

The Concord Consortium
37 Thoreau Street
Concord, MA
01742

978.369.4367
fax 978.371.0696
info@concord.org
<http://www.concord.org>

SEEING MATH

TELECOMMUNICATIONS PROJECT

The Concord Consortium, Concord, Massachusetts

FOCUS OF THE PROJECT

The Seeing Math Telecommunications Project will create and deliver exemplary teacher professional development materials on the use of standards-based mathematics for teachers in grades four and five. Research conducted by the project will help the academic community understand more about the use of online professional development environments for teaching and the effect such instruction has on student learning and attitudes towards math.

AN EDUCATIONAL INNOVATION

Principal Investigator Dr. Robert Tinker says, "The key innovation of the Seeing Math project will be ten highly interactive online digital video case studies. These will provide vivid mathematics teaching exemplars linked to resources related to Standards 2000 content and process standards."

It is well known that video case studies, when properly supported, are far more effective in improving teaching techniques than hours of abstract discussions or readings on how to teach. A video shows an entire environment, illustrates how to organize classroom space and time, and explains how to respond to typical student issues. The Internet is increasingly able to handle video on demand, so it is natural to include video case studies in teachers' professional development.

Online video case studies can be made highly interactive by linking them to lesson plans, typical student work, relevant standards and assessments, background content, expert commentary, teacher reflection, and moderated online discussion groups. As appropriate to the topics, there will be links to relevant tools, simulations, and implementation guidance. At any point, the user can stop, replay, jump ahead, or dive into the rich surrounding content.

Online courses using case studies will be much more interactive than typical workshops that use case studies. The online teacher will be in charge, able to control the pace and depth of the experience. The privacy of the experience will permit teachers to acknowledge their content weaknesses and brush up on their understanding of content and technology. On the other hand, the online discussion areas will encourage collegiality and reflective sharing around focused, relevant issues.

To stimulate productive and intense dialog among teachers about improved mathematics teaching, the case studies will be used in *moderated online, graduate-level mini-courses*. To ensure that Seeing Math resources are well-utilized and integrated into local teacher professional development programs, the project will offer an online course for staff developers. This strategy will enable the project to provide personalized teacher professional development opportunities to a large number of teachers.

The greatest challenge generated by the new mathematics standards is that effective implementation requires teachers to make fundamental changes in teaching practice, acquire a deeper understanding of content, and become familiar with technology. It is likely that much of the current backlash against the standards is fueled by examples of poor implementation by unprepared teachers. If the nation is to benefit from the increased student mathematics learning promised by the new standards, and for the standards to function as intended, an intensive teacher professional development effort is urgently needed for all mathematics teachers.

This new teacher knowledge is not easily acquired. Most teachers of mathematics need a sustained program of professional development. Teachers need to upgrade their teaching strategies by seeing and discussing better alternatives. Busy teachers need ways of doing this that are available anytime, anywhere. Online case studies and courses provide a powerful, cost-effective way of providing these alternatives.

GOAL

The goal of the Seeing Math program is to provide a web-based professional development course for teachers using video case studies. By presenting a window into the practice of selected teachers, we provide a starting point for the user to begin a larger exploration of his/her own practice. The profiled classroom is not presented either for critique or as recipe for emulation. Rather, it is meant to be a basis for other teachers to reflect on their own practice. By following the lessons and the decision-making process the case teacher makes, the users are privy to the unique experience the teacher and students have. These are windows onto another professional's practice. Just as these teachers make decisions about their practice, we want our participants to use these cases as a way to inform their own practice.

The Seeing Math cases are not created to showcase flawless curriculum taught by brilliantly trained mathematicians to students whose only desire is to maximize their mathematics potential. Rather, the teachers who have invited us into their classrooms are real teachers, working with real students.

These teachers are courageous, for they have offered their classrooms to use as case studies. Many are trying curricula that are new to them and are still developing the best way to use it. By presenting the problems these teachers face, the mistakes they make and the solutions that grow from imperfect situations, Seeing Math provides a rich source of insight that all teachers can use to develop their own practice.

