

An Agricultural Literacy Assessment of Social Studies Teachers in South Carolina Participating in an Immersive Agricultural Experience

Walker Reid¹
K. Dale Layfield²
Christopher J. Eck³
Dara Park⁴

Abstract

Studies in the career development of youth identify middle school as the optimum time for career exploration, as it advances young adolescents' self-awareness, knowledge of prospective careers, and goal setting. In South Carolina, only 5% of public middle schools provide agricultural education. The purpose of this study was to measure the agricultural awareness and literacy impact of social studies teachers participating in a five-day study tour through mixed method procedures. A pre- and post-tour survey given to participants indicated a significant increase in knowledge and perception of agriculture after the tour. The qualitative analysis included collecting photographs and reflections from participants at the end of each tour day. A codebook was developed, and after three rounds of coding, the five themes that emerged from participants' experiences were: 1) 21st-century agriculture production, 2) a need for agricultural literacy, 3) dissemination of information for greater agricultural literacy, 4) sustainable agricultural practices, and 5) the historical impact of agriculture. The major finding of this study was that the tour improved agricultural literacy. Participants recognized the extent of the agricultural knowledge they gained on the tour and described their intentions to enhance the social studies curriculum by exploring the state's historical and contemporary agricultural systems.

Introduction

As the global population continues to rise, it becomes clear that there is a disconnection between the public and their knowledge of agricultural practices (Kovar et al., 2013). Population expansion and urbanization lead to more significant gaps in literacy and exposure to food systems and farming. As people move to more urban areas, there are fewer firsthand experiences with agriculture (Clemens et al., 2018; Kovar et al., 2013). Agriculture research, education, and infrastructure support has significantly decreased since the 1980s and 90s (Jones et al., 2017). Fifty percent of the world's active economic population was involved in agriculture in the 1980s, dropping to 38% in 2014 (Jones et al., 2017). This downsizing was supported because agriculture was not seen as an international growth sector during infrastructure growth in the 1970s (Jones et al., 2017). Reflecting this shift in support, programs focusing on agricultural education and training (AET) for the general workforce were not the focus during this time in the United States (Jones et al., 2017). As a result, agricultural and related areas are not seen as providing many career

¹ Walker Reid was a Graduate Assistant in the Department of Agricultural Sciences at Clemson University, 246 McAdams Hall, Clemson, SC, 29634, eliwalkerreid@gmail.com.

² K. Dale Layfield is an Associate Professor of Agricultural Education in the Department of Agricultural Sciences at Clemson University, 246 McAdams Hall, Clemson, SC, 29634, dlayfie@clemson.edu. ORCID# 0000-0002-1487-6922

³ Christopher J. Eck is an Assistant Professor of Agricultural Education in the Department of Agricultural Education, Communications and Leadership at Oklahoma State University, 234 Agricultural Hall, Stillwater, OK 74078. Chris.eck@okstate.edu. ORCID#0000-0002-1645-3632

⁴ Dara Park is a Professor of Soil and Water Dynamics at Clemson University, 263 Poole Ag Science Center, Clemson, SC, 29634. darap@clemson.edu.

opportunities compared to other disciplines (Jones et al., 2017). Because of this misconception, there is a push for incorporating agricultural education into the standard education curriculum to teach students about the opportunities in agriculture and shift negative misconceptions about this field of study (Jones et al., 2017).

Teaching agricultural issues and related science inside classrooms provide students with real-life scenarios and hands-on experience to apply knowledge to prepare students to use current 21st-century skills (Knobloch, 2008). Motivation to teach these topics depends on the teacher's perception of the topic's usefulness, their perceptions of the issues, and how much time and effort they are willing to expend to teach about said topics (Knobloch et al., 2007). Overall, core content teachers who have more experience with agricultural practices are more likely to incorporate agriculture into their curriculum (Mars & Ball, 2016; Vallera & Bodzin, 2016). Organizations like the Farm Bureau, 4-H, the National FFA Organization (FFA), and Cooperative Extension agencies have programs for agricultural education and outreach in the classroom (Mars & Ball, 2016; Vallera & Bodzin, 2016). Unfortunately, not all students have access to agricultural programming; therefore, working to embed agriculture as a context in core content areas is essential.

