

Implementation of Agriscience Fair by Middle School Agricultural Education Teachers

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Abstract

One of the tools middle school SBAE teachers can use to deliver the total program is research-based SAEs, for which students can receive recognition through the FFA Agriscience Fair. This study examined why middle school SBAE teachers implemented the FFA Agriscience Fair into their programs. This study built on previous literature in this area, but with a specific focus on middle school programs. Using a qualitative case study, seven teachers that had various levels of use with Agriscience Fair were interviewed. Teachers were categorized into their levels of use for this innovation and spanned across multiple levels. Major themes from the interviews emerged that found the Agriscience Fair award area was a tool that teachers used to help strengthen their program by enriching the program offering and providing hands-on learning for students. Themes of teachers learning to figure out the complex rules of the competition to be successful as well as using relationships to help students be successful emerged. Recommendations were made to make the award area more intuitive, especially for teachers who are newer to the implementation including providing examples of manuscripts and presentation materials, providing lesson planning resources, and professional development.

Introduction and Theoretical Framework

Teachers use a complex process of curricular decision-making to determine the ideal blend of learning experiences to provide to students. These decisions are often based on learning contexts, beliefs about students, beliefs about teaching and learning, expectations for students and success, and self-efficacy (Ruppar et al., 2015). In school-based agricultural education (SBAE), these decisions are typically mediated by balancing program delivery through classroom/laboratory instruction, student participation in the National FFA Organization, and Supervised Agricultural Experiences (SAEs) (Croom, 2008). The proliferation of middle school programs since the 1980s has raised questions about how these programs should be delivered to middle school students (Frick, 1993). In 1985, 22% of all secondary instructors taught at least one section of a middle school course in agriculture (Phipps & Osborne, 1988). In 2020, there were 442 teachers teaching exclusively middle school and 107,856 students in middle school agricultural education classes, which has nearly doubled since 1994 (Jones et al., 2020; Rossetti & McCaslin, 1994).

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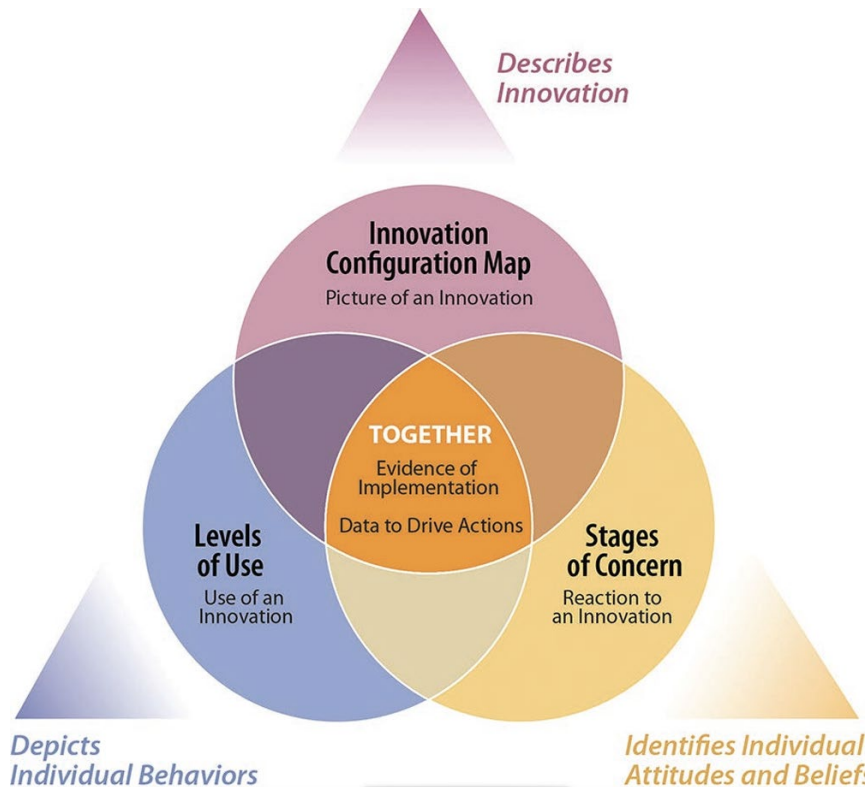
Research-based SAEs have been a tool used by SBAE teachers to provide an accessible option for students to engage in SAEs (Thiel & Marx, 2021). Research-based SAEs also provide an opportunity for the application of scientific principles that promote meaningful learning for students (Thoron et al., 2011). The FFA Agriscience Fair began as the Agriscience Student Recognition Program in 1988 (National FFA History, n.d.) and provides student recognition for outstanding research-based SAEs (National FFA Organization, n.d.-a). According to Jones et al. (2020), middle school Agriscience Fair participation has been an avenue for FFA participation for middle school students. In 2023, 363 students competed in the Agriscience Fair at the national level and the Agriscience Fair award program has the largest number of middle school members at the national level (M. Young, Personal communication, September 13, 2023). Despite this involvement, little has been done to examine if middle school teachers implement research-based projects into their programs or how the FFA Agriscience Fair is structured for middle school participants. Further investigation into this could determine if middle school participation in the Agriscience Fair is intracurricular or if it simply serves as a competition added on. Further, examining strategies for teachers who are implementing Agriscience Fair could provide insight for other teachers. Conversely, exploring the challenges and barriers will provide an opportunity to recommend improvements to the award area and create resources for middle school teachers and students.

