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Experimental Studies in School-based Agricultural Education from 2006-2016: A Synthesis of the Literature in the Journal of Agricultural Education

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Abstract

The purpose of this synthesis of literature was to identify and analyze existing research that used experimental or quasi-experimental design in school-based agricultural education. This study utilized published articles in the Journal of Agricultural Education from the years 2006 through 2016. The study identified 35 articles that met the criteria of the investigation. Studies were analyzed and compared based on number of participants and duration. Trends in research constructs were found to be the impact of curriculum design, technology, laboratory approaches, and methods of active learning on student outcomes. Trends in researcher recommendations included extended treatment durations, larger sample sizes, follow-up research addressing long-term knowledge retention, increased teacher training through professional development, and exploring the impact of teaching methods and curriculum design on constructs such as student motivation, interest, and self-efficacy.

Keywords: synthesis of literature; experimental design; quasi-experimental design; school-based agricultural education

Introduction

Educational methodology and curriculum design in America's K-12 school systems continue to experience a state of dynamic change due to the pressure of increased student performance (Hanushek, Peterson, & Woessmann, 2010). Federal and state educational policy, along with local authority, often pursue the goal of meeting America's need for college and career ready students (Darling-Hammond, Wilhoit, & Pittenger, 2014). Mass efforts to quantify students' college and career readiness have led to school accountability through standardized testing, which has strengthened the lens of classroom and teacher accountability (Wang, Beckett, & Brown, 2006). In an era of high-stakes education where classrooms and teachers must demonstrate educational merit, agricultural education programs must be well positioned to justify their worth by measurable student achievement.

Integration of Science, Technology, Engineering, and Math (STEM) education, as well as other core curricula, into agricultural education, is one strategy that has gained attention. In fact, Priority 3 of the 2016-2020 American Association for Agricultural Education (AAAE) National Research Agenda (NRA) proposed the question "What are effective models for STEM integration in school-based agricultural education curriculum?" (Stripling & Ricketts, 2016, p. 31). Although curriculum integration and adoption may be a sensible solution to increased student academic

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performance in core curricula, some fear that an overemphasis of core curricula in agriculture could undermine student acquisition of agricultural competency and technical skills (Parr, Edwards, & Leising, 2008). The debate of what is to be taught in agricultural education curriculum continues to form as non-traditional agricultural education curriculum emerge to meet the needs of a changing student demographic, teacher demographic, and education policy reform. Research that investigates the design of specific curriculum on student performance creates empirical evidence that can guide teaching and learning in agriculture.

Research in school-based agricultural education (SBAE) should critically analyze the curriculum taught and investigate the effectiveness of teaching methods to determine how the content is most effectively taught (Thoron & Myers, 2011a). As curriculum integration continues to expand in SBAE, new methods for teaching these concepts should be analyzed. The 2016-2020 AAAE NRA called for research in examining the effectiveness of instructional strategies currently not highly used in agricultural education, but have served as effective strategies in other disciplines (Roberts, Harder, & Brashears, 2016). According to the National Academy of Science (1996), the preferred method of teaching science education has shifted form traditional teaching approaches, such as direct instruction, to approaches that favor active learning. Other research in education has praised active learning strategies such as experiential and inquiry-based learning (Deters, 2005; Gass, 2005). Furthermore, technology continues to change how curriculum is delivered. The role of technology inclusion in the classroom is continuously expanding as access and money to support the use of technology becomes more readily available (Cuban, Kirkpatrick, & Peck, 2001; United States Department of Education, 2010).

Experimental or quasi-experimental research on the effectiveness of curriculum design and teaching methodology in SBAE programs is vital to establish a wide-body of empirical evidence that can support best teaching and learning practices in modern SBAE (Thoron & Myers, 2011a). In fact, the AAAE NRA proclaimed "utilizing research to draw a connection between the impacts of our academic programs and student preparedness and success is essential for survival and sustainability of agricultural leadership, education, and extension education..." (Stripling & Ricketts, 2016, p. 32). According to Thoron and Myers (2011a), the establishment of a standards-based educational system has produced the need for more experimental research on teaching methods that increase student learning in SBAE. Furthermore, experimental research on teaching methods in agricultural education can promote school administrators to offer professional development opportunities to teachers that are based on best practices. Thoron and Myers (2011a) argued "one challenge is the lack of studies that support specific methodologies" (p. 175). The U.S. Department of Education (2003a; 2003b) has provided research funding to encourage experimental design that utilizes random treatment and control groups. The AAAE NRA also expressed the need for experimental studies that examine student learning outcomes through inquiry-based instruction and STEM-infused agricultural curriculum (Stripling & Ricketts, 2016).

