Exploring How an Integrated Skills Acquisition Activity Impacts the Teaching Ability and Perceived Self-Efficacy to Teach Agricultural Technical Skills of Preservice Teachers

Abstract

School based agricultural education (SBAE) teachers are required to have expertise in pedagogy and a complex array of agricultural content areas. This study integrated an experience with agricultural technical skills and pedagogical experimentation for preservice teachers in a teaching methods course. An integrated skills acquisition (ISA) treatment based on an experiential learning cycle and specific to each skill was developed to provide guided instruction for technical skills demonstrated in a microteaching. Treatment and control groups were compared and measured on their self-efficacy to teach an agricultural technical skill and their ability to teach an agricultural technical skill. The treatment group received guided instruction for skills and the teaching method while the comparison group were only guided through the teaching method. The treatment group participants increased their self-efficacy to teach and ability to teach agricultural technical skills. The comparison group had no statistically significant changes in self-efficacy or ability to teach agricultural technical skills.

Keywords: experiential learning; self-efficacy; technical skills; integrated skills; teaching ability; guided instruction; preservice teachers; quasi experimental

Introduction

Teachers must have skills in both pedagogy and the content they teach (Darling-Hammond & Bransford, 2005). School base agricultural education (SBAE) curriculum has required teachers to teach content area skills in a scope of uniquely different disciplines in the field of agriculture (Phipps et al., 2008). Agricultural teacher educators have facilitated the formal experiences of this diverse content in addition to the pedagogical experiences teachers required (Barrick & Garton, 2010). As subject area experts, SBAE teachers built their current understandings through prior experiences before teaching professionally (Kolb et al., 2014). If a new teacher possessed few previous first-hand technical experiences with a subject, they may have had trouble teaching that subject (Roberts & Ball, 2009). Preparing to teach any uncertain agricultural content presumably adds to the challenges for new teachers. In contradiction, teachers proficient in agricultural technical skills who lack in the knowledge of pedagogy may have similar deficits in their ability to teach (Roberts & Ball, 2009). Therein lies the problem, how can teacher educators provide enough experience with agricultural content area for preservice teachers during teacher education programs so that new teachers are ready for success? This study explores one possible approach to integrate technical skills and pedagogy.

Literature Review

If the amount of experience to gain expertise in each content area was equal to the amount required to gain expertise in teaching and learning, agricultural education degrees might resemble medical school. The scope of agricultural content included in SBAE is so broad it is difficult to adequately cover in a teacher education program (Barrick & Garton, 2010). Because experiential learning played a foundational role in the history agricultural education (Roberts, 2006) it is important to consider its role in learning. Models of experiential learning defined different types of experience, but the first experience generally provided focus to the learner (Roberts, 2006). For many learners, first experiences were observational (Roberts, 2006). After an initial experience, a period of reflection and generalization occurred in preparation for the next experience (Roberts, 2006). The ability to reflect and generalize on a previous experience to inform the next experience is what progressed learning (Roberts, 2006). More authentic and quality experiences offered learners better opportunity to learn (Dewey, 1938). If learners perceived an experience as positive, they were more likely to be motivated to reattempt the experience (Bandura 1997). If positive motivation occurred and the learner progressed their knowledge/ability through additional experiences, then a sense of personal belief or self-efficacy to utilize their new knowledge/skill was strengthened (Bandura, 1997). This confluence of experiential learning and self-efficacy informed the progress of agricultural teacher education curricula (McKim & Velez, 2017; Sheehan & Moore, 2019). It can be concluded that in each iteration of the experiential learning cycle a positive experience for a learner resulted in their motivation to continue learning. Following this premise, the experiences that graduates from agricultural teacher education possessed were identified by two categories; (a) unique lived experiences of the individual before, during, and after teacher education and (b) those planned experiences facilitated and guided by teacher educators in the teacher education program.

Generally accepted among teacher educators, pedagogical content knowledge (PCK) is the fusion of pedagogical knowledge and content knowledge (Berry et al., 2015; Etkina, 2010). Developing PCK typically required some level of positive self-efficacy in content knowledge (Kola & Sunday, 2015; Rice & Kitchel, 2018). For some preservice teacher's, previous agricultural contexts largely contributed to their capacity for PCK (Rice & Kitchel, 2017). The agricultural teacher education degree was developed to provide experiences in both pedagogy and content to prepare new agricultural educators (Barrick & Garton, 2010). Despite those intended outcomes, some preservice teachers felt unprepared in agricultural content knowledge at the end of their degree program (Rice & Kitchel, 2015). They felt the agricultural content learned during teacher education was separated from their future need to teach the content (Rice & Kitchel, 2015). The scope of this perceived deficit was highlighted by a few recent studies which presented a range of specific technical skills/knowledge expected of new SBAE teachers (Albritton & Roberts, 2020; Ramesy & Edwards, 2012, Wells et al., 2021).

