Evaluations of Elementary Science Curricula and Instructional Practices

Students continue to struggle to attain mastery of rudimentary science knowledge and skills. According to the 2009 National Assessment of Educational Progress (NAEP) in science, only 34 percent of fourth-graders, 30 percent of eighth-graders, and 21 percent of twelfth-graders scored at or above the proficient level in science. These findings from the 2009 NAEP science report emphasize the need for science education interventions to help improve students’ science achievement. Identifying effective science curricula and instructional practices for improving students’ science achievement is not an easy task. Compared to subject areas such as reading or mathematics education, there have been few rigorous evaluations of science interventions. In fact, science education is not even listed as one of the topic areas currently being reviewed by the What Works Clearinghouse. This is a void that must be filled in order to improve students’ science achievement. Furthermore, the recent report by the President’s Council of Advisors on Science and Technology (PCAST; 2010) stressed the importance of rigorous research and the need for increasing the development, replication, and implementation of scalable STEM programs in order to prepare and inspire students to pursue STEM fields. To address this need, the Institute of Education Sciences has funded three efficacy evaluations of elementary science curricula and instructional practices.

In the first evaluation, the researchers are testing the efficacy of the Promoting Science among English Language Learners (P-SELL) curriculum at Grade 5. P-SELL is a full year science curriculum designed to promote standards-based, inquiry-driven science learning and focuses on science instruction with ELL students to enhance understanding of science and acquisition of English language and literacy. The P-SELL curriculum includes a complete set of classroom materials, including the student book, teachers’ guide, science supplies, and trade books related to science topics.

In the second evaluation, the researchers are evaluating the efficacy of the Science Writing Heuristic (SWH) instructional approach at Grades 4 to 6. The SWH instructional approach consists of a framework designed to guide science inquiry activities and provide metacognitive support to prompt student reasoning about data. The SWH approach embeds instruction about building scientific arguments within typical science inquiry lessons in grades 4 to 6. By having students use scientific argument within the context of the topics for which they are building understanding, students are not separating the concept of argument from how knowledge is constructed in science.

In the third evaluation, the researchers are testing the efficacy of the Assessing Science Knowledge (ASK) diagnostic and formative assessment system in Grades 3 and 4. Currently, Assessing Science Knowledge is integrated into 16 modules of the Full Option Science System, a widely used K-8 science curriculum. The diagnostic assessment tools in Assessing Science Knowledge are designed to monitor student progress at critical junctures in the curriculum, enabling teachers to adjust their instruction according to how well their students are mastering the material.

This symposium will present and discuss some of the challenges in conducting rigorous efficacy trials in science education and share preliminary results from their evaluations.