Each of the cases we present explores the way individual teachers meet the challenge of implementing standards. The surrounding course materials provide guidance and support for considering the cases in the light of the standards set forth by the National Council of Teachers of Mathematics (NCTM) in *Principles and Standards for School Mathematics 2000*.

CASES BEING PRODUCED

Ten cases will be produced and pilot tested in a selected nation wide sample of representative school districts. The following six cases will be available around September 2001.

MA001. Numbers and Operations: Division with Remainders.

Grade range: 3 to 6

For 4th and 5th graders, division with remainders and the inverse nature of division and multiplication are key ideas. Lead math teacher Nancy Horowitz and another cluster teacher, Mary Beth O'Connor, present the same lesson. Students in each class build understanding about the nature of the division by creating and solving their own story problems. The lesson lays a conceptual foundation for division before presenting a formal algorithm.

MA002. Data Analysis and Probability: Using Data to Make Predictions

Grade range: 5 to 6

This case presents ways to support NCTM standards for grades 3-5 that invite students to collect, analyze and make predictions from data. The video shows two lessons from Rhonda Singleton's 5th grade class. The first explores mathematical fairness. The second shows the relationship between sample size and accuracy of predictions about a whole population.

MA003. Algebra: Pan Balance Equations

Grade range: 3 to 6

Audrey Soglin's 5th grade class manipulates concrete representations of equivalence, using pan balances to understand the nature of equations and operations on equations. Students investigate a model for solving equations using one and two variables. By laying a firm foundation at the upper elementary level, this lesson supports a district commitment to teaching algebra in 8th grade to all students.

MA004. Geometry: Calculating the Area of a Triangle

Grade range: 3 to 6

Traditionally students learn to find the area of geometric shapes by using formulas. In this class, Noreen Winningham guides her 5th grade students as they build a foundation for understanding the area of a triangle and methods to calculate it before learning the standard formula.

MA005. Numbers and Operations: Adding Fractions

Grade range: 4 to 6

Adding fractions always presents conceptual difficulties. Teri Donnelly's 5th grade class approaches adding fractions with unlike denominators using manipulatives. The lesson emphasizes magnitude of the fractions and their sum rather than an algorithm to obtain an answer. Students build conceptual understanding of the fraction's magnitude before learning to manipulate fractional notation and obtain an answer using least common multiples.

MA006. Data Analysis and Probability: Data Sets and Measures of Center

Grade range: 3 to 6

Teaching in an ESL class presents unique issues. Not only must a teacher ensure students understand math content, but she must also assess understanding when students lack strong language skills for communicating their ideas. 30% of Lala Sahakian's 4th grade students have arrived in the US during the past 18 months. There are 5 different languages spoken at home. Students collect, organize and analyze data to determine maximum, minimum, range, mode, median, and mean.

