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Examining the Implementation of Plant Pathology Curricula in School-Based Agricultural Education: A Pilot Study

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Abstract

With increasing emphasis on post-secondary readiness in core subjects such as English, Mathematics, and Science, educators in Career and Technical Education face significant challenges, including declining enrollment and the integration of updated curricula. This study aimed to address these issues within agricultural education by piloting a new plant pathology curriculum designed for secondary School-Based Agricultural Education classrooms. The curriculum, which focuses on the ice nucleator properties of Pseudomonas syringae, aimed to enhance student engagement and critical thinking through an interactive, hands-on laboratory experience. Using a multi-case study research design, three high school agriculture teachers piloted the curriculum, and the study analyzed its effectiveness in promoting student comprehension and laboratory success rates. Data were collected through classroom observations, interviews, and student engagement metrics. Findings highlight the importance of content knowledge for teachers, the challenges in laboratory implementation, and the need for professional development to increase confidence in teaching complex scientific concepts. The study concluded with recommendations for refining curriculum development processes and further research on teacher perceptions and curriculum efficacy in agricultural education.

Introduction and Literature Review

Over the last two decades, there has been a continued push to increase post-secondary readiness among high school students, particularly in core content areas such as English, Mathematics, and Science (DiBenedetto, 2015; Mishkind, 2014). In response, Career and Technical Education (CTE) programs, including School-Based Agricultural Education (SBAE), face increasing pressure to maintain relevance and rigor (Camp & Heath-Camp, 2007a). This includes addressing challenges such as declining enrollment, curriculum alignment with science standards, and the demand for interdisciplinary instruction (Camp & Heath-Camp, 2007b; Lambert et al., 2014; Martin et al., 2006). Within this context, SBAE educators are expected to offer robust, standards-aligned instruction that connects agriculture to STEM disciplines.

The National Council for Agricultural Education (NCAE) (2023) established the Agriculture, Food, and Natural Resources (AFNR) Career Cluster Content Standards to guide instruction in SBAE programs

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across the United States. As of 2025, the AFNR Career Cluster includes nine instructional pathways: Agribusiness Systems, Animal Systems, Biotechnology Systems, Environmental Service Systems, Food Products and Processing Systems, Natural Resources Systems, Plant Systems, Power, Structural and Technical Systems, and Agricultural Education (The NCAE, 2023). These pathways represent the foundational structure of SBAE curriculum nationwide and inform course development at the state and local levels. The specific competencies within each pathway are determined through a combination of industry input, educational standards committees, and national leadership organizations such as the NCAE, National FFA, and Advance CTE. These bodies meet regularly to revise and update the AFNR standards, with major revisions typically occurring every five to seven years (Advance CTE, 2020; The NCAE, 2023).

Many states and local education agencies develop additional supporting materials such as lesson plans, slide decks, and assessment tools to assist educators in implementing content aligned to the AFNR pathways (The NCAE, 2023). However, limited research exists on how these resources are perceived by teachers or how effectively students engage with them, especially in advanced scientific topics such as plant pathology. While many SBAE programs include units on plant science, few provide in-depth, lab-based experiences specifically focused on plant pathology (The NCAE, 2023). Existing research often addresses general science integration in SBAE but lacks focused studies evaluating teacher implementation and student engagement with rigorous plant content (Lambert et al., 2014).

Plant pathology is a foundational discipline in agriculture, with direct implications for crop production, food security, and sustainable farming practices (Agrios, 2005). Introducing students to plant diseases and their prevention supports both scientific literacy and career readiness in areas such as agronomy, biotechnology, and integrated pest management. Engaging students in investigative labs such as this one can develop transferable skills in observation, data interpretation, and evidence-based reasoning. These competencies are essential for students pursuing post-secondary agricultural science careers and align with national goals for college and career readiness (Mishkind, 2014).

