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Agricultural Education Teachers Competence to Teach Agricultural Mechanics: A Gender Comparison

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Abstract
Gender equality in agricultural education has been achieved in most areas of agricultural education, except in agricultural mechanics (Johnson, 1991). This study sought to examine the self-perceived competence to teach agricultural mechanics skills and the amount of training received at the university level in relation to gender by Iowa agricultural education instructors. We found differences in self-perceived levels of competence to teach agricultural mechanics skills and the amount of training received at the university level in relation to gender. We also found that males enjoyed teaching agricultural mechanics skills, whereas females did not enjoy teaching agricultural mechanics skills. Even though female agricultural education teachers did not enjoy teaching agricultural mechanics skills, they identified agricultural mechanics as important to the state curriculum. We recommend that university faculty adopt strategies that will help strengthen the confidence of female preservice teacher education candidates to teach agricultural mechanics skills. It is also recommended that university faculty provide opportunities for preservice teacher education candidates to observe exemplary female agricultural education teachers teaching agricultural mechanics.

Introduction
The profession of teaching at the secondary level is often considered a female dominated career, although in agricultural education it previously appeared to be male dominated (Rocca & Washburn, 2008). However, recently research by Smith, et al. (2022) indicated that the percentage of women in agricultural education has been increasing. According to the latest national study on the supply and demand of secondary agricultural education teachers, female teachers occupied the majority of the teaching positions (Smith, et al., 2022). Furthermore, the Smith et al. study noted that females made up 76% of the newly qualified agricultural education teachers.

As the agricultural education teaching profession continues to become more gender-balanced in most areas of agricultural education, historically agricultural mechanics is an area where sex-equality has not been achieved (Cole, 1985; Johnson, 1991; Kelsey, 2006) and needs to be revisited. Dillingham, et al. (1993) stated that only 9.5% of women agricultural education teachers preferred to teach agricultural mechanics over other agricultural education courses.

Conversely, 52.4% of women would rather teach agricultural education courses other than agricultural mechanics. The other 38.1% of women did not have a preference between agricultural mechanics and other agricultural education courses. However, Foster, et al., (1991) found that women did enjoy teaching agricultural mechanics courses. Women teachers identified one factor capable of deterring women from becoming agricultural education teachers--a lack of knowledge within agricultural subject areas. One of the subject areas within agricultural education that requires a sound and structured program to obtain competence in order to teach is agricultural mechanics (Hubert & Leising, 2000).

Agricultural mechanics has been defined as a laboratory-based instructional area where additional time is needed to effectively prepare teachers (Hubert & Leising, 2000). Osborne (1992) stated that agricultural mechanics has the greatest potential to address many teaching objectives when compared with any other segment of the agricultural education curriculum. The wide range of agricultural mechanics skills taught can have a lasting impact on a student's life by molding future life skills (Farrell, 1984) and a student's ability to work with technology (Harper, 1990). Byrd et al. (2015), found that most agricultural education teachers were not prepared well enough to teach agricultural mechanics, however they still enjoyed teaching agricultural mechanics skills.

Nonetheless, learning the required competencies to effectively teach agriculture can be a daunting task for males and females alike. Eccles et al. (1993), indicated that differences emerge in an individual's perceived competence in gender-based activities. Male teachers may exhibit higher levels of perceived competency in an agricultural mechanics course due to the appearance of being a male-dominated activity. Ensuring and maintaining a high level of competence to teach agricultural mechanics requires dedication from both the agricultural education preservice teachers and post-secondary teacher education faculty. The task of preparing preservice teachers in agricultural mechanics has become increasingly difficult in recent years. Harrison, et al., (1993) found that university level agricultural mechanics programs have been marked by declining enrollments and less financial support despite expansion of the agricultural mechanics industry sector. This has also been seen by critics who have stated that agricultural mechanics is non-essential; however, it remains popular in secondary programs (Hubert & Leising, 2000).

