Journal of Agricultural Education, 63(3), 283-296
https://doi/10.5032/jae.2022.03283

My Ag Teacher Never Made Me Go To The Shop! Pre-Service Teacher's Perceived Self-Efficacy in Mechanics Skills Change Through Experience.

Jason D. McKibben[1], Marco Giliberti[2], Christopher A. Clemons[3], Kelly Holler[4], James R. Lindner[5]

Abstract

The purpose of this study was to determine students' perceived confidence in mechanics skills increases through exploration and enlargement of the college education experience. This paper describes the relationship between West Virginia University first-semester agricultural education pre-service teachers' perception of their confidence in specific woodworking skills and who the student considered to be their primary instructor of woodworking-based skills, (university faculty, schoolteachers, family/friends, the student themselves) as they entered the teacher preparation program. Bandura's theory of self-efficacy and social learning was adopted as the theoretical framework for this study. This study utilized a quantitative non-experimental survey research design. Quantitative methods and correlational analysis were employed to provide clarity. The homogeneous nature of the population provided no demographic variables of significance. The results of data analysis found that all participating students (n = 11) reported a higher level of self-confidence in selected woodworking skills after a sixteen-week-long course of agricultural mechanics education. Results of the Spearman's (r_s) correlation indicated that a highly significant relationship existed between students' perception of self-confidence in woodworking (wood testing, identifying, measuring) and who the students perceived to be their primary teachers of woodworking as they finished the semester. No significant correlations existed at the beginning of the semester. By learning more about agricultural education students' perception of learned woodworking skills, stakeholders will be better equipped to make up-to-date programming pronouncements about the long-term assessment of agricultural mechanics courses, and their relevance to the agricultural education curriculum.

***Keywords**:* agricultural mechanics, pre-service teachers, self-confidence

Author Note: Jason D. McKibben: https://orcid.org/0000-0003-2080-202X;
Marco Giliberti: https://orcid.org/0000-0002-2772-3626;
Christopher A. Clemons: https://orcid.org/0000-0001-9879-0888;
Kelly Holler: https://orcid.org/0000-0001-9711-8088;
James R. Lindner: https://orcid.org/0000-0002-1448-3846

[1]Jason D. McKibben is an Assistant Professor of Agriscience Education in the Department of Curriculum and Teaching at Auburn University, Haley Center, Auburn, AL 36849, jdm0184@auburn.edu

[2]Marco Giliberti, is an Adjunct Professor of Architecture at Fairmont State University in Fairmont, WV 26554, marco.giliberti@fairmonstate.edu

[3]Christopher A. Clemons is an Assistant Professor of Agriscience Education in the Department of Curriculum and Teaching at Auburn University, Haley Center, Auburn, AL 36849 cac0132@auburn.edu

[4] Kelly Holler was a graduate research assistant in the of Agriscience Education in the Department of Curriculum and Teaching at Auburn University, Haley Center, Auburn, AL 36849

[5]James R. Lindner an Alumni Professor and Program Leader in Agriscience Education in the Department of Curriculum and Teaching at Auburn University, Haley Center, Auburn, AL 36849

Correspondence concerning this article should be addressed to Jason D. McKibben, Assistant Professor of Agriscience Education, Auburn University, AL 36849; email: jdm0184@auburn.edu

Introduction

The search for meaningful and effective teaching has led to the debate on agricultural education program development (Edgar et al., 2016). Teacher preparation programs are a set of teaching practices designed to prepare students to be effective practitioners of all facets of agricultural content. The teaching of hands-on education and problem-solving skills constitutes the backbone of school-based agricultural education preparation programs contextually defined in this study as SBAE. Emphasis is given to both cognitive and hands-on skills (Edgar et al., 2009). SBAE preparation programs are designed to offer pre-service teachers a greater degree of self-esteem based on the perception of the skills acquired, self-confidence, self-efficacy, and the results obtained with defined learning objectives (Whittington et al., 2006).

