

FACILITATING INTERDISCIPLINARY TEACHING AND LEARNING IN AGRICULTURE

Eric Stubbs, Brian Myers,
Kathryn Stofer,
Laura Warner, and
Kirby Barrick



Department of Agricultural
Education and
Communication
University of Florida

BACKGROUND

- Integrated STEM education emphasizes interdisciplinarity, but how to define disciplines and their structure is not well agreed-upon.
- Goals of interdisciplinary learning include improving synthesis, communication, and other science skills that cross disciplinary boundaries.

BACKGROUND

- *Disciplinary perspective* – complex knowledge acquisition and specialized methods require separate learning of disciplines.
- *Interdisciplinary perspective* – demonstrating how disciplines overlap in real-world contexts will increase interest, achievement, and persistence.

PURPOSE AND OBJECTIVES

Synthesize teacher preparation literature from agriculture and other interdisciplinary STEM domains to establish principles to guide interdisciplinary teaching.

1. Identify common principles in both agricultural education and STEM education domains.
2. Evaluate and synthesize conceptual models from both domains.

RESEARCH METHOD

- Integrative literature review as described by Torraco (2005).
- A constant comparative process encouraged synthesis.
- Two phases: Review of literature from our discipline and an NRC report on integrated STEM education, followed by a search of Web of Science to review a sample of relevant journal articles.

RESEARCH METHOD

- Relevant agricultural education texts were selected based on our expertise:
 - *Preparing and Advancing Teachers in Agricultural Education*
 - *National Standards for Teacher Education in Agriculture*
 - *Journal of Agricultural Education* articles
- Also included NAE & NRC (2014) report that defines a framework of integrated STEM education.

RESEARCH METHOD

- Thompson Reuters® Web of Science search terms:

Search Procedure Results

Broad Search Term	Search Within Term	Results	Results Meeting Criteria
“Teacher Education”		>12,000	
	STEM	44	6
	Interdisciplinary	78	7
	Integrated curriculum	9	3