Effectively preparing teachers starts for the preservice candidate by enrolling in courses within the teacher education program and culminates during the student teaching process as students develop the skills to become successful teachers (Krysher, et al., 2012). Ingersoll (1996) stated that subject-specific training at the postsecondary level is one of the most important characteristics of a qualified high school teacher. When a program is missing vital skill development in its' coursework, it can negatively impact the candidate. Krysher et al. (2012) claimed that "the lack of potential learning experiences could lead to lower levels of student proficiency, which then can diminish teachers' levels of confidence or self-efficacy" (p. 29). Teaching self-efficacy has been defined as a "person's beliefs on his or her own capability to organize and execute courses of action required to successfully accomplish a specific teaching task in a particular context" (Tschannen-Moran et al., 1998, p. 233). Therefore, an individual's self-efficacy can affect their ability to teach (Krysher et al., 2012).

Theoretical Framework

The theoretical framework for this study is Bandura's (1977) social cognitive theory. Social cognitive theory relates to a person's self-efficacy. A person's judgments on his or her own beliefs to execute a plan of action for a performance are defined as self-efficacy (Joet et al., 2011). Through the cognitive process, human behavior is purposive or regulated by thought (Bandura, 1994). A human's personal efficacy beliefs therefore helps to shape one's own thoughts prior to acting (Bandura, 1994). When one has a high level of self-efficacy, she/he can visualize personal success in performance. Those with a low level of self-efficacy visualize failure scenarios and dwell on many issues that go wrong (Bandura, 1994). Within social cognitive theory, individuals attend to four sources of efficacy expectations which include mastery experiences, vicarious experiences, physiological and emotional states, and social persuasion (Joet et al., 2011).

An experience where success in one setting causes a belief there will be success in the future is described as a mastery experience. If one achieves success, efficacy will be built, while failures will decrease a person's mastery experiences. If agricultural education teachers had previous successes with developing competencies to teach agricultural skills, a high self-efficacy will most likely be developed (Bandura, 1994). Hoy (2000) believed that the most powerful source of efficacy expectations is mastery experiences. Developmental skills that are modeled for the agricultural teachers by someone else are defined as vicarious experiences. Vicarious experiences allow an individual to observe a modeled behavior and follow that same pattern (Hoy, 2000). Bandura (1977) indicated that the more closely an observer mirrors the modeled actions the stronger the impact of self-efficacy. Physiological and emotional states include the various emotions that agricultural education teachers face when attempting to master a specific skill. Various emotions that teachers face may play a role in how competent teachers teach. Lastly, social persuasion involves a 'pep talk' regarding a specific performance; this may include feedback from supervisors or from students to the teacher. If a teacher is verbally told that agricultural standards are met then the result would be a high self-efficacy rating. Hoy (2000) indicated individuals may experience setbacks during social persuasion, especially when the feedback or 'pep talk' is not positive. A participant's actions, feelings, and communication with others about a specific skill can have an effect on how participants rated personal competency in agricultural mechanics. With reduced coursework in agricultural mechanics in post-secondary programs would that lead to lower self-efficacy in teaching?

Purpose and Objectives

As there is an increase in the number of female agricultural education teachers (Smith et al., 2022) it is necessary to understand teacher efficacy concerns of both male and female teachers. This study aligns with the American Association for Agricultural Education's National Research Value: Increasing Prosperity through innovation in Agricultural, Food, and Natural Resource Systems by connecting STEM content aligned to agricultural mechanics curriculum (AAAE, 2023). With these purposes in mind, the following research objectives were identified

1) Identify the demographic characteristics of the male and female agricultural education teacher in Iowa.

2) Determine the self-perceived competence to teach; the amount of training and skills received at a secondary school; and the amount of training and skills received at a post-secondary school in agricultural mechanics by gender.
3) Identify differences between the self-perceived competence of agricultural mechanics skills by gender.
4) Identify differences of self-perceived amount training in agricultural mechanics received at the post-secondary level by gender.