Many programs utilized agricultural content area expert faculty to facilitate agricultural experiences (Barrick & Garton, 2010). This relieved some of the facilitation requirements of experiences for teacher educators but without collaboration (Barrick & Garton, 2010) it may have also separated content from pedagogy for teacher education students. Some programs have included content course work in the context of pedagogy (Burris et al., 2005; McCubbins et al., 2016 Woodtich et al., 2018) and some have relied on discipline area experts. One could posit that in an optimal situation, the relationship built between content area expert and teacher educator needed to be collaborative. Barrick and Garton (2010) referenced the American Federation of Teachers (1998) findings that coordination between teaching and learning experts and content area experts were troubled. In the agricultural education literature, one study was found that made a direct inquiry to the collaborations between science and agriculture teachers (Stephenson et al., 2008). Though Stephenson et al. (2008) referenced high school teachers it provided evidence for positive student outcomes that came from collaborative efforts of science and agriculture teachers. The agricultural education literature yielded few inquiries into university departmental faculty collaboration in this context.

The issue of facilitating content area learning experiences in the context of pedagogy has persisted. The complications facilitating adequate content area expertise across the scope of agriculture made the general teacher educator's task seem streamlined in comparison to the agricultural teacher educator. Many agricultural teacher educators lacked resources, especially time, to include all the preferred agricultural experiences in the context of teaching. This study explored one promising strategy to strategically include agricultural content into pedagogical course work.

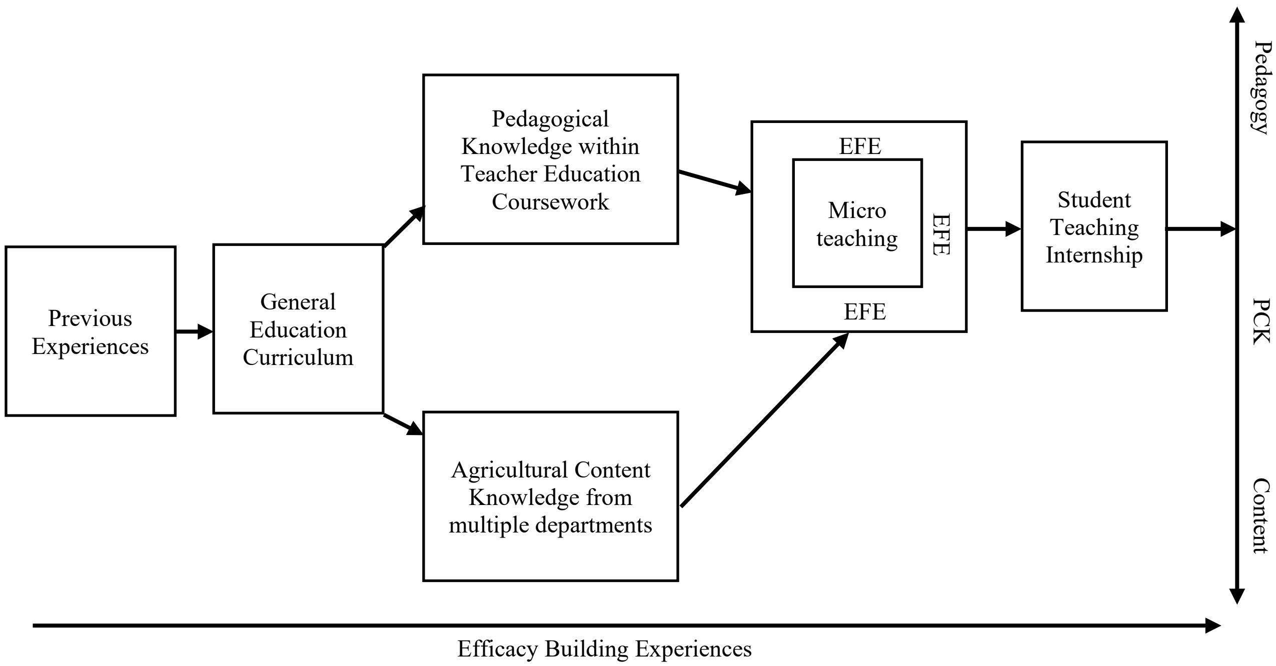
Theoretical Framework and Conceptual Model

