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Building the House: Agricultural Educators' Perceptions of Planning and Managing Agricultural Education Facilities

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Abstract

Facilities are a critical component of an agricultural education program. Yet, there has been limited research done on agricultural educators' perceptions of facilities, especially since the facilities and resources of every agricultural education program can be highly variable. The purpose of this study was to understand the participants' perceptions of agricultural education facilities for both secondary and post-secondary agricultural education. A series of individual interviews were conducted among a group of certified agricultural education teachers at both the secondary and post-secondary level in Minnesota. The findings revealed: 1) the importance for support from key partners, such as advisory boards and community businesses, 2) the need for additional training for both in-service and pre-service teachers to better understand how to effectively plan and utilize facilities, and 3) the need for facility upgrades and maintenance to ensure student safety and preparation for the agriculture, food, and natural resource workforce. Additional research is recommended to better understand participants' perceptions of facilities in both secondary and post-secondary teacher preparation programs, which can lead to additional professional development or the creation of helpful resource guides to inform educators or administrators about agricultural education facility design and management.

Introduction and Literature Review

Providing students with experiences in agricultural education instruction requires consistent strategic planning and facilities to ensure any equipment or processed agricultural products are safe (Koundinya et al., 2010). The National Council for Agricultural Education (2016) establishes and periodically reviews the National Quality Program Standards (NQPS); their document establishes the importance of having relevant and safe facilities in all forms of agricultural instruction, and identifies "Program Design and Instruction - Facilities and Equipment" (p. 23) as its own standard, accompanied by 10 quality indicators, recognizing the fact that these facilities and equipment should be industry-grade, safe, accessible, and include ample space for storage and organization. For the purposes of this research, we will define agricultural education as: "A systematic program of instruction available to students desiring to learn about the science, business, and technology of plant and animal production and about the environmental and natural resources systems. Students are provided opportunities for leadership development, personal growth, and career success." (National Council for Agricultural Education, 2024). Additionally, facilities will be defined as the spaces, equipment, and tools utilized to support student learning within an agricultural education program (National Council for Agricultural Education, 2016).

The design and development of facilities begins with a thoughtful integrated planning process. Integrated planning occurs at the intersection of a program's mission, vision, and values with both the academic and strategic plans of a school district, and should be developed to allow for easier vertical and

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horizontal decision-making (Brodnick & Norris, 2016). At its core, a program can develop and utilize the plan as a helpful guide to make mission-driven decisions across individual departments, or using a top-down approach where administrators make decisions which impact all individuals across the district. Additionally, a strong plan will include key performance indicators that can be utilized to evaluate the implementation and effectiveness of the plan (Brodnick & Norris, 2016). Since agricultural education requires an assortment of highly-specialized equipment, we examine this topic from both an internal and external lens. From an internal perspective, the barriers involved in designing and delivering agricultural curriculum are first examined. External partners such as stakeholders and advisory councils, however, play a significant role in addressing barriers, and an overview of the opportunities that can develop from a partnership with an advisory council is worth discussing.

The Internal Battle: Barriers to Designing Agricultural Curriculum

In designing agricultural curriculum, the literature has cited several examples of barriers and challenges faced by educators of all ages and backgrounds related to designing and delivering agricultural education curriculum. Three key themes related to barriers emerged from the literature review: 1) funding and facility condition, 2) teacher competence, and 3) student safety.

Funding and Facility Condition

One of the first struggles related to designing and delivering agricultural education curriculum relates to the funding and facility availability and conditions that a program has. Lambert et al. (2018) conducted a study related specifically to school farms, which is just one of the many types of agricultural processing-based facilities that an agricultural education program may utilize to facilitate classroom or experiential learning opportunities for students. In their study, they found that the condition and management of school facilities to be the most important factor in determining their use of the farm within a program. These findings were supported by Wells et al. (2018), who found that pre-service teachers recognized that facilities that are well-maintained and in good condition help create a more positive image for the program for students and stakeholders. Not all programs have the ability to maintain this, however and this is where the issue of funding comes to light. In the Lambert et al. (2018) study, aside from the challenge of facility condition and management, funding and availability of resources were cited as two additional barriers for programs to overcome. Agricultural education programs have unique needs that are shaped by the community in which they are located (Croom, 2009; Krieg & Krieg, 2021) so some may already have access to facilities such as a land lab, a greenhouse, or a food processing facility (Shoulders & Myers, 2012). Programs which have existing facilities face the challenge of having enough funding and resources necessary to maintain these facilities, while those without existing facilities face the challenge of securing the funding needed to design and construct these facilities. Given the unique content and context of agricultural education curriculum (Roberts & Ball, 2009), the issue of funding has been an ongoing challenge. Individual states or geographic regions may promote various types of curriculum or encourage their teachers to adopt certain types of teaching practices based on existing or upcoming needs since programs are driven both by the communities in which they find themselves (Roberts & Ball, 2009). A study conducted by Wilson et al. (2002) cited lack of funding and lack of equipment as the top two barriers to adopting an equipment-intensive curriculum. Smalley et al. (2023) also found funding for supplies and equipment to be another issue, especially if educators are needing to pay for any training they may need to receive to teach a certain curriculum or content area. Having to purchase equipment and facilities is one major expense, but if an educator needs additional training to utilize the equipment, this can be another additional expense that complicates budgeting and further limits a program or district's budget (Smalley et al., 2023).