Teacher training programs address several challenges in the development of SBAE teachers. Providing satisfactory training in technical subjects and skills frames educational delivery models of many post-secondary teacher preparation programs in the United States. Formal hands-on education learning models and agricultural mechanics courses have been subject to heightened scrutiny in recent years. Several studies (Rocca & Washburn, 2006; Phipps et al., 2008; Rhoades et al., 2009; Shultz et al., 2014) reported the reduced interest in agricultural mechanics and the consequent progressive number of hours dedicated to agricultural mechanics education in the last two decades. This introspective analysis poses three essential questions for teacher education programs: does agricultural mechanics education still have a role in teacher development, is hands-on education (pragmatic education) able to satisfy the educational needs of a contemporary agricultural education program, and where are agricultural mechanics and lab-based education situated in the agricultural teacher preparation curriculum?

An agricultural education teacher preparation program relies on practical education and prepares students to teach academic and technical subjects related to the agricultural industry. Agricultural education curricula have increasingly drifted from primarily hands-on learning to a cognitively pedagogical learning approach (Byrd et al., 2015). Providing adequate preparation in technical content areas is a major challenge in preparing SBAE teachers (Burris et al., 2005).

In the constructivist ethos, teacher education programs must ensure experiences (Dewey, 1938). Exposure to experiences is necessary for students to gain confidence, especially in motor skill development. Are agricultural education programs not ensuring the technical training of pre-service teachers? Byrd et al. (2015) reported agricultural education teachers chose to take only one course in agricultural mechanics as part of their pre-service preparation and tend to take fewer courses in agricultural mechanics. In the United States, agricultural education teacher preparation programs require on average 120-credit hours for successful completion of major areas (Johnson et al., 2012). Burris et al. (2005) reported that 29% of agricultural education teacher preparation programs required no agricultural mechanics courses. The number of hours in agricultural mechanics taught in teacher education programs can vary between five and 12 (Burris et al., 2005). This lack of training coupled with the reported 25-40% instruction time dedicated to agricultural mechanics (Phipps et al., 2008) has produced an imbalance of expectations for preparation. The resulting imbalance and reduction of mechanical instruction have contributed to the decline of prepared teachers.

McKim and Saucier (2013) reported a lack of preparation leads to unsafe learning situations for students. Given these conclusions and the published research conducted in the preceding two decades, there is a prevalent need for pre-service agricultural education programs to provide sound quality technical preparation for pre-service teachers. (Blackburn et al., 2015; Leiby et al., 2013; McKim & Saucier, 2013). Related literature on agriculture student-teacher development could lead one to conclude that training for agriculture students and for pre-service agricultural education instructors who influence skill development must be considered for study (Autor, et al., 2003; Wells et al., 2019). The skills acquired through the interaction of students and instructors (formal and/or informal) help learners develop pragmatic pathways to enhance students' technical development (Becker, 2009). With the reduction of credit hours in agricultural mechanics, pre-service agriculture education students will be expected to teach those concepts. If schools are going to require SBAE teachers to safely and responsibly instruct students in a lab setting how comfortable are SBAE teachers providing instruction for those skills?

Theoretical Framework

Bandura's (1977) self-efficacy and social learning theories model framed this study. Bandura suggests that a person's learning behavior is a combination of three distinct factors: surrounding environment, previous behavior, and personal characteristics. Bandura suggested these three factors influence one's capacity to learn. Bandura goes on to say that learning is a product of the relationship between the learner and their specific social context and that a learners perceived self-efficacy influences the social learning process. Bandura (1977) described self-efficacy as one's belief in the likelihood to complete a specific task. Furthering the work in 1986 Bandura described self-efficacy as "people's judgments of their capability to organize and execute courses of action required to attain designated types of performances" (p. 31). Self-efficacy comes from four distinct experiences: mastery experience, vicarious experience, social experience, and psychological experience.

Mastery experiences are based on an authority figure such as a teacher's perception or interaction with the student is the most critical efficacy source (Bandura, 1997). The vicarious experience occurs when a student is exposed to a peer teaching or observes teaching materials/methods. The social experience occurs when a student develops a favorable or unfavorable attitude towards collaborating with cooperating teachers, feedback from teachers, or peer encouragement and is considered the most fleeting or tangential to long-term efficacy. Finally, the psychological or emotional experience occurs when a student perceives themselves as comfortable or uncomfortable when they engage in teaching activities; this leads to a decision to re-experience or reject the teaching (Bandura, 1977; 1997).