Purpose and Objectives

The purpose of this study was to determine the impact of an immersive program for South Carolina eighth grade social studies teachers, known as Studies of Occupation, Culture, and Innovations toward Agricultural Literacy (SOCIAL), on their awareness and potential integration of agricultural literacy. Three research objectives guided this inquiry:

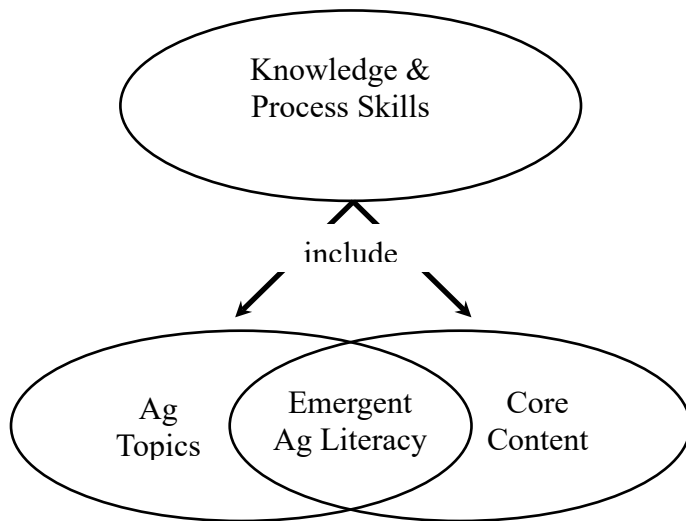
1. Describe the demographic characteristics of participants in the SOCIAL (Studies of Occupation, Culture, and Innovations toward Agricultural Literacy) tour.
2. Determine participants' agricultural awareness before and after the SOCIAL tour utilizing adapted agricultural literacy assessment by Knobloch & Ball (2003).
 - H0: All participants had similar agricultural awareness following the SOCIAL tour.
 - H1: There was a positive change in participants' agricultural awareness following the SOCIAL tour.
3. Identify agricultural literacy themes participants viewed as valuable to integrate into their curriculum following the SOCIAL tour.
 - Each participant uploaded three photos with a 100-maximum-word summary to respond to the prompt: *What did you find the most impactful about today?*

Conceptual Framework

This study is guided by the agricultural literacy theory outlined by Powell et al. (2008). This study addresses the connection between middle school teachers' experience teaching social studies and their knowledge about historic agricultural events and practices in South Carolina. Middle school social studies teachers' knowledge and skills play a pivotal role in their agricultural literacy, ultimately impacting the core content they teach. Utilizing inductive learning outlined by Powell et al. (2008), social studies teachers can begin to address agricultural literacy through a social and historical knowledge of agriculture (Figure 1).

Figure 1

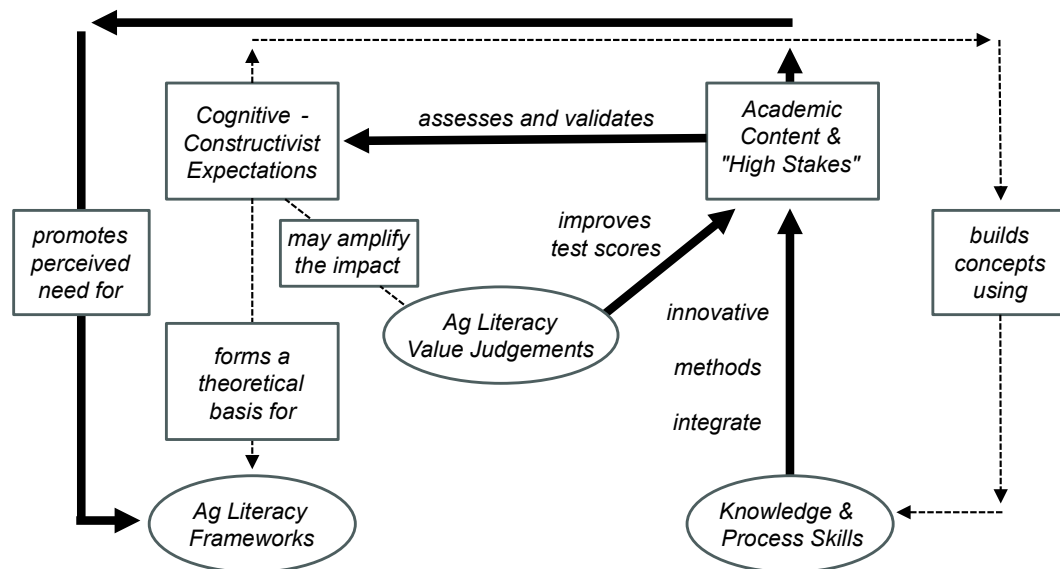
Inductive Model of Emergent Agricultural Literacy.