Methods

A descriptive research methodology was used to summarize the characteristics of agricultural education teachers' perception of their level of competence of agricultural mechanics skills. This study specifically analyzed participants' competency related to 54 agricultural mechanics skills condensed into five constructs. A modified, paper-based questionnaire was utilized by the researchers for the purposes of this study. The paper-based instrument contained three sections. The first section contained 54 selected agricultural mechanics related skills by construct. The construct areas included Mechanics Skills, Structures/Construction, Electricity, Power and Machinery, and Soil and Water. Utilizing a five-point summated rating scale respondents were asked to rate the 54 agricultural mechanics skills in regards to their perceived competence to teach each skill. The options for selection ranged from 'no-need' to 'very strong'. The second section contained 15 demographic questions related to the agricultural education teacher. The third section consisted of nine questions related to the demographics of the agricultural education teacher's program and school.

A team of five university faculty members with expertise in the fields of agricultural mechanics and agricultural education determined that the content within the instrument was valid for measuring the objectives of this study. Following the suggestions of Dillman, et al., (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 the pilot study led researchers to adopt a paper-based, rather than electronic instrument. *Post-hoc* reliability was estimated following the suggestions of Gliem and Gliem (2003) and resulted in acceptable reliability coefficients for competency per construct. Construct coefficients are displayed in Table 1.

Table 1

Post-hoc Reliability Coefficients for Competence, Appropriateness, Amount of Training at High School, and Amount of Training at a Post-secondary School by Construct Area

Construct Area	Mechanics	Structures/ Construction	Electricity	Power and Machinery	Soil & Water
Competence	0.95	0.96	0.95	0.98	0.85
Appropriateness	0.95	0.92	0.94	0.97	0.87
Amount of Training at High School	0.96	0.97	0.91	0.97	0.82
Amount of Training at Post-secondary School	0.97	0.98	0.96	0.97	0.91

Data were collected from secondary agricultural education teachers who attended the Iowa agricultural education teachers' conference and served as the population for this study (N=130). The population was a convenience sample because of the ease of having respondents' in one place for a given amount of time and the teachers' likelihood to be involved in annual professional development activities (Ary, et al., 2014). During the conference a print-based survey was distributed to the participants. Each participant was offered a power tool institute safety curriculum as an incentive for completing and returning the questionnaire. This yielded a response rate of 79.2% as 103 of the 130 surveys were returned. With 103 completed questionnaires, the researchers deemed that the convenience sample size was large enough to yield some stability in the results (Ferber, 1977). However, to avoid non-response bias and other sampling problems the researchers elected to address non-response error by following the suggestions of Miller and Smith (1983). A Pearson's $\chi 2$ 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 convenience sample, data from this study should be interpreted with care so as not to extrapolate beyond the target population. Data was analyzed using PASW Statistics 18.0, a software program for statistical analysis. Descriptive statistics and a *chi-square* (χ^2) test were used to compute differences in the perceived competency by gender. To determine the effect size Cramer's *V* was calculated.

Findings

Identifying the characteristics of the average male and female agricultural education teacher in Iowa was the purpose of objective one. In the current study, the average male agricultural education teacher (n = 69) was 42 years old, held a bachelor's degree, and had taught for 18 years. The average male teacher completed two agricultural mechanics courses at a four-year university through a traditional teacher training program. High levels of enjoyment and importance of teaching agricultural mechanics were perceived by the average male agricultural mechanics teacher. The average male teacher also trained an agricultural mechanics team for the state FFA Career Development Event.

The average female agricultural education teacher in this study (n = 34) was 30 years old, had obtained a bachelor's degree, and had taught for 6 years. The average female teacher completed one agricultural mechanics course in a traditional four-year university teacher training program. The level of enjoyment of teaching agricultural mechanics by the average female was somewhat to moderate enjoyment. However, female respondents felt that agricultural mechanics was important to teach, but on did not train a team to compete at the state FFA CDE. Table 2 identifies demographic frequencies by gender and Table 3 identifies demographic perceptions by gender.