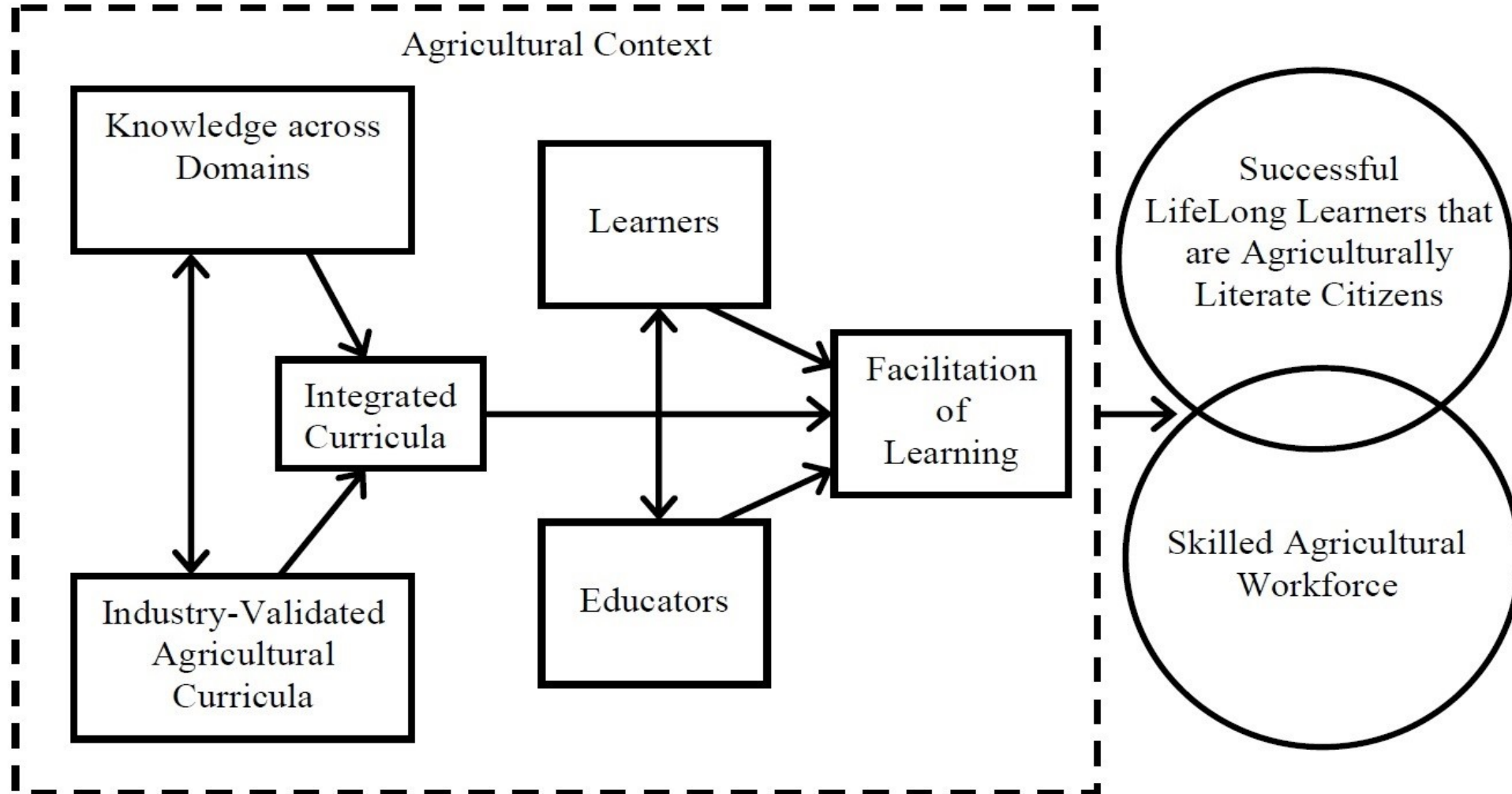
- A total of 16 articles were included in the second phase of the review.

FINDINGS

Agriculture uses science, technology, engineering, and mathematics to provide food and fiber to a growing population, so agricultural education inherently meets the definition of integrated STEM education.



INITIAL REVIEW: CONCEPTUAL MODEL OF TEACHING AND LEARNING IN AGRICULTURE



HIGHLIGHTS FROM THE REVIEWED ARTICLES

- Use active learning and student collaboration (Spelt, Biemans, Tobi, Luning, & Mulder, 2009).
- Interdisciplinary STEM teaching plays a vital role in economies that are increasingly driven by innovation (Corlu, Capraro, & Capraro, 2014).
- Positive feedbacks from learning outside of one's specialization.
- Positive feedbacks from industry and research experiences.

SYNTHESIZING THEMES FROM THE LITERATURE

- Ten principles were identified and supported with citations from both literature reviews.