In the broader education literature, science fairs have been shown to have positive impacts on students. Science fairs have been shown to promote learning and increase scientific literacy (Schmidt & Kelter, 2017). Students who participate in multiple years of science fairs are more likely to choose a Science, Technology, Engineering, or Math (STEM) major in college (Sahin, 2013). Despite these potential benefits, science teachers in middle grades may not be implementing these concepts at a high level. According to Banilower et al. (2018), 46% of middle grades science teachers emphasized “learning how to do science” as a key instructional objective. Less than half of middle school science teachers offered opportunities to compete in science fairs (Banilower et al., 2018). This limited participation among middle school students and the direct applied nature of agricultural education provides a unique opportunity for students to participate in the FFA Agriscience Fair.

The Concerns-Based Adoption Model (CBAM) was used as the conceptual framework for this study. CBAM examines the process of change in education, specifically how individuals negotiate the decision-making process for implementing new techniques with their students (Hall, 1974). CBAM explores three diagnostic dimensions that examine the interplay between the individual behaviors, attitudes and beliefs of individuals, and the nature of the innovation (see Figure 1). The model was designed to help identify the variables involved with the change process and categorize them to help those involved with implementing change. The CBAM consists of three components for guiding the change process: innovation configuration, stages of concern, and levels of use. An innovation configuration map provides an overview of the process and models quality implementation. The stages of concern help to identify individuals’ attitudes about an innovation. The level of use determines where individuals are regarding their current usage of the innovation (Hall et al., 1975).

Figure 1

Three Diagnostic Dimensions of the Concerns-Based Adoption Model



Note. Adapted from “CBAM: The Concerns-Based Adoption Model” (American Institutes for Research, 2015).

The focus of this inquiry was to create an innovation configuration map to explore middle school teachers’ implementation of the Agriscience Fair process and to explore how the Agriscience Fair could be adjusted to make the adoption more streamlined. This innovation configuration map conceptualizes high-quality implementation of agriscience fair. By understanding those teachers who implement agriscience fair at a high level, and the challenges other teachers face, we can create a clear picture of the implementation and recognize potential challenges. The levels of use help to identify where individuals are in their current adoption. According to Hall et al. (1975), there are eight levels of use related to implementing a practice ranging from nonuse to renewal (see Table 1). For this study, we focused on teachers ranging from routine use, or who are still learning the system to teachers in the renewal phase, or teachers who thoroughly implemented the practice and are seeking new ways to imbed the innovation in creative ways.