Student Safety

As outlined by the NQPS and supported by the literature, another significant barrier that has been existing for many years is the challenge of prioritizing and maintaining student safety measures through their regular use of facilities and equipment (Dyer & Andreasen, 1999; Saucier et al., 2014; Wells et al.,

2018), especially related to the area of agricultural mechanics (National Council for Agricultural Education, 2016). There is such a wide range of equipment found in agricultural facilities (Shoulders & Myers, 2012), so maintaining safety procedures and having safe, operational equipment in those facilities can be time-consuming and expensive (Smalley et al., 2023; Wilson, 2002). A study conducted by McKim and Saucier (2011) revealed the importance and perceived need of safety training for a group of agricultural educators who participated in their state-wide questionnaire. Another earlier study conducted by Barrick and Powell (1986), further revealed that first year teachers specifically indicated a low level of knowledge relating to the management of laboratory learning, revealing a need for additional professional development or pre-service training opportunities, revealing that this has been a concern for many years. Training should be connected to and designed on the basis of the industry standards that students will be held accountable to in future employment experiences (Swafford & Hagler, 2018).

The External Resource: The Role of Advisory Councils

Advisory councils have been a tool utilized to guide the development and engagement of agricultural and career and technical education programs since the 1920s (Phipps et al., 2008) and were eventually established as a required component of agricultural education programs with the passage of the Vocational Education Act of 1963 and the Education Amendments of 1977 to be eligible for federal funding (Barbour, 2010; Hayward & Benson, 1993). Advisory councils meet periodically to discuss the challenges and successes of an agricultural education program and develop strategies and goals to propel the program forward (Barbour, 2010; Masser et al., 2014). Since the needs of each individual agricultural education program are unique, the goal of an advisory council is to address the needs of an individual community and ensure that those needs are reflected within the agricultural education program (Masser et al., 2014). Despite the help and assistance an advisory council can provide an agricultural educator, there is a perceived need in helping educators, especially early-career teachers, in determining how to better mobilize and equip their advisory councils to assist in achieving program goals (Myers et al., 2005; Sorensen et al., 2010).

To better understand the role of advisory councils, a study conducted by Taylor et al. (2017) focused on evaluating the implementation and use of advisory councils. Their study consisted of a questionnaire completed by 85 school-based agricultural educators throughout the state of Tennessee. Among the list of 14 advisory council tasks provided, respondents were asked to provide a rating of the current level of influence their advisory council currently has on each of the tasks, along with a rating of the level of influence their advisory council should have on each of the tasks. Results indicated that 76.5% of participants reported the use of an advisory council, those with advisory councils reported the greatest amount of current influence or involvement in tasks such as serving as a communication link between the public and the program, identifying equipment needs for the program, determining program objectives, and determining objectives of the program (Taylor et al., 2017). Additionally, a mean weighted discrepancy score (MWDS) was calculated to compare both the levels of influence, the influence the council currently has versus the level of influence the council should have. and among the 14 tasks, identifying the facility needs was the item with the greatest amount of discrepancy (Taylor et al., 2017). Educators responding believed that the advisory council should have more stake in identifying facility needs than they currently do (Taylor et al., 2017). Aside from this study, there has been limited recent scholarly work examining the role of advisory councils in agricultural education.

Summary

Agricultural educators have the opportunity to engage with a wide range of facilities within their programs (Shoulders & Myers, 2012), each serving unique purposes and functions. The advancement and maintenance of these facilities to overcome key challenges related to safety (Dyer & Andreasen, 1999; Saucier et al., 2014; Wells et al., 2018) and funding (Smalley et al., 2023; Wilson, 2002) relies on engagement by key stakeholders, such as advisory councils (Taylor et al., 2017) and administrators (Disberger et al., 2023; Wilson et al., 2002) to guide strategic planning efforts (Brodnick & Norris, 2016).

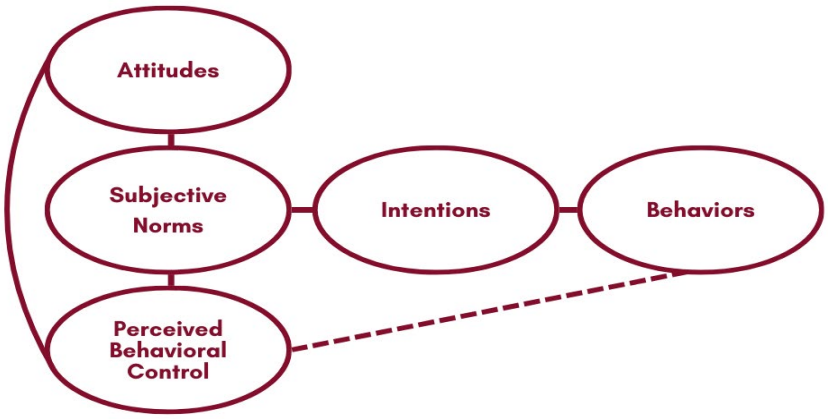
However, recent literature reveals a gap surrounding agricultural educators' perceptions of their facilities at the secondary and post-secondary levels, which prompted the need to conduct this research.

Theoretical Framework

The theory of planned behavior is "designed to predict and explain human behavior in a specific context" (Ajzen, 1991, p. 181) and was used to guide the development of this study and the questions asked of participants. Ajzen's (1991) framework includes three key components that carefully considers an individual's attitudes, their subjective norms, and their perceived behavioral control. One's attitude consists of their agreement and norms internalized beliefs in regard to a particular idea or concept (Ajzen, 1991). The attitude of an individual connects with their subjective norms; these take into account their own assumptions related to behaviors or key practices they recognize (Ajzen, 1991). The perceived behavioral control of an individual then considers one's subjective norms and attitudes and examines how easily someone will be able to perform a specific, learned action through the result of their reflection and being aware of challenges or barriers that may lie ahead in the future. Figure 1 depicts the connection between these three concepts, and illustrates how these concepts come together to influence an individual's intent to complete and eventually act on a specific task or behavior.