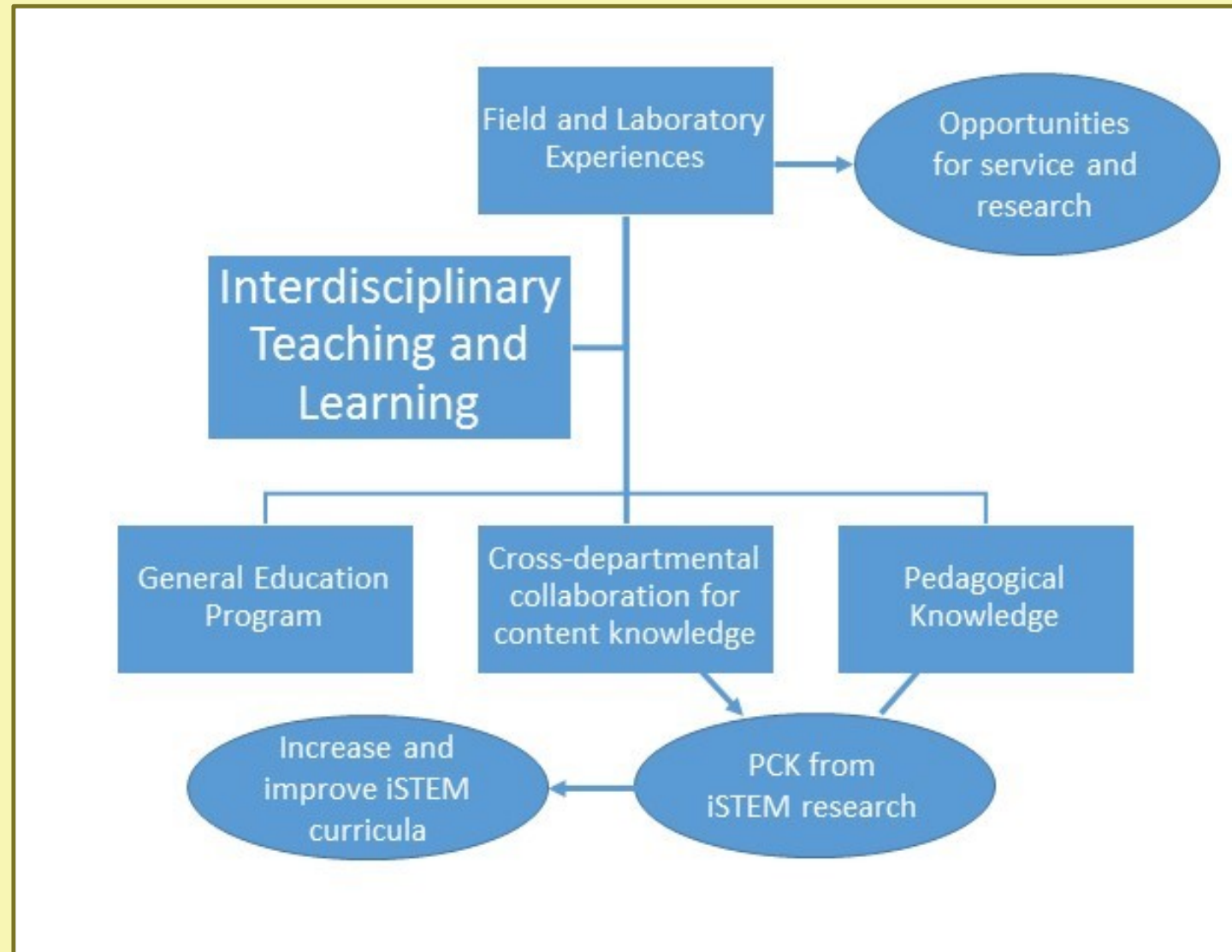
TEN PRINCIPLES FOR INTERDISCIPLINARY T&L

1. Teach knowledge from multiple disciplines; use experiential learning and reflection on teaching practice
2. Integrate content knowledge with pedagogical content knowledge across domains
3. Acknowledge diverse learning styles
4. Place abstract knowledge in the context of real world issues
5. Emphasize problem solving skills and problem-based learning

TEN PRINCIPLES FOR INTERDISCIPLINARY T&L

6. Provide broad content knowledge across domains; depth of learning according to course focus or students' interests
7. Teach 21st century competencies, especially digital skills
8. Learning outside of the classroom
9. Collaborate with faculty or graduate students from other departments for teaching, especially departments of agricultural education
10. Continued professional development related to interdisciplinary teaching skills

CONCEPTUALIZING INTERDISCIPLINARY TEACHING AND LEARNING



RECOMMENDATIONS

- Identify STEM domains that are less integrated in a given course and incorporate them.
- Describe links to other disciplines, even if they are not directly taught as part of the curriculum.

RECOMMENDATIONS

- Use active learning and student-centered projects that allow students to pursue interests across disciplines.
- Require collaboration among students, especially those from different majors.

QUESTIONS?

THANKS FOR LISTENING

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