Inductive learning and application of agricultural literacy involve applying other areas of knowledge to agricultural practices and processes (Powell et al., 2008). Using this framework can help rework the existing curriculum to showcase how agricultural decision-making and problem-solving involve knowledge in current standards taught (see Figure 2; Powell et al., 2008).

Figure 2

Paradigm Shift Promoting a Shared Vision of Agricultural Literacy (Powell et al., 2008).



Note. From “Agricultural literacy: Clarifying a vision for practical application,” by Powell, D., Agnew, D., and Trexler, C, 2008, *Journal of Agricultural Education*, 49(1). <https://doi.org/10.5032/jae.2008.01085>.

One of the significant drawbacks of incorporating agriculture into existing education programs is related to these existing standards being overcrowded (Knobloch et al., 2007). Utilizing inductive agriculture learning can help rework the existing curriculum to showcase how agricultural decision-making and problem-solving involve knowledge in current standards taught (Figure 2; Powell et al., 2008).

Methods

This study employed a convergent parallel mixed methods design (Creswell & Plano Clark, 2011) to better understand the agricultural literacy outcomes of SOCIAL participants. The frame of the study was based on e-mail addresses of public, private, and charter middle school social studies teachers in South Carolina during the 2021-2022 academic year. An invitation to apply to become a Fellow in the SOCIAL Academy was sent via e-mail to each of the teachers on three different dates. The invitations included a link to a survey (Qualtrics, 2022) requesting demographic information and the completion of an essay prompt to be eligible for program participation selection. A total of 13 participants were honored as Fellows in the SOCIAL Academy ($N = 13$). SOCIAL aimed to engage the teacher fellows in an immersive professional development experience through a summer tour highlighting modern agricultural production, thereby connecting them to agricultural occupations, culture, and innovations, while also providing an online graduate course for the teacher fellows to develop lesson plans and tools to integrate the agriculture and history curricula and achieve state social studies standards for students.

Quantitative Methods

A survey instrument was created utilizing the agricultural literacy assessment part A developed by Knobloch and Ball (2003) to address objectives one and two. The original reliability for part A of the survey instrument was estimated using Cronbach's alpha method ($r = 0.89 - 0.94$) in a pilot study (Knobloch, 1997, p. 57). Data analyzed for objective two included the ten items adapted from Knobloch & Ball (2003). The Cronbach's alpha for the 10 constructs used in Knobloch and Ball's 2003 study was calculated to be $r = .82$, which is deemed acceptable (Nunnally, 1978). For this study, the reliability of the pre- and post-instruments, Cronbach's alpha statistics resulted in standardized item alphas of $\alpha = .82$ and $\alpha = .87$, respectively, which is identified as good internal consistency (Cortina, 1993).

The survey followed a 4-point Likert-type scale where participants indicated how much they disagreed or agreed with ten statements, using: Strongly Disagree (1), Disagree (2), Agree (3), and Strongly Agree (4). Pre- and post-survey data was analyzed using SPSS Version 27 software. Research objective one employed descriptive statistics (i.e., frequencies and percentages). The pre- and post-test data were analyzed using a paired-sample t -Test to compare scores before and after the weeklong SOCIAL tour to gauge changes in perceptions about agricultural practices to address the second research objective. To determine the effect size of the findings, a Hedges' g analysis ($n < 50$) was used for this study. Sawilowsky's (2009) convention for effect size was used as the framework to determine effect (i.e., $.01 =$ very small, $0.2 =$ small, $0.5 =$ medium, $0.8 =$ large, $1.2 =$ very large, and $2.0 =$ huge).

Qualitative Methods

Photo elicitation was utilized to address the third research objective. Participants shared photos throughout the weeklong farm tour experience to convey what was most important to them in more diverse terms than interviews alone can provide (Boron, 2013). Photo elicitation is vital for researchers who "... want to capture participants' feelings, thoughts, intentions, previous behaviors or the ways in which people organize their mental understandings and then connect these understandings to their world." (Richard & Lahman, 2015, p. 4). Each participant uploaded three photos with a 100-maximum-word summary to respond to the prompt: *What did you find the most impactful about today?* after the end of each tour day. After the weeklong farm tour, 195 photos and reflections were expected from the participants ($N = 13$).