Bandura (1977) reported that a positive relationship exists between the four identified self-efficacy experiences (mastery, vicarious, social, emotional) and an increase in self-efficacy as well as a positive relationship between self-efficacy and career perseverance. Self-efficacy depends in part on the quality of one's experiences and is related to self-confidence. Efficacy is generally connected with the outcome of the task while confidence connects with a personal belief of the level of ability somewhat disconnected from the outcome. This understanding makes efficacy a form of situated self-confidence. Bandura (1997) indicated that self-confidence is how an individual identifies their capability to reach a certain level of achievement. The more confident a person is in their abilities, the more likely they are to succeed, and thus the more likely they are to grow their self-efficacy. A higher perceived level of self-efficacy boosts one's perceived self-confidence. Bénabou and Tirole (2002) extended Bandura's sentiment of self-confidence as the positive attitude of individuals to trust themselves. Lenney (1977) furthered the understanding of self-confidence and how the individual meets their expectations of performance and skills self-evaluations. Self-confidence is regarded by many as a strong regulator of conduct and one of the strongest indicators of action in people's daily lives. By measuring 'self-confidence', researchers measured the strength of certainty about a performance (Druckman, & Bjork, 1994).

School-based agricultural education teachers' self-efficacy has been the subject of numerous studies. McKim and Velez (2016) counted 30 studies focusing on the self-efficacy of agricultural education teachers in the 2000s-2010s. Aschebrener et al. (2010) found a correlation between early career agriculture teachers' perceived self-efficacy and perceived success in teaching students with special needs. Edgar et al. (2007) concluded that the student-teachers perceived self-efficacy increased in a peer-to-peer learning environment, compared with the more traditional constructed class environment, where the teacher is the primary source of the information. Knobloch (2006) found that perceived self-efficacy increased among student teachers who held a positive attitude toward two agricultural mechanics student teaching experiences. Wolf et al. (2010) found that vicarious experience accounted for the strongest relationship with perceived self-efficacy among Ohio agriculture student teachers Rocca and Washburn (2006) studied a group of preservice student-teachers and found that both alternatively and traditionally certified teachers perceived themselves efficacious.

Roberts et al. (2006) and Harlin et al. (2007) observed a self-efficacy trend line decreasing over the semester and concluded that, contrary to common-sense expectations, positive linear trendlines are not always suitable for describing the self-efficacy of student-teachers in the agricultural education classroom; on the contrary, a nonlinear line is often observed. Wheeler and Knobloch (2006) studied Illinois student teachers in their first four years of teaching agriculture and found that there was a statistically significant, negative relationship, between student teachers perceived self-efficacy and teaching experience.

Purpose and Objectives

The purpose of this study was to determine if students' if student confidence in agriculture mechanics skills improved through exploration and engagement during their college education experience. Three research questions guided this investigation to better understand post-secondary agricultural education pre-service students' confidence in mechanical skills development: how confident were agricultural education students' in skills associated with woodworking at the beginning of a course, at the end of that course, and identify the individual they believed taught them the most about woodworking; does the relationship between who the student considered their primary instructor of woodworking-based skill affect students' confidence in the specific skills associated with woodworking as they entered the teacher preparation program; and what was the relationship between who the student considered their primary instructor of woodworking-based skills and the student's confidence in the specific skills associated with woodworking as they completed the basic agricultural mechanic's course.

Methods

Instrumentation

This descriptive study utilized survey research methods as described by Ary et al. (2014). A researcher-developed questionnaire was used consisting of 31 items utilizing a Likert-type summated rating scale asking students to rate their confidence in certain skills associated with woodworking. These included the ability to use a hand saw, table saw, powered miter box, band saw, stationary planer, stationary jointer, drill press, handheld power drills, handheld circular saw, handheld jigsaw, handheld sander, pneumatic nail gun, reading plans, reading measurements on a plan, and reading a tape measure. The instrument contained questions about skills such as constructing a framed structure like a shed or small building, constructing small woodworking projects such as a table, box, or step stool, and constructing complex woodworking projects such as chairs, cabinets, or desks. Questions were also presented about selecting wood finishes, identifying wood by grade, specie, preparing wood joints, and questions regarding safe work habits. The topics of the questionnaire have been a part of the first-day packet for agricultural mechanics at West Virginia University since 1995 and are directly reflective of specific skills associated with high school content standards for agricultural mechanics in West Virginia. Content validity was reviewed by a team of four university faculty for 25 years by aligning it directly with the changes in West Virginia content standards for agricultural mechanics as those changes are made.