Figure 1

Theory of planned behavior (Ajzen, 1991; Sansom, 2021)



The context of this research was to understand the perceptions of both secondary and post-secondary agricultural educators as they connect to their attitudes, subjective norms, and perceived behavioral control. The interview guide was designed to understand how the educators' attitudes and facilities influence or potentially hinder their ability to effectively teach their students. Questions aimed to examine each educator's attitudes toward the facilities they have either inherited, designed, and managed and are described in greater detail in the methodology. This research also allowed participants to articulate their desired, ideal situation in regard to facility design and consider if additional training or other resources could support them in their intention and decision to effectively utilize or update facilities in their instruction as a way to connect to the intention component of the model. Through predicting the attitudes and intended behaviors of these participants (Ajzen, 1991), we can better understand the needs and barriers of agricultural educators. Then, we can utilize the findings to provide agricultural educators and pre-service agricultural education teacher preparation programs with additional resources, tools, training opportunities, or even curriculum to help them in their facility design and management processes.

Purpose and Research Questions

The purpose of this research was to understand the participants' perceptions of agricultural education facilities for both secondary and post-secondary agricultural education. This purpose was guided by three key research questions:

1) What types of facilities are most commonly utilized in agricultural education settings, and how are these facility needs determined?
2) What are the limiting factors associated with developing or managing facilities for agricultural education settings?
3) What is the perceived role of teacher education programs in developing pre-service agricultural educators' capacity to develop knowledge about facilities?

Methodology

Reflexivity, Positionality, and Epistemology

We acknowledge our background related to teacher preparation and agricultural education facilities. Both of us offer experience teaching in a secondary setting and work with pre-service agricultural educators, and both have experience with planning, designing, and maintaining facilities. Since the research concerns participants' perceptions related to agricultural education facilities at both the secondary and post-secondary levels, related biases concerning preferences toward specific facilities or ideals were extracted from the development of questions, the interpretation of results, and the development of recommendations to uphold the integrity of the study.

We also acknowledge our pragmatist worldview and that this perspective influences our perception and ideas related to the research (Kaushik & Walsh, 2019). Within this worldview, we believe that multiple different types of approaches or methods can be utilized to reach answers and that one's knowledge is based on our practical, lived experiences (Kaushik & Walsh, 2019; Merriam & Tisdell, 2016; Morgan, 2014). Questions posed by pragmatists are generally designed to solve problems that they view will have practical implications within a discipline or society as a whole (Kaushik & Walsh, 2019; Morgan, 2014), and they tend to select from a range of methods or tools based on the task or question at hand (Kaushik & Walsh, 2019; Morgan, 2014). The pragmatic approach guided the development of questions since the aim was to have research findings that would have real-world applications for in-service teachers, administrators, and teacher educators. We felt that a qualitative approach utilizing interviews as a methodology was a practical way to approach this. Following three analytical levels of coding as prescribed by Merriam and Tisdell (2016) and utilizing an inductive approach to analysis allowed for findings with real-world implications to emerge (Thomas, 2006).

Research Design

A series of seven, one-on-one interviews were conducted with seven participants, presently representing a variety of roles at both the secondary and post-secondary levels. It is worth noting that all participants offered at least some level experience teaching school-based agricultural education at the secondary level and earned their teacher certification through a traditional, 4-year teacher preparation program. We recognize that these individuals have varying backgrounds in terms of years of experience and years since they have completed their formalized teacher preparation training. However, individuals currently in the classroom with more than four years out of their formal teacher preparation program have all had the opportunity to engage with at least one student teacher at their school district within the last three years and in order to participate in the study, indicated that they are up-to-date in their understanding of what the state's teacher preparation programs are sharing with pre-service teachers regarding agricultural facilities planning and management. More information about the participants is outlined in Table 1 below.

Table 1

Demographics of Study Participants

Pseudonym	Gender	Current Position	Years Teaching Secondary SBAE	Total Years in Ag Education
Angie	Female	Associate Professor	5	24
Bruce	Male	CTE Coordinator	4	6
Grace	Female	Teaching Assistant Professor	3	18
Hanna	Female	Secondary AFNR Educator	4	4
Mark	Male	AFNR Mechanics Lecturer	35	45
Sarah	Female	Secondary AFNR Educator	30	30
Tim	Male	CTE Coordinator	15	21

Prior to conducting the seven, one-on-one interviews, the study was screened and approved by the IRB. Participants were randomly selected from a database of over 300 licensed agricultural educators or teacher preparation program staff in the state of Minnesota in summer 2024 and invited to participate in the study. The inclusion criteria was that members had to either hold an agricultural education teaching license or currently be working at a teacher preparation program preparing pre-service agricultural education teachers within Minnesota. For in-service teachers and CTE coordinators who were selected to participate with more than four years of teaching experience, we also asked if they are up-to-date with current practices in post-secondary training, which all invited to the study indicated they have through hosting a student teacher in the last three years and/or being active on a pre-service teacher program advisory council. Aside from these criteria, we did not have any specific inclusion or exclusion criteria related to gender, years of experience, or age.

We recognize that there are three categories of positions examined within the research: agricultural education teachers, CTE coordinators, and post-secondary agricultural education pre-service teacher preparation faculty members. All participants offered at least four years of teaching experience within the secondary school-based agricultural education classroom, and all earned their teacher certification through a traditional, 4-year teacher preparation program. With our pragmatic epistemology and approach to the study, the goal was to understand how these perspectives compare or contrast, as all three roles are critical in the development and advancement of agricultural education programs. University agricultural education faculty members prepare future teachers to enter their classrooms, and once they enter their classrooms, they must interact with administrators or CTE coordinators to get their requests approved (Disberger et al., 2023; Wilson et al., 2002). This study examined the perspectives and ideas of each of these three closely-related audiences who all share the commonality of secondary agricultural education classroom teaching experience.