Table 1*Level of Use of the Innovation*

Level of Use	Description of the Level
Nonuse	State in which the user has little or no knowledge of the innovation, has no involvement with the innovation, and is doing nothing toward becoming involved.
Orientation	State in which the user has acquired or is acquiring information about the innovation and/or has explored or is exploring its value orientation and its demand upon the user and the user system.
Preparation	State in which the user is preparing for the first use of the innovation.
Mechanical Use	State in which the user focuses most effort on the short-term, day-to-day use of the innovation with little time for reflection. Changes in use are made more to meet user needs than client needs. The user is primarily engaged in a stepwise attempt to master the tasks required to use the innovation, often resulting in disjointed and superficial use.
Routine	Use of the innovation is stabilized. Few if any changes are being made in ongoing use. Little preparation or thought is being given to improving innovation use or its consequences.
Refinement	State in which the user varies the use of the innovation to increase the impact on clients within immediate sphere of influence. Variations are based on knowledge of both short- and long-term consequences for clients.
Integration	State in which the user is combining own efforts to use the innovation with the related activities of colleagues to achieve a collective effect on clients within their common sphere of influence.
Renewal	State in which the user reevaluates the quality of use of the innovation, seeks major modifications or alternatives to the present innovation to achieve increased impact on clients, examines new developments in the field, and explores new goals for self and the system.

Measuring Implementation in Schools: Level of Use. (Hall et al., 2013, p. 5)

Purpose and Objectives

The purpose of this study was to examine the decision-making process of middle school teachers implementing the FFA Agriscience Fair into their program. The case study approach was used to examine middle school teachers across levels of use in implementing FFA Agriscience Fair. The research was guided by the following research question: Why do middle school teachers implement the Agriscience Fair into their program?

Methods

This qualitative research study sought to understand middle school teachers' experiences with the Agriscience Fair. The study was approved through the institutional review boards at both research institutions involved in the project. Invited participants (see Table 2) were chosen to maintain representation of the various FFA regions and with varying levels of observed success in the awards structure of Agriscience Fair. We worked with both National FFA staff as well as State FFA staff in areas with middle school engagement in Agriscience Fair to identify teachers to interview. We sought nominations of individuals at varying levels including those who have had success at the state or national level as well as those who were in the earlier phases of implementing Agriscience Fair. Participants were given pseudonyms and are presented below with additional information about their experience with the Agriscience Fair. We sought a diverse panel of teachers with a range of experience and understanding of Agriscience Fair.

Table 2

Description of the participants experience with Agriscience Fair

Participant Pseudonym	Experience with Agriscience Fair	Region
Gabriella	4 years, some success but learning from co-teacher	Western
Hannah	4 years, success at national level but limited classroom integration	Southern
Katie	4 years, extremely successful with several national winners each year	Central
Samantha	8 years, some success at the state and local level	Western
Riley	9 years, had success on the state level and a few top 10 at national level	Western
Emily	10 years, 3 years with middle school, national winners and all students implementing in the classroom	Eastern
Carly	12 years, track record of success at the national level and high levels of classroom integration	Southern

Semi-structured interviews (see Table 3) were conducted between October 2022 and June 2023. Some interviews were conducted in person during the National FFA Convention while others were conducted via Zoom, but two members of the research team were present for each interview. These team members made notes on the conversation and their overall observations. We also attempted, through this process and the peer debriefing that followed, to bracket out our own biases and where those might be

influencing the interpretation of the findings. This was further aided by having two research team members who had much less experience with the Agriscience Fair.

All interviews were audio or audio/video recorded to allow for transcription in addition to researcher notes to ensure dependability (Lincoln & Guba, 1985). Transcripts were sent to participants for member checking to ensure accuracy of the data collected and allow another opportunity for teachers to review their input and retract any statements they did not want included in the research. No statements were removed from the data through this process.