The theoretical foundation of this study's treatment utilized a crossover of experiential learning theories (Dewey, 1938; Kolb, 1984; Roberts, 2006) and social cognitive theory through the scope of self-efficacy (Bandura, 1986; 1997). Roberts' (2006) depicted the process model of experiential learning as a cyclical and perpetual process that initiates learner focus through experience inspiring reflection and generalization. Bandura (1986) suggested that positive experiences and negative experiences affect motivation. Dewey (1938) suggested that not all experiences were educative experiences. Teacher education curriculum employs the cycle of experiential learning throughout its curriculum (Roberts, 2006). Experiential learning constantly cycles knowledge and skill building experiences throughout the teacher education program (Estepp & Roberts, 2011). Preservice teachers possess some unknown amount of previous experience which teacher educators identified as the foundation for new knowledge (Bandura, 1986). New agriculture teachers were expected to have proficiency in content knowledge, learning theory, pedagogy, PCK, and professional knowledge (Darling-Hammond & Bransford, 2005; NCATE, 2008; Whittington, 2005).

The conceptual model for this study followed a general experiential path of a preservice teacher with the understanding that each agricultural teacher education program is unique. Students enrolling in agricultural teacher education may have prior experiences in agriculture, but generally, agricultural experience was not a prerequisite. Previously lived agricultural experiences were unique, diverse, and difficult to assess against prescribed standards. As previously stated, programs varied but many offered a similar requirement of course work in both pedagogy and content knowledge (Roberts & Kitchel, 2010). Scarce resources and access to specific content area departments drove most content area coursework outside the agricultural teacher education program (Edwards & Thompson, 2010). This application appeared sufficient but without adequate communication it may have been difficult to know what experiences lead to which outcomes for preservice teachers (Edwards & Thompson, 2010). Pedagogical knowledge constructed within teacher education was facilitated by advancing experiences (Retallick, 2005). Early field experience (EFE) hours and microteaching typically occurred before the student teaching internship. EFE observations and in class/in field microteachings were the first active opportunities for preservice teacher experimentation with pedagogy (Miller & Wilson, 2010). These pedagogical experiences were progressive and prepared preservice teachers for an authentic learning experience during the student teaching internship (Retallick, 2010). Figure 1 depicts the described progression and flow of teacher education experiences. The intent of this model is to show the experiences which led to PCK. PCK is a developed skill of professional educators in which pedagogical knowledge and content knowledge possessed was synthesized to create a successful teaching strategy for student learning (Shulman, 1986). With the complexities of the SBAE content curriculum (Phipps et al., 2008), agricultural teacher educators have facilitated strong efficacy in pedagogical content but have generally struggled to provide experiences in technical content. Figure 1 includes the researchers' general approximation for preservice teacher PCK at the end of teacher education.

Figure 1

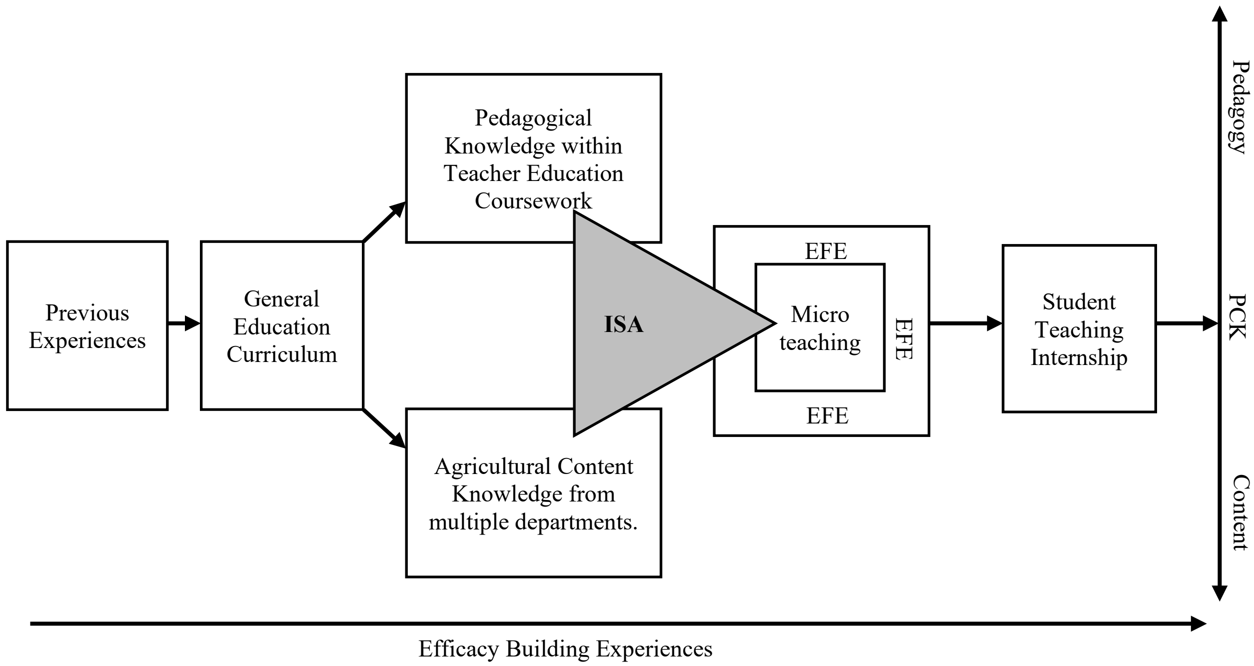
Conceptualization of the current state of content knowledge and skill in teacher education



