Learning Modules Focused on Learner-Centered, Knowledge-Centered, Assessment-Centered, and Community-Centered Environments

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Introduction

Students studying the natural sciences often do not view agriculture careers as attractive career choices" (President's Council of Advisors on Science and Technology, 2012). Approximately 40% of the agriculture-related employment opportunities in the United States go unfilled each year (Goecker et al., 2015). The purpose of this USDA-NIFA-PD-STEP project was to create and evaluate a Science and Agriculture Academy (SAA), which consists of a community of high school science and agriculture teachers who receive two years of professional development and instructional support aimed toward increased awareness of the multidisciplinary nature of agriculture and the related degree and career opportunities in the food, agricultural, natural resource, and human sciences, and helping teachers design and facilitate courses based on teaching and learning theory and principles.

Methods

"In order to teach in a manner consistent with new theories of learning, extensive learning opportunities for teachers are required" (NRC, 2000, p. 203). Due to the current prominence of traditional teaching approaches in colleges and secondary schools. Sustained professional development opportunities built off of education theory and teaching and learning principles is challenging, but it can be achieved (NRC, 2000). In order to prepare teachers to develop curricular materials based on the learner-centered, knowledge-centered, assessment-centered, and community-centered learning environments (NRC, 2000), 12 online modules were developed on the following topics: constructivism, culturally responsive teaching and Vygotsky's zone of proximal development, principles and instructional implications of constructivist design, teaching for depth and progressive formalization, conceptualizing and generalizing, core disciplinary ideas of science, congruency in assessment and learning, designing and conducting meaningful formative assessment, designing and conducting meaningful summative assessment, classroom and school communities, and connecting school and the broader community. The modules were developed to help teachers better connect scientific, business, economic, environmental, and social issues and a degree in agriculture (NRC, 2009).

Participants will use the teaching and learning concepts from the modules to work with another participant to develop curricular materials that are aligned with the disciplinary core ideas of the Next Generation Science Standards, and to effectively teach both agriculture and natural science students. The development and incorporation of the curricula materials will aid teachers and students in connecting the natural sciences and social issues with agriculture.

Findings/Development of Online Modules

Based on the four learning environments identified by the NRC (2000), 12 online learning modules were developed and used for this professional development program.

Learner-centered Environment

The learner-centered modules focused on constructivism, culturally responsive teaching, and instructional implications of constructivist design. The essence of constructivism is that learners build their own knowledge based on their experiences (Fosnot, 1996; Steffe & Gale, 1995; as cited in Doolittle & Camp, 1999). Constructivism allows teachers to design an authentic learning environment that builds on the learner's prior knowledge and skills. This environment requires the teacher to switch roles and become a facilitator of learning (Doolittle & Camp, 1999). A teacher must understand and respect that the learner attaches their own beliefs, understandings, and cultural practices to the academic content being taught in the course. When developing a learner-centered environment, the teacher may use discovery learning (Schunk, 2012), peer tutoring (Clarkson & Luca, 2002), and cooperative learning to help design a course based on constructivism.

Knowledge-centered Environment

The knowledge-centered modules focused on teaching for depth and progressive formalization, and conceptualizing and generalizing. The emphasis of a knowledge-centered environment should be on the big picture and how the it connects with foundational knowledge (NRC, 2000). Overtime, the teacher helps the learner to transform and formalize their ideas. Conceptualization occurs when the learner has the opportunity to develop a deep understanding of the subject matter and generalization occurs when the learner can transfer learning to new contexts (UDL, 2018).

Assessment-centered Environment

The assessment-centered environment modules focused on congruency in assessment and learning, designing and conducting meaningful formative assessment, and designing and conducting meaningful summative assessment. Assessment should be considered at the beginning of course design (Wiggins & McTighe. 2005).

Community-centered Environment

The community-centered environment focused on the classroom and school community as well as connecting school and the broader community. Building a sense of community within the classroom and school helps to increase academic motivation. Teachers have the ability to shape the cultural norms in their classroom to encourage productive learning. Experiential learning opportunities beyond the classroom and school will help the learner to see how their knowledge connects to the greater community.

Conclusion

The learner-centered modules focused on constructivism, culturally responsive teaching, and instructional implications of constructivist design can be used to provide research-based knowledge to guide teachers in course development and facilitation. Information from these modules could improve learning environments and provide an enhanced educational experience.

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