Table 3

Overview of semi-structured interview guide

Category of Question	Prompting Questions
Introductory Grand Tour Questions	Tell us a little about your experience with the Agriscience Fair. Why are you drawn to the Agriscience Fair? How does it help you meet the goals of your classroom or total ag. ed. Program?
Classroom Implementation	How do you implement it in your classroom? Tell us a little about the type of instruction you implement in your classroom to teach agriscience content to students. How does Agriscience Fair help students understand the scientific process? How does Agriscience Fair help students learn the scientific process as it is applied to agriculture and natural resources?
Agriscience Fair as competition	Why do you choose to enter your students into the Agriscience Fair competition? What is it about the Agriscience Fair competition that helps meet your program goals? How well do middle school students deal with the aspects of success and failure that comes with competition?
Age level appropriateness	Based on your experience teaching middle school students- How would you assess their ability to understand the scientific process to solve agricultural problems? How would you assess their ability to come up with project ideas? How would you assess their ability to implement rigorous scientific methods to conduct an experiment? How do you assess their writing ability? Are your students competent enough to complete the written portion of Agriscience Fair? How would you assess their ability to analyze data to make practical recommendations?
Rules and Process appropriateness	What aspects of the manuscript process work well for you and your students? What aspects of the manuscript process are challenging for you and your students? What changes would you like to see to the manuscript process? (Follow up specifically about the review of literature and methods section) What aspects of the interview process work well for you and your students? What aspects of the interview process are challenging for you and your students?

	What changes would you like to see to the interview process?
Questions for highly successful programs	Your students have experienced a level of success in ASF, what do you attribute that to? What advice would you give to other teachers considering getting their students involved in the Agriscience Fair? Would you like to see any changes to the program at the state or national level? What recommendations would you make to national FFA or your state superintendent?
Questions for moderately successful programs	What are your goals for your students regarding the agriscience competition at the state and national level in the future? Would you like to see any changes to the program at the state or national level that help you meet those goals?

All research team members have experience teaching agriculture at the high school level with one team member also having middle school experience. All team members also have experience managing, scoring, judging and/or coordinating state or national Agriscience Fair competitions.

The researchers originally coded interviews individually, re-reading all transcripts and using open coding to allow participant voice to emerge (Creswell, 2012). After this first round coding, we met to share observations, to seek intercoder agreement, and to discuss possible constructed themes and clarify the terminology. After this round, we had another round of coding where the team looked for clear supporting quotes for the constructed themes as well as to identify any recurring items that were not represented in the first round of constructed themes. This constant comparative analysis through multiple step coding allowed us to transform the raw data into themes representative of participants (Glaser & Strauss, 1967). Themes are presented here using thick, rich descriptions to ensure trustworthiness (Creswell, 2012).

Results

The initial data analysis consisted of determining the level of use from each participant. After the transcription, we met to discuss the level of use of the participants. The level of use for the participants was described in Table 4.

Table 4

Participant level of use of the Agriscience Fair

Participant Pseudonym	Level of Use
Gabriella	Routine use
Samantha	Routine use
Hannah	Refinement
Katie	Refinement
Carly	Integration

Riley	Integration
Emily	Renewal

Three themes were constructed as a result of the open coding process. These themes were: Agriscience Fair is a tool to help strengthen the total program, these teachers are learning to *play the game*, and teachers are using relationships to help their students have success in Agriscience Fair.

Theme 1: Agriscience Fair was a tool to help strengthen the total program

The teachers in this study see the Agriscience Fair as a valuable tool to enrich their programmatic offerings and provide hands-on experiences for students. Teachers were using specific aspects of the Agriscience Fair to enhance what they are already doing in their program and to provide unique opportunities for students to apply what they are learning to authentic scenarios as well to build concrete skills related to the scientific method and data reporting process.

