

Connections that Create Science conceptual Change
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Abstract

The goal of the professional development project is to increase science conceptual understanding and ability to deliver inquiry-based instruction among middle level teachers of science. Kansas middle school teachers and K-State faculty will collaborate to improve science conceptual understanding and instructional strategies for “ALL” students. Research has shown that teacher knowledge, beliefs, and experience have the greatest influence on the selection of science pedagogy. (Weiss, I., Pasley, J., Smith, P., Banilower, E., & Heck, D., 2003) The teachers will participate in a professional development program designed to improve science knowledge, beliefs, and experience in inquiry-based teaching. Science education, biology, physics and engineering faculty will model the application of science concepts for meaningful learning. As a connection to real-world applications, teachers will apply conceptual understanding using the National Science Foundation [NSF] endorsed science curricular materials from the “Science Education for Public Understanding Program (SEPUP)”, TI-graphing calculators and sensors. The middle-level modules are considered exemplary science content related to real-world issues, and promote the development of higher order thinking skills. Studies to identify student achievement in classrooms of middle level teachers with similar experiences using SEPUP have shown high gains in affective and cognitive outcomes (Siegel, Nagle & Barter, 2004). As a result of the professional development, teachers will demonstrate the ability to “tailor learning situations to the needs of individuals and groups” (pg. 62, National Research Council [NRC], 1996). This collaborative effort will institutionalize a support system for middle science teachers with Kansas State University education, science, and engineering faculty. The project is estimated to impact 12 middle level science teachers, 12 paraprofessionals, and approximately 1,500 middle school students.

The professional development process will:

- Build on teachers’ current understanding of life and physical science concepts.
- Increase teachers’ ability to engage students in scientific inquiry and modeling.
- Prepare teachers to adapt and deliver science instruction appropriate to meet the needs of diverse learners.
- Increase teachers’ science pedagogical content knowledge.
- Increase teachers’ ability to develop formative and summative assessment of students’ science conceptual understanding using real-world problems.
- Improve student science achievement and critical thinking skills.

- Create a continuous support system among middle school science teachers, paraprofessionals, and university faculty (education, biology, geology, physics, and engineering) to improve middle level science education in high need local education agencies.