The confidence scale offered was a five-point scale to indicate their confidence in their abilities to perform the skills (1= no confidence, 2 = below average confidence, 3= average confidence, 4= above-average confidence, 5= high confidence). Section two specifically asked students to self-report their primary instructor (none, university faculty, secondary school teachers, family/friends, self-taught) of the skills being referenced.

A pilot study was conducted using the same data collection platform. The instrument was administered to students in a senior level method course and consisted of students who have taken the target class earlier in their degree plans (*n*=10). Data were then collected using a questionnaire distributed through Google Classroom, the format employed by the instructor for routine communication, testing, and assignments with students. Utilizing suggestions made by Warmbrod (2014), Cronbach's alpha coefficient was calculated (α=.976) and the instrument was found to be internally reliable. Based on the meta-analysis conducted by Warmbrod (2014) this was determined to be suitable for use in the primary study.

Data Collection

The target population was students enrolled in the introduction to agricultural mechanics course at West Virginia University (*n*=12). This class is normally taken in the first semester of enrolment in the teacher education program. This population was targeted to allow for the description of the individuals entering teacher education without influence from other teacher education coursework. The instrument was distributed to the population via an email invitation that explained the answers would not reflect on the student's grade. Students were told that they did not have to participate, but that their participation would help guide the projects in the class. One student chose to exercise their right to not participate. The request generated 11 usable results (92%). Participant characteristics results did not yield large enough variations to warrant testing for gender, class year, or age (Table 1). All students enrolled in the course were female agricultural education majors in their first semester as agricultural education majors at West Virginia University. Due to the specific nature of this population, results should not be generalized beyond this study.

Table 1

Personal characteristics

Question Type	Self-Reported Characteristics	*f*
Gender	Female	11
	Male	0
School year	Senior	1
	Junior	2
	Sophomore	1
	Freshman	7
Age	18	5
	19	3
	20	1
	21	1
Ag Ed in HS	Yes	11
	No	0

Data Analysis

Due to having fewer than 30 samples in the data set, a Spearman's (r_s) correlation was calculated (Scott & Mazhindu, 2005). The use of Spearman's (r_s) correlation when data are numeric ordinal type data is appropriate according to Field (2013). The variable of "who taught you these skills" was given numerical value ranking the training level from the most formal (university faculty) to the least formal (self-taught) with zero representing an absence of training drawing upon Ott's (1984) definition of Spearman's ranking order (0 = none 1 = university faculty, 2 = schoolteachers, 3 = family/friends, 4 = self-taught). The magnitude of correlation was judged based on Miller (1994) interpretation of reporting statistical analysis. Miller suggests values for interpretation of correlation as: 1.0 = perfect, $.70 \geq r_s \geq .99$ = very high, $.50 \geq r_s \geq .69$ = substantial, $.30 \geq r_s \geq .49$ = moderate, $.10 \geq r_s \geq .29$ = low, $.00 \geq r_s \geq .09$ = Negligible. These values are in line with the suggestions made by Field (2013) and Hinkle et al. (1982).

Findings

Research Question One

Research question one asked how confident are agricultural education students in skills associated with woodworking at the beginning of a course, at the end of that course, and identify the individual they believed taught them the most about woodworking? Due to the high internal consistency (α=.976), the research team felt confident that summated scores and averages be reported (Warmbrod, 2014). The 31-item scores were aggregated into one construct and referred to as "confidence in woodworking" and reported in Table 2. The entire group of incoming students reported a low mean score (*M* = 1.77, *SD* = 0.62) on the composite variable confidence in woodworking. After the course, students were asked to complete the same assessment on their confidence in woodworking. At the end of the course, confidence in woodworking construct score had risen by two points and become much more clustered (*M* = 3.79, *SD* = 0.31).

Table 2

Mean score for confidence in woodworking as a construct for students

Results of Research Question One	*M*	*SD*
Self-confidence in woodworking of incoming students	1.77	0.62
Self-confidence in woodworking of students after an intro course in mech	3.79	0.30

Note. N=11.

When the construct data taken at the beginning of the course was examined (Table 3) students who reported having mostly been instructed by a schoolteacher (secondary agriculture teacher in every case) had the lowest mean score (*M* = 1.34, *SD* = 0.18, *z-score* = -0.69) and the individual reporting having been self-taught had the highest mean score (*M* = 2.63, *z-score* = 1.37).