The Agriscience Fair is a tool for Gabriella to combat preconceptions of her program saying, “we're just kind of still trying to change the mindset of people who knew what [the program] was before, or who went through the program before, and we want them to see that it is a rigorous program.” Riley introduced the “Agriscience [Fair] as a way to engage our middle school students in some FFA competitions and be able to take them to nationals, and then to also just add some validity to our program, as far as science standards.” Riley also stated they “brought Agriscience Fair in because...we wanted to be able to have a project we could show to our administration that these are the things our students are doing.” Similarly, the Agriscience Fair was a way to “beef up the curriculum” for Carly, who went on to note the standards do not take an entire year for her students, so the Agriscience Fair was a way to enhance the course by embedding it and making it “a culminating project.” The Agriscience Fair is used to teach students using all parts of the three-component model. According to Hannah, “I’m calling [Agriscience Fair] the SAE Projects.” Carly stated they were a class requirement, but students could receive recognition through FFA. Oftentimes, teaching in the classroom involves only one component of the agricultural education three component model, but middle school teachers are able to strengthen their program by teaching all three using the Agriscience Fair in their classrooms.

Teachers noted that embedding the Agriscience Fair into their classes allows students to build valuable life skills like communication, data analysis, interview skills, time management, and writing skills. Katie shared her belief that the Agriscience Fair is not only a good fit in her classes, but also that it is an attainable task for all her students, saying, “We have kids of all levels. Some other schools in our area or our state will say that [Agriscience Fair] only for honors kids...No, this can be literally everybody from your special needs kids to whoever it may be.” While discussing her desired outcomes for students, Carly remarked “What's more valuable is that they learn, in my opinion, to communicate well, and to present themselves well.” In relation to data analysis for middle school Agriscience Fair, Emily mentioned how it was important “to make sure my students were the ones who were doing the work and not doing a statistical analysis.” She continued to share how she had to bridge the knowledge gap for her students because, “it was never something that was part of our content in our schools. So, they weren't learning it, even in math class, to do data analysis to that level.” By increasing inclusivity, embedding Agriscience Fair into classes, and addressing the knowledge gaps in students, teachers are strengthening the total program.

The Agriscience Fair is a tool that can be used to build and sharpen interview skills in students. Carly stated the importance of interviews in the Agriscience Fair, “I really find value in the interview process. I think there is more life skill in simply understanding the scientific method, and then just the presentation and the communication skills that come with an interview.” Emily explained how her students do not only interview as a part of the Agriscience Fair, saying “we incorporate interviews with people in

industry into our agriscience project, so they did an interview with the Commissioner of Agriculture.” Strengthening students’ skills and understanding of the scientific method, presentation skills, and effective communication help to strengthen the total program.

The manuscript is a large portion of the Agriscience Fair and requires technical writing to complete. Oftentimes, middle school students are not learning the writing skills necessary in their other classes, so it should be taught in the SBAE classroom. Emily stated “Science teachers come to me frequently, and they're like, ‘We love having your kids in class because they already understand what a lab report is, how to read it, how to do it. They know the language.’” While the writing requirement is a challenge, Emily also mentions “I would not want to see the expectation lower, because I have found that students can get to that expectation.” Despite the challenges of having students write a manuscript, the teachers seem to believe it was a valuable part of the process and additive to help them strengthen their program. The participants did not indicate specific strategies used to scaffold this but did note using the award as a motivation for writing and budgeting enough time for students to work.

SBAE teachers have also found unique ways to build in Agriscience Fair opportunities at school. Hannah has worked to utilize her three-acre space, sharing how she has “identified seven components within my very small ag area” where students can complete their Agriscience Fair research. Katie’s approach was similar in how “we do all of our research in-house. These are all authentic projects we have...We literally have seventy-five buckets around my classroom, the biology teacher’s room. We have grow lights.” Utilizing resources available is an important part of the total program, as some programs have more than others. Because of these unique resources, completing in-house projects can create uncommon opportunities for projects.

Multiple teachers noted how success breeds success and encouraged continued participation in Agriscience Fair in their programs. Emily said, “after you have success once, it's a motivator for others to get there, because...they realize that it's attainable.” Carly shared, “Our students that did it in eighth grade with me, and then they, honestly, we laugh, we say, ‘to get a taste for blood,’ and they've been to nationals, and they want it again.” As programs find success, they find recognition from administrators and community members that can strengthen the total program.