Research in education that employs an experimental or quasi-experimental design seeks to actively test an independent variable (Ary, Jacobs, Sorensen, & Walker, 2014). True experimental designs randomly assign the treatment to each participant, and therefore, maximizes control of extraneous variables and have the greatest internal validity. Rarely is true experimental design feasible in intact classrooms, as it is common for all students in each classroom to be exposed to either the same treatment or the same control. According to Gall, Gall, and Borg (2007), quasi-experimental design can be defined by a study lacking random assignment to groups, but offer other strategies to control extraneous variables. Another design, pre-experimental, often considered as a weak design, does not use randomization of treatment nor controls for extraneous variables (Ary et al., 2014). Typically, researchers in education use quasi-experimental designs, and if employed appropriately, can be just as effective as experimental designs (Rubin, 1974).

Conducting experimental or quasi-experimental research in education can be difficult. Gaining permission from school administrators, teachers, parents, and students, as standard procedure required by institutional review boards (United States Department of Health and Human Services, 2017), may be challenging. Furthermore, following proper methodology in experimental research may be difficult in natural classroom settings. A proper treatment duration is necessary to accurately measure the effects of the treatment (Ary et al., 2014). This factor is especially critical when exposing students to a new teaching method they may not be familiar with (Thoron, 2010), and when measuring complex learning constructs such as critical thinking and problem-solving ability, which take longer to cognitively develop (Thoron & Myers, 2012a). Obtaining and retaining a sufficient sample size that is practically and statistically significant, without finding significance due to an inflated sample size (Hays, 1973), may also be challenging. Previous studies indicated participant mortality rates are often as high as 50% in quasi-experimental designs (Boone, 1988; Dyer, 1995; Flowers, 1986; Myers, 2004). Researchers using experimental and quasi-experimental designs in SBAE must be aware of such challenges and should analyze previous literature to seek practical designs and researcher recommendations (Thoron & Myers, 2011a).

Purpose

Although the need for experimental research in SBAE is well pronounced in literature, an investigation of previous experimental studies and consideration of recommendations is warranted to improve future experimental-based studies in SBAE. An analysis of existing research will determine what has been done to meet this research need, while providing recommendations for future experimental-based research in SBAE. Furthermore, an analysis of the quality of existing experimental research is needed in order to compose the standards for experimental research in the discipline. The purpose of this investigation was to identify and synthesize existing research that used experimental-type designs in SBAE. This study utilized published articles in the *Journal of Agricultural Education* from the years 2006 through 2016. The following research questions guided this study's investigation:

1. How many studies involving experimental or quasi-experimental research in school-based agricultural education were conducted and published?
2. What was the duration of treatment method implemented in the experimental or quasi-experimental research designs?
3. How many participants were sampled in the experimental or quasi-experimental research designs?
4. What trends in research foci and research results were common in the experimental or quasi-experimental designs?
5. What trends in research recommendations were suggested by authors of experimental or quasi-experimental studies?

Methods/Procedures

This study used a mixed method research synthesis as its design. A mixed method research synthesis allows the researcher to gather a collection of related studies in an effort to provide an effective summary of knowledge regarding a specific topic (Heyvaert, Hannes, & Onghena, 2016). The publications of interest for this research were studies that used experimental or quasi-experimental designs in SBAE. We examined articles published in the premier journal for agricultural education – *Journal of Agricultural Education*.

We limited the literature to include only studies whose subjects included middle-school through high school students (Grades 6 through 12) in SBAE classrooms. Furthermore, we included only literature published from 2006-2016 in the *Journal of Agricultural Education* in an effort to narrow the scope of the study. We looked at all publications from volumes 47 through 57 and included articles that met the following parameters: (a) published in the *Journal of Agricultural Education*; (b) published between 2006 and 2016; (c) utilized experimental or quasi-experimental design; and (d) included subjects in middle school or secondary SBAE programs.