Participants who uploaded a photo but no corresponding reflection, or a reflection but no corresponding photos were removed from the study. A total of 60 photos with corresponding reflections were received and analyzed across 12 participants (92.3%).

Photographs and reflections were coded as one single unit building off a similar qualitative study done in 2017 (Baker et al., 2017). The first round of coding followed Saldaña's (2016) pre-coding techniques, as researchers identified noteworthy reflections, quotes, and photos. The second round of coding used initial coding method that "...breaks down qualitative data into discrete parts, closely examines them, and compares them for similarities and differences" (Saldaña, 2016, p. 115). The third round of coding utilized a focus coding process that identifies the most reoccurring categories in the data (Saldaña, 2016). The research team individually coded themes and then collaborated to finalize themes observed from the photo and reflection submissions (Baker et al., 2017). Throughout this coding process, member checks were conducted across the research team to ensure credibility (Creswell & Poth, 2018).

When conducting qualitative inquires, a reflexivity statement is essential to better understand the positionality of the research team (Creswell & Poth, 2018). The research team was composed of two agricultural education faculty members, one of whom previously taught middle school agriculture, a plant and environmental science faculty member, and a graduate research associate. Two of the faculty members and the graduate research associate played integral roles in facilitating the SOCIAL program.

Results/Findings

The first research objective was to describe the demographic characteristics of participants in the SOCIAL program. Ten participants (76.9%) completed the pre- and post-tour surveys. Respondents ranged from 21 to 60 years of age, with the majority (60%) being female ($n = 6$). All participants were white non-Hispanics and five (50%) earned a master's degree, three (30%) earned a doctorate, and two (20%) earned a bachelor's degree. All participants were currently social studies teachers in South Carolina and were selected to participate in the SOCIAL program through a competitive application process. Table 1 outlines the demographics of participants.

Table 1

Demographic Characteristics of SOCIAL Program Participants (n = 10)

Characteristic	Category	<i>f</i>	%
Gender	Female	6	60
	Male	4	40
Race/Ethnicity	White Non-Hispanic	10	100
Education	Bachelor's degree completed	2	20
	Master's degree completed	5	50
	Doctorate degree completed	3	30
Teaching Experience	1 - 10 years	4	40
	11 - 20 years	4	40
	21 - 31 years	2	20
Age	21 - 30 years old	1	10
	31 - 40 years old	2	20
	41 - 50 years old	2	20
	51 - 60 years old	5	50

Research objective two aimed to compare participants' agricultural literacy before and after the SOCIAL tour through their pre- and post-tour scores. There was a significant increase ($df = 9, p < 0.05$) from pre- to post-tour survey grand means ($M = 3.06$ with $SD = .193$ and $M = 3.25$ with $SD = 0.126$ for pre- and post-tour surveys, respectively). Therefore, the null hypothesis was rejected, as there was a positive change in participants' agricultural awareness following the SOCIAL tour. To determine effect size of the findings, a Hedges' g analysis was used since the $n < 50$ for this study. The effect size for this analysis ($g = 2.44$) was found to exceed Sawilowsky's (2009) convention for a huge effect ($d > 2.0$). Table 2 provides item means and standard deviations for pre- and post-tour, where questions 9 and 10 are reverse coded as they are negatively asked questions.

Table 2

Pre- and Post-Tour Means and Standard Deviations (n = 10)

Item	Pre-Tour		Post Tour	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
1. Agriculture could enhance K -12 education.	3.70	0.48	3.80	0.42
2. Basic knowledge of agriculture is important to make daily decisions.	3.30	0.67	3.60	0.70
3. Agriculture could be integrated into social studies.	3.60	0.52	3.90	0.32
4. Agriculture includes processing food and fiber.	3.20	0.63	3.70	0.48
5. Agriculture is a highly technological industry.	3.60	0.52	3.90	0.32
6. Agriculture is science-based industry.	3.60	0.52	3.90	0.32
7. Agriculture has a skilled, educated workforce.	3.60	0.52	3.90	0.32
8. Agriculture has a lot of career opportunities.	3.60	0.52	3.80	0.42
9. The study of agriculture is a waste of time in middle school education.	1.20	0.42	1.00	0.00
10. Agriculture is too outdated to be taught in middle schools.	1.20	0.42	1.00	0.00

The findings for research objective three identified five agricultural literacy themes participants viewed as valuable while on the weeklong farm tour: (a) twenty-first-century agricultural production, (b) agricultural literacy recognition and application, (c) dissemination of information in social studies classrooms, (d) sustainable agricultural practices, and (e) the historical impact of agriculture on South Carolina after a three round coding process following the conventions of Saldaña (2016).