Interdisciplinary teaching has become a key strategy for addressing these challenges. Wang and Song (2021) emphasized that "interdisciplinary learning is viewed as the best way to learn about and perceive complex scientific phenomena in the real world" (p. 693). This aligns with the broader push for integrating science, technology, engineering, and mathematics (STEM) into all CTE fields. Yet, the success of this integration depends not only on curriculum design but also on teachers' confidence, professional development, and access to high-quality instructional materials (Lambert et al., 2014; Ufnar & Shepherd, 2018). Without proper support, teachers may struggle to bridge the gap between agricultural content and scientific rigor, resulting in missed opportunities for deeper student learning.

Despite the availability of structured pathways, the implementation of science-based lessons, such as those in plant pathology, remains inconsistent. While SBAE teachers often demonstrate strong agricultural content knowledge, their comfort with integrating advanced scientific concepts may vary. Studies have shown that confidence in teaching STEM-related topics is closely tied to teacher preparation and access to relevant training (DiBenedetto, 2015; Lambert et al., 2014). Furthermore, the complexity of scientific labs often creates logistical and pedagogical hurdles, particularly in schools with limited resources or time constraints (Lambert et al., 2014).

To explore these dynamics further, this study piloted a plant pathology lesson grounded in scientific inquiry and aligned with the Plant Systems pathway of the AFNR standards. The lesson, which focuses on the ice nucleator properties of *Pseudomonas syringae*, was adapted from a common undergraduate lab to be more accessible for high school SBAE classrooms. The study aimed to observe how teachers implemented the lesson, identify challenges related to instruction and lab execution, and evaluate student engagement with the content. This work responds to the growing need for SBAE programs to prepare students through rigorous, relevant, and interdisciplinary learning experiences that align with STEM education goals. It also contributes to the understanding of how curriculum design and professional development can support teachers in delivering complex scientific content. The curriculum and study design were developed to allow both teachers and students to engage meaningfully with plant science concepts through active learning.

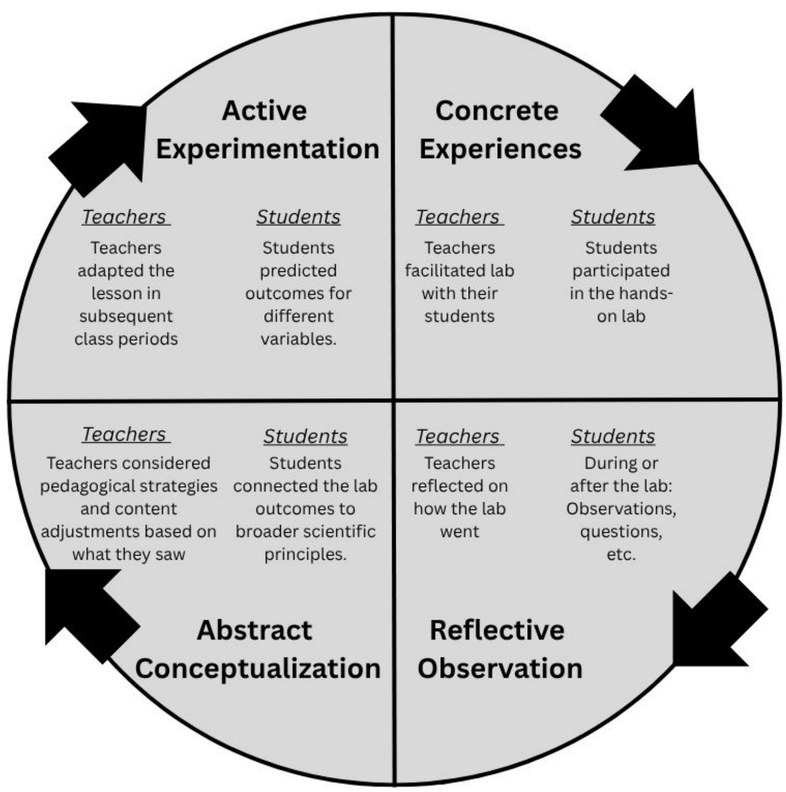
Theoretical Framework

This study was framed using Kolb's Experiential Learning Theory (1984) which emphasizes the importance of experience as the cornerstone of learning and development. The theory outlines a four-stage learning cycle: concrete experience, reflective observation, abstract conceptualization, and active experimentation. This cycle suggests that effective learning occurs when individuals engage in a hands-on experience, reflect on it to identify insights, conceptualize those insights into theories or frameworks, and then actively test their comprehension in new situations (Kolb, 1984).