When the data were examined comparing the end of the course to the beginning of the course (Table 3), groups' mean scores increased above the mean score of the highest category seen in the assessment before the class began. The students who reported having mostly been instructed by faculty (junior college students transferring into the program in every case) had a score well below the mean (*M* = 3.41, *SD* = 0.23, *z-score* = -1.29). Those who indicated schoolteacher (secondary agriculture teacher in every case) had a score comparable to the mean (*M* = 3.69, *SD* = 0.53, *z-score* = -0.34). The individual who reported being self-taught continued to have a higher mean score (*M* = 4.09, *z-score* = 1.03).

Table 3

Score for woodworking confidence based on who was the primary instructor.

Primary Instructor	*f*	Before			After			Change	
		M	*SD*	*z-score*	*M*	*SD*	*z-score*	*M*	*z-score*
Faculty	3	1.38	0.11	-0.64	3.41	0.24	-1.29	+2.03	0.12
School Teacher	2	1.34	0.18	-0.69	3.69	0.53	-0.34	+2.35	1.09
Family/Friends	5	2.01	0.70	0.38	4.08	0.57	0.98	+2.07	0.25
Self-Taught	1	2.63	--	1.37	4.09	--	1.03	+1.46	-1.64
None	0	--	--	--	--	--	--	--	--
Total	11	1.77	0.62	--	3.79	0.30	--	+2.02	--

Note. Mean scores are averaged means for items on a Likert scale 1= no confidence, 2 = below average confidence, 3= average confidence, 4= above-average confidence, 5= high confidence.

When examined as a change score, the students' change in confidence in woodworking at the end of a course all increased (*M* = 2.02). When data are examined based on who the student considered their primary instructor of woodworking skills, those who listed "schoolteachers" as their primary source of woodworking knowledge had the largest change in score (*M* = 2.35, *z-score* = 1.09). Those who identified themselves as being taught by "family/friends" saw an overall positive change in their woodworking construct score (*M* = 2.07, *z-score* = 0.25). As could be expected, the individual indicating they were self-taught started with the highest score but had the lowest change score (*M* = 1.47, *z*-score = -1.64).

Research Question Two

The second research question asked about the relationship between who the student considered their primary instructor of woodworking-based skills affect students' confidence in the specific skills associated with woodworking as they entered the teacher preparation program. Results of the Spearman's (r_s) correlation are indicated in Table 4. No significant relationships existed between students' perceived level of self-confidence in the specific skills associated with woodworking at the start of the semester and who the respondents considered to be their primary instructor of woodworking-based skills.

Table 4

Correlation between level of confidence and primary instructor at the start of the semester.

Woodworking Skill	*M*	*SD*	r_s	Magnitude*
Testing the strength of the completed project.	1.91	0.54	0.60	Substantial
Wood identification and selection (i.e. grade, specie, type)	1.36	0.92	0.57	Substantial
Cutting using hand saws	2.18	0.87	0.53	Substantial
Testing strength and defects of wood	1.82	0.87	0.49	Moderate
Proper preparation for wood jointing	1.18	0.87	0.44	Moderate
Appropriate eyewear selection for woodworking	3.18	0.87	0.42	Moderate
Cutting using the handheld circular saw	0.91	0.94	-0.37	Moderate
Selecting appropriate nails and screws	2.18	0.98	0.32	Moderate
Constructing a framed structure (i.e. shed, barn)	1.00	0.77	0.31	Moderate
Using hand power drills	2.64	1.12	0.29	Low
Safety rules for handling equipment for woodworking	2.36	0.92	0.28	Low
Cutting using a powered miter box	0.73	0.65	-0.28	Low
Identify and use different wood jointing techniques	1.73	1.1	0.27	Low
Tool selections and usage for woodworking	1.82	0.6	0.25	Low