Table 2

Iowa Secondary Agricultural Teachers Demographic Characteristics

	Males		Females	
Demographic Characteristics	*f*	%	*f*	%
Age				
20-29	16	23.5%	18	52.9%

30-39	16	23.6%	14	41.2%
40-49	8	11.7%	0	0%
50-59	23	33.8%	2	2.9%
60-69	4	5.9%	0	0%
70+	1	1.5%	0	0%
Years taught				
0-9	22	31.9%	27	79.4%
10-19	16	23.2%	6	17.7%
20-29	13	18.8%	1	2.9%
30-39	17	24.7%	0	0%
40+	1	1.4%	0	0%
Alternatively Certified				
Yes	17	25.0%	16	48.5%
No	51	75.0%	17	51.5%
Highest Level of Education				
Bachelor's	42	60.8%	22	64.7%
Master's	27	39.2%	12	35.3%
Trained an Ag Mechanics CDE team				
Yes	33	48%	10	30%
No	36	52%	24	70%

Table 3

Iowa Secondary Agricultural Teachers Perceptions of the Amount of Courses Taken at the Post-Secondary Level, Enjoyment, and Importance of Agricultural Mechanics

	Males		Females	
Demographic Perception	*M*	SD	*M*	SD
Ag Mechanics Courses Completed				
Four-year University	1.98	2.40	1.15	1.65
Enjoy Teaching Ag Mechanics	4.30*	0.89	2.85*	1.32
Feel Ag Mechanics is Important	4.33**	0.98	4.32**	0.72

Note: *Based on a scale of 1: Not Enjoyable, 2: Somewhat unenjoyable, 3: Neutral, 4: Somewhat enjoyable, and 5: Very Enjoyable. **Based on a scale of 1: Not Important, 2: Somewhat Important, 3: Neutral, 4: Somewhat Important, and 5: Very Important.

Objective two sought to determine the self-perceived gender differences in competence in the five agricultural mechanics construct skill areas. Table 4 identifies the construct grand means and standard deviations of self-perceived gender differences and agricultural mechanics skill constructs by gender. For each construct, males indicated a higher self-perceived competence than did females. The power and machinery construct had the largest difference between males ($M = 3.50$) and females ($M = 2.27$). Furthermore, males had received more training at the post-secondary level than females. The construct with the largest difference in regards to the training received at the secondary level between males ($M = 2.65$) and females ($M = 1.79$) was the structures/construction construct.

Table 4

Grand Means of Iowa Secondary Agricultural Teachers Perceived Level of Competence, Importance and Training received at a Post-Secondary School to Teach Agricultural Mechanics by Gender by Construct Area

	Males		Females	
Construct	*M*	*SD*	*M*	*SD*
Competence				
Mechanics	3.15	1.02	2.28	1.06
Structures and Construction	3.76	0.97	2.78	1.24
Electricity	3.04	1.08	2.07	1.13
Power and Machinery	3.50	1.04	2.27	1.23
Soil and Water	2.85	0.95	2.38	1.11
Training at the University				
Mechanics	2.32	1.02	1.77	0.79
Structures and Construction	2.65	1.15	1.79	1.18
Electricity	2.44	1.08	1.70	0.92
Power and Machinery	2.19	0.95	1.39	0.59
Soil and Water	1.81	0.77	1.50	0.95

Note: *Based on a scale of 1: No Need, 2: Some, 3: Moderate, 4: Strong, and 5: Very Strong.

Objective three sought to determine the difference between gender and the specific self-perceived competence to teach agricultural mechanics skills. Statistically significant differences were found in all the constructs between male and female respondents. The critical value for χ^2 (df* = 4) in this study was 9.49. Statistically significant differences between males and females determined by skill area were found if the critical value was over 9.49. To determine the effect size Cohen (1988) proposed standards to interpret Cramer's *V*: (.10) small effect, (.30) medium effect, and (.50) large effect. Table 5 indicates the mean, standard deviation, *chi-square*, and Cramer's *V* for the competencies that were found to be statistically significant by gender for the construct of mechanics skills. The mechanics construct consists of skills related to metal working, welding, fencing, plumbing, and computer aided design. The competency with the largest difference was oxy-acetylene cutting χ^2 (4, n = 99) = 30.82, $p < .05$.

