

**Agricultural Mechanics Skills Possessed by Pre-service Agricultural Education Students**

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## **Introduction**

Teacher education programs face a myriad of challenges in preparing secondary Agricultural Education teachers. Student teachers reported high levels of anxiety associated with teaching agricultural mechanics prior to and during student teaching (Foster, 1986). Numerous studies indicated that teacher knowledge of agricultural mechanics was in need of improvement both prior to and after accepting teaching positions (Schlautman and Siletto, 1992). Foster (1986) recommended that Agricultural Education majors participate in early experience programs designed to address those factors of highest anxiety, one being teaching agricultural mechanics.

Recent evidence (Burris, McLaughlin, McCulloch, Brashears, & Frazee, S. 2010) indicated many agricultural education teachers (particularly early-career teachers) felt less comfortable teaching agricultural mechanics than other agricultural content areas. Borne and Moss (1988) indicated that “on-the-job/self-study” made the greatest overall contributions to preparation as first year agriculture teachers. Kotrlik and Drueckhammer (1987) found that agricultural mechanics, along with supervised occupational experience programs, were the two most important components in ensuring quality programs in the future.

Given previous research, pre-service teachers need greater exposure and understanding of agricultural mechanics before becoming secondary Agricultural Educators. The following research objective was used to guide this study: Determine the agricultural mechanics skills possessed by pre-service Agricultural Education students enrolled in an agricultural mechanics course. 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.

## **Theoretical Framework**

The theoretical framework guiding this study is Bandura’s (1977) social learning theory. The social learning theory suggests that learning is a cognitive process that takes place in a social context and can occur through observation or direct instruction. Direct instruction is used to teach a specific skill, while observational learning is thought to be most important during childhood education. This theory was selected based on the nature of the majority of agricultural mechanics courses. Shinn (1987) found that the amount of time devoted to laboratory instruction may compromise one-third to two-thirds of the total instructional time in many agriculture programs. The large amount of time that is devoted to hands-on learning in the agricultural laboratory suggests that direct instruction and observation are vital to agricultural mechanics instruction.

## **Methods**

The population consisted of agricultural education students enrolled in an agricultural mechanics teaching methods course at Iowa State University from spring 2015 to spring 2016 (N = 44). The instrument was developed by faculty in Agricultural Systems Technology at Murray State University. Survey questions were based on the basic skills that students should possess in the following four constructs: electricity, small engines, surveying/precision farming, and metal work. The questionnaire was presented to a panel of experts consisting of agriculture education and agriculture system technology faculty members to establish face and content validity. The reliability coefficient (Cronbach’s Alpha) for the questionnaire was 0.868. The competency

levels were based on a 5 point Likert scale: 0 = no experience, 1= have observed, 2= done with assistance, 3= can perform without supervision and 4= perform(ed) routinely. Surveys were administered on the first day of each course to measure the skills of the incoming students.

### Results

Basic demographic results indicated significantly more females (77.3%) enrolled in the course than males (22.7%). Respondents represented three different agricultural majors, with agricultural education (93.2%) being the most common. Approximately 81.8% of the participants had either lived or worked on a farm. Over 55% of the participants reported having no experience in any of the four constructs, with metal working having the least amount of experience. Construct area results are summarized in table 1.

Table 1.

*Average Response Frequency by Construct Area*

Area	No. of Skills	(0) No Experience		(1) Observed		(2) With Assistance		(3) With Supervision		(4) Perform Routinely	
		f	(%)	f	(%)	f	(%)	f	(%)	f	(%)
Electricity	11	255	(55.4)	88	(19.1)	64	(14.1)	15	(3.3)	17	(3.7)
Metal Working	5	137	(62.6)	33	(15.1)	27	(12.3)	19	(8.7)	3	(1.4)
Precision Ag.	9	227	(58.7)	73	(18.9)	49	(12.7)	23	(5.9)	15	(3.9)
Small Engines	8	200	(56.8)	62	(17.6)	41	(11.7)	26	(7.4)	23	(6.5)

Note: Response frequencies from each of 33 individual skills averaged within the four constructs.

### Conclusions/Implications/Recommendations

Based on the results it can be concluded that there is a lack of agricultural mechanics skills possessed by Agricultural Education pre-service teachers entering the only agricultural mechanics course required for certification. Requiring only one agricultural mechanics course at for teacher licensure ensures that pre-service Agricultural Education teachers receive enough training at the post-secondary level to be able to observe the skills and perform those skills with assistance, therefore limited their ability to perform those skills routinely. The findings in this study suggest that the students will not have enough opportunities to master the agricultural mechanics skills to a level where they will be comfortable when they enter a classroom to teach agricultural mechanics thus supporting previous research findings (Burriss, McLaughlin, McCulloch, Brashears, & Frazee, S. 2010). Based on Bandura's social learning theory, adding additional coursework at the post-secondary level would give pre-service teachers the needed direct instruction to provide a cognitive background in agricultural mechanics. Implementation of additional courses at the post-secondary level would help better prepare Agricultural Educators and ensure an improvement in their ability to perform agricultural mechanics skills as well as potentially improve their self-efficacy to teach agricultural mechanics.

### References

- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review* 84, 191-215.

- Borne, C., & Moss, J. W. (1988). Effectiveness of agricultural education student teaching in the Southern Region of the United States. Thirty-Seventh Annual Southern Region Research Conference in Agricultural Education, Proceedings.
- Burris, S., McLaughlin, E., McCulloch, A., Brashears, T., & Frazee, S. (2010). A comparison of first and fifth year agriculture teachers on personal teaching efficacy, general teaching efficacy, and content efficacy. *Journal of Agricultural Education*, 51(1), 22-31. doi: 10.5032/jae.2010.01022
- Burris, S., Robinson, J. S., & Terry, R. (2005). Preparation of pre-service teachers in agricultural mechanics. *Journal of Agricultural Education*, 46(3), 23-34. doi: 10.5032/jae.2005.03023
- Doerfert, D. L. (Ed.) (2011). *National research agenda: American Association for Agricultural Education's research priority areas for 2011-2015*. Lubbock, TX: Texas Tech University, Department of Agricultural Education and Communications.
- Foster, R. (1986). Anxieties of agricultural education majors prior to and immediately following the student teaching experience. In *Seeking Solutions for Tomorrow's Challenges: Proceedings of the Thirteenth Annual National Agricultural Education Research Meeting*. Dallas, Texas. Pp. 34-40.
- Kotrlik, J.W. & Drueckhammer, D. (1987). The importance of selected external factors and programmatic components in planning vocational agriculture programs. *Journal of Agricultural Education*, 28(4), 26-31, 49. doi: 10.5032/jae.2005.03023
- Schlautman, N.J. and Siletto, T.A. (1992, Winter). Analysis of laboratory management competencies in Nebraska agricultural education programs. *Journal of Agricultural Education*, 54(4), 24-43. doi: 10.5032/jae.2011.04024
- Shinn, G. (1987). September-the time to improve your laboratory teaching. *The Agricultural Education Magazine*, (60) 3, 16-17.