Kolb’s (1984) theory also informs the teacher’s role in facilitating learning, as educators must create opportunities for all four stages of the experiential cycle. In this study, teachers not only delivered the curriculum but also engaged in reflective observation through post-lesson interviews, identifying strengths and areas for improvement in the curriculum. Both teachers and students engaging in the content delivery of this study experienced the four stages of Kolb’s (1984) model (see Figure 1). By aligning curriculum design with Kolb’s (1984) experiential learning principles, this study provides a framework for evaluating how hands-on, inquiry-based approaches can enhance student engagement, foster critical thinking, and promote the integration of scientific concepts in SBAE classrooms.

Figure 1

Application of Kolb’s Experiential Learning Theory in the Plant Pathology Curriculum in Teachers and Students



In the context of this study, Kolb's (1984) framework is particularly relevant because it underscores the value of experiential learning in fostering scientific inquiry and critical thinking—skills essential for success in CTE and SBAE. Experiential learning is commonly used as a teaching method to engage students in interactive experiences focused on the content being taught within the classroom. The development of this curriculum was rooted in experiential learning as a teaching method; therefore, guiding this research of the piloting of the curriculum allowed the researchers to examine the experience of conducting the lab and how the students proceed to reflect, conceptualize, and continue applicational experimentation with the content.

Purpose

This study aimed to develop and evaluate the piloting of an accessible plant pathology curriculum for secondary SBAE classrooms. This curriculum focuses on demonstrating the ice nucleator properties of *Pseudonomas syringae* through an interactive lab. The study aimed to determine the effectiveness of the curriculum in promoting student reflection, conceptualization, and engagement with a financially feasible lab exemplifying complex scientific processes. The study followed the following research questions:

1. How do students engage with the plant pathology curriculum and lab experience?
2. To what extent does the lab activity effectively demonstrate the ice nucleator properties of *P. syringae* in a secondary agricultural education setting?
3. How does the curriculum evolve through feedback and implementation by each teacher who piloted the lesson?
4. What challenges and successes do teachers experience while implementing the curriculum in their classrooms?

Methods

This study began with the development of a plant pathology curriculum aimed at demonstrating the impact of *Pseudomonas syringae* on plants, particularly emphasizing its ice nucleation properties. The curriculum design was inspired by a lab typically completed by undergraduate students in plant pathology. However, adjustments were made to make the lesson more accessible and feasible for secondary SBAE classrooms, both in terms of cost and complexity. To achieve this, researchers collaborated closely with a plant pathology professor to create a comprehensive and scalable lesson plan that would not only convey the scientific principles but also engage high school students in hands-on learning. This approach aligns with calls for greater use of inquiry-based learning in SBAE (T. Marshall et al., 2022), ensuring that students engage in authentic scientific investigation rather than passive content delivery. While the curriculum was initially adapted for secondary use based on expert input, further refinements were made throughout the study based on each case. Because of the iterative nature of implementation across classrooms, specific changes and their rationale are described in the findings to reflect how the curriculum evolved in response to teacher feedback and student engagement.

A multi-case study research design was employed for this study, with each high school agriculture teacher serving as an individual case (Yin, 2014). This design enabled the researchers to explore how the curriculum was implemented in different classroom settings, providing a rich comprehension of the varied contexts in which the curriculum could be applied. As described by Yin (2014), case studies are effective for observing contextual variables and dynamic interactions, making them suitable for analyzing the complex nature of curriculum implementation and the subsequent student engagement and outcomes.

The selection process included identifying participants interested and familiar with the curriculum content to teach the interactive lab multiple times to see how different groups of students in separate classes interacted with the curriculum (C. Marshall et al., 2022). Three teachers agreed to participate, serving as the three individual cases for this study. The three cases are described in the findings section to illustrate how each implementation informed ongoing curriculum refinement and contributed to the iterative development process.