Table 5

Statistically Significant Differences Between Teacher Competence and Mechanics Skills by Gender

Competency Area	*n*	*M*	*SD*	χ^2	*V*
Oxy-Acet. Welding	99	3.25	1.12	25.68	.509
Oxy-Acet. Cutting	99	3.51	1.09	30.82	.558
Oxy-Propylene Cutting	85	2.44	1.24	10.89	.358
Plasma Cutting	92	3.20	1.17	19.12	.456
SMAW Welding (arc)	98	3.65	1.07	19.51	.446

GMAW Welding (mig)	96	3.51	1.17	20.95	.467
Welding Safety	98	3.98	1.13	13.31	.369
Metallurgy & Metal Work	85	2.51	1.03	14.13	.408
Hot Metal Work	85	2.29	0.99	10.29	.348
Cold Metal Work	84	2.36	1.01	13.33	.398
Tool Conditioning	83	2.52	1.07	17.87	.464
Oxy-Acet. Brazing	91	2.81	1.22	19.67	.465
Soldering	89	2.64	1.13	17.28	.441
Pipe Cut. & Thread	82	2.49	1.14	18.79	.479
Plumbing	86	2.62	1.11	15.68	.427
Mechanical Safety	91	3.37	1.24	30.44	.578

Note: *df* =1* df* is calculated by taking (Row-1) or (Column-1), whichever is smaller. $p < .05$

Within the structures/construction construct, statistically significant differences were found in eight of nine competencies. This construct encompasses skills that include operating woodworking equipment to planning of woodworking projects. The competency with the largest difference χ^2 (4, n = 88) = 36.01, $p < .05$ and the largest effect size (V = .640) was concrete as shown in Table 6.

Table 6

Statistically Significant Differences Between Teacher Competence and the Construct Structures/Construction by Gender

Competency Area	*n*	*M*	*SD*	χ^2	*V*
Woodworking Hand Tools	94	3.70	1.12	12.91	.371
Woodworking Power Tools	94	3.74	1.04	13.88	.384
Concrete	88	3.19	1.24	36.01	.640
Selection of Materials	90	3.37	1.10	21.24	.486
Bill of Materials	92	3.62	1.10	20.85	.476
Fasteners	88	3.11	1.21	29.53	.579
Construction Skills (Carpentry)	92	3.38	1.22	23.70	.508
Construction and Shop Safety	93	3.84	1.15	15.52	.409

Note: *df* =1* df* is calculated by taking (Row-1) or (Column-1), whichever is smaller. $p < .05$

The electricity construct competencies were related to safety, residential wiring, and electrical motors. Statistically significant differences were found between genders in electricity controls χ^2 (4, n = 89) = 28.0, $p < .05$, ($V = 0.56$) wiring skills χ^2 (4, n = 91) = 24.4, $p < .05$ ($V = 0.51$), and electrician tools χ^2 (4, n = 90) = 23.9 ($V = 0.51$). Statistically significant differences were also found in types of electrical motors χ^2 (4, n = 86) = 23.9), $p < .05$ ($V = 0.45$), cleaning motors χ^2 (4, n = 81) = 11.39), $p < .05$ ($V = 0.37$), and electrical safety χ^2 (4, n = 88) = 12.9, $p < .05$($V = 0.38$) as displayed in Table 7.

Table 7

Statistically Significant Differences Between Teacher Competence and the Construct Electricity and Gender

Competency Area	*n*	*M*	*SD*	χ^2	*V*
Electricity Controls	89	2.58	1.11	28.02	0.56
Wiring Skills	91	2.98	1.28	24.48	0.51
Electrician Tools	90	2.89	1.27	23.98	0.51
Type of Electrical Motors	86	2.43	1.06	18.13	0.45
Cleaning Motors	81	2.35	1.02	11.39	0.37
Electrical Safety	88	3.08	1.32	12.94	0.38

Note: *df* =1* df* is calculated by taking (Row-1) or (Column-1), whichever is smaller. $p < .05$

The power & machinery construct included competencies related to small engines, tractors, machinery, and safety. Statistically significant differences between genders were found in all 15 competencies of this construct. The competencies with the largest and strongest difference included small engine services – 4 cycle χ^2 (4, n = 90) = 37.98, $p < .05$ (V = 0.65) *as* shown in Table 8.