The integrated skills acquisition (ISA) intervention was developed by the researchers as the treatment for this study. The researchers posited that the ISA would benefit student development of technical content area efficacy and proficiency in the context of pedagogy. This proposition contributes to Roberts and Ball's (2009) concept of teaching within the context of agriculture. The ISA proposes the practicing of a technical agriculture skill within the context of teaching. The semantics of this may seem trivial but the concept was to initiate and build experience for emerging teachers who may feel inadequate in the content they teach (Stripling et al., 2014). The ISA was modeled after coursework in some programs that combined learning agricultural content and pedagogy for preservice teachers. Differently, the ISA did not combine a content discipline and pedagogy in the same course, it introduced a content area skill during a course taught in the context pedagogy. The ISA treatment can be seen in Figure 2. ISA is depicted within a triangle pointed as an arrow with the flow of experiences as they build through teacher education experiences. Each corner connects the pedagogical and content knowledge being learned by preservice teachers by experimentation as applied through their microteaching experiences. Figure 2 depicts the ISA treatment as an aligning measure for the course of teacher education if compared to Figure 1.

Figure 2

Concept model for Integrated Skills Acquisition (ISA)



Purpose and Objectives

The purpose of this study was to explore how an Integrated Skills Acquisition (ISA) treatment impacted preservice teachers' *teaching* of agricultural technical skills. The objectives were to:

1. Compare changes in self-efficacy of preservice teachers receiving an ISA to teach an agricultural technical skill to those not receiving an ISA.
2. Compare the ability of preservice teachers receiving an ISA to teach an agricultural technical skill to those who did not receive an ISA.

This study sought to provide clarity of current needs and further capabilities for including agricultural skills into agricultural teacher education and aligns with Priority 5: Efficient and Effective Agricultural Education Programs of the American Association of Agricultural Education (AAAE) National Research Agenda (Roberts et al., 2016).

Methods

The Publication Manual of the American Psychological Association (2020) permits large research projects to be presented in multiple publications with similar but unique methods sections. This study represents part of a larger study on skills integration in teacher education. Campbell and Stanley (1963) defined the design of this study as a static-group comparison due to the non-symmetrical size of the groups. The effects of a treatment on one group were compared to the nontreatment or comparison group (Campbell & Stanley, 1963). The dependent variables were the participants' (a) self-efficacy to teach agricultural technical skills and (b) ability to teach agricultural technical skills. The independent variable was the ISA treatment. Pre and post questionnaires and an observational rubric were developed and implemented via Qualtrics®.