As interviews were conducted in the summer and we recognized that agricultural educators were busy with their summer programming demands, we chose to start with 10 recruitment emails to individuals who met the inclusion criteria described. A total of 10 recruitment emails were distributed in July 2024; five individuals represented secondary educators and five represented post-secondary educators. A total of eight responded and agreed to participate in the study, with seven participants scheduling interviews. Prior to engaging in the research, participants were briefed on the purpose and questions of the study, and provided acknowledgement of their informed consent (Sargeant, 2012). Data saturation was achieved after seven interviews, so no additional interviews were scheduled (Merriam & Tisdell, 2016; Mwita, 2022).

Data Collection and Authenticity

Data Source

Data were collected through seven, one-on-one interviews hosted via Zoom in summer 2024. According to Gudkova (2018), "the interview should be understood as an interaction which takes place between two persons who form their experiences and interpretations of their past behavior together" (p. 77). Participants agreed to have their interviews recorded and transcribed through providing informed consent. An interview guide was developed for all participants, consisting of 11 questions. An expert panel of teacher educators, who have background in both secondary and post-secondary agricultural education and facility design and management, were provided with the purpose and research questions connected to the study. These experts were asked to review an initial draft of the interview guide to assure the items connected to the purpose and research questions and provided recommendations to improve prior to conducting the seven interviews. The expert panel provided several ideas and recommended changes to the interview guide, and these recommendations were all taken into account to create the final interview guide that was grounded in the theoretical framework for the study. Table 2 provides an overview of some of the questions that were on the final interview guide and how they connected to the theory of planned behavior (Ajzen, 1991), as this served as the guiding theoretical framework for the study. Participants were able to reflect on the facilities of their current school or teaching position, and for those who have worked in multiple school districts or in multiple positions, they were able to reflect on the facilities they encountered elsewhere.

Table 2

Sample Questions Included in Interview Guide and Connection to the Theoretical Framework

Question	Component of Theory of Planned Behavior (Ajzen, 1991)
What types of facilities do you utilize in your agricultural education program?	Subjective Norms
How do you determine your program's facility needs?	Subjective Norms
How much time do you spend each week maintaining your facilities?	Subjective Norms
How do you feel about your existing facilities?	Attitudes
To what degree did your teacher preparation program help you in planning, designing, and maintaining facilities?	Attitudes
What are some of the most significant barriers you face in facility plans, designs, and maintenance?	Attitudes
If you could redo or improve the facilities within your program, what would you do?	Intention
What recommendations or advice would you give post-secondary teacher preparation programs as they provide experiences for pre-service teachers to become comfortable with planning, designing, and maintaining facilities?	Intention

Data Management

All collected data were coded by hand, and all data including interview field notes, memoing, transcripts, and video recordings, were stored on a secure, password-protected cloud storage system approved by Iowa State University. Transcripts were generated on the Zoom platform and checked for accuracy by our research team. After reviewing the interview field notes we gathered, listening to the

recordings, and rereading the transcripts using annotations and highlighting, codes were developed. These codes were then categorized into key themes to clearly convey the findings related to the research questions.

Data Saturation and Analysis

Three levels of data analysis occurred: 1) reviewing transcripts, 2) isolating codes into categories, and 3) the emergence of themes (Merriam & Tisdell, 2016). Transcripts were re-read and thoroughly reviewed prior to developing codes. Each transcript was then color-coded by hand to help identify categories, which then allowed for our themes to emerge. Throughout the analysis process, it was important to ensure data saturation had occurred. According to Mwita (2022), the "saturation point not only assures the validity and credibility of information for the study but saves researchers' time and energy in collecting the same" (p. 414). When looking at data saturation, Mwita (2022) described the factors of data collection length and relevancy of respondents to be two of the key factors that lead to determining the point of data saturation. After conducting member checking and peer debriefing, it was determined that data saturation had been reached preliminarily as responses were seeming to already point to specific findings, and provide enough data, rich descriptions, and needed evidence to develop well-supported themes for the study (Mwita, 2022). Merriam and Tisdell (2016) posit "Reaching a point of saturation or redundancy means that you begin hearing the same responses to your interview questions or seeing the same behaviors in observations; no new insights are forthcoming" (p. 101). However, one cannot fully recognize they have reached a point of data saturation until data analysis begins (Merriam & Tisdell, 2016). Our initial belief that data saturation had occurred was confirmed as the coding process began, so no additional interviews were scheduled.

In analyzing the data and generating themes that derived from the qualitative data, an inductive approach was utilized. Thomas (2006) described this process as "approaches that primarily use detailed readings of raw data to derive concepts and themes" (p. 238). We approached the data analysis process utilizing the ideas presented by the participants to develop our codes, categories, and eventually, the themes that were generated.

Trustworthiness

To establish trustworthiness, three key procedures were employed: 1) member checking, 2) peer debriefing, and 3) building a trusting relationship with each participant. To start, member checking ensured that the notes captured and themes captured represented the ideas and perspectives of the participants to the closest and fullest extent possible (Ahmed, 2024). At the conclusion of the interview, the researcher restated key points and notes taken, and then followed up throughout the coding and transcription process with individual participants to ensure they agreed with the codes, categories, and themes that emerged throughout the data collection process. Participants were contacted and given the opportunity to ensure that their quotes and ideas were represented in the way that they were intending to ensure we as researchers were fulfilling the goal of representing them to the fullest extent possible (Merriam & Tisdell, 2016). Additionally, the peer debriefing process was utilized throughout the process, as this is also recommended as another key way to establish trustworthiness in reporting qualitative data (Ahmed, 2024; Spall, 1998). According to Spall (1998), "in debriefing, a researcher and an impartial peer pre-plan and conduct extensive discussions about the findings and progress of an investigation" (p. 280). The peer debriefing process allowed us to ensure that the findings were being understood and represented as impartially and truthfully as possible. We had frequent conversations while creating the interview guide and planning the study, following interviews to ensure findings were being reported in alignment with the research purpose and questions, and throughout the data analysis process to ensure that the findings were being shared in the most clear way possible while upholding the thoughts and ideas of our study participants. Finally, trust was established between our research team and study participants as a way to add trustworthiness to the study as a whole (Ahmed, 2024; Stahl & King, 2020). Rapport was built with participants so they felt comfortable so they could trust our research approach and feel comfortable sharing their thoughts. As recommended by Merriam and Tisdell (2016), trust was established through asking questions before the interview and getting to know the participants on a more personal level outside of a research setting, such as asking how their day was going and how they have been enjoying their summer vacation since interviews were conducted in July and

August. In doing so, we ensured they were in an environment that allowed them to share their ideas in a more comfortable and natural way.