Table 8

Statistically Significant Differences Between Teacher Competence and the Construct Power & Machinery by Gender

Competency Area	*n*	*M*	*SD*	χ^2	*V*
Small Engine Services – 2 cycle	88	3.10	1.08	25.67	.540
Small Engine Services – 4 cycle	90	3.27	1.19	37.98	.650
Small Engine Overhaul	88	3.14	1.24	32.28	.606
Small Engine Safety	90	3.37	1.23	27.13	.549
Tractor Service	87	3.02	1.25	28.69	.574
Tractor Maintenance	86	3.07	1.30	26.42	.554
Tractor Overhaul	85	2.65	1.17	21.34	.501
Tractor Selection	83	2.77	1.10	24.84	.547
Tractor Operation	85	3.19	1.28	20.61	.492
Tractor Safety	87	3.36	1.32	16.61	.437
Tractor Driving	86	3.34	1.35	21.50	.500
Service Machinery	86	3.01	1.29	25.38	.543
Machinery Selection	85	2.89	1.21	25.28	.545
Machinery Operation	87	3.03	1.24	23.24	.517
Power & Machinery Safety	89	3.26	1.36	21.72	.494

Note: *df* =1* df* is calculated by taking (Row-1) or (Column-1), whichever is smaller. $p < .05$

The soil and water construct encompasses competencies related to precision agriculture, surveying, and legal land descriptions. Three of the five competencies in this construct exhibited a statistically significant difference between…and is indicated by Table 9. The three areas included global positioning systems, χ^2 (4, n = 91) =10.96, $p < .05$ (*V = xx)*, use of survey equipment χ^2 (4, n = 90) = 10.51, p <. 05 (V = *xx)*, and legal land descriptions χ^2 (4, n = 93) = 13.12, p < .05 (V = *xx)*.

Table 9

Statistically Significant Differences Between Teacher Competence and the Construct Soil and Water and Gender

Competency Area	*n*	*M*	*SD*	χ^2	*V*
Global Positioning Systems	91	2.89	.924	10.96	.347
Use of Survey Equipment	90	2.67	1.060	10.51	.342
Legal Land Descriptions	93	3.39	1.207	13.12	.376

Note: *df* =1* df* is calculated by taking (Row-1) or (Column-1), whichever is smaller. p < .05

Identifying any relationship between the competence of agricultural mechanics skills received at the university and gender was the purpose of objective four. In the mechanics skills construct, seven of 19 skills showed a significant relation with gender. The tool conditioning skill χ^2 (4, n = 97) = 18.57, p < .05 (V = 0.47) exhibited the largest statistically significant relationship with gender. The majority of the skills that had a statistically significant relationship with gender were related to metal work. In the structures/construction construct, eight of nine agricultural mechanics skills exhibited a statistically significant relationship with gender. The two skills with the largest statistically significant relationships were selection of materials χ^2 (4, n = 88) = 21.94, p < .05 (V = 0.50) and bill of materials χ^2 (4, n = 89) = 22.90, p < .05 (V = 0.51). Refer to Table 10.

Five of six agricultural mechanics skills in the electricity construct exhibited statistically significant relationships. Types of electrical motors had the largest statistically significant relationship χ^2 (4, n = 85) = 19.27, p < .05 (V = 0.48) in the electricity construct. Within the power and machinery construct all the agricultural mechanics skills had a statistically significant relationship with gender. The largest statistically significant relationships were between gender and small engine overhaul χ^2 (4, n = 86) = 23.86, p < .05 (V = 0.53) and small engine safety χ^2 (4, n = 86) = 23.79, p < .05 (V = 0.53). The soil and water construct had three of five agricultural mechanics skills with a statistically significant relationship with gender. The skill with the largest statistically significant relationship was legal land descriptions χ^2 (4, n = 86) = 15.53, p < .05 (V = 0.43). Refer to Table 10.