The purpose of treated lumber	2.45	0.82	0.23	Low
Using a pneumatic nailer/stapler	1.64	0.81	-0.22	Low
Using a stationary jointer	1.18	1.08	-0.21	Low
Using a stationary planer	1.73	1.1	0.2	Low
Constructing simple wood projects (i.e. table, box, step stool)	1.91	1.04	0.12	Low
Cutting using a table saw	1.45	0.93	-0.11	Low
Selecting wood finishing (stains, oils, paints)	1.55	0.82	0.08	Negligible
Cutting using the handheld jig saw	1.18	0.98	-0.08	Negligible
Using a handheld sander	1.91	1.38	0.07	Negligible
Constructing complex wood projects (i.e. chair, cabinets, desks)	1.00	0.89	0.06	Negligible
Reading Measurements	3.18	0.87	-0.06	Negligible
Advantages and disadvantages of wood-joining processes	1.36	0.81	0.05	Negligible
Identification of errors (improper cutting, gluing, jointing)	1.64	0.67	0.05	Negligible
Using the stationary drill press	1.27	1.1	-0.04	Negligible
Selection of personal protective equipment for woodworking	2.91	0.83	-0.02	Negligible
Cutting using a band saw	1.09	0.83	0	Negligible
Advantages of standardized lumber usage for woodworking	1.27	0.47	0	Negligible

Note. (n = 11), *Based on Miller, (1994)

Research Question Three

Research question three inquired about the relationship between who the student considered their primary instructor of woodworking-based skills and the student's confidence in the specific skills associated with woodworking as they completed the basic agricultural mechanic's course. Five significant correlations were found ($p < .05$). Correlations between confidence in specific woodworking skills after taking the course and who the students considered their primary instructor of woodworking are displayed in Table 5.

A significant, very high positive relationship existed between the students' perceived level of self-confidence in selecting wood finish such as oils, paints, stains, and who the students considered their primary instructor of woodworking after taking the course, (r_s (11) =.80, $p < .05$). A significant, very high positive relationship existed between the students' perceived level of self-confidence in cutting wood by using a handheld jig saw and who the students considered their primary instructor of woodworking, (r_s (11) = .77, $p < .05$). A significant, very high positive relationship existed between the students' perceived level of self-confidence in reading measurements and who the students considered their primary instructor of woodworking after taking the course, (r_s (11) = .70, $p < .05$). A significant, very high positive relationship existed between the students' perceived level of self-confidence in testing the strength and defects of wood and who the students considered their primary instructor of woodworking before taking the course, (r_s (11) = .70, $p < .05$). A statistically significant, substantial positive relationship existed between the students' perceived level of self-confidence in identifying and selecting woods and who the students considered their primary instructor of woodworking after taking the course (r_s (11) = .63, $p <$ .05). It is noted that all the significant correlations were positive, indicating that students who more likely had less formal instruction as their initial primary instruction were more likely to have a higher score on this self-confidence scale at the end of the course.

Table 5

Correlation between perceived confidence and primary instructor at the end of the semester.

	Primary instructor***			
Woodworking Skill	*M*	*SD*	r_s	Magnitude**
Selecting wood finishing (stains, oils, paints)	3.73	0.91	0.80*	Very High
Cutting using the handheld jig saw	3.91	0.94	0.77*	Very High
Reading Measurements	4.36	0.81	0.70*	Very High
Testing strength and defects of wood	3.45	0.69	0.70*	Very High
Wood identification and selection (i.e. grade, specie, type)	3.00	0.89	0.63*	Substantial
Cutting using the handheld circular saw	3.18	1.08	0.57	Substantial
Using the stationary drill press	3.09	1.38	0.54	Substantial
Cutting using a band saw	3.18	0.98	0.52	Substantial
Testing the strength of the completed project.	3.91	0.83	0.52	Substantial
Cutting using a table saw	4.00	0.78	0.52	Substantial
Constructing simple wood projects (i.e. table, box, step stool)	4.55	0.69	0.52	Substantial
Cutting using hand saws	4.45	0.69	0.43	Moderate
Tool selections and usage for woodworking	4.00	0.45	0.43	Moderate
Cutting using a powered miter box	3.55	1.37	0.42	Moderate
Using a stationary planer	3.27	1.27	0.41	Moderate
Constructing a framed structure (i.e. shed, barn, etc…)	3.18	0.87	0.37	Moderate
Advantages and disadvantages of wood-joining processes	3.64	0.67	0.36	Moderate
Advantages of standardized lumber usage for woodworking	3.64	0.67	0.36	Moderate
Using a stationary jointer	2.64	1.29	0.32	Moderate
Selection of personal protective equipment for woodworking	4.82	0.41	-0.32	Moderate
Using a handheld sander	4.64	0.68	0.29	Low
Identification of errors (improper cutting, gluing, jointing)	4.09	0.70	0.27	Low
Constructing complex wood projects (i.e. chair, cabinets, desks)	3.18	0.98	0.20	Low
Using hand power drills	4.36	0.81	0.15	Low
The purpose of treated lumber to prevent weathering and rotting	4.36	0.81	0.13	Low
Identify and use different wood jointing techniques	3.27	0.91	0.09	Negligible
Safety rules for handling equipment for woodworking	4.45	0.52	0.06	Negligible
Using a pneumatic nailer/stapler	4.36	0.81	0.03	Negligible
Selecting appropriate nails and screws	3.45	0.82	0.01	Negligible
Proper preparation for wood jointing	3.09	0.94	0.00	--
Appropriate eyewear selection for woodworking	5.00	0.00	--	--