Population and Sample

The population for this study focused on preservice agriculture teachers in the southern region. A convenience sample of 19 preservice teachers were selected from students self-enrolled in the fall 2019 teaching methods course at the University of Florida. These students represented a cohort that would take the student teaching internship experience course in the spring of 2020. The small sample was not optimal for statistical power so efforts to increase the sample were sought (Kline 2013). The Clemson University agricultural teacher education program was deemed comparable based on programmatic similarity and was added to the study as a comparison to the group at the University of Florida. Similarity was due in part to the lead agricultural teacher educator at Clemson University being a recent graduate from the program at the University of Florida. This raised the total study population to $N = 33$ the treatment group was composed of 19 preservice teachers where 18 were undergraduates and one was a graduate student. The treatment group included 12 on campus and seven at a satellite campus. The comparison group included 14 undergraduate students and one graduate student. Some issues led to participant mortality. Two participants from the treatment group were taking the teaching methods class as an elective and were vocally not interested in teaching or education, so their data was not included. In addition, some participants did not complete the questionnaire data and could not be included as full participants. The final sample resulted in a total population of 28 preservice teachers. The treatment group ($n = 18$) at the University of Florida and the comparison group ($n = 10$) at Clemson University. Treatment group participants had a full class on Mondays and were assigned into five lab sections. Comparison group participants had a full class on Mondays and were assigned into two lab sections. The small sample size and unequal comparison groups were not optimal for generalizability. These limitations were deemed acceptable for the exploratory purposes of this study. The researchers titled the study exploratory for the reader to be aware its potential limitations.

Integrated Skills Acquisition Procedures

The fifth week on the syllabus of the teaching methods course for both groups was scheduled as the week designated to concentrate on the demonstration method. To begin, participants viewed a 15-minute video of a demonstration on plant propagation in an authentic SBAE environment taught by a current graduate assistant (former SBAE teacher). As part of the teaching methods course, an instructional lecture video recorded by the teacher educator at the University of Florida was distributed before the demonstration class meeting to both groups. These videos were to be watched prior to attending class due to its design as a flipped classroom (Conner et al., 2014). After students watched the videos, a class was held during which reflective discussion occurred.

Random assignment of technical skills. After the videos were viewed and class discussions were complete, a microteaching utilizing the demonstration method was assigned. In the past, no specific technical skill was assigned for this assignment at either institution. For the purposes of this study, a specific skill was assigned as the content of their microteaching based on a draw from a hat. No skill was represented more than once for each lab section. The participants were asked if they had any experience with the skill they drew and those with previous experience were asked to draw again or trade with another participant.

The list of skills included in this study was based on the skills that new SBAE teachers may need (Albritton & Roberts, 2020). A panel of expert agricultural educators selected eight skills: (a) wire a duplex receptacle (agricultural mechanics); (b) propagate a plant by division (horticulture); (c) transplant a plant (horticulture); (d) apply a livestock identification ear tag (animal science); (e) administer an intramuscular injection (animal science); (f) administer a subcutaneous injection (animal science); (g) conduct a water test (natural resources/soil); (h) and conduct a soil ribbon test (natural resources/soil science). Frequencies of the randomly assigned skills were calculated with Microsoft SPSS®. Skill assignments for the treatment group were: 22.2% ($f = 4$) administer an intramuscular injection; 16.7% ($f = 3$) wire a duplex receptacle, 16.7% (*f* = 3) transplant a plant, 11.1% (*f* = 2) administer a subcutaneous injection, 11.1% (*f* = 2) apply a livestock identification ear tag, 11.1% (*f* = 2) conduct a water test, 5.6% (*f* = 1) propagate a plant by division, and 5.6% (*f* = 1) conduct a soil ribbon test. Frequencies of the same eight skills as randomly assigned to the comparison group were: 20% (*f* = 2) wire a duplex receptacle, 20% (*f* = 2) propagate a plant by division, 20% (*f* = 2) administer a subcutaneous injection, 10% (f = 1) transplant a plant, 10% (*f* = 1) apply a livestock identification ear tag, 10% (*f* = 1) conduct a water test, 10% (*f* = 1) conduct soil ribbon test, and 0% (*f* = 0) administer an intramuscular injection.

Previous experiences. Treatment and participant groups self-reported their agricultural experiences on the pre-efficacy for technical skills instrument (ETSI) Instrument (described below). The frequency data of these reports were analyzed using Microsoft SPSS®. The data were collected from the treatment group (*n* = 18) and the comparison group (*n* = 10). The treatment group reported 38.9% (*f* = 7) were raised rurally with 11.1% (*f* = 2) raised on a farm/ranch. A household whose primary income was agriculture was only experienced by 16.7% (*f* = 3). Previous experience with SBAE was more prevalent where 88.9% (*f* = 16) of treatment group participants were in the FFA. Only 27.8% (*f* = 5) had experiences through 4-H Clubs and 44.4% (*f* = 8) held agricultural jobs. These frequencies are visible in Table 1. Of the comparison group, 70% (*f* = 7) had been raised rurally, 50% (*f* = 5) on a farm/ranch, and 30% (*f* = 3) had a family whose primary income came from agriculture. The comparison members were 90% (*f* = 9) previous FFA members and 40% (*f* = 4) members of 4-H. Previous agricultural employment was held by 80% (*f* = 8). These frequencies are visible in Table 1.