Table 10

Statistically Significant Differences Between the Amount of Training Received at the Post-secondary Level of Agricultural Mechanics Skills by Gender

Competency Area	*n*	*M*	*SD*	χ^2	*V*
Welding Safety	97	2.99	1.53	10.04	.322
Metallurgy & Metal Work	86	2.19	1.27	10.99	.358
Hot Metal Work	85	2.12	1.18	11.57	.369
Cold Metal Work	86	2.14	1.22	14.24	.407
Tool Conditioning	85	2.16	1.17	18.57	.467

Oxy-Acet. Brazing	92	2.46	1.30	11.69	.357
Mechanical Safety	89	2.45	1.37	10.28	.340
Woodworking Power Tools	93	2.52	1.36	17.82	.438
Drawing and Sketching	85	2.14	1.19	15.62	.429
Concrete	87	2.33	1.32	17.53	.449
Selection of Materials	88	2.36	1.33	21.94	.499
Bill of Materials	89	2.48	1.34	22.90	.507
Fasteners	87	2.14	1.18	18.03	.455
Construction Skills (Carpentry)	91	2.45	1.35	16.77	.429
Construction and Shop Safety	92	2.77	1.41	15.97	.417
Electricity Controls	87	2.13	1.12	13.41	.393
Wiring Skills	89	2.30	1.18	14.22	.400
Electrician Tools	89	2.24	1.14	12.34	.372
Type of Electrical Motors	85	2.07	1.12	19.27	.476
Cleaning Motors	81	2.00	1.10	10.86	.366
Small Engine Services – 2 cycle	85	2.28	1.20	13.35	.388
Small Engine Services – 4 cycle	86	2.42	1.29	18.87	.468
Small Engine Overhaul	86	2.41	1.31	23.86	.527
Small Engine Safety	86	2.42	1.37	23.79	.526
Tractor Service	82	1.79	1.01	13.49	.406
Tractor Maintenance	81	1.81	1.07	11.82	.382
Tractor Overhaul	80	1.68	0.93	10.14	.356
Tractor Selection	79	1.71	0.97	11.94	.389
Tractor Operation	80	1.74	0.97	10.93	.370
Tractor Safety	83	1.87	1.11	10.17	.350
Tractor Driving	81	1.73	1.00	10.22	.355
Service Machinery	80	1.72	0.95	17.09	.462
Machinery Selection	81	1.86	1.05	11.54	.377
Machinery Operation	82	1.84	1.03	11.69	.378
Power & Machinery Safety	85	2.01	1.19	17.38	.452
Global Positioning Systems	84	1.70	0.94	9.94	.344
Use of Survey Equipment	84	1.87	1.06	14.65	.418
Legal Land Descriptions	86	2.16	1.26	15.53	.425

Note: *df* =1* df* is calculated by taking (Row-1) or (Column-1), whichever is smaller. $p < .05$

Conclusions

The findings from this study have led to several conclusions. First, it can be concluded that the majority of female participants are new to the profession with less than six years of experience; whereas the male teachers who participated in this study have been teaching for over 17 years. This aligns with the findings in Smith et al. (2022) that identified 76% of beginning teachers are female. This might also have an effect on the perceived competence level because the majority of male teachers have had ample time to learn agricultural mechanics skills by this stage in their careers. Current findings support Burris et al. (2005) observation that perceived competence improves with the experiences gained through years of teaching.

It can further be concluded that there are differences in competence when considering gender. This research is consistent with Eccles et al., (1993) which indicated that perceived competence levels differ by gender-related activities. Male teachers perceived themselves competent whereas, female teachers perceived themselves as somewhat competent to teach agricultural mechanics skills. This supports the notion of Cole (1985) and Johnson (1991) that agricultural mechanics has not achieved gender equity in terms of competency to teach. Female teachers perceived themselves as somewhat competent to teach agricultural mechanics in this study which supports the findings of Hubert and Leising (2000) that additional time is needed to effectively teach and prepare teachers in agricultural mechanics. Another possibility is that female teachers might be more modest about their abilities than male teachers.

