Cultivating Curiosity: Engaging Pre-Service Agricultural Education Teachers in Inquiry-Based Instruction

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Introduction and Need for Innovation

Developing inquiry-oriented teachers is a critical goal of contemporary post-secondary Agricultural Teacher Education programs (Baldock et al., 2022; Wells et al., 2015). Inquiry-based instruction helps students think critically, solve problems, and connect classroom content to authentic agricultural contexts (Parr & Edwards, 2004; Thoron & Myers, 2011). However, pre-service teachers often lack confidence and experience in implementing inquiry models, particularly when teaching secondary students enrolled in introductory agricultural coursework (Smolleck et al., 2006).

To address this gap, a 10-hour inquiry-based certification program was delivered over the course of 3 weeks in a teaching methods course to prepare pre-service teachers to teach a middle school agricultural literacy curriculum. The training engaged participants in understanding and practicing structured, guided, and open inquiry while providing both pedagogical foundations and ready-to-use classroom lessons (Sizer et al., 2021). This innovation responds to national priorities to integrate STEM and problem-solving into agricultural literacy education (Spielmaker, 2023; National Research Council, 2009). By embedding certification within teacher preparation coursework, this innovative initiative promotes both content mastery and instructional self-efficacy, empowering future educators to lead inquiry-based instruction confidently in secondary Agricultural Education classrooms (Eck et al., 2021).

How It Works

The 10-hour inquiry-based certification program was incorporated into six regularly scheduled class sessions for an undergraduate course on laboratory management. In addition to participating in the required certification components, students completed two activities designed to assess understanding of inquiry-based instruction and to address potential pitfalls in its implementation in a middle- or high-school classroom.

The first activity required students to assess a series of vignettes depicting structured, guided, or open inquiry. Students needed to justify the characteristics of each scenario and determine methods to adapt each vignette to another form of inquiry-based instruction. The second activity was a capstone “Inquiry Implementation” challenge at the conclusion of the program. Students were asked to preview a lesson and all related materials, then complete the following tasks: 1) identify the modality of inquiry-based learning used in the lesson, 2) discuss evidence of spiraling and scaffolding from the assigned lesson to other parts of the curriculum, and 3) propose a realistic implementation plan including necessary teacher preparation, required set-up, and safety/PPE concerns.

Results to Date

Students completed an IRB-approved instrument prior to the first class session and at the conclusion of the certification program to measure changes in knowledge, skills, and abilities related to inquiry-based instruction. As shown in Table 1, students demonstrated statistically significant gains in their ability to identify modalities of inquiry-based instruction, modify existing lessons to incorporate inquiry-based instruction, and implement various forms of inquiry-based instruction during their upcoming student teaching internship.

Table 1. *Perceived Readiness to Implement Inquiry-Based Instruction by Mean Change (n = 14)*

Statement	Pre		Post		Mean Δ	*t(14)*	*p*	Cohen's *d*
	μ	*σ*	*μ*	*σ*				
I can explain to others the difference between structured, guided, and open inquiry.	3.36	.84	4.43	.89	.86	-3.71	<.01	.86
I can facilitate inquiry-based activities even when outcomes are unpredictable.	3.79	.70	4.50	.52	.71	-2.69	<.01	.99
I can manage a classroom where multiple student groups are investigating different problems.	3.86	.87	4.50	.65	.64	-2.09	.028	1.15
I can modify existing agricultural lessons to include inquiry components.	3.86	.86	4.43	.85	.57	-1.47	.082	1.45
I can confidently implement inquiry-based instruction during my student-teaching placement.	3.79	.80	4.29	.61	.50	-1.84	.045	1.02

Note: Scale: 1 = Strongly Disagree, 2 = Somewhat Disagree, 3 = Neither Agree nor Disagree, 4 = Somewhat Agree, 5 = Strongly Agree

Future Plans & Advice to Others

In future semesters, participants will implement one inquiry-based lesson from the certification program in a local middle or high school classroom, allowing them to apply inquiry facilitation skills in an authentic teaching context. Future research will extend this work through a larger cohort study examining how inquiry-based certification influences pre-service teachers' instructional self-efficacy, pedagogical creativity, and perceptions of agricultural literacy integration following completion of student teaching. Findings from these efforts will inform teacher preparation programs seeking to embed content-specific inquiry training and field-based application within methods coursework. For successful replication, teacher educators are encouraged to model inquiry before expecting its implementation, to scaffold instruction from structured inquiry, then continue to guided and open inquiry, and to ground facilitation in authentic agricultural contexts. Finally, curating tangible resources, such as lesson repositories, instructional videos, or inquiry-based rubrics may further enhance participants' motivation to incorporate inquiry-based instruction into future practice.

Costs and Resources Needed

Costs include a certification fee ($200 per participant) and printing costs for participant binders. Resources needed include basic laboratory equipment (e.g., electronic balances, beakers, and graduated cylinders), household or everyday items (e.g., cups, coffee filters, plastic containers, and food products), standard classroom supplies (e.g., rulers, markers, safety glasses, and instructional handouts), and locally available consumable materials (e.g., soil, seeds, water, and recyclable materials). While a comprehensive materials list is provided by the certifying organization, hosts may creatively substitute comparable items based on budget, time, or local availability without compromising the integrity of the inquiry-based activities.

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