Findings

Agricultural education facilities can be existing structures within a building, or in some cases, some programs may have entire buildings dedicated to their facilities. As the data analysis occurred, it seemed fitting to compare the idea of facilities to a structure, such as a home. One participant, Tim, even made this comparison in one of his responses as he shared:

> It's like building a house if anybody's been through that process. When it's built, you're always gonna see things that you wish you would've done differently. I don't think it matters how many places you go and look or how many, how much research you do, [you won't know until] once you're living in it, once you're teaching in it.

A Home is Only as Strong as Its Foundation—Facilities and Partnerships Serve as the Foundation of an Agricultural Education Program

A home built on sandy soil or on a corroded platform can be highly problematic for many reasons. All participants recognized the importance of facilities as the access to facilities can heavily influence the curriculum taught. In his role as a CTE administrator, Bruce commented:

> For all of our courses, we base our facilities off of our curriculum and so that is one thing that, especially here in [school], I have been tasked with leading is ensuring that our curriculum is in place so that we can have facilities that match it, I think a great example is we are working on implementing ProStart or more culinary-based curriculum and so we will be redesigning our facilities to meet the needs of that ProStart program.

Table 3 summarizes the facilities that are managed within each participant's agricultural education program. While all participants reported managing a classroom space with storage within their program, many reported not having adequate storage to organize and systematize their supplies, this was especially for those working in an agricultural mechanics shop setting, especially Sarah and Mark. Mark mentioned the idea that "you could always use more [storage]." A recent trend some programs mentioned is the use of flexible learning spaces ("flex spaces") and wet labs. These types of environments can be adapted based on the type of learning that is occurring, such as a space for students to work on a landscape drawing, a floral arrangement, or even working on agriscience research SAE projects.

Table 3

Agricultural Education Facilities Managed by Study Participants

Pseudonym	Setting	Classroom	Greenhouse	Kitchen	Shop	Other Facilities
Angie	Post-Secondary	✓		✓		Wet lab
Bruce	Secondary	✓	✓	✓	✓	Drones lab
Grace	Post-Secondary	✓		✓		Wet lab
Hanna	Secondary	✓	✓	✓		None
Mark	Post-Secondary	✓			✓	None
Sarah	Secondary	✓		✓	✓	Test plot; hoop house
Tim	Secondary	✓	✓	✓	✓	Outdoor space; flex space; wet lab

While the curriculum highly influences what facilities are needed or present within a program, participants also indicated that direction received from the community and key program stakeholders often influences what is taught or offered in the program. Grace mentioned that these stakeholders' perceptions are influenced by "local or industry needs." Likewise, Hanna shared the importance of partnering with industry stakeholders as we look toward the future:

> Asking industry people what are you using, and how can we prepare our kids as they go on. And that also gives them those hands-on, practical skills like I know how to use this piece of equipment, that is like specialized [..] that's our whole thing in ag ed, is that we are preparing the next generation and exposing these kids to careers so it should be the equipment they would be using in these careers.

All participants, regardless of teaching in a secondary or post-secondary setting, mentioned the involvement of their local advisory board. Grace noted that her advisory board was instrumental in determining the types of equipment used to guide her program development. She commented:

> [...] the people on that board were people that were in industry, that were like, 'oh we are seeing this in the industry, so students need to be training on this piece of equipment.' And so, it was really easy for me to identify items that we didn't have or facilities we didn't have or ways we could expand our facilities because of them coming directly from industry and telling me that.

The composition and level of involvement of the advisory boards mentioned by Grace and other participants varied widely from program to program. Advisory boards were important for programs to utilize in overcoming key challenges in an effort to advance their programs. Participants identified that the advisory board was essential in overcoming barriers related to 1) administrative roadblocks and 2) funding, which are expanded on in the following paragraphs.

When considering both his secondary and post-secondary experiences, Mark expressed several concerns regarding the nuances of working with administrators or getting approval to proceed with facility update or design projects. Mark shared, "the process of getting things approved is not a really smooth, easy process. There is a lot of different offices that your plan has to go through it seems like and that sometimes gets in the way." Tim reiterated multiple times that once a plan is approved, an agricultural educator must be "insistent on their involvement" with all features of the project, including working with designers or administrators who are making higher-level decisions. He noted that while this requires a great deal of time, clear communication, and attendance at meetings, it helps to ensure that the teacher's perspective is, at a minimum, acknowledged.

Both Mark and Sarah mentioned that a lot of times, having a plan for funding is critical to achieving approval from administrators, and they have turned to grants or garnering support from advisory board members or the boosters club to help raise the needed funds to update or maintain facilities. However, Sarah pointed out that many of these grants ask for matching dollars from the school district which makes it difficult to qualify if funding is already limited. Based on the seven participants' responses to the questions, it was evident that even with funding allocations afforded by the Perkins legislation, the funding received by a program can be limited and is highly variable from district to district. The fundings and resources of a program serves as the baseline of the experiences, and ultimately, the facilities they are able to offer their students.