Each publication that met the parameters of this study was investigated and content for each study was organized in a matrix. *Microsoft Excel®* was used as the recording software to complete a matrix that included the following for each study: (a) the title of the study; (b) the authors of the study; (c) the year of the study; (d) the duration of treatment in the study; (e) the number of participants involved in the study; (f) the treatment construct; and (g) the results of the study.

We investigated Question 1 of the study by analyzing the total number of studies that met the research parameters by year. Question 2 was investigated by determining the lengths of the treatments used in the studies. The lengths of treatment used in the studies contained various units ranging from minutes to semesters. In order to compare the varying treatment units between studies, we converted all treatment lengths to 50-minute instructional days. Research Question 3 was investigated by comparing the number of participants which data were obtained for each study. Participants who dropped studies or who did not meet researcher criteria were not included in comparison of the studies. Research Questions 4 and 5 were investigated by coding the research and categorizing the purpose of each study into consistent themes. All coding adhered to transparent and systematic procedures (Noblit & Hare, 1988; Pawson, 2006). The constant comparative method of analysis (Glaser, 1965) was used to identify central themes for research Questions 4 and 5.

Findings

Research Question 1: How many studies involving experimental or quasi-experimental research in school-based agricultural education were conducted and published?

Research Question 1 sought to determine the number of studies that were published in the *Journal of Agricultural Education* from 2006-2016 on subjects associated with SBAE that used experimental or quasi-experimental design. Six hundred and seventy-six articles were published in the *Journal of Agricultural Education* from 2006 through 2016. Of these articles, 35 met the parameters of being considered an experimental or quasi-experimental design (Ary et al. 2014) within SBAE, resulting in roughly a 5% publication rate. An average of slightly more than three articles per year were published. The number of publications per year ranged from a low of two in 2007, 2008, 2009, and 2010 to a high of six in 2014. Table 1 displays the number of experimental or quasi-experimental studies that met the criteria of this study and that were published in the *Journal of Agricultural Education* between 2006 and 2016.

Table 1

Number of Publications in JAE Involving Experimental Studies in School-Based Agricultural Education from 2006-2016 (n=35)

Year	Number of Publications
2006	3
2007	2
2008	2
2009	2
2010	2
2011	4
2012	4
2013	4
2014	6
2015	3
2016	3
Total	35

Research Question 2: What was the duration of treatment methods implemented in the experimental or quasi-experimental research designs?

Research Question 2 sought to determine and compare the duration of treatment methods used in publications that met the criteria for this study. Previous research in education indicated the duration of treatment may impact the significance of results (Hillocks, 1984).

Thirty-two of 35 articles included a specific duration for the length of treatment that was used in the study. However, the units in which the duration of treatment was given varied considerably between studies. Some studies used weeks as an indicator for duration, although other studies used hours or days. In order to better compare treatment duration, the researchers converted units to instructional days, which was established to be 50 minutes. Therefore, a study with a treatment duration of 75 minutes would convert to 1.5 instructional days and a study with a treatment duration of 2 weeks would be convert to 10 instructional days assuming treatments are not given on weekends. Three studies were not included in the comparison of treatment duration. One study contained a treatment duration described as instructional units and could not be accurately converted. Two studies did not include a description of treatment duration.

Nine of the 32 studies had a treatment duration of 5 instructional days or less, followed by six studies that had a duration between 6 to 10 days. Few studies ranged from 11 to 30 instructional days, while a gap existed in which no studies were found to have a treatment duration between 31 and 50 days. Four studies had a treatment duration that ranged from 56 to 60 instructional days. Three studies described using a semester-long duration, which was converted to 90 instructional days. Three other studies described being a full school year, which was converted to 180 instructional days. The average study was slightly longer than 40 instructional days. Table 2 displays the number of studies by treatment duration.

Table 2

The Number of Experimental Studies by Treatment Duration Described by Instructional Days (50-minutes) (n=32)

Instructional Days	Number of Studies
1-5	9
6-10	6
11-15	1
16-20	2
21-25	2
26-30	1
31-35	0
36-40	0
41-45	0
46-50	0
51-55	1
56-60	4
~90	3
~180	3
Total	32

Note. Three studies were omitted due to unclear treatment duration.

Research Question 3: How many participants were sampled in the experimental or quasi-experimental research designs?