Table 1

Frequencies of Previous Agricultural Experiences by Group

	Treatment (*n* = 18)		Comparison (*n* = 10)	
	f	% Yes	*f*	% Yes
Raised in a rural setting	7	38.9	7	70.0
Raised on a farm or ranch	2	11.1	5	50.0
Primary family income came from agriculture as a child.	3	16.7	3	30.0
Former members of FFA	16	88.9	9	90.0
Former members of 4-H	5	27.8	4	40.0
Ever employed in agriculture	8	44.4	8	80.0

ISA treatment. The ISA treatment was designed to compress the elements of Roberts' (2006) experiential learning process model into a guided initial experience and practice. This cycle was executed individually with each participant using a common structure to provide individualized guidance. A list of procedures was developed for each of the eight skills based on the researchers' experiences with each of the skills as professional agricultural educators. The ISA treatment were administered during lab sections, scheduled ahead of time for approximately 30 minutes, and were each a series of seven steps for all participants of the treatment group. The steps were: (a) an explanation that the ISA was intended as a learning experience; (b) their assigned skill was presented in the context of agriculture; (c) a materials list was developed; (d) an initial step by step skill demonstration was executed by the researcher with verbal explanations; (e) the demonstration was repeated for a second student observational experience; (f) a YouTube video was watched and critiqued of an expert performing the skill in an authentic agricultural environment; (g) the participant completed the skill while verbally explaining their actions to the researcher. Each participant was explicitly informed that the ISA was not a lesson in pedagogy but a lesson in the technical skill they were to teach. Any questions participants had about teaching methods during the ISA were redirected to their course instructor. The ISA session was informal and allowed each individual participant to pause, ask questions, and seek clarifications. The researcher also provided his contact information to each participant in case of further inquiry, but no participants sought further support.

Comparison group guidance. No additional instruction was provided to the comparison group in relation to their assigned skills. They were instructed to develop the demonstration on their skills utilizing the pedagogical lessons taught in class. Any additional help about teaching their specific skill was treated as usual and only discussed formally if they inquired with the professor at Clemson outside of class time.

Microteaching Demonstration. The microteaching assignments are a usual part of the teaching methods courses as were video recordings of those assignments designed for student reflection. This built-in design made it possible for the researcher to assess ability later. After each section's participants taught their microteaching lessons, they logged into Qualtrics® and were administered the post ETSI. Procedures for the treatment are visible in Table 2.

Table 2

Procedural Schedule for Treatment and Comparison Groups.

Fall Semester	Treatment	Comparison
Week 4	Demonstration video watched	Demonstration video watched
Week 5-6	Demonstration Lesson & Assignment of skill	Demonstration Lesson & Assignment of skill
Week 6-7	**ISA** + Participants self-prepare	Participants self-prepare
Week 7-8	Peer microteaching assignments	Peer microteaching assignments

Instrumentation

Two quantitative instruments were used to collect data for the dependent variables. The Efficacy for Technical Skills Instrument (ETSI) was developed to measure: (a) self-efficacy for performing the skill and (b) self-efficacy for teaching the skill. Only data related to self-efficacy for teaching the skill was used in this study. The ETSI administered through Qualtrics® and was adapted from the *Agricultural Teacher Self-Efficacy Survey* (Shelton 2015) and the *Student-Centered Use of Technology Teacher Efficacy Scale* (Ferreira, 2013), which were both adaptations of the *Teacher Self Efficacy Survey* (TSES) (Tschannen-Moran & Woolfolk Hoy, 2001). The ETSI instrument inquired about participants' self-perception of their efficacy and ability to engage students in exploring real-world issues using agricultural tools and resources. A nine-point Likert-type scale recommended by Bandura (2006) was used with a field of five response options. Response options alternated based on the wording of the question. Questions beginning with "To what extent" offered the response options: none, very little, some, quite a bit, and a great deal. Questions beginning with "How well can you" offered the response options: I cannot, not well, moderate, well, and very well. The ETSI included 20 total items with 12 items measuring the variable of self-efficacy to teach the technical agricultural skill. The portion of the ETSI instrument designed to measure the self-efficacy to teach a skill variable was pilot tested by using Florida SBAE teachers. An invitation to take the ETSI was sent out over the Florida agricultural education listserv with a link to the ETSI. A total of 60 current SBAE teachers took the test and provided input on improving the instrument's face and content validity. A test for statistical reliability was conducted and found the 12 questions for self-efficacy to teach a skill highly reliable with a Cronbach's alpha of .945.