Foundations Can be Strengthened—Training Influences the Ability to Strengthen Facilities

All respondents indicated that they believed their teacher preparation program did not adequately prepare them for planning, designing, and maintaining agricultural education facilities. However, Grace

and Angie cited examples of touring other agricultural education programs, and provided evidence of how they offer these experiences to individuals in their teacher preparation courses to expose pre-service teachers to different facility layouts and tools. Grace shared, "Two things that really prepared me for that [teaching agricultural mechanics]. The courses specific to teaching skill acquisition, but also teaching about tools, and equipment, and program management where it didn't necessarily need to take place in a shop, but talking about how you manage your program." She later added the value in tours of both off- and on-campus facilities:

> We often went to facilities around the university that were university-owned and that was a conversation that was always had was not just about maybe the equipment we were using, but the facility in which things were stored and how they were managed. [...] We also had our ag mech classes if you will in a local high school with a really great ag teacher who spent a lot of time talking about the management of his facilities, how he got funding for things, how he leveraged partnerships within the community, but then also, even within the school, and how using the alumni, and boosters, and all the things. That high school teacher and his program were really critical in that development of my understanding and knowledge of it.

Hanna commented that she enjoyed having the opportunity to tour programs as part of her student teaching internship and essentially "trade places" with another peer so they were able to check out the facilities of another school for a day. While Angie also mentioned that while she did appreciate having tours and visits of other school-based agricultural education facilities as an undergraduate student and enjoys offering that opportunity to train and develop her current pre-service teachers within her role as an associate professor, she noted:

> I don't think I was prepared for the school district or state-specific nuances. So like, how do you go about like repairing equipment and machinery? Or, how do you prioritize purchases for your ag ed program, and things like that, like how do you navigate those processes? I don't think I was prepared for that.

All participants agreed that having additional training opportunities would help them feel more prepared for working with facilities, and this could occur either in the post-secondary, teacher preparation setting or provided to in-service educators. However, as they were reflecting on their own teacher preparation experiences, several participants reflected that teaching "systems" as opposed to specific tools or equipment is likely most beneficial, since no two programs are the same. Bruce commented, "The biggest thing would be don't waste a whole lotta time on teaching the maintenance of tools, equipment but teach about how one might go about finding the support, the resources; who are the experts in the state [...] that can help." Angie also added:

> I don't necessarily know if it is possible to prepare folks for what that is, I think it is possible to provide that big picture, like this is what it may be like, this is so and so's experience, these are what their facilities look like. But then, depending on your district and how things are, and what funding resources are, that's gonna be really different from school to school or state to state.

While many participants held similar beliefs to what Bruce and Angie commented, Sarah noted that there would be value in having exercises for pre-service teachers that consist of facility planning scenarios they complete that enable them to "consider a variety of funding levels."

Homes Wear and Tear—Facility Maintenance and Reconstruction is Needed

Participants agreed curriculum should continue to develop based on key industry trends or local workforce needs to prepare students for careers, and as a result facilities must continue to evolve to provide students with rich, real-world experiences. However, when facing barriers of finances and administrative support, it can be difficult to actually address the wear and tear that inevitably occurs over time in agricultural education facilities. The issue of funding is felt at both the secondary and post-secondary teacher preparation program level. Angie commented, "We know we want to turn out teachers who are ready to go in today's classroom or today's program, but we can't do that on yesterday's dollars."

Some of these changes and improvements could be classified more as wants or desires, while others could be classified as immediate needs. All participants cited an interest in wanting updated facilities and articulated value in having industry-grade facilities to improve the student learning experience. Hanna noted, "I would love industry-standard kitchen equipment. Getting stainless steel countertops, and like a convection oven would be awesome. I'd say in the greenhouse, we really need an updated cooling system." As CTE administrators, Bruce and Tim also articulated that at times, he feels the curriculum is progressing beyond the scope of the facilities. Grace added that it is important to recognize "the need to eliminate certain equipment [if] it is outdated and/or the curriculum doesn't support it." However, even in a perfect world if programs were given additional money or established partnerships to allow for the purchase or donations to help obtain the equipment they desired to utilize, Tim, Bruce, Sarah, and Grace all cited that the limitation of space would pose a significant issue in their existing programs.

Additionally, Hanna and Bruce discussed that outdated facilities can become a major safety concern while also limiting the experiences of students working toward careers in agriculture. In some schools, these immediate facility needs that are related to safety are not being addressed, which can become problematic for ensuring student and teacher safety. Hanna mentioned, "As far as the shop goes, [...] our ventilation system just isn't what it should be. So when we had five or six kids welding at the same time, it would just get so smoky and the kids would like get lightheaded."

If given the opportunity to conduct a redesign or purchasing new equipment, Tim, Grace, Hanna, and Bruce all commented on the importance of taking the time to visit and evaluate other schools' agricultural education facilities to mimic or take note of some of the best equipment, strategies, or layouts that are proving to be effective in other programs and implement them into the facility updates. Similar to ideas shared previously about the importance of working with industry, Mark commented on the importance of working with local businesses to allow them the opportunity to provide input on the facilities and also leveraging them as a potential funding source. If he could do it all over again, Mark would ask some critical questions of these businesses; he noted "What do they want to see me teaching? What do they want to see in my shop that they think would benefit their future employees? I didn't do enough of that." However, when conducting major design projects, some noted it may be a good idea to take a step back and remember to save some money to use in case holes in the plan are discovered after the fact. Tim expanded on this idea by sharing, "If you do get the opportunity to remodel or redesign facilities, I think one thing that I would do differently is see if I could hold some budget back. Give me 12 months to work in the facility and if I see something that's missing."

Conclusions and Recommendations

Conclusions

RQ 1: What types of facilities are most commonly utilized in agricultural education settings, and how are these facility needs determined?