Theme 2: These teachers are learning to *play the game*

Teachers often find themselves not only guiding students in research and writing for the Agriscience Fair, but also learning to *play the game* effectively. *The game* refers to the written and unwritten rules and best practices that will help their students realize success in the state and national Agriscience Fair award program. Teachers in this study identified making the Agriscience Fair project the students’ own, creating timelines for implementation, creating and borrowing resources for students, and being proficient in both technical writing and teaching technical writing as components needed to *play the game*.

Middle school SBAE teachers provide support to their students to make their Agriscience Fair project their own. Emily said “they like this project better than what they do in science class, because it's a topic that they chose. It's their interest.” Because students can begin Agriscience Fair projects in 6th grade, middle school students can find themselves with multiple unique projects during this time. Carly has her students reflect on their previous SAE projects “and then try to find a way to do something useful or related for their Agriscience [Fair research] to make it a little more tangible for them to grasp hold of.” When students have ownership and interest in their project, and use them to build upon each other, students are able to work toward realizing the success in the Agriscience Fair award program.

Another method teachers have found useful to their success in implementing the Agriscience Fair is to break down the project components and have their students follow a pre-planned timeline for project completion. Samantha explained how she has set “dates and times that [students] have to submit to me

certain things...that's how I chunk it as I go.” Emily described a similar approach where she has learned to “start early and break it into sections,” cautioning to “not start a month before and hand those kids this expectation of writing a twenty-page lab report and be like ‘alright pal, see you in fifteen days,’ because it's not going to happen.” By structuring the project and establishing pre-planned due dates for items, teachers are developing time management and organization skills in their students.

Creating or borrowing resources was also important to the teachers participating in this research study. To support students when coming up with projects, Samantha shared how at a previous national competition she “took a picture of each of the display boards, and then created a PowerPoint presentation. That then, was my lead in. ‘Hey, this is what guys are doing. This is what kids your age are doing.’” Riley also collected resources, saying “We've also accumulated resources from other teachers on projects and we share those lists with [students].” Gabriella referenced how she felt capable of incorporating Agriscience Fair after attending a workshop led by another SBAE teacher who “did a good job with [Agriscience Fair]...and gave us, like all of her materials and her timeline, and how she implemented it in her classroom.” By sharing resources, teachers are able to utilize quality materials that other teachers have created.

Another component is how technical writing is one of the most prevalent parts of the Agriscience Fair, so the teachers have learned to become proficient in training their students in this area. Of her previous experiences with Agriscience Fair, Emily said she learned “the level of requirements that would be there as far as using a scientific vocabulary,” and she made “sure my kids went into the contest knowing what the controls were with the independent variables, the dependent variables.” Technical writing requires a much different style compared to creative writing students are used to, so when teachers ensure students can use the scientific vocabulary, they are setting their students up for success as they advance into secondary school and beyond.

Theme 3: Teachers are using relationships to help their students have success in Agriscience Fair

Building an Agriscience Fair project involves more than just experiments and displays. Teachers and students must also cultivate relationships. Teachers recognize the value of connections with others involved in building a successful Agriscience Fair project. Support from teachers, school members, and others in the community, the journey from a parent’s role to a teacher’s, and the existence of a science fair culture at a school all contribute to engagement, collaboration, and growth of students.

Community connections are important to the teachers because they provide support and encouragement for students. Hannah shared how she worked “to get those students who are really interested in [Agriscience Fair] connected in and getting them their resources to support them, because there’s a lot of support out there. The students just have to be connected.” A connection Katie was able to make for her students was with the state Department of Agriculture after they received a grant that aligned with the students’ Agriscience Fair research. She shared how “they asked for [the student] data. And so, you had these two eighth grade students that were sharing actual data to the [State] Department of Agriculture.” Students who participated in this project built valuable relationships with both the Department of Agriculture and community members that have interest in the area of the project.