Data Sources and Collection

Multiple data sources were collected between Spring 2023 and Spring of 2024 to achieve crystallization, or triangulation, of the study. These sources included classroom observations and a post-pilot interview with the teacher. Between the three cases, the interactive lab lesson was taught in five different classes during the spring semesters of each academic year. Class periods ranged from 55 to 90 minutes depending on the school's bell schedule, resulting in some variation in how the curriculum was delivered. In classes with longer periods, both the direct instruction and lab activity were completed in a single day, while in shorter class periods, the lesson was divided across two consecutive days. Regardless of schedule structure, all students received the same instruction and materials. Researchers observed the teacher delivering the lesson and took detailed field notes on student learning, lab success, and student questions that arose throughout the sessions. These class periods featured direct instruction and the lab demonstrating the ice nucleator properties of *P. syringae*. After each case piloted the curriculum, researchers used insights from the prior interview and observations to refine the lesson with the goal of increasing successful lab outcomes. Following the classroom observations, a semi-structured interview was conducted with the teacher to discuss the curriculum's success and potential areas for improvement.

Data Analysis and Trustworthiness

Using both deductive and inductive analytical approaches, the researchers engaged in open, axial, and selective coding to allow findings to emerge from each case and establish connections across concepts (Creswell, 2013). The combination of these approaches enabled the development of individual codes and pattern matching to form the broader themes presented in this study. Member checking was used to confirm the accuracy of interpretations, and data collection continued until saturation was achieved (Merriam & Tisdell, 2015).

To enhance trustworthiness, cases were intentionally selected to include variation in teacher certification type, years of experience, and program structure. Rich, thick descriptions were used to provide contextual depth to both the data and resulting themes (Merriam & Tisdell, 2015). The research team also addressed potential bias through ongoing reflexivity and a clear disclosure of positionality (Creswell, 2013).

The research team consisted of individuals with backgrounds in agricultural education, qualitative research, and plant pathology. The lead researcher, a former SBAE teacher and current doctoral candidate, brought practical insights into curriculum implementation and classroom instruction. The other researchers contributed expertise in scientific content and qualitative research methodology. Reflexivity was maintained throughout the extended data collection period, which spanned from January 2023 to May 2024, by consistently documenting how the research team's experiences shaped interactions, interpretations, and analytical decisions. The lead researcher's familiarity with the classroom context helped establish strong rapport with participants but also required ongoing reflection through memoing and debriefs to avoid bias in evaluating implementation (Creswell & Poth, 2018; Merriam & Tisdell, 2015).

This research was conducted as a pilot study with a small sample of three teachers across five classroom implementations; therefore, the findings should be interpreted with caution and are not intended to be broadly generalizable to all SBAE contexts. The study was designed to be exploratory, focusing on understanding teacher implementation, curriculum refinement, and student engagement rather than establishing widely applicable conclusions. Additionally, the iterative nature of the curriculum, which evolved throughout the study based on teacher feedback, introduced some variation in lesson delivery and classroom contexts that may have influenced implementation consistency and student outcomes.

Findings

Case 1

Case 1 involves a female teacher, referred to by the pseudonym Rebecca, who was in her fourth year of teaching agricultural education at the time of data collection. Rebecca was traditionally certified in agricultural education and held a master's degree. Prior to her current role, she spent two years teaching at a different school before transitioning to her current position in a two-teacher program at a mid-sized high school located in a growing suburban county in Georgia. The community is known for its blend of rural traditions and expanding suburban development, with many families connected to small farms, greenhouses, or landscaping businesses. The school serves approximately 1,300 students and offers a variety of CTE pathways.

Rebecca primarily taught horticulture within the school's agricultural education program and is responsible for guiding students through plant science concepts, greenhouse management, and FFA involvement. At the time of data collection, she agreed to participate in the study by piloting the newly developed plant pathology curriculum in one of her upper-level horticulture classes. The class included students with prior agricultural coursework and active involvement in plant-based SAE projects.