Just as there are a variety of spaces utilized in a home, such as a garage, a kitchen, bedrooms, and living rooms, there are many different facilities that make up an agricultural education program. Similarly, each room in a house serves a specific role or function, just as each facility in a program oftentimes has a

specific role or use. The research revealed that there is a wide variety of facilities utilized by agricultural education programs at both the secondary and post-secondary level. As indicated in Table 3, participants articulated that classroom and kitchen spaces were most common, with several also indicating use of agricultural mechanics facilities and greenhouses, all of which require a great deal of funding and maintenance. These facility needs are determined based on the workforce needs of the local community and the curriculum they perceive as important to be teaching within the agricultural education program (Masser et al., 2014; Myers et al., 2005; Sorensen et al., 2010). When examining the theory of planned behavior, by understanding the existing facilities of educators, we are able to understand the background of their program and curriculum, and start to understand how their attitudes perceiving facility design and management and the context they find themselves in (subjective norms) could be connected with one another (Ajzen, 1991).

RQ 2: What are the limiting factors associated with developing or managing facilities for agricultural education settings?

Over time, homes undergo wear and tear, and homeowners have other pressing demands that can take precedence over attending to these needed repairs or improvements. Community ordinances, building codes, lot sizes, or homeowner associations may also restrict homeowners from making these adjustments. Agricultural education programs also face similar dilemmas, as budgets and the need for approval from a variety of entities may limit the chance of these desired improvements becoming a reality within their agricultural education programs. Limited space, restrictive budgets, and administrative approval were the most commonly discussed barriers and limiting factors for participants, and comments connected to these three areas surfaced in each of the seven interviews. These findings support and build upon the work of existing literature (Smalley et al., 2023; Wilson et al., 2002). Participants acknowledged the support of the advisory board or other partnership opportunities as tools to assist in overcoming these barriers. Furthermore, a lack of training is something that was addressed by many participants. A study by Boone and Boone (2007) revealed facility management was ranked fourth and tenth among a list of areas of concern among beginning and experienced agricultural educators, respectively. As teachers migrate from school to school, the facilities they have will be different, so facility knowledge is a challenge for teachers in all career stages. Previous work has identified the need for training, especially in facilities such as agricultural mechanics laboratories (McKim & Saucier, 2011; Swafford & Hagler, 2018) so educators know how to safely effectively design, use, and manage these types of environments. Additional training both on how to garner and secure support, including administrative and financial support, and training on how to effectively design and manage facilities can influence teachers' intentions about improving their facilities, and in turn, make them more likely to consider updating their facilities to better support their students (Ajzen, 1991).

RQ 3: What is the perceived role of teacher education programs in developing pre-service agricultural educators' capacity to develop knowledge about facilities?

While many homeowners do not undergo formal training to prepare themselves for the tasks and responsibilities associated with this pursuit, not all, but several agricultural educators do enter the classroom after successful completion of their pre-service training in order to become prepared to manage and design facilities. All participants within our study completed a formal pre-service agricultural education training program, and all of them also recognized that their teacher preparation programs could have done more to prepare them for the work involved in facility design and management. However, some argued that the role of teacher education programs should be to provide pre-service teachers with experiences learning how to navigate systems in regard to facility design and management. For example, teaching a student how to use a specific type of tool or equipment or even how to manage or plan a very specific type of facility may not be the best use of time since there is no guarantee that each pre-service teacher, or any for that matter, will need to teach with those related tools or spaces in their program. While teaching them how to use a specific, learned action can be helpful practice, many participants including Bruce, Angie, Mark, and Tim argued that it is equally as important that pre-service programs emphasize the importance of thinking holistically about using equipment and facilities as a whole since the items and equipment they have within their

classroom will most likely be different than the exact pieces of equipment they use in their pre-service training experiences. By utilizing a systems approach, it can allow pre-service teachers to get an overview of how to broadly plan and manage different types of facilities, and the experts they can turn to in times of need for troubleshooting specific questions or issues they may have on certain types of equipment. By offering pre-service educators with experiences that allow them to connect their learning to a variety of different applications through facility instruction, this can increase their intentions to seek additional training regarding facilities to change their behaviors on how they utilize facilities and resources within their program (Ajzen, 1991).

Recommendations

RQ 1: What types of facilities are most commonly utilized in agricultural education settings, and how are these facility needs determined?

While each home can have different rooms or spaces tied to specific functions, driven by the goals and desires of the owners, agricultural educators can have the same for their facilities. Additionally, homes can look different from one part of the country to another; some may have storm cellars to protect from drastic tornadoes while others may instead have heated garages to keep spaces warm from extremely cold, negative temperatures in the winter; some places may even have both of these features. Similarly, agricultural education programs can have livestock pens, showing arenas, greenhouses, gardens, kitchens, and much more. But what facilities exist most commonly on a national level, and how are they maintained? Given the small sample size of this study, we can draw some conclusions but these insights are limited in scope with only seven participants who were confined within a specific geographic region. Research recommendations focused on the first research question would involve conducting a national-level study to better understand the types of facilities that are utilized, and the size of facilities. We recognized in this research that there are some common facilities among participants, including greenhouses, classrooms, kitchens, and agricultural mechanics facilities. However, conducting more elaborate research that carefully examines the design and layout of these facilities, such as the square footage of the facilities, or even more technical items such as the number of electrical outlets, accessibility, or age of equipment, might be helpful for providing recommendations and best practices for agricultural education stakeholders (National Council for Agricultural Education, 2016). This research revealed that there was extreme variability in the quality and quantity of facilities in agricultural education programs, so having a stronger understanding of these facilities may assist in developing plans for future agricultural education facilities for programs looking to build or update their facilities. Through this additional research, participants could also reflect on what they might consider doing differently with their facilities. Although participants were not directly asked to cite limitations of their facilities within this study, many participants did allude to changes they would make to their facilities; they wished they would have had the opportunity to learn from others' mistakes or anticipate some of the limitations prior to inheriting or designing their facilities. This type of research would help the agricultural education scholarly community understand what types of facilities exist in agricultural education, and areas where updates are needed. These research findings could assist in developing a toolkit or even a best practices guide that could be disseminated to individuals looking at designing or updating facilities with recommendations on square footage, types of equipment to consider, and much more.

