Video-rich, Web-based Professional Development to Improve Science Discussions

Background

Perhaps the greatest challenge required by the *Next Generation Science Standards* is the creation of coherence—coherence in order to develop deeper learning from grade to grade, and coherence in the support systems of curriculum, assessment, and professional development.

To help students develop scientifically sound ideas and practices, curricula need to support deep restructuring of their knowledge. This requires that the core ideas of science are addressed with coherence from one grade to the next. Moreover, it requires alignment among curriculum, assessment, and professional development.

Many National Science Foundation-funded projects, including The Inquiry Project at TERC, are engaged in creating curriculum coherence through careful study of how learning progresses. The Inquiry Project curriculum is based on elaboration and refinement of the grades 3–5 portion of a learning progression for matter, and focuses sharply on the core idea of matter and its component ideas of material, weight, volume, and transformations of matter. The curriculum carefully builds the foundation for students' later understanding of matter at both the macroscopic scale, visible to the naked eye, and the microscopic scale, where matter appears as discrete particles. The curriculum emphasizes progressive deepening of understanding across grades, the integration of mathematics into the science content, and a focus on inquiry and scientific practices.

A complementary project, Talk Science, provides scalable, Web-based professional development designed to help teachers facilitate productive science discussions. The professional development is explicitly aligned with the Inquiry curriculum, providing coherence and near transfer between teacher learning, and what and how they teach.

To strengthen classroom science discussions, teachers deepen their understanding of science content, study video cases of discussions taking place in other classrooms, and develop nine strategies to support productive talk. They engage in guided independent study, try out ideas in their classrooms, and participate in grade-level study-group meetings in order to share their progress.

The Inquiry and Talk Science team comprises diverse expertise: teachers and their students, school leaders, science educators, scientists, cognitive psychologists, socio-linguists, curriculum developers, Web developers, and researchers. Of special importance were the teachers who openly shared their classrooms and practice.

Documented Results

A longitudinal study was conducted to compare the learning of students who used the Inquiry Curriculum with those who did not. This informed further refinement of both the curriculum and learning progression. Students who had the curriculum made more progress in moving from perception-based to model-mediated understanding of materials and matter. The report is available at http://inquiryproject.terc.edu.

The Talk Science research is still underway. It focuses on the process of teacher learning and the changes in discussion patterns evidenced in science classrooms. Four key areas are considered: (1) classroom discourse practices, (2) teachers' participation in study groups, (3) teachers' understanding about the role of discussion in science classes, and (4) teachers' facility with the scientific ideas in the curriculum. Preliminary analysis of the data suggests that teachers are able to bring more productive talk moves into

their classroom discussions, especially when the curriculum incorporates science discussion.

Over the past seven years, the Inquiry Project curriculum and Talk Science professional development have been implemented in urban, suburban, and rural classrooms. Approximately 50 classrooms in Massachusetts and Vermont use the curriculum. The materials were revised based on the research findings and feedback from the classroom.

Potential Applications
The Inquiry Project curriculum and guides for grade-specific implementation workshops are openly available for school and district use at http://inquiryproject.terc.edu.

The Talk Science Professional Development Program is also openly available at http://inquiryproject.terc.edu. This program is designed to work in conjunction with the Inquiry Project curriculum, providing just-in-time support. Links to the Talk Science cases are embedded in the Inquiry Project curriculum so that teachers have easy access to these resources as they teach. The program is most successful when supported and recognized by district or school leaders. There are cases, however, where grade-level teams have successfully organized and facilitate their own study.

Many of the Talk Science strategies are applicable to other curriculum areas and may be helpful for cross-discipline professional development purposes.

For More Information
Please contact Sue Doubler (sue_doubler@terc.edu).