During the curriculum implementation, several areas for improvement were identified through classroom observations and the post-interview, including lab setup, instructional clarity, student engagement, and the interest approach. Rebecca's feedback provided key insights for refining the curriculum in terms of structure, timing, and student comprehension.

Lab Set Up and Instructional Clarity

Rebecca highlighted the need for all lesson plan documents to clarify what the teacher will set up and successfully execute the lab with students. Mimicking a very common yet expensive lab that Plant Pathology majors complete during their undergraduate studies, the hands-on lab of the curriculum demonstrated the ice nucleator properties of the bacteria *P. Syringae* with the use of an ice bath, a sample of the bacteria and distilled water. Being the first pilot of the curriculum, Rebecca noted the importance of specific measurements in lab set up saying, "The materials need to be highlighted in the lesson plan to make sure we have it, and on the student worksheets so they know what they are supposed to get when working with their group." Rebecca further explained that anything that will be used should either be provided in color or have a digital option to ensure students see what is intended to be viewed.

Additionally, Rebecca commented that portions of the lab guide were vague and needed more specifics. She emphasized being clear with times that students are supposed to complete specific steps, remarking, "The worksheet cannot just say to make an ice bath with ice and water but needs to give step-by-step instructions with clear measurements of how much ice and salt are needed." Moreover, Rebecca indicated that many of the instructions needed to use more "elementary" language, while some of the reflection questions needed to be shortened for clarity. There were multiple areas of the lab that Rebecca noted were confusing to her students for these reasons saying, "It might be helpful to have a lab instruction PowerPoint for students to follow step by step or maybe every few steps with images or short clips. This could be a list, visual guide, or picture sequence." There were a low number of groups, two out of 14, who observed the desired outcome of the lab illustrating the ice nucleator properties.

Student Engagement and Interest Approach

Despite the feedback on areas for improvement, Rebecca noted, "All students found the lab to be cool, enjoyable, and entertaining." She said that the interactive nature of the lab activity contributed to the students' positive reception of the curriculum. However, Rebecca also suggested including guided notes for the PowerPoint presentation and shortening the presentation to avoid student disengagement from losing focus. An interactive activity for the direct content portion of the lesson (ex. Kahoot, Quizzizz, Padlet, etc.) could provide a component for students to engage with the content of broader plant pathology.

Rebecca emphasized a need for an interest approach that better engaged students at the start of the lesson. "Before the content slides, there needs to be more context that provides the 'why factor.' Why should students care about learning about these bacteria?" It was observed that students might benefit from visual aids and a direction guide on the board to help address confusion throughout and empower critical thinking in students with multiple sources of help.

Case 2

Case 2 is a male teacher, referred to by the pseudonym Robert, who was in his 15th year of teaching at the time of data collection. Robert was originally certified to teach secondary social studies and spent the early part of his career in that field before transitioning into agricultural education. For the past ten years, he has served as the sole agriculture teacher at a small rural high school located in a close-knit farming community in Georgia. The area is characterized by strong agricultural traditions, with local farms, poultry houses, and livestock playing a central role in the local economy and culture.

The school enrolls approximately 500 students in grades 9 through 12. While relatively small, it maintains a strong sense of school pride and community involvement. Many students have family ties to agriculture or animal care, which is reflected in the program's two primary pathways: horticulture and veterinary science. As a single-teacher program, Robert is responsible for delivering all agriculture coursework, managing the FFA chapter, and coordinating student Supervised Agricultural Experience (SAE) programs.

At the time of data collection, Robert piloted the plant pathology curriculum in a Basic Agriculture Science (BAS) class during their horticulture unit. The class included a mix of freshmen and sophomores with varied exposure to science-based agricultural content.

Content Knowledge

While students were actively engaged throughout the lesson, Robert shared that he felt somewhat uneasy teaching the lesson due to a lack of content knowledge related to the specific plant pathology topic. This was also noted through classroom observations where Robert's response to questions lacked detail beyond what was provided in the PowerPoint presentation. Robert shared, "I only took one intro-level horticulture course, so this is not my area of expertise. I tried to give them as much information as I knew." While Robert lacked content knowledge, the researchers engaged in a conversation to determine the amount of time Robert spent reviewing the lesson plan before teaching the lesson. Robert said, "I took time to review the plan and PowerPoint this morning before classes started." The researchers reviewed the lesson plan and made additional notes to increase teachers' retention of the plant pathology content.