The Integrated Skills Proficiency Rubric (ISPR) instrument measured (a) the ability to teach an agricultural technical skill and (b) the ability to perform an agricultural technical skill. Only data related to the ability to teach an agricultural technical skill was used in this study. The ISPR was adapted from the *Objective Structured Assessment of Technical Skills* (OSATS) (Reznick et al.,1997), originally used to assess student's performance proficiency of surgical skills. The ISPR was to collect data observing a video recording of the participants teaching their assigned skill. The ISPR was completed using Qualtrics® for uniformity in instrumentation. Scoring was similar to a 100-point graded assignment. A panel of experts composed of part of the researcher's graduate committee reviewed this instrument for content and face validity. Measures of ISPR reliability were conducted utilizing a test/retest (Guttman, 1945). The researcher scored three microteachings. After one week, the researcher rescored the microteachings. Similarity of the test/retest scores provided evidence for the instrument's reliability.

Data Analysis

Microsoft SPSS® was used to analyze descriptive statistics including means, standard deviations, and frequencies on demographic data, efficacy to perform a technical skill, and efficacy to teach a technical skill. Ability to teach an agricultural technical skill was analyzed with an independent samples t-test comparing the mean scores from the ISPR for the treatment group and the comparison group. Self-efficacy to teach an agricultural technical skill was analyzed using a paired samples t-tests that compared the pre and post ETSI mean scores for the treatment and comparison group. Effect sizes were determined using Cohen's d and interpreted using Davis' (1971) descriptors of small effect (.2), medium effect (.5), and large effect (.8).

Limitations

Interaction of variables in the multiple group design were considered selection interaction by Campbell and Stanley (1963) and potentially created an effect error for this study. Additional threats to internal validity were posed by the geographic locations of the sample. The treatment group and comparison group were in different programs in different states and had different instructors, so communication and timing were similar but not exact. The researchers' provided for consistency through all facets of the design and implementation.

Findings

Changes in Self-efficacy to Teach an Agricultural Technical Skill

Overall, the treatment group had a large increase in self-efficacy to teach agricultural technical skills. Means from the pre and post ETSI scores were computed. A comparison of means was conducted by calculating paired sample t-tests for each group. The test yielded a statistically significant difference (t = -4.23, p = .00, d = 1.00) for the treatment group pre scores (M = 6.37, SD = 1.12) and post scores (M = 7.23, SD = .80) on perceived self-efficacy to perform agricultural technical skills with a large effect size (d = 1.00). The comparison group test yielded no statistically significant difference for self-efficacy to teach agricultural technical skills (t = -1.65, p = .13) between the pre scores (M = 6.33, SD = .91) and post scores (M = 6.78, SD = 1.25). These results can be viewed in Table 3.

Table 3

Perceived Self-Efficacy to Teach a Skill

Treatment Group *University of Florida*	*n*	*M*	*SD*	*t*	*p*	*d*
Pre-Teaching Efficacy	18	6.37	1.12	-4.23	.00	*1.00
Post-Teaching Efficacy	18	7.23	.80			
Comparison Group *Clemson University*	*n*	*M*	*SD*	*t*	*p*	
Pre-Teaching Efficacy	10	6.33	.91	-1.65	.13	
Post-Teaching Efficacy	10	6.78	1.25			

Note. * = large effect size

Ability to Teach an Agricultural Technical Skill

Group means were calculated for ability to teach agricultural technical skills and compared between groups utilizing an independent samples t-test. The test found a significant difference (t = 2.54, p = .017, d =.99) where the treatment group's (M = 90.94, SD = 8.75) ability to teach technical agricultural skills was higher than (M = 82.00, SD = 9.26) than the comparison group. These results can be viewed in Table 4.