Theme #1: Twenty-first Century Agricultural Production

Participants' first day on the farm tour was at a Clemson Research and Education Center (REC) where they learned about precision agriculture. Throughout the day, participants learned about drone technology and other precision agriculture equipment and their influence on modern agriculture practices. For many participants, this was their first exposure to modern agriculture in the field. Multiple participants acknowledged how farmers benefited from modern technology use in agricultural production. The main benefit participants discussed was how technology and modern agricultural practices could save farmers

money: “This cost-saving technique [Precision Agriculture] could keep farmers in business.” (Participant 1); “This [Precision Agriculture] saves farmers money since the entire field doesn’t need to be fertilized at the same level.” (Participant 1); “It [Precision Agriculture] makes economic sense for the for the farmer...” (Participant 12). On day 4, participants were exposed to topics on Integrated Pest Management (IPM) and turf management at the Pee Dee REC. Participant 1 mentioned that IPM is “...about maximizing profits for the farmers...” and “... Lowering management costs drives profit...” To further support this theme, Figure 1 provides a photo and reflection from two participants.

Figure 1

Photographs and reflections (left to right) from participants 5 and 7



“Demonstration of a splicing tool used for grafting watermelon plants onto squash root systems. This is an example of the high technology being used in growing healthy and thriving crops. Tools and techniques are thoroughly tested and this information is shared with local the local community to practice by local farmers.”



“When I use this image in my classroom with students, I plan to explain how farmers water specific areas on their farmers with this large irrigation equipment. It was amazing to see firsthand how the equipment would slowly move across the field...Once the data is collected from the drone...Farmers use technology in agriculture daily.”

Theme #2: Agricultural Literacy Recognition and Application

Throughout the tour, participants remarked on various agricultural knowledge they lacked. Participants acknowledged how little they knew about crops grown in South Carolina, how agricultural production is interdisciplinary, and how Clemson Cooperative Extension Service research benefits both producers and South Carolina community members. Participants discussed the interdisciplinary aspects of agricultural work. Participant 7 stated, “Agriculturalists incorporate their knowledge of both science and math with this process [crop and soil science research].” and “...clear communication is vital.” Participants also discussed the importance of Clemson Cooperative Extension Service research and community outreach to South Carolina producers. Similar to participant observations about technology, participants linked Clemson’s Cooperative Extension services as a resource for grower success. To expand on this, Figure 2 shows Participant 7 discussing the interdisciplinary aspects of agricultural work. She states, “Agriculturalists incorporate their knowledge of both science and math with this process [crop and soil science research],” and “...clear communication is vital.” Building off this comment, participants also discussed the importance of Clemson Cooperative Extension Service research and community outreach to South Carolina producers.

Figure 2

Photo and reflection from Participant 7.



“...At the REC, researchers determine which corn crop grow best for the area. Agriculturalists incorporate their knowledge of both science and math with this process. This is important because farmers do not what to plant a field of corn seeds in an area not suitable for the specific soil and location. Clemson equips local farmer with successful planting techniques. Students may want to go into this field because clear communication is vital.”

Theme #3: Dissemination of Information in Social Studies Classrooms

The participants agreed to create a plan to share their experiences during the event with their students through their photos and reflections when they return to their respective social studies classrooms. During the five-day tour, the participants recognized that students would be interested in many areas of modern agriculture practices. One area of interest the participants thought their students would be interested in is the economic impact agriculture has in the United States and worldwide. Outside of economic interest, participants saw benefits in touring various SOCIAL locations again with their students to introduce them to agriculture in South Carolina. Throughout their reflections, participants also remarked on several ways agriculture could benefit students in their career aspirations: “Students may want to go into this field because clear communication is vital.” (participant 7); “Researchers are seeking to have a greater understanding of this [microplastics] impact. Students can think about a career that focuses on studying microplastics.” (participant 7); “Students may want to earn a degree in turf grass management and develop environmentally friendly golf courses that are more sustainable in regard to irrigation.” (participant 7); and “I would really like to show my female students some role models from the trip” (participant 12). Figure 3 furthers the impact of the experience through the participant’s lens.

Figure 3

Photos and reflections (left to right) from participants 7 and 12.