Increase Success Rate

During the lesson, students were given written directions, a video demonstration, and a demonstration by the teacher. However, students succeeded in having the laboratory experience to work correctly in four of the nine groups, or 44% of the time. This led the students in groups whose laboratory experience did not go as planned to become discouraged. The agriculture teacher in the room worked to encourage the students positively by sharing, "It is okay if it didn't work. Just make sure that you are watching other groups as they shake their bottles."

Case 3

Case 3 is a male teacher, referred to as the pseudonym Colton, who was in his first year of teaching agricultural education at the time of data collection. Colton entered the profession through an alternative certification route after completing his undergraduate studies in animal science and education. He teaches at a large, suburban high school located in a fast-growing community situated near a metropolitan area in Tennessee. The school serves over 2,000 students in grades 9 through 12 and offers a wide range of academic and career pathways to meet the needs of a diverse student population.

The agriculture program at this school includes five teachers, each specializing in different areas within the program. Colton is responsible for teaching the introductory agriculture course, which is required for all students beginning the agriculture pathway. His students are primarily ninth graders who are new to agricultural education and come from a variety of academic backgrounds.

At the time of data collection, Colton piloted the plant pathology curriculum in three of his introductory classes. The lessons followed a plant science unit and were designed to introduce students to hands-on scientific investigation within the context of agriculture. Colton's role in a large and well-resourced program allowed him to focus specifically on refining instruction in the entry-level course and supporting students as they began exploring agricultural concepts through experiential learning.

Increase Success Rate

With the succession of classes within the same day, Colton could conduct trial-and-error protocols with the lab instructions to get the highest student lab success rates. During the first block course, students expressed confusion when developing the ice bath to effectively get the water to a cold enough temperature to freeze the control bottle. By the end of the class period, with the measurements provided, only two groups [out of twelve total groups] got to add the bacteria to the experimental bottle after seeing the control bottle freeze. Colton said, "Those two groups saw what we were hoping to see; everyone else ran out of time because it took so long for the water to get to temperature."

Utilizing the information from the first block, Colton gave a thorough demonstration during the second block to a smaller class of students of how to create an ice bath with more specific ice and salt measurements. Colton explained the changes he tried during 2nd block, saying, "I brought out 8oz plastic cups to disperse salt to groups. I ensured each group received approximately a cup filled three-quarters of the way full." This accelerated the ice bath cooling process, allowing three groups [of four total] to observe the expected results of the lab within approximately 25 minutes. Due to the small class size, Colton found it easy to assist students during this time; however, they reflected a more extensive class: "it's harder for me to get around to everyone who has a question in a bigger class. Also, students can get distracted and antsy if it takes too long to see results."

Finally, during block 3, with a slightly larger class size of 16 students, Colton decided to instruct all groups to add a full 8oz plastic cup worth of salt to the ice bath in hopes of quickening the cooling process. Utilizing the same directions, students, on average, got the ice baths to the correct temperatures within 15 minutes. The success rate by the third block was 88%, with seven groups out of eight seeing the expected outcomes of the lab.

Successional Class Periods

Colton was the only case that experienced teaching this lab in succession within the same day, and he spoke of introducing new implications to conducting the lab that had not been seen in prior cases. He said, "It is super important to clean all of the materials in between classes well with bleach otherwise it can throw off the results for the next group of students using the materials." This cleaning process seemed to be a bit difficult in between short passing periods of approximately five minutes, especially since Colton did not have a sink inside his classroom. In contrast, being able to experience piloting this curriculum multiple times did allow Colton to engage in a reflective process about ways to improve the delivery of the lesson each time, as highlighted above. He elaborated, "Each class has different students, so I thought about how I would modify it to fit what the classes needed slightly."

