Talk Science! Scalable, Web-based Professional Learning to Improve Science Teaching & Learning

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Talk Science! is a four-year research and development project to enhance and study science teachers' facilitation of productive science talk in the classroom. The project is developing new web-based resources, *Talk Science!* PD, to help elementary teachers facilitate scientific discourse. The resources are closely aligned with the NSF-funded Inquiry Curriculum, a curriculum for Grades 3-5 about the nature of matter and the conceptual development of material, mass, volume, and density.

The project is led by TERC in close collaboration with schools in Massachusetts and Vermont along with linguists and scientists from Clark University, Tufts University, and Boston University.

Research Questions

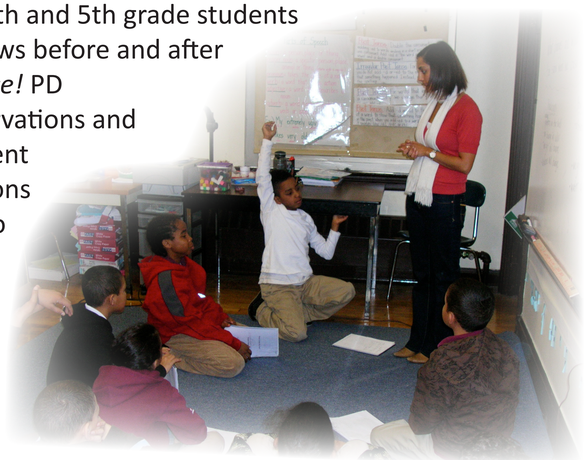
1. How do teachers' awareness, understanding and skills for supporting science talk change as they use *Talk Science!* PD?
2. How do teachers' understanding of science concepts and processes change as they use *Talk Science!* PD?
3. How does student talk change as a result of changes in teachers' language-related actions?
4. How do classroom discourse patterns change as a result of changes in the teacher's action?

Design Research

Our research is designed to study the impact of new web-based resources on teachers' facilitation of science discussions and on students' participation in the practices of science. Observation protocols and coding schemes will be used to capture key elements of change in student and teacher discourse.

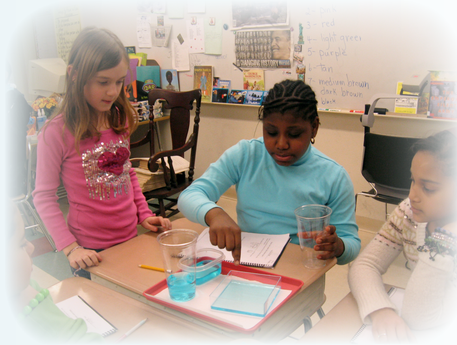
Data collection

- 18 teachers of 4th and 5th grade students
- Teacher interviews before and after using *Talk Science!* PD
- Classroom observations and video to document science discussions
- Teacher portfolio artifacts produced during their *Talk Science!* PD



Why Talk is Important

Research from the learning sciences, classroom research, and the National Research Council's consensus reports on teaching and learning science are clear: talk is central to doing and learning science well (Duschl and Osborne 2002; Duschl, Schweingruber et al. 2007; Michaels, Shouse et al. 2008). Yet effective scientific discourse is mostly absent in classrooms (Barnes 1992; Lemke 1993; Alexander 2001; Cazden 2001). Despite well-designed curricula and well-intentioned teachers, students are failing to obtain a deep understanding of science and to develop critical 21st century skills, such as negotiating shared meaning-building and weighing arguments with evidence and co-constructing problem resolution (Dede 2007). This is the challenge we address.



Web-based Teacher PD

Our professional development efforts will result in web-based multimedia resources for 4th and 5th grade teachers that are aligned with the NSF-funded Inquiry Curriculum and focused on promoting scientific discourse in classrooms. The resources will be available in TEACHERS LANE, which accompanies the Inquiry Curriculum (inquiryproject.terc.edu).

Talk Science! PD resources will include:

- Scientist video cases revealing scientists' talk as they engage in the student inquiries
- Classroom video cases of small and large group discussions
- Vignettes of children thinking aloud about key scientific concepts
- Teacher reflections
- Position-driven discussion questions

Evaluation

The project evaluation will 1) provide information on the functionality of the *Talk Science!* resources to inform revision, 2) demonstrate the extent to which teachers successfully use *Talk Science!* in a variety of educational settings, and 3) provide evidence of the promise of *Talk Science!* to improve teaching and student participation in the practices of science.

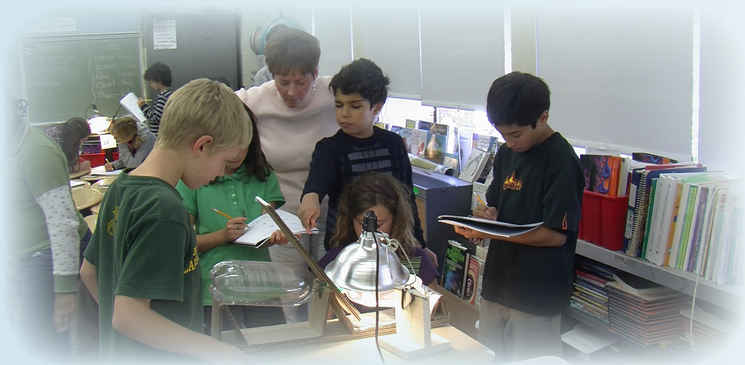
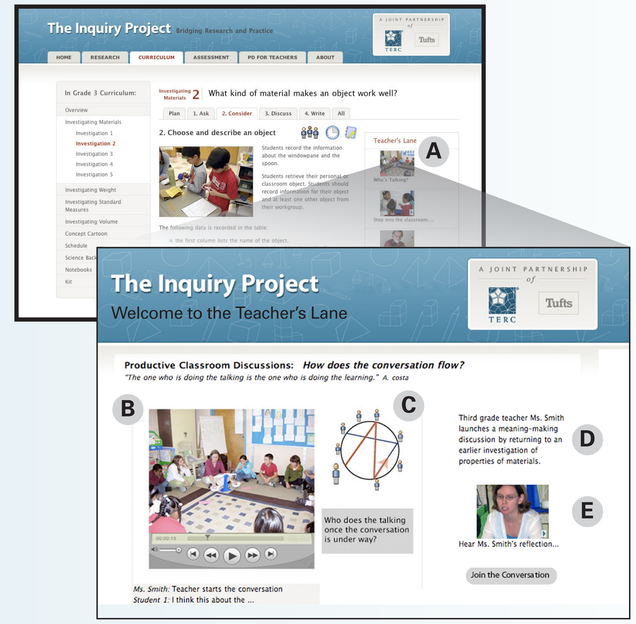


Illustration of *Teacher's Lane*



A Click an object in the *Teachers Lane* and the user is taken to a "case" page.

B This case explores how discussion moves from one person to another in all-class discussions. The video clip (3-5 minutes) is from the current investigation the teacher is doing with her class. Thus, teachers using *Teachers Lane* gain information about the lesson they are planning to teach while learning new pedagogical strategies.

C The pedagogical strategy explored is about how to allow conversation to flow student-to-student rather than teacher-student-teacher. A multimedia tool to the right of the video tracks the flow of discussion as it happens. This representation makes visible how the discussion moves person to person. Transcript of video, below the navigation bar, aids the user in thinking explicitly about what students are saying.

D Text to the right of the video introduces the classroom. Who is the teacher? How does she introduce the discussion?

E Click on Ms Smith's image and the user hears (audio only) Ms Smith reflecting on the learning culture she has established in her classroom—one in which children listen to each other and respond to each other rather than only to her. How did she go about making this shift?