Note. (n = 11), *p< .05.; **Based on Miller, 1994; ***1 = faculty, 2 = teachers, 3 = family/friends, 4 = self-taught

Conclusion, Implications, and Recommendations

This research was conducted to ascertain agricultural education students' confidence in skills associated with woodworking and identify the individual they viewed as their teacher of woodworking. Students' confidence was measured at the start and end of an agricultural mechanics class at West Virginia University. Based on this study, students entering agricultural education courses have overall low confidence in their ability to perform woodworking skills. These results are consistent with the existing body of literature concluding that students entering agricultural education are lacking in the basic skills typically associated with agricultural mechanics such as woodworking (Burris et al., 2010; Wells et al., 2013).

The focus on the safe operation of equipment and safe practices in the shop has been the foundation of what the teacher education faculty encourage future teachers to mirror in their high school labs. As prior research has shown (Whittington et al., 2006), students who do not have confidence in their ability to perform a skill are less likely to teach that skill. The use of these tools in a lab setting is important to ensure the students can go on and teach those same skills to students (McCubbins et al., 2016). The research question examined the student's confidence rating of their ability to perform basic woodworking skills. It is heartening that a small exposure (three-hour course, in one 16-weeks semester) resulted in a dramatic increase in students' confidence scores. Students showed increased confidence in their ability to work safely. The three items specifically mentioning confidence in safety (selection of personal protective equipment, safety rules for handling equipment, and appropriate eyewear selection) all showed shifts in the positive direction. Students reported high confidence in their ability to be generally safe in the shop. This is consistent with Burris et al. (2010) findings that only after a few years of teaching, content efficacy increased with agricultural mechanics with a higher effect size than all other content areas.

The largest gain in score was in the use of a powered miter saw a tool used extensively in the project-based learning environment of the course studied. Students began by having little to no confidence in their ability to perform the task and ended with average to above average confidence. The same can be said for the jig saw, hand sander, pneumatic nailer, table saw, circular saw, band saw, drill press, hand drills, and stationary planer. All tools were used extensively in the project-based learning environment of the West Virginia University lab. The noted exception was the stationary joiner, which did show an increase in confidence score but did not achieve the same level as the other tools. This was reflective of the joiner not being a major part of the course, having no real reason to use it in the projects being constructed in the course students having little cause to experience the tool directly.

Teacher education programs should work to ensure that students are given ample time to use the tools they will be engaging within the classroom to gain a better level of confidence in their abilities. Teacher educators should regularly ensure that the projects being used in the laboratory experiences are designed in such a way to ensure the tools being used are reflective of the tools expected to be taught in the school laboratory.

Research question two described the relationship between who the student considered their primary instructor of woodworking-based skills and the student's confidence in the specific skills associated with woodworking as they entered the teacher preparation program. There were no statistically significant differences in the students' confidence either at the beginning or end of the course based on their perception of who they considered to be their primary instructor. Practical differences were seen in the students based on who the student indicated as their primary instructor. Students who had "teacher" listed, high school agriculture teacher in every case, and those listing "university faculty" junior college instructors in every case, scored much lower on the confidence scale as a construct. The schoolteacher group also showed the largest rate of change in the class, increasing their overall confidence score. Those who listed self-taught, or family and friends scored higher in the pre-collection, but their post score was close to the mean, as the students who indicated lower scores, in the beginning, became more confident. This indicates that those who considered themselves self-taught or with family and friends experienced marginal changes.