Some teachers have experience with the Agriscience Fair as a parent and teacher. Hannah said, “My experience started as a mom...my oldest son was required to do a science fair project for his honors science class, and so the teacher – seventh grade teacher at the time [was] like, ‘Let's find something different’” which led to a conversation with the FFA advisor encouraging them to submit the project to the state Agriscience Fair competition. Encouraging cross-curricular connections builds important relationships for future Agriscience Fair collaboration.

Relationships with other teachers in their school or state were identified as important to the success of the Agriscience Fair in their programs. Katie explained how she has a “Biology teacher that helps me,”

continuing to share that they help with "a lot of things agriscience." Katie mentioned that they "try to integrate English teachers because I really believe in cross-curricular [relationships]." Riley has used English teachers in her school to edit manuscripts. Katie shared that she has served as a source of knowledge for other teachers in her state because she has "given a lot of presentations in our state, and so I think it's important for every state to have a couple of people that they've done it. They get it." When discussing barriers, Samantha said that she "was able to reach out to another advisor" for help with the application process.

Schools that already have a culture of science literacy usually promote a culture where students are allowed to experiment, hands-on learning, and critical thinking (McKenzie, 2023). In reference to the school culture, Emily stated "we were what was considered a new tech school. So, everything in our school had to be project or problem based," which allowed the Agriscience Fair to easily align with the culture of the school. Katie realized her school's "Science Department had done a little bit of research with the Intel [International Science and Engineering Fair] program, so they were already going to science fairs, and then I'm like well, '[student] could do that through FFA too. Let's try and double dip.'"

Conclusions, Implications & Recommendations

This study investigated middle school SBAE teacher implementation of the Agriscience Fair in their programs. There was consensus between participants that the Agriscience Fair added value to their programs and agriscience research had been incorporated in their classes. Participants in this study chose to utilize the Agriscience Fair in their programs to increase validity and strengthen the total program through either an embedded class requirement, SAE expectation, or stand-alone FFA activity. Participants indicated that they were continuing to use the Agriscience Fair because of their increased understanding of the award program which improved their ability to teach students about research. Many of the participants also credited relationships with other teachers, FFA advisors and community members to their continued success and implementation of the Agriscience Fair in their programs.

We recommend that middle school SBAE teachers look to incorporate the Agriscience Fair into their programs, specifically as an in-class assignment. In alignment with Thiel and Marx's (2021) study, the Agriscience Fair is an opportunity to impact all three components of SBAE with one activity. The Agriscience Fair accomplishes this through in-class research, skill attainment through SAE, and FFA involvement through participation in state or national Agriscience Fair competitions.

The National FFA Organization has already created lesson plans and resources for teachers to implement Agriscience Fair projects in their classrooms (National FFA Organization, n.d.-b). While these lesson plans are a great resource, they are geared towards high school students. Instead of asking middle school teachers to modify or create resources, pre-made lessons should be created to incorporate the Agriscience Fair into middle school classrooms and made available through the same National FFA platform. Participants told us they were building or borrowing resources to learn how to implement Agriscience Fair into their programs. By having middle school specific resources and lessons available through National FFA, teachers could more easily and equitably implement Agriscience Fair into all programs despite their prior experience, or lack thereof, with research. These lessons should include a focus on the scientific method and technical writing. Participants told us that students are most likely not learning strong research or technical writing skills in other classes, and it is up to the SBAE teacher to bridge this gap. For the teachers incorporating the Agriscience Fair in their classes, those at schools with semester or year-long classes have had an easier time incorporating the Agriscience Fair in their curriculum than those who only have students for a six week or nine-week rotation. Many of these shorter courses were exploratory options for sixth graders to discover where they might want to focus in seventh and eighth grade. Another key component to include in the pre-made lessons are timelines for implementation of

various lengths ranging from six weeks to year-long to accommodate the unique structure of middle school schedules.