Research Question 3 sought to determine and compare the number of participants sampled in research designs included in this study. According to Olejnik (1984), the four factors that should be taken into consideration when determining sample size in educational research are: criterion for statistical significance, level of statistical power, statistical analysis strategy, and the size of an effect judged to be meaningful. It was assumed that appropriate procedures for determining sample size were followed by the studies included in this review of literature given all published articles were peer-reviewed and deemed acceptable for publication in the *Journal of Agricultural Education*.

Thirty-four of the 35 studies analyzed in this review included the number of student participants in which data were collected. One study only reported mean data from intact classrooms, therefore, an assumption on the total number of participants could not be made and the study was excluded in the analysis for Research Question 3. The number of participants in the studies ranged from 33 to 672. Nine studies had a range of participants from 51 to 100. Ten studies had a range of participants from 101 to 200 and six studies included between 401 and 450 participants. The mean number of participants was roughly 223 students (*SD=166.5*); however, it was common for larger studies to include multiple publications from varying areas of research within the study, accounting for an inflated mean. Table 3 displays the number of studies by the sample size of each study.

Table 3

The Number of Studies by the Sample Size of The Study

Number of participants	Number of Studies
0-50	2
51-100	9
101-150	5
151-200	5
201-250	0
251-300	3
301-350	0
351-400	2
401-450	6
451-500	1
>500	1
Total	34

Note. One study was excluded as the number of student participants was not reported.

Research Question 4: What trends in research foci and research results were common in the experimental or quasi-experimental designs?

Research Question 4 sought to establish trends in areas of investigation for the research areas published. Through coding each study's primary area of investigation, several trends in research emphasis were revealed: (a) studies that investigated curriculum; (b) studies the investigated the use of technology; (c) studies that investigated laboratory approaches; and (d) studies that investigated a method of active learning.

Results indicated that the area of investigation for 14 studies involved curriculum. Six studies investigated the effect of a new curriculum on student outcomes. Examples of studies focused on new curriculum efforts include: Rusk, Brubaker, Balschweid, and Pajor, (2006); Salle, Edgar, and Johnson, (2013); Sapp and Thoron, (2014); Schafbuch, Vincent, Mazur, Watson, and Westneat, (2016); Skelton, Stair, Dormody, and Vanleeuwen, (2014); and Wagler et al., (2008). The inclusion of new curriculum involving farm safety (Schafbuch et al., 2016), biodiesel (Salle et al., 2013), swine (Wagler et al., 2008), and livestock ethics (Rusk et al., 2006) all increased student knowledge in learning constructs measured. Four studies investigated the enhancement of existing agriculture curriculum with math (Edwards & Leising, 2009; Parr, Edwards, & Leising, 2006; Parr, Edwards, & Leising, 2008; Young, Edwards, & Leising, 2009). As a component of a large study on math-enhanced curriculum, Parr et al. (2006) found a math-enhanced agricultural power and technology curriculum increased student performance on mathematics placement tests. However, Edwards and Leising (2009) found a change in students' mathematical ability to solve workplace problems after exposure to math-enhanced agriculture curriculum was not significant. Furthermore, Parr et al. (2008) found the math-enhanced curriculum did not lower students' technical competence.

Two studies investigated science-enhanced curriculum (Haynes, Robinson, & Key, 2012; Pearson, Young, & Richardson, 2013). In a one-semester pilot study, Pearson et al. (2013) partnered SBAE teachers and science teachers to create and teach students context-based agriculture lessons. Compared to a control group, posttest scores indicated students who experienced a science-enhanced curriculum demonstrated significant positive achievement in science scores with the exception of the bottom scoring quartile. In a shorter casual comparative study, Haynes et al. (2012) found students exposed to a science-enhanced, CAERT curriculum did not perform significantly better on a science proficiency exam compared to a comparison group. In another study addressing science curriculum, Shoulders and Myers (2013) found students exposed to 6 weeks of socioscientific issues-based instruction increased content knowledge scores from pretest to posttest both proximally and distally.

Three quasi-experimental studies examined technology integration on student performance (Bunch, Robinson, Edwards, & Antonenko, 2014; Conoley, Croom, Moore, & Flowers, 2007; Pense, Calvin, Watson, & Wakefield, 2012). Bunch et al. (2014) did not find a significant effect on student achievement in mathematics or agriculture when students were exposed to digital game-based learning over traditional direct instruction. However, Pense et al. (2012) found traditional students and students with learning disabilities exposed to interactive web-based tools increased achievement. In another experimental study, Conoley et al. (2007) found that electronic audience response systems increase student achievement.