For professional practice, it is recommended that professional organizations such as state-level agricultural education teachers' associations host tours or opportunities for other educators to visit and see examples of updated and well-managed agricultural education facilities across their local region or throughout the entire state. While these tours could simply consist of walking around facilities and having conversations about what facilities they have and how they manage them, these conversations and in-person visits could provide pre-service educators with the opportunity to learn more about facilities, gain some additional insights into new equipment or facility layout ideas. Furthermore, these tours could also feature time for teachers to collaboratively problem-solve, share resources, and discuss ideas for how they might go about overcoming key barriers in facility planning or management. More formalized tours including presentations or planned out talking points certainly would be welcomed, but based on comments shared

by participants, the informal conversations about facilities and seeing them in-person would work sufficiently without adding the stress of developing a formal program to the plates of agricultural educators who are willing to host these types of tours.

RQ 2: What are the limiting factors associated with developing or managing facilities for agricultural education settings?

Just as there are limitations to building or improving features of a home, there are limitations such as budgets, building codes, square footage, and the need to seek approval from external entities who play a role in strategic planning and financing (Brodnick & Norris, 2016). Our research revealed general trends in common limitations such as finances, facility condition, and administrative barriers, which are also supported by the literature (Dyer & Andreasen, 1999; Saucier et al., 2014; Smalley et al., 2023; Wells et al., 2018; Wilson et al., 2002). However, the degree to which these barriers are faced can vary from school to school. Research recommendations surrounding the barriers and limitations of facility development and management involve conducting additional quantitative research of a larger population of educators. This additional research should be in respect to the geographic areas agricultural educators represent, to better understand and quantify the most significant barriers and challenges they face. While there are several variables which influence these barriers and challenges faced, having additional context or background on these issues could inform additional professional development or training opportunities to better support agricultural educators looking at updating or redesigning their existing facilities.

The findings of this study can assist in the development of an administrator toolkit or handbook. It was referenced by all participants that working with administration and having them fully understand the needs for facility updates was a significant barrier. By bringing to light some of the common issues that were shared by participants, and packaging those into an easy-to-understand resource that can be given to administrators, along with relevant supporting literature or statistics regarding the importance of safety and workforce development, it could help administrators or local decision-making entities better recognize the need for and importance of agricultural education facilities and lend itself to leveraged support, or at a minimum, acknowledgement of key issues. The findings from this study could also be paired with findings from other existing research or research that emerges from the future recommended research studies to hone in on specific areas of facility maintenance and design that can be helpful for educators, administrators, or other stakeholders to reference in managing agricultural education facilities.

RQ 3: What is the perceived role of teacher education programs in developing pre-service agricultural educators' capacity to develop knowledge about facilities?

A homeowner looking to build or improve their home likely relies on the training or expertise of an architect. Similar to agricultural educators who strive to provide real-world experiences for students so they are successful in the field and can develop important technical and human relations skills (Barnett, 2011; Wells et al., 2015), the architect draws upon their prior experiences and training to make key recommendations for homeowners as they go through the building process. As a result, we must provide training experiences that will prepare future agricultural educators to be equipped to train their students for a variety of careers to satisfy the surge in demand for agricultural careers (Hill et al., 2021). Research recommendations for the third research question center around measuring pre-service agricultural educators' level of knowledge regarding agricultural education facilities prior to, during, and after completing their teacher preparation program. A questionnaire should be developed to gauge their existing knowledge of facilities prior to enrolling and could provide teacher educators with ideas of students who may offer expertise or ideas to share with the class, or even connections to potential tours or guest speakers. The same questionnaire should be administered throughout the teacher preparation experience, and immediately after the student teaching internship. This research would be able to measure the progression, or perhaps regression, of pre-service teachers' confidence with utilizing and managing facilities, and enable programs to modify curriculum or provide additional experiences to help their pre-service teachers feel prepared to design and manage agricultural education facilities.

For professional practice, if an agricultural education teacher preparation program is fortunate enough to have ownership of or access to an abundance of facilities, providing opportunities for pre-service teachers to take on facility management or repair roles also serves as another key recommendation. In her interview, Angie referenced that one example of this would be hiring pre-service teachers as student workers, providing them with an employment opportunity, but also an opportunity to build their confidence in safely maintaining or preparing facilities for their future classrooms, such as kitchens or mechanical shops. While the equipment they use in their future classrooms may not be identical, their role would provide them with basic facility management experiences while alleviating some of the extra hours teacher educators invest to ensure facilities are safe and ready for teaching. If the challenges of funding, space, or capacity to maintain facilities are of concern, agricultural education teacher preparation programs should instead look toward securing partnerships with industry leaders who can assist in providing pre-service teachers with experiences working with unique facilities. For example, in the Midwest, there is a current need for careers in the meat sciences area. If a teacher preparation program does not already have access to a meat processing lab, they should seek out a partnership with a local butcher shop or a larger corporation, such as Hormel, to provide opportunities for facility tours, butchering experiences, and exposure to safe, sanitary practices that pre-service teachers can learn from. Alternatively, these partnerships could result in equipment or facility donations for teacher preparation programs, or solicitation of feedback on existing facilities to make them more industry-relevant or safe for pre-service teachers, so they are able to model these practices once they enter classrooms of their own.

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