“Students need to understand the ecological diversity in South Carolina. The wetlands are a valuable natural resource and provide important plant and animal habitats...A visit to this location may provide students with a firsthand experience for a greater understanding of how to preserve our wetlands.”



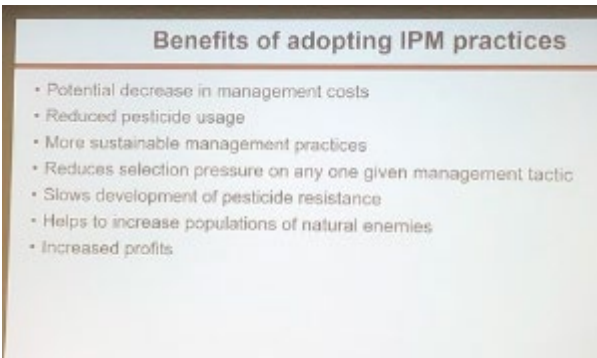
“I think students will be open to the idea of changing what we view as beautiful – particularly when we explain the dynamics of habitat and linking habitats for wildlife.”

Theme #4: Sustainable Agricultural Practices

Throughout the five-day tour, participants expressed concerns over urbanization’s impact on natural resources and animal habitats. The use of water in modern agricultural practices and tourism was another concern of the participants. Participant seven commented on turf management while touring the REC: “...perhaps unsustainable use of water was concerning to me at the site. I realize that growing turfgrass is important for tourism in South Carolina, but can we develop sustainable practices?” Participants also expressed concerns over plastic pollution. Participant five remarks on the benefits of pollinators, along with how urbanization and habitat loss has negatively impacted pollinator numbers: “Farmers are in dire need for the arrival of pollinators to jump-start the fertilization process...With the ever-expanding development of human habitat, the decline of pollinator habitat is alarmingly steep.” However, throughout the tour, participants acknowledged researchers’ and farmers’ efforts to farm sustainably to combat the negative impact of agricultural practices on the environment. Participant one comments, “Contrary to what people think, farmers desire to use the least amount of pesticides and irrigation possible” when learning about IPM benefits at the Pee Dee REC. The use of water in modern agricultural practices and tourism was another concern of the participants (see Figure 4).

Figure 4

Photos and reflections (left to right) of participants 1 and 7.



“Contrary to what people think, farmers desire to use the least amount of pesticides and irrigation possible.”



“This image reflects the delicate balance between human development and natural habitats. A moderate amount of pesticides are used in an environmentally friendly manner. There are an abundance of plants and animals to be found.”

Theme #5: Historical Impact of Agriculture on South Carolina

After struggling to find a stable cash crop, rice was discovered to thrive in the Lowcountry of South Carolina. Enslaved laborers were brought to South Carolina because of their “...technical knowledge and skills in rice cultivation and irrigation...” and to bring “...established knowledge systems with them to the Lowcountry”. As a result, the Gullah heritage grew in the Lowcountry. Participants’ reflections documented the role of agriculture in South Carolina’s history (Figure 7). Participant nine commented on the Gullah-Geechee community’s influence on South Carolina culture and development:

Carolina Gold Rice is also a key ingredient in many traditional Southern dishes. These efforts to Carolina Gold Rice shine a spotlight on South Carolina food-ways and the influence of the Gullah-Geechee on American cuisine! I can add to this effort to replenish South Carolina’s Carolina Gold Rice production while studying the Gullah Geechee and their enormous contribution to both the economic and cultural development of South Carolina.

Participants’ reflections documented the role of agriculture in South Carolina’s history (Figure 5).

Figure 5.5

Photos and reflections (left to right) from participant 5 and 10.



"...the important role of the Gullah Geechee people in the success of rice as a cash crop in South Carolina since its founding, and the terrible price they paid as the enslaved workforce who grew, harvested and processed rice on which immense fortunes were made. The descendants of the Gullah Geechee community are neighbors, and faculty are working to make into collaborators in restoring rice as a viable crop in helping to feed our population."



"The following images shows the antebellum slave cabins that are located in Friendfield Village on the Baruch Estate in Georgetown, SC...It was an eye opening experience to see what life was like for slaves who lived in this particular area. I begin to think about all the history that has taken place on the ground we were standing on."