It was found that males enjoyed teaching agricultural mechanics, which supports the concept that agricultural mechanics seems to be a male dominated area (Eccles, 1987). This is in line with the notion that agricultural mechanics is a content area that still needs to work on creating gender equality (Cole, 1985; Johnson, 1991). It can also be concluded that female teachers did not enjoy teaching agricultural mechanics skills as much as their male counterparts. This contradicts the findings from Dillingham et al. (1993) where female teachers indicated that they enjoyed teaching agricultural mechanics skills. 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. This would support the findings of Foster et al. (1991) who stated one possible deterrent of female teachers to teach agricultural education was the lack of knowledge in agricultural subjects. One possible reason for this is the reduced amount of required agricultural mechanics courses in teacher education programs, which reduces the amount of mastery and vicarious learning experiences to which the teachers were exposed. Could this be changed if there were more time for repetition in their post-secondary agricultural mechanics courses? If female teachers believe themselves as not competent enough to teach agricultural mechanics their self-efficacy will decrease in that area (Bandura, 1994).

It can also be concluded that there is a relationship between the amount of training received at the post-secondary level and gender. One possible reason for this is that the older male participants may have had the opportunity to take more post-secondary agricultural mechanics courses because of older degree programs with more required credit hours and the possibility of additional courses due to the quarter system formerly utilized by the institution that produces the most agricultural education teachers in Iowa. In addition to the fact that female agricultural education teachers perceived themselves as somewhat competent to teach, this supports Ingersoll's (1996) statement that one of the most important characteristics of a successful teacher is the training received in college. This confirms the statement by Hubert and Leising (2000) stating that agricultural mechanics requires additional time to learn. This also supports the conclusions of Wells et al. (2013) who state more course work in agricultural mechanics is needed to address the changing student interests in agricultural mechanics. Although males were more confident in their ability to teach agricultural mechanics, they were only of average competence of the subject matter. Are teachers with average competence in agricultural mechanics in need of future professional development opportunities? Some might suggest that if these teachers are going to train an agricultural mechanics CDE team for competition at the state level that more competence is needed to ensure the team would be competitive.

Recommendations

The conclusions from this study have led to several recommendations; first, professional development activities should be offered for agricultural education teachers within Iowa because of the low levels of perceived competence identified from this study for both female and male agricultural education teachers alike. Perhaps offering workshops and other professional development opportunities for beginning teachers and even women-only events could aid in the growth of new or beginning teachers. It is also recommended to consider other opportunities to enhance learning during teacher preparation programs. Can student organizations, teacher preparation programs, and teacher associations find opportunities to prepare future teachers outside of the traditional classroom time?

It is recommended that post-secondary faculty in agricultural education teacher preparation programs adopt strategies that help motivate all pre-service agricultural education students to increase confidence in teaching agricultural mechanics skills. It is important for university faculty to also instruct preservice teachers on how to show real-life applications of agricultural mechanics to both female and male students. Teacher education faculty should provide opportunities for preservice teachers to observe exemplary female agricultural education teachers teaching agricultural mechanics skills. This opportunity to observe female agricultural education teachers could be offered during early field experiences within the teacher education program. This will provide vicarious learning opportunities which will in turn help increase pre-service teacher candidate's self-efficacy (Bandura, 1994) in regard to agricultural mechanics.

It is further recommended that post-secondary faculty work with veteran teachers to host agricultural mechanics CDE training sessions for early career teachers. Furthermore, holding training sessions at the state level CDE after the contest has completed could further help in increasing the teaching efficacy of both female and male teachers alike. To further encourage female agricultural teachers to learn agricultural mechanics skills and content it is suggested that workshops should be led by veteran female teachers. Learning from another female teacher may have a positive impact on the ability to learn agricultural mechanics through vicarious experiences (Bandura, 1994) and then leading to mastery experiences.

Further research is recommended to identify potential discrepancies between teachers' ability to teach agricultural mechanics and their perceived competence. This further research could eliminate any machismo effect that may have occurred as well as identify and gaps in content mastery where professional development can be implemented. Further research should be conducted to determine if there is a difference in competency among early career teachers whereas this study focused on all teachers. We also recommend colleting longitudinal data that tracks teacher's competency prior to entering student teaching, after student teaching, and each of the first five years of teaching to identify if and when teachers reach higher levels of self-efficacy to teach agricultural mechanics. This data could also be used to determine if there are any relationships between competency to teach and teachers' intentions to leave the profession.

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