Soil and Water Training and Skills Received at the Secondary and Post-secondary Levels

Skill Area	*n*	Spearman Rho Correlation
Profile Leveling	75	.756*
Differential Leveling	75	.714*
Global Positioning Systems (GPS)	82	.603*
Use of Survey Equipment	82	.543*
Legal Land Descriptions	83	.429*

Note. *p < .05

Conclusions/Implications

This descriptive study was designed to address the question of whether or not a correlation existed between the quantity of agricultural mechanics training and skills received at the secondary and post-secondary levels. The first objective sought to describe the demographic characteristics of agricultural education teachers in Iowa who participated in this study. The typical respondent was male (*n* = 69, 67.0%), reported 10 or fewer years of teaching experience (*n* = 54, 52.4%) and indicated their highest level of education was a bachelor's degree (*n* = 64, 62.1%). It is also worth noting that slightly more than one quarter (*n* = 26, 25.2%) of the respondents indicated having more than 25 years of teaching experience, foreseeably implying a high rate of retirements in the near future. These results aligned with previous research indicating Iowa agricultural education teacher demographics (*n* = 195) as 71.9% male, 42.5% with 10 or fewer years of teaching, and 61.5% with a bachelor's degree as their highest level of education (Iowa Department of Education, 2010).

The second objective of this study sought to examine the relationship between the amount of agricultural mechanics training received at the secondary and post-secondary levels. Spearman correlations were utilized to determine if such a relationship existed. The researchers discovered a significant positive relationship with all 54 skills. The strongest correlations existed in the "Tractor Selection" (r_s = .758) and "Profile Leveling" (r_s = .756) skills while the weakest correlations were found in the "Oxy-acetylene Cutting" (r_s = .338) and "Small Engine Services – 2 Cycle" (r_s =. 337) skills. This data set indicated that a significant relationship does exist between the amount of agricultural mechanics training received at the secondary level and pre-service agricultural education teachers' intentions to pursue post-secondary agricultural mechanics instruction.

Saucier, McKim, and Tummons (2012) found that the in-service needs of Missouri secondary agricultural education teachers were highest in laboratory safety followed by areas such as welding, carpentry, electricity, engines, concrete, and plumbing. Within this population, the researchers found that significant correlations existed between the instruction of agricultural mechanics areas such as construction and shop safety and electrical, welding, carpentry, concrete, and plumbing skills at the secondary and post-secondary levels, thereby indicating that instruction in the topic was given. However, Saucier et al. (2012) also found that teachers identified needs for development in these skill areas. The possibility remains that while these teachers identified having received previous instruction in these areas, perhaps agricultural mechanics educational needs have not been met, indicating the potential presence of agricultural mechanics knowledge gaps.

In accordance with the findings of Fraze et al. (2011), these data suggest that previous exposure to topics during secondary level instruction influenced the pursuit of those topics in post-secondary coursework. Further, this data is supported by Fishbein and Ajzen's (1975) Theory of Reasoned Action, as these agricultural education teachers' beliefs, intentions, and decisions to teach agricultural mechanics were seemingly influenced by the number of agricultural mechanics courses taken while they were enrolled as secondary students. As a result, it is conceivable to postulate that pre-service agricultural education teachers' attitudes about agricultural mechanics in secondary agricultural education are a likely determinant of the extent to which they pursue agricultural mechanics courses at the post-secondary level. Pursuit of additional agricultural mechanics education at the post-secondary level could be indicative of pre-service teachers' intentions to teach agricultural mechanics in their own programs.

Agricultural education teachers wield significant influence over students' content acquisition in the comprehensive agricultural education program (Park & Osborne, 2007; Sankey & Foster, 2012). Active agricultural education teachers' current curricula could hold considerable influence over the content areas that future teachers choose to address. Reis and Kahler (1997) found that while secondary agricultural education students in Iowa were pleased with most aspects of agricultural education, they were discontent with the agricultural mechanics coursework offered in their schools. Perhaps this is true for students enrolled in secondary agricultural education today as well. It is reasonable to hypothesize that if learning in agricultural mechanics courses is unsatisfactory or nonexistent at the secondary level, then pre-service agricultural education teachers could choose to forego post-secondary agricultural mechanics instruction completely. In turn this could compromise the receipt of valuable instructional time in the content area. Despite the decline in required post-secondary agricultural mechanics coursework (Hubert & Leising, 2000), it is imperative that agricultural education teachers still maintain competence in the content area (Saucier et al., 2012) to meet the needs of stakeholders (Ramsey & Edwards, 2011).