Conclusions/Discussion/Implications/Recommendations

There was a significant change in participants' perceptions of agriculture pre- and post-tour experience. This change in perception is supported by previous research, as Peticara and Swenson (2019) identified how attending a farm tour can lead to a change in "...behavior, knowledge, and/or attitude." Participants also saw value in agricultural literacy after attending the SOCIAL tour, as there was a positive change in participants' agricultural literacy based on the SOCIAL Academy summer tour with a large effect.

Participant reflections showcase the public's continued need for agricultural literacy as they reflect on what they gained and learned from the five-day SOCIAL tour experience. Participants felt a connection to sustainable agricultural practices and the care the industry puts into its work. Participants showed an increase in awareness about modern agricultural practices and their impact on the environment after the tour. Participants experienced a paradigm shift over the course of the study tour as participants discussed various ways that agricultural topics could be taught inside their classrooms, aligning with previous research (Powell et al., 2008). The expressed interest teachers provided about sharing job opportunities and experiences within their classrooms supports the idea that nontraditional agricultural educators can increase a child's agricultural literacy in non-agriculture classrooms (Peticara & Swenson, 2019). This highlights the potential for social studies teachers to implement inductive learning of agricultural literacy through the social and historical knowledge of agriculture, which further supports the conceptual framework of Powell et al. (2008).

In addition, students may be attracted to the technology integration and career opportunities in agriculture. Jones et al. (2017) discuss the common misconception that agriculture does not contribute to “modern economic and social life.” Participants’ observations about modern technology used in agriculture and its benefits challenge this belief. Participants acknowledged that technology used in agricultural practices creates multiple financial benefits, showing that producers contribute to the modern economic system in South Carolina despite the misconception that agriculture provides no contribution to modern economics. Technology use discussed by participants highlights the agricultural sector in South Carolina using modern science on a daily basis. Parker and Wagner (2016) discuss the varying job opportunities present in the agricultural sector. Participants can convey the diversity of agriculture-related work to their students, relating the opportunities to students’ interests.

While this study was limited to the middle school social studies teachers in South Carolina who participated in the SOCIAL experience, the participants are representative of the state, as over 80% of teachers in the state are white non-Hispanics and majority female according to the South Carolina Department of Education (2023). Therefore, the findings of this study should be considered for potential transferability to states hosting similar programs with comparable aims.

Participants were most intrigued by sustainable agricultural practices throughout the tour. Much of their commentary and reflections discussed the use of natural resources (i.e., water) and land management issues in the agricultural sector. Thus, future programming should aim to focus on sustainable practices and the potential implementation as a context across core content areas. Additionally, school-based agricultural education teachers could utilize this by incorporating more sustainable agricultural topics into their outreach programs, potentially attracting more people to adult education opportunities and developing additional school-site collaborations.

Future research would benefit from following up with the teachers inside their classrooms to assess the agricultural literacy of students after being exposed to their teachers’ experiences and the teachers’ efficacy to integrate agriculture as a context within social studies classes. This could provide a clearer answer on the effectiveness of learning about these experiences on students’ own perceptions and beliefs about modern agricultural practices through behavioral changes in classroom implementation. In addition, this study should be replicated with a larger population, including teachers in multiple states specializing in different content areas (science, math, robotics, etc.). Pre- and post-tour surveys should be linked in the future to explore individual growth in agricultural awareness and literacy, further allowing the research team to determine the impact of personal and professional characteristics on their agricultural literacy. As our sample cannot be generalized to all South Carolina 8th-grade social studies teachers and beyond, other states should replicate this study in their settings to address agricultural literacy among social studies middle school teachers in their state. Additional funding should also be sought to replicate this study outside of COVID restraints and to more general education teachers to gain a larger sample size and better reflect the diversity of South Carolina 8th-grade middle school teachers. It is further recommended that the conceptual framework (Powell et al., 2008; see Figure 1) be used to further integrate agricultural literacy into core content areas to promote decision-making and problem-solving skills, ultimately creating a paradigm shift in the development of an agriculturally literate society.

References

- Baker, M. A., Culbertson, A. L., Robinson, J. S., & Ramsey, J. W. (2017). Seeing what they see--A photovoice analysis of exploratory early field experiences. *Journal of Agricultural Education, 58*(2), 252–267. <https://doi.org/10.5032/jae.2017.0252>.