Multiple teachers were exposed to the Agriscience Fair through the work of professional development and information shared by other teachers. Currently, the National FFA Guidelines outline a different set of manuscript guidelines for middle school division participants. To increase the proliferation of the Agriscience Fair among this rapidly growing group of SBAE programs, states should offer workshops specifically directed toward middle school teachers to build self-efficacy to allow focused discussion on the middle school guidelines and suggestions for incorporating the Agriscience Fair into their programs. Teacher educators can support this effort by leading these professional development opportunities as well as exposing pre-service teachers to agriscience research and the Agriscience Fair in their coursework.

To increase participation, sponsors and organizations supporting the Agriscience Fair could consider offering SAE grants specific for Agriscience Fair studies. This funding and support could increase both interest in the Agriscience Fair as well as the understanding that research is a viable SAE option for students.

Teachers cited materials being offered by others as both one of the ways they got started in the research program but also as a resource they would want. Stakeholders from state and national level Agriscience Fairs could consider providing middle-school appropriate examples of high-quality manuscripts and presentation materials to allow teachers and students to see the desired end goal more clearly for the project. This modeling could increase not only the quantity of projects, but also quality. Middle school agriculture teachers should also connect with others in their school, other middle school ag teachers, and community members. Perhaps National FFA could offer a guide to help lead conversations with these potential Agriscience Fair partners.

There are limitations in this study. First, qualitative studies are not generalizable beyond the participants. Second, this study does not include participants operating at the levels of use below routine use of CBAM. Insight from participants in nonuse, orientation, and preparation would garner insight into how neophytes to this innovation consider the adoption. Additionally, those who are in the mechanical use phase or who have tried the Agriscience Fair and opted to not continue would be additive.

We recommend teachers continue to use the Agriscience Fair in the middle school classroom. We want to develop an innovation configuration map, which is a key part of the CBAM process, for the implementation of the Agriscience Fair for middle school programs. This map is beginning to crystallize as a result of this study, but development is an iterative process. The components of the innovation configuration map provide key components for ideal implementation. Based on this study, the initial components for implementation are (a) using the Agriscience Fair to strengthen the total agricultural education programs (b) using strategies to scaffold the agriscience research SAE process, and (c) using relationships in the school and community to support students. Future studies could provide clarity in developing this tool to guide adoption. We see best practices for implementing the Agriscience Fair as a classroom component as an effective practice for middle school teachers, especially teachers who successfully scaffold the workload of the research process, particularly the manuscript, for students. Improved resources related to the Agriscience Fair including providing examples of manuscripts and presentation materials, as well as tools to embed agriscience instruction into the classroom would be helpful for teachers.

Recommendations for Future Research

We offer the following recommendations for future research. To better clarify the innovation configuration map, future research could increase the sample size to identify teacher behaviors of each step of the CBAM process. How the CBAM model varies across regions of states or states with a higher or lower focus on SBAE could also be examined. There is also value in investigating teachers' stages of concern related to adoption of Agriscience Fair. CBAM has seven stages of concern, ranging from unaware to renewal (Hall, 1974). Understanding where teachers fall within the stages of concern can inform the professional development needs of teachers and identify promising practices for complete adoption of Agriscience Fair into SBAE programs. Future studies related to CBAM should include all aspects of Agriscience Fair, from supporting student projects to the application and presentation components as there can be varied areas of concern based on the Agriscience Fair component.

We also recommend future research connecting to other Agriscience Fair stakeholders. Current industry needs of the agriscience research industry could illuminate any missing components of the Agriscience Fair process. If the outcomes of Agriscience Fair and research SAEs are skill development and career exploration it is important to know what skills are being valued in agriscience research careers. Research into the student perspective, and even more importantly, the student impact of Agriscience Fair could be extremely beneficial in the proliferation of agriscience research in SBAE programs. Understanding what supports helped guide students and areas of challenge can inform how teachers implement Agriscience Fair in their programs.

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