Three studies analyzed formative assessment strategies in laboratory settings (Thoron & Myers, 2010; Thoron & Myers, 2011b; Thoron & Rubenstein, 2013). These studies compared the effect of using Vee maps with standard laboratory reports on student outcomes. Vee maps are designed to encourage students to form their own investigations by creating an inquiry question, developing a list of key words, creating a graphic organizer and lab procedure, performing research to collect data, and writing report conclusions. Experimental studies on using Vee maps compared to standard laboratory reports conclude that students gain more content knowledge and increase high-order thinking skills (Thoron & Myers, 2010; Thoron & Rubenstein, 2013). Furthermore, research indicated the use of Vee maps is unbiased based on gender, grade, and ethnicity (Thoron & Myers, 2011b).

Lastly 11 studies were found that investigated active learning methods on student performance. Myers and Dyer (2006) investigated laboratory integration using three levels of treatment: (a) subject matter approach without laboratory experimentation; (b) subject matter approach with investigative laboratory experimentation; and (c) subject matter approach with prescriptive laboratory experimentation. Findings indicated that students taught using the subject matter approach with investigative laboratory experimentation scored higher on content knowledge and science process skills compared to students using the subject matter approach with prescriptive laboratory experimentation. In a study exposing 200 students to nine, 50-minute lessons utilizing either active learning strategies or passive learning strategies, students exposed to active learning strategies had higher positive perceptions of the teaching method compared to students exposed to passive learning (Mueller, Knobloch, & Orvis, 2015).

Two studies examined experiential learning on student outcomes. In a study involving wind energy curriculum, Baker and Robinson (2016) assigned 80 students to either a four-hour lesson using direct instruction or a four-hour lesson using experiential learning. They found students who were assigned to the experiential learning method scored higher on creativity scores and practical use of knowledge scores.

Six studies researched the effects of inquiry-based instruction. A large study by Thoron and Myers (2011a) compared the use of inquiry-based instruction to the subject matter approach on student content knowledge achievement. The 12-week study incorporated seven different secondary schools across the U.S. and included 437 students. Seven units of instruction were taught using either the treatment or control. A pretest was given to students before each unit and a posttest was given after each unit. Findings indicated students who received inquiry-based instruction had higher content knowledge achievement compared to students taught through the subject matter approach. Further research from this study concluded students taught through inquiry-based learning also scored higher in argumentation skills and in scientific reasoning (Thoron & Myers, 2012a; Thoron & Myers, 2012b). Data from this study illustrated that inquiry-based instruction did not affect the knowledge retention levels of students with special needs (Easterly & Myers, 2011). In a 12-week study involving 170 students, Thoron and Burleson (2014) investigated student perceptions when taught through inquiry-based learning. The study administered 21 questions on a Likert-type scale that evaluated students' attitudes towards agriscience and students' attitudes towards inquiry-based instruction.

Research Question 5: What trends in research recommendations were suggested by authors of experimental or quasi-experimental studies?

Research Question 5 sought to synthesize researcher recommendation involving future studies. Through coding the recommendations section of each publication, five common themes in research recommendations were found: (a) future experimental studies should extend treatment duration; (b) future experimental studies should include larger sample sizes; (c) future experimental studies should address students' long-term outcomes; (d) professional development should be utilized to ensure instructors deliver treatment appropriately; and (e) future studies in teaching methodologies and curriculum design should investigate student motivation, interest, and self-efficacy.

Many studies concluded the duration in which the treatment was conducted may not have been long enough to properly impact student variables. Therefore, several studies included this issue as a limiting factor. Although increasing duration of experimental studies could lead to more significant results, longer treatment durations may come at a cost. Teachers who often implement experimental studies in their classrooms may be weary of large time commitments longer-term studies bring. Furthermore, longer studies may increase mortality rates that could interfere with statistical significance. Seven studies suggested follow-up research using experimental design extend the duration of the treatment (Baker et al., 2014; Baker & Robinson, 2016; Bunch et al., 2014; Burris & Garton, 2007; Parr et al., 2006; Pennington et al., 2015; Rose et al., 2015).