Recommendations

The researchers recognize that correlations are not causations. Therefore, more research should be conducted exploring additional factors that could potentially influence pre-service agricultural education teachers' decisions to enroll in selected agricultural mechanics courses at the post-secondary level. Are their decisions influenced by their experiences and exposure to agricultural mechanics content areas at the secondary level, or are they just a result of the required coursework? Future studies should also be directed toward creating an up-to-date catalog of the required agricultural mechanics coursework at agricultural education teacher preparation institutions. Furthermore, in-depth explorations of how these coursework requirements are determined should be examined. Is it a result from university tradition? Who are the stakeholders in the development of agricultural mechanics courses at the secondary and post-secondary levels? How much congruency should exist between the two levels?

Regarding teacher preparation practices, it is imperative that agricultural education teachers should receive as much positive exposure to agricultural mechanics as possible in order to ensure future instruction at the secondary level (Burris et al., 2005). Positive experiences in content areas influence desires and decisions to pursue further educational opportunities in those fields (Fishbein & Ajzen, 1975; Fraze et al., 2011). Thus, in order to provide maximum opportunities for cognitive growth in agricultural mechanics, quality instruction should continue at both the secondary and post-secondary levels (Burris et al., 2005; Hubert & Leising, 2000). Experiential learning provided through laboratory experiences remains a dominant and effective tool in agricultural education (Roberts, 2006; Shoulders & Myers, 2012). Thus, research should be conducted to determine if high-quality experiential learning is currently taking place in secondary and post-secondary agricultural mechanics coursework and laboratory experiences.

To increase student enrollment in secondary agricultural mechanics, the researchers recommend that agricultural education teachers launch efforts to modernize existing secondary agricultural mechanics curricula and facilities. Due to the evolutionary nature of mechanics technology, transitioning agricultural mechanics programs to reflect updates in the field and attract student attention is essential (Saucier & McKim, 2011). Student interests are in a perpetual state of change, thereby demanding that curricula be updated often to reflect those changes (Sutphin & Newsom-Stewart, 1995). Challenging hands-on learning experiences (particularly in courses that utilize learning laboratories extensively, such as agricultural mechanics) provide methods through which teachers can replicate real-world situations and students can experience practical, industry-based educational settings (Shoulders & Myers, 2012). Increasing the rigor of secondary agricultural mechanics coursework could help to address changing student interests through movement away from traditional production-oriented agricultural education curricula and toward coursework that emphasizes theory and application (Parr et al., 2009), thereby increasing students' utility of the agricultural mechanics curriculum. As a result, student enrollment in these courses may increase.

To address post-secondary practices, efforts should be made to expand the agricultural mechanics coursework offered to pre-service agricultural education teachers. As credit hour requirements for pre-service agricultural education teachers have decreased, agricultural mechanics coursework is often removed from teacher preparation curricula (Burris et al., 2005; Hubert & Leising, 2000). Because agricultural systems technology is continuously advancing, teachers must be prepared to keep pace with these new innovations (Doerfert, 2011). By requiring that pre-service teachers enroll in agricultural mechanics coursework at the post-secondary level, beginning teachers will be better prepared to address the need for "a highly educated, skilled workforce capable of providing solutions to 21st century challenges" (Doerfert, 2011, p. 19). It is vital that agricultural education teacher preparation programs continue to develop pre-service teachers' competencies in this fundamental curriculum area. Beginning teachers feel less confident teaching agricultural mechanics than any other curriculum area (Burris et al., 2010). However, Burris et al. (2010) indicated confidence in teaching agricultural mechanics increases with experience.

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