- Borron, A. S. (2013). Picturing the underserved audience: Photovoice as method in applied communication research. *Journal of Applied Communications*, 97(4), 6–19. <https://doi.org/10.4148/1051-0834.1124>.
- Clemons, C., Lindner, J. R., Murray, B., Cook, M. P., Sams, B., & Williams, G. (2018). Spanning the gap: The confluence of agricultural literacy and being agriculturally literate. *Journal of Agricultural Education*, 59(4), 238–252. <https://doi.org/10.5032/jae.2018.04238>.
- Cortina, J. M. (1993). What is coefficient alpha? An examination of theory and applications. *Journal of Applied Psychology*, 78(1), 98–104. <https://doi.org/10.1037/0021-9010.78.1.98>.
- Creswell, J. W., & Plano Clark, V. L. (2011). *Designing and conducting mixed methods research*. Sage.
- Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches*. Sage.
- Field, A. (2018). *Discovering statistics using SPSS* (5th ed.). Sage.
- Jones, K., Williams, R. J., & Gill, T. B. (2017). If you study, the last thing you want to be is working under the sun: An analysis of perceptions of agricultural education and occupations in four countries. *Agriculture and Human Values*, 34(1), 15–25. <https://doi.org/10.1007/s10460-016-9685-4>.
- Knobloch, N. A., Ball, A. L. (2003). An examination of elementary teachers' and agricultural literacy coordinators' beliefs related to the integration of agriculture. Agricultural Education Research Summary Report, 1–18. <https://doi.org/10.13140/RG.2.2.16867.353661>.
- Knobloch, N. A., Ball, A. L., & Allen, C. (2007). The benefits of teaching and learning about agriculture in elementary and junior high schools. *Journal of Agricultural Education*, 48(3), 25–36. <https://doi.org/10.5032/jae.2007.030>.
- Knobloch, N. A. (2008). Factors of teacher beliefs related to integrating agriculture into elementary school classrooms. *Agriculture and Human Values*, 25(4), 529–539. <https://doi.org/10.1007/s10460-008-9135>.
- Kovar, K. A., & Ball, A. L. (2013). Two decades of agricultural literacy research: A synthesis of the literature. *Journal of Agricultural Education*, 54(1), 167–178. <https://doi.org/10.5032/jae.2013.01167>.
- Mars, M. M., & Ball, A. L. (2016). Ways of knowing, sharing, and translating agricultural knowledge and perspectives: Alternative epistemologies across non-formal and informal settings. *Journal of Agricultural Education*, 57(1), 56–72. <https://doi.org/10.5032/jae.2016.01>.
- Nunnally, J. C. (1978). *Psychometric theory* (2nd ed.). McGraw-Hill.
- Parker, J. E., & Wagner, D. J. (2016). From the USDA: Educating the next generation: Funding opportunities in food, agricultural, natural resources, and social sciences education. *CBE—Life Sciences Education*, 15(3), fe5. <https://doi.org/10.1187/cbe.16-01-0052>.
- Perticara, L., & Swenson, R. D. (2019). Farm to classroom: Encouraging teachers' infusion of agriculture following a farm tour. *NACTA Journal*, 63(2), 331–340. Retrieved from

<https://web.p.ebscohost.com/ehost/detail/detail?vid=3&sid=cba58016-f59b-4aed-9fc9-d6f322c874ba%40redis&bdata=#AN=141616715&db=eft>.

Powell, D., Agnew, D., & Trexler, C. (2008). Agricultural literacy: Clarifying a vision for practical application. *Journal of Agricultural Education*, 49(1), 85–98.
<https://doi.org/10.5032/jae.2008.01085>.

Richard, M.V., & Lahman, M.K.E. (2015). Photo-elicitation: Reflexivity on method, analysis, and graphic portraits. *International Journal of Research & Method in Education*, 38(1), 3–22,
<https://doi.org/10.1080/1743727X.2013.843073>.

Saldaña, J. (2016). *The Coding Manual for Qualitative Researchers*. Sage.

Sawilowsky, S (2009). New effect size rules of 0 thumb 2. *Journal of Modern Applied Statistical Methods*, 8(2), 467–474. <https://doi.org/10.22237/jmasm/1257035100>

South Carolina Department of Education. (2023). *South Carolina Teachers by Race and Gender*.
<https://ed.sc.gov/data/reports/scde-educator-profession-reports/scde-educator-profession-reports/sc-teachers-by-race-and-gender/>

Vallera, F. L., & Bodzin, A. M. (2016). Knowledge, skills, or attitudes/beliefs: The contexts of agricultural literacy in upper-elementary science curricula. *Journal of Agricultural Education*, 57(4), 101–117. <https://doi.org/10.5032/jae.2016.04101>.