

Blurring Boundaries: Interdisciplinary Teaching Across Educational Contexts

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Introduction

The convergence of multiple disciplines in educational spaces is essential to preparing the next generation of professionals with the interdisciplinary mindset needed to systematically address complex problems like climate change, hunger, and social injustice (Scherer et al., 2019). Multiple disciplines converging in an educational space occurs on a gradient from *crossdisciplinary* work, in which one discipline analyzes the work of another, to *transdisciplinary* collaborations which focus on authentic problems unconstrained by disciplinary traditions, language, or norms (Pauley et al., 2019). On that gradient, *interdisciplinary* efforts involve the integration of multiple disciplinary components within one bounded context. For example, an interdisciplinary learning environment may involve engineering students, preservice Extension educators, and soil science majors working together to increase farmer adoption of a water-saving irrigation technology. Importantly, educational experiences which mirror the inter- and transdisciplinary nature of authentic situations and problems are critical to preparing individuals to succeed, and find solutions, in real-world contexts. However, teachers from across educational contexts (i.e., elementary, secondary, post-secondary) are often ill-equipped to construct learner-centered, interdisciplinary experiences for their students (McKim et al., 2017). Therefore, the objective of this panel is to foreground the innovative work being done by three scholar-practitioners implementing and evaluating interdisciplinary learning experiences across educational contexts. In the remaining sections of this proposal, a summary of the work being done by the three scholar-practitioners is described followed by the proposed structure of the workshop and expected outcomes for attendees.

Panel Member Focal Projects

Elementary Context: Increasing awareness among elementary-level students about food security, environmental conservation, and the climate requires a holistic approach that permits a better understanding of the different connections among natural processes. Using the contexts of Agriculture, Food, and Natural Resources (AFNR), the course "Plants, Climate, and Food" for third-grade students in Indiana was created. The course consists of five lessons that include life science, math, physical science, and Earth and Space science standards. During the lessons, students discuss general concepts of botany, develop projects with plants in different conditions, identify food security concepts, explore food resources around the world, and learn about the value chain. Overall, students who participate in the course increase in their knowledge of plant science, food security, and climate through the interdisciplinary approach to STEM and AFNR Education.

Middle and High School Context: Future agriculturalists will face unprecedented challenges from growing populations, dwindling farmland, and changing precipitation patterns. Addressing these challenges will require proficiency in inquiry, reasoning, sense-making, and problem-solving, all of which are central objectives of the Next Generation Science Standards (NGSS). Through an NSF Graduate Research Fellowship, I am developing and testing secondary agriscience curricula called the *Future of Agriculture Curriculum for Teaching Sustainability (FACTS)*. This curriculum consists of two semesters of content in Natural Resources and Plant

Systems aligned to both the national AFNR academic standards as well as the NGSS. The curriculum purposely integrates supervised agricultural experiences into classroom discussions and investigations in order to better enable transfer from the classroom to community-based settings. In lieu of rote content, the curriculum emphasizes science literacy and systematic reasoning in authentic contexts in order to prepare students to make more informed and more sustainable decisions as future agriculturalists.

Postsecondary Context: Purdue University is transforming STEM teacher education from a model of instruction in demarcated subject areas to a model in which teachers learn to integrate scientific inquiry, engineering and technological design, and mathematical thinking and reasoning as pedagogical approaches to STEM instruction. To address this goal, a semester-long graduate-level course, *Teaching Integrated STEM through AFNR* was developed. The course was co-taught by two instructors. The course was a three-credit experience consisting of three-hour weekly sessions. The course aimed to equip graduate students with the knowledge and skills to become informal educators who integrate STEM through AFNR instruction. Throughout the 15 weeks, students framed individual's view of STEM integration through AFNR and explored learner-centered teaching practices such as inquiry-based and project-based learning using an integrated STEM approach. Students also developed and implemented their STEM-integrated curriculum through AFNR lessons in an informal educational setting.

Structure of the Presentation

This workshop will start with the lead facilitator sharing the importance of interdisciplinary teaching and learning and engaging attendees in a discussion of the interdisciplinary educational experiences they have participated in as teachers and learners. Then, each of the three scholar-practitioners will share a 10-minute summary of their innovative work to support interdisciplinary teaching and learning starting with elementary education then to secondary education and concluding with post-secondary education. Next, there will be a facilitated dialogue between attendees and panelists clarifying the work shared by the panelists. The final phase of the workshop will be breakout rooms or roundtable discussions – broken up by elementary, secondary, and post-secondary foci –envisioning collaborative opportunities to increase the prevalence, and quality, of interdisciplinary teaching and learning.

Expected Participant Outcomes

Participants who engage in this workshop will be able to (a) describe the importance of interdisciplinary education, (b) describe three approaches to fostering interdisciplinary teaching and learning across educational contexts, and (c) explore collaborative opportunities to increase student access to, and learning during, interdisciplinary educational experiences. From a National Conference on Learner-Centered Teaching perspective, it is anticipated this workshop will yield grant, research, and/or teaching collaborations among educators at diverse institutions focused on increasing student-centered interdisciplinary teaching and learning across educational contexts.

References

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