Conclusions, Discussion, and Recommendations

Through this multi-case study approach, the researchers concluded that it is essential for teachers to deeply comprehend the content they are teaching, rather than merely facilitating laboratory experiences for their students. Although the curriculum developed in this study incorporated a significant amount of content knowledge into the lesson plan and laboratory materials, it raised concerns about teachers' ability to possess and convey sufficient content knowledge in plant pathology. These concerns align with the broader challenges faced by educators in CTE fields, where content knowledge, especially in complex scientific topics like plant pathology, is crucial for delivering effective instruction (DiBenedetto, 2015; Mishkind, 2014).

This curriculum has the potential to support science comprehension in agricultural education classrooms, particularly in plant science units where integration of core biology concepts, such as bacterial processes and freezing points, can reinforce student comprehension of science content found on standardized assessments. As science continues to be a heavily tested subject area in many states, agricultural curricula that include rigorous, standards-based lab experiences may help strengthen science literacy and improve student performance in tested areas.

The findings also resonate with Kolb's Experiential Learning Theory (1984), which emphasizes the importance of learners, including educators, progressing through the stages of concrete experience, reflective observation, abstract conceptualization, and active experimentation. For teachers to successfully implement complex science-based curricula, they must first experience and internalize the material themselves, fostering both confidence and the ability to guide students through experiential learning cycles. However, in this study, only one teacher was able to fully engage in all stages of Kolb's model through repeated delivery of the lab within the same day. This allowed for immediate refinement between classes, highlighting the value of allowing teachers multiple opportunities to apply and adjust new curricula.

While this study underscores the value of professional development, it is important to recognize the limitations of generalizing findings from a qualitative study with three participants. The need for professional development, specifically in content knowledge and pedagogical strategies, is grounded in the experiences of the participating teachers, who reported challenges related to content unfamiliarity. However, teachers with stronger plant science backgrounds may not face the same difficulties. Rather than generalizing to the entire profession, the study suggests that the variability in teachers' backgrounds necessitates differentiated support and training, which is central to Kolb's (1984) framework.

The practical recommendations from this study emphasize that professional development programs should adopt an experiential approach, mirroring the stages of Kolb's (1984) cycle. Programs should begin by engaging teachers in concrete experiences with hands-on laboratory activities, followed by guided reflection to help them conceptualize the material in ways that are meaningful to their instructional practices. Finally, teachers should have opportunities to experiment by applying the curriculum in their classrooms, followed by feedback and iterative refinement. This approach ensures that teachers not only learn the content but also build confidence in integrating it into their instruction. By incorporating experiential learning into professional development, educators can more effectively bridge the gap between theoretical knowledge and practical application in the classroom. These recommendations align with the

NCAE's (2023) efforts to provide rigorous standards and resources in agricultural pathways such as Plant Systems and Biotechnology.

It is important to note that the teachers in this study were not involved in the original design of the curriculum. They were provided with the lesson and supporting materials to implement in their classrooms. Therefore, while professional development is essential, future curriculum development efforts should also include teacher voices earlier in the process. Involving teachers in curriculum co-design can enhance instructional alignment, anticipate classroom challenges, and empower educators to take ownership of new material. This should be a key component of future science lessons and curricula to be utilized for agricultural education.

Furthermore, the multi-case study approach was effective in collecting detailed feedback from participating teachers, enabling the iterative refinement of the curriculum to better align with classroom needs. While the study's conclusions are not intended to generalize broadly, the findings offer a valuable framework for supporting agricultural educators in implementing new and challenging curricula. By aligning professional development and curriculum design with Kolb's (1984) Experiential Learning Theory, this study highlights a pathway for advancing agricultural education through tailored and iterative approaches. Future studies should expand on this work by exploring how experiential learning principles can be applied to other agricultural pathways, such as Animal Science, Agribusiness, and Natural Resources, to better prepare both educators and students for success in post-secondary education and careers in agriculture. This approach ensures that curricula are not only scientifically rigorous but also accessible, engaging, and effective in promoting experiential learning outcomes.

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