Based on Bandura's theory of self-efficacy (1977), it would be thought that students who had been formally educated in agricultural mechanics at either a secondary or post-secondary school would have a higher-than-average efficacy. In this instance that was not the case. Those who had formal education scored lower than those with informal education. This group could be best summed up in the anecdotal statement from one participant about their experiences in school, "my ag teacher never made me go to the shop, I did the paperwork for him while the other kids were in the shop". If we are going to predominantly recruit future teachers ranks of active high school FFA members (McKibben, et al. 2022), we must be more intentional about how and what they are trained to do. Ag mechanics courses were seen as placeholders for officer teams and CDE training events. We must encourage our practicing agriculture teachers and pre-service agriculture teachers to not deny students learning opportunities based on organizational activities or status in those organizations.

Students at the beginning of the course had no individual items that were found to have significant correlations between who the student identified as the primary instructor and the individual concept. By learning more about agriculture students' perception of woodworking skills, school stakeholders will be equipped to make better programming pronouncements about the long-term assessment of agricultural mechanics courses, and their relevance to the agricultural education curriculum. As we recruit students and future agriculture teachers, it's important to remember that our expectations based on our understanding of their background mean little as far as specific experiences are concerned. These results remind us that skills are teachable and as teacher preparation programs it's our responsibility to do just that, allow the students to learn those skills.

Agricultural education pre-service teachers' perception of who they considered being their primary instructor had a strong correlation with their perceived self-confidence in woodworking notably in five specific skills: 1) selecting wood finishing, 2) cutting using the hand-held jig saw, 3) reading measurements, 4) testing strength and defects of wood, and 5) wood identification and selection. Most of these skills were less practical skills that would be learned in a home shop or by a casual hobbyist. The selection of wood finish by furniture makers was rarely a topic of conversation beyond which color of the available product to purchase. The same could be said for wood identification and selection. The proliferation of indoor lumber yards housing a limited number of species of lumber and boards would not lead to the impromptu learning of this skill. Logically it follows that those who came into the program with a higher level of confidence in the more common skill-based topics these less seen items would provide the largest opportunity for upward movement in their confidence to those students who came in confident in their skills.

Students who indicated their primary instructor was family/friends and self-taught showed an increase in their confidence in reading measurements. One would assume that those entering the semester with confidence in their ability to perform basic woodworking skills (i.e. using a miter saw) would also have confidence in what could be viewed as a precursory skill of measuring, however, these results indicate that that ass not true. Otherwise, there would be a high correlation at the beginning of the semester with confidence in the measuring skill in the group showing the other basic woodworking skills. This might bring to light a deficiency in the method the less formal training is being conducted and the focus of those training at home are on just using the tool (i.e. a saw) and not using the tool in the service of the best outcome of the project by measuring and cutting accurately. Agricultural mechanics instructors need to continue to focus on the skill of measuring and the importance of using tools towards an outcome of accuracy rather than just completion.

The overall findings of this study agree with Bandura (1977), who stated that a direct relationship exists between self-confidence and self-efficacy. The findings in this study indicated that more hands-on education experiences might be used to encourage less confident students with less exposure in their acceptance of agricultural mechanics education at West Virginia University. This supports the recommendations of Blackburn et al. (2015) who suggested that more course work and dedicated time for novice students is needed to be able to gain self-confidence and thus self-efficacy in agricultural mechanics.

The study supports Knobloch's (2006) findings that college-level hands-on education showed a significant positive impact on student teachers' perceived self-confidence about agricultural mechanics skills. It also expanded Rocca and Washburn's (2006) finding that formal education shows a significant impact on student-teachers perceived self-efficacy when compared with non-traditional education. Findings from this study also support McCubbins et al. (2016) conclusion that hands-on education is appropriate for the agricultural student training. As well as the finding that curriculum areas requiring laboratory, workshop or hands-on activities must be incorporated into the agricultural student curriculum.

Limitations and Future Research

The findings of this small sample study are changing the way we approach our units of instruction in agricultural mechanics. We are using these data to evaluate our teaching of these topics to ensure we are making decisions that lead pre-service teachers to incorporate skill-based knowledge and effective teaching methodologies. We recommend that the profession does the same. In light of the anecdotal evidence collected during this study about teachers not requiring certain students to participate in agricultural mechanics, a more formal study should be undertaken to investigate that topic in mechanics and other agricultural education pathways.

Additional studies are recommended to explore the value of the pre-service teachers' prior experience, the depth of that experience, and the impacts those experiences had before formal preparation have on students' efficacy and more importantly on their ability to be effective teachers.

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