Table 4

Comparison of Group Ability to Teach a Skill

	Treatment Group (*n* = 18)		Comparison Group (*n* = 10)				
Variable	*M*	*SD*	*M*	*SD*	*t*	*p*	*d*
Ability to Teach	90.94	8.75	82.00	9.26	2.54	.017	*.99

Note. * = large effect size

Conclusions

Self-efficacy to Teach

Increased self-efficacy is an intended outcome of teacher education (Sheehan & Moore, 2019). Based on the findings, participants from the treatment group experienced a large increase in their self-efficacy to teach an agricultural technical skill. Bandura (1977) argued that perceived self-efficacy predicts motivation to attempt a behavior. The treatment group's self-efficacy to teach an agricultural technical skill was increased. The treatment group's experience was facilitated by teacher educators that brought together learning the pedagogical method while learning the content/skill to be taught. Participants were provided an initial and simultaneous focus on the teaching method and skill at the time of assignment. This began the cycle of Roberts' (2006) process model of experiential learning for the pedagogical experience, the skill experience, and the PCK experience. After the initial focus, an experience in the demonstration teaching method and in learning the skill occurred. The timing and context in which the treatment group learned about the teaching method and how to perform the skill were simultaneous. As the participants reflected on their initial experiences with the method and skill, both experiences had to be directed toward executing the microteaching assignment (Roberts, 2006). Self-efficacy seems to have been derived from the dual process of experiential learning for the treatment group. This aligns with Sheehan and Moore's (2019) findings of increased teacher self-efficacy that resulted from a teaching methods course.

The comparison group did not have a statistically significant change in self-efficacy to teach agricultural skills. The initialization of the Roberts (2006) experiential learning cycle was the same for the comparison group as the treatment group for both teaching method, skill, and PCK. After the initialization, the teaching method was the only element that received guided instruction that facilitated experiential learning. Comparison group participants were left to their own devices to develop their ability to learn the skill to be taught. The comparison group, similar to the treatment group, were guided through at least two cycles of the experiential learning model, however, they were focused only on the demonstration teaching method (Roberts, 2006). Guided initial experiences of the demonstration method occurred with the video sent home (focus/observational experience), the instructional video (guided reflection and generalization), and the class discussion which served as another guided cycle. The agricultural skill to be taught was only initiated by teacher educators while the content for their demonstrations was left to their own self-guided learning. It is plausible that self-efficacy to teach agricultural technical skills did not increase for the comparison group because of self-guided learning.

Teaching Ability

The ability of each group to teach agricultural technical skills was also different. It was concluded that the treatment group had higher ability scores than the comparison group. It is plausible that the ISA resulted in this difference. Stripling and Roberts (2014) successfully integrated math ability during a similar agricultural teaching methods course. The context of teacher education programs for each group may have contributed to some of the difference in teaching ability, but the nature of the individual cohorts is more intriguing. The treatment and the comparison groups' previous agricultural experiences were similar except for higher percentages of the comparison group that were raised on a farm or ranch and had been employed in the context of agriculture. These contexts may have helped with knowing the skill but may not have been vital to the act of teaching the skill. All participants were assigned skills to which, as part of the research design, they confirmed they had little or no previous experience. In addition, it is assumed that most students in a teacher education program have very little previous experience with formal teaching methods. Participants from either group likely had little other than prior vicarious experiences learning through the demonstration method to contribute to this experience. The ability of preservice teachers to teach a skill they did not have in a teaching method which they learned only in theory and initialized at the same time, was likely affected by the ISA intervention.

Recommendations

Finding ways to include the process of learning skills beyond teacher education is vital for new SBAE teachers. It is recommended that teacher educators assess their assignments within agricultural teacher education coursework to infuse different agricultural skills commonly taught in SBAE. Any amount of initial experiences teacher educators can facilitate within the context of teacher education could be the start of invaluable experiential learning cycles for preservice teachers. These initiated cycles may lead to deeper thought and inquiry for preservice teachers under the guidance of teacher educators. Developing learning processes for specific content may provide strategies for learning and teaching other topics. Studies that consider the transferability of a similar intervention should be conducted. Because time and capital resources are limited for teacher educators, it would be to their advantage to utilize the content area expert faculty within colleges of agriculture. The development of strong and meaningful relationships with the technical agricultural departments is recommended. The specific faculty who teach courses in which preservice teachers enroll should be engaged for collaborative efforts. Perhaps collaborative assignments could be creatively synthesized between teacher education faculty and subject area faculty. In addition, replication of this study with a larger sample could provide more generalizable findings inferable to a larger population. A deeper inquiry to discover the more nuanced and individual reasoning for participant increases in self-efficacy and ability should be sought through qualitative methods. Longitudinal data following the effects of an ISA into the first years of teaching may also provide evidence to its utility for new teacher professional development. It is also recommended that teacher educators conduct needs assessments of beginning preservice teachers and new SBAE teachers for agricultural skills abilities and efficacy. A comparison of these data could be helpful for teacher educators in making appropriate connections to the content area teaching needs of both populations.

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