Several studies included a small sample size as a limiting factor to their research design. Larger sample sizes may increase statistical power and include a more representative sample of the student body in agricultural education. It should also be noted, however, larger sample sizes can increase research cost and effort. Furthermore, larger sample sizes may require more schools and teachers which can unintentionally cause an increase in treatment variability, yet it may offset student and teacher fatigue (Shoulders & Myers, 2013). Eight studies recommended future research increase the sample size used in the experimental design (Baker et al., 2014; Blackburn & Robinson, 2016; Bunch et al., 2014; Easterly & Myers, 2011; Rose et al., 2015; Sapp & Thoron, 2014; Schafbuch et al., 2016; Witt et al., 2014).

Six studies recommended future research in experimental design investigate long-term knowledge retention of subjects exposed to treatments (Baker et al., 2014; Bunch et al., 2014; Myers & Dyer, 2006; Pennington et al., 2015; Sapp & Thoron, 2014; Wagler, et al., 2008).

Retention of desired student outcomes and long-term knowledge gains are often the goal of education. A deferred posttest, a post posttest, or a follow-up study using qualitative design could determine if differences in student outcomes are held long-term.

Several studies cited treatment methods may not have been delivered appropriately due to poor teacher knowledge of instructional methodology used in the study. In order to combat this issue, four studies recommended that adequate professional development opportunities be held for classroom teachers who are implementing instructional methodology (Haynes et al., 2012; Johnson & Roberts, 2011; Schafbuch et al., 2016; Thoron & Burleson, 2014). Professional development provided to teachers will make the implementation of the research design more effective, and could positively impact teachers and students in ways not associated with the study.

Lastly, future research recommendations called for more experimental studies involving the impact of curriculum design and teaching methods on other factors besides academic achievement. Witt et al. (2014) recommended future experimental research in cognitive behavior and student engagement. Sapp & Thoron (2014) recommended additional studies that determine the effects of teaching methods on students' attitudes toward subject matter and teaching approaches. Other recommendations included additional experimental studies on student motivation, interest, and self-efficacy (Baker & Robinson, 2016; Pense, Watson, & Wakefield, 2010; Salle et al., 2013; Thoron & Myers, 2012a).

Conclusions & Recommendations

A total of 35 experimental or quasi-experimental studies within SBAE were published in the *Journal of Agricultural Education* between 2006 and 2016, indicating roughly a 5% publication rate. This number seems low considering the need for experimental-based research in SBAE. Are researchers not conducting experimental-based studies in SBAE or are such studies not being accepted for publication? It is recommended the profession employ a rejuvenated commitment toward conducting and publishing quality experimental research in SBAE.

Findings indicated a majority (*n=21*) of studies included a treatment duration of less than 30 instructional days, with nine studies being less than 5 days in length. It is recommended that caution be given to results of studies that utilize short treatment durations, especially when measuring learning constructs that take time to develop (Ary et al., 2014). Eleven studies were longer than 50 instructional days. Most studies had between 50 and 200 participants with only two studies having less than 50 participants and one study having more than 500.

Trends in research focus included the impact of curriculum design, technology, laboratory approaches, and methods of active learning. Studies suggested future research in experimental design in SBAE include extended study durations, larger sample sizes, follow-up research addressing long-term knowledge retention, increased teacher training through professional development, and exploring the impact of teaching methodologies and curriculum design on constructs such as student motivation, interest, and self-efficacy.

There are several limitations to this synthesis of literature. Research assumptions were made when analyzing data for this study. We had to make assumptions regarding varying units of duration for treatments in order for studies to be compared. Converting units such as weeks of instruction to 50-minute instructional days yields a chance of researcher error. Furthermore, several of the publications could have been a part of larger studies. We assumed each published article was an independent study and, therefore, depending on interpretation, averages for concepts such as treatment duration and number of participants could be significantly skewed. Incomplete data from some studies could have affected the analysis for this research.

It is recommended that further investigation on experimental studies in SBAE continue beyond the *Journal of Agricultural Education.* This report did not analyze the statistical significance of findings found in studies or if studies followed proper research design and reliable instrumentation. Measures such as comparing reported effect size could increase the rigor of future research syntheses. Future experimental research in SBAE should include random selection and true experimental design whenever possible (Blackburn & Robinson, 2016; Pearson et al., 2013; Haynes et al., 2012). Future quasi-experimental research should also make every effort to use best practices in educational research. Lastly, researchers must fully question if the quality and number of published experimental-based research studies in SBAE are adequately meeting the needs of the profession as discussed in the National Research Agenda.

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