SCALE Key Concepts

This series of articles illustrates key concepts of the SCALE five year National Science Foundation-funded project.

The SCALE partnership aims to improve K-12 mathematics and science teaching and learning working with four urban school districts: Los Angeles Unified School District, Denver Public Schools, Madison Metropolitan School District, and Providence Public School District. Other partners include California State University, Dominguez Hills; California State University, Northridge and University of Wisconsin-Madison. These articles reflect the major themes of the National Science Foundation's Math and Science Partnership (MSP) Program: Partnerships Across Institutions; Challenging Courses and Curricula; Evidence-based Design and Outcomes; Teacher Quality, Quantity and Diversity; and Institutional Change and Sustainability.

Immersion Units and the Inquiry Toolbox

Some efforts to improve teaching and learning start with the notion of capitalizing on a child's sense of curiosity. Particularly in science education, harnessing a natural sense of curiosity can play a strong role because asking questions is so central to the discipline. Scientists extend this initial curiosity into a formal process called inquiry. This inquiry process was defined by the National Science Education Standards and forms the core of SCALE Science Immersion Units. Classroom scientific inquiry has five essential features in which the learner:

- Engages in scientifically oriented questions
- Gives priority to evidence in responding to questions
- Formulates explanations from evidence
- Connects explanations to scientific knowledge
- Communicates and justifies explanations

Engaging students in scientific inquiry to develop deep understanding of standards-based science concepts is both a philosophical approach to learning and a teaching/learning strategy.

The inquiry process, in the laboratory and in the classroom, is rarely sequential. Questions may be revised, or evidence revisited, or alternative explanations explored. A lot of time is spent on the questions to be explored in a science inquiry classroom. For example, in a kindergarten classroom engaged in an inquiry to learn about animal characteristics, the teacher guides students in developing an animal data chart. In order for new information to be added to the chart, students must be able to justify their answers with evidence. If a student suggests an unsupported explanation, the teacher asks, "How do you know that?" In this way, even very young students begin to learn the difference between opinion or imagination and evidence. Engaging students in scientific inquiry to develop

deep understanding of standards-based science concepts is both a philosophical approach to learning (based on the belief that one must construct a scientific explanation by engaging in inquiry to learn for understanding) and a teaching/learning strategy.

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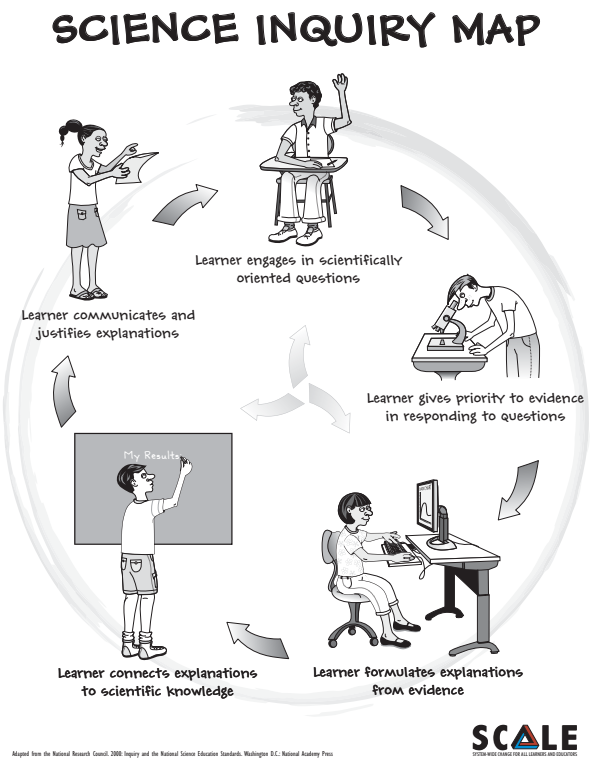
SCALE Key Concepts: Immersion Units and the Inquiry Toolbox

This learning strategy follows a more natural process, starting with students' innate curiosity. For example, a student may wonder about rainbows, which becomes an exploration topic in science class. In order to make sense of this phenomenon, the teacher will guide students in an inquiry process to uncover what they already know about rainbows including misconceptions they might have, what questions they need to answer and ultimately what scientific principle(s) underlies the phenomenon. As new ideas are investigated, students put together pieces of information that are evidence-based and make sense. Eventually, an understanding develops that there is an association between sunlight and water vapor. Sometimes,



when information doesn't make sense, the students will back track and rethink old ideas or new theories. The teacher guides the process along the way, helping each student build his or her own understanding of a rainbow. *–August 2007*

For more information about concepts and ideas in this article, go to these links:

http://www.scalemsp.org/files/research/Products/How_Do_You_Know_That.pdf

http://www.scalemsp.org/index.php?q=immersion_units

http://www.scalemsp.org/files/research/Products/SchunnEtal_ExtendedInquiryScienceDesignGoal2ConceptPaper.pdf

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