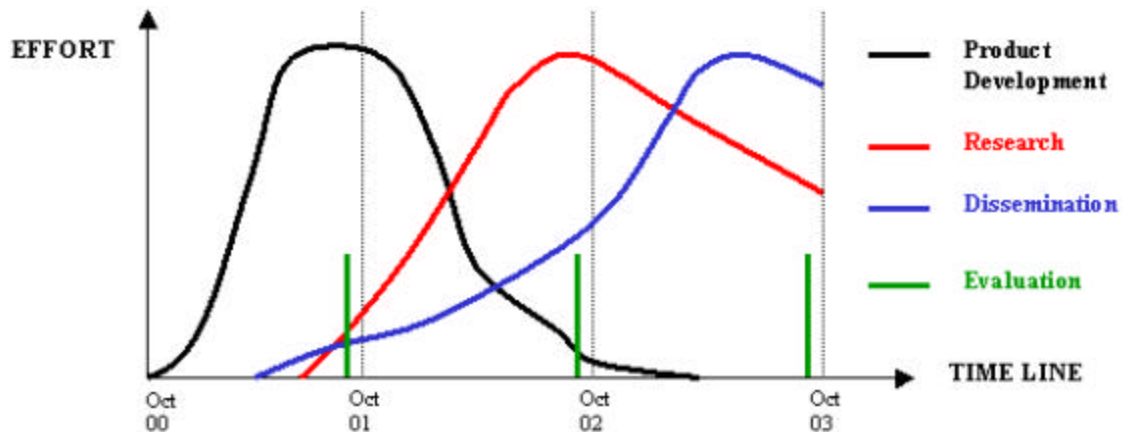
EXPECTED RESULTS

The Seeing Math Telecommunications Project builds community among participant math educators through its highly individualized modular design and its capacity to support review, dialogue and reflect on teaching in reaction to the video-based case studies. These video case studies offer pre-service educators a window onto other classrooms and the extended meaning of “standards-based” teaching. They also offer a mirror to practicing teachers in which they can see and reflect on their own assumptions about the meaning of extended content and pedagogy encouraged by the NCTM Standards 2000. The project will generate and share with the math learning and teaching community:

- Ten *highly interactive video case studies* focused on critical topics of math teaching at 4th and 5th grade. Each case will deal with at least one pair (content and process) of the NCTM 2000 Standards. Six case studies are being prepared during the first year of the project, four will be produced during the second. The cases will be tested during second and third year in pilot school districts where an incremental number of schools per year will be participating.
- Two *online mini courses for Math teachers*. Online courses provide an opportunity for teachers to reflect in depth about the case studies, their own teaching, new content, technology, and relevant standards. Mini-courses will last approximately a half-semester, will require about 25 hours of quality time on-line and off, and carry the equivalent of two graduate credits. Possible topics would be “Supporting Learning through Inquiry” and “Student Assessment in Inquiry Classrooms”.
- One *staff development course* devoted to help staff developers and other administrators make full use of the Seeing Math resources. It will introduce the content and approach of the ten case studies and mini-courses. The course will be available in online and workshop format. As with the mini-courses, the online courses will use the asynchronous, scheduled model based around online discussions supported by a trained facilitator.
- One *technology course* devoted to provide assistance to administrators and teachers on integrating technology. We will focus on the ways in which technology would enhance the other case studies. This will make it feasible to create the case studies in relatively technology-poor classrooms while making them applicable to environments that have more resources available.
- One *online course for online facilitators*. The Concord Consortium will develop a “meta-course” that will train mini-course facilitators based on its successful experience in the INTEC and Virtual High School projects. This will be 40-hour online course in sections of 20 participants carrying three graduate credits.
- A nationwide group of school districts, around 51 from 17 states, having *direct experience with the video case studies and netcourses* produced by the project. School districts from at least 15 states are invited to participate in the pilot experience.
- *Research results from the project*, derived from design studies starting the second year will help refining the experience and learning from the project. As a bases for learning from the experience, major promises of Seeing Math will be assessed in the pilot and partner schools, and critical success factors will be determined.

TIMELINE

The following graph illustrates evolution of the production, dissemination and research functions over the expected lifespan of the project. Evaluation will take place periodically. At this time, only the first year is funded, but it is expected that years two and three also will be funded.



FUNDS

The project is funded for one year and may ultimately be funded for as many as five years from the U.S. Department of Education's Office of Educational Research and Improvement.

PROJECT PARTNERS

The Concord Consortium (www.concord.org), a nonprofit research and development organization in Concord, Massachusetts, leads and coordinates the project. Partners with Concord Consortium are TeachScape (www.teachscape.com), a New York City company providing online teacher professional development, and Research for Better Schools (www.rbs.org) a nonprofit organization that helps improve education for students.

THE CHALLENGE

The Seeing Math project is one of the first major projects to use this technology. Even though it will reach thousands of teachers, a much larger effort is needed. Hundreds of case studies and short courses are needed to meet the diverse needs of all teachers. Seeing Math could be the first step in a coordinated, large-scale national effort to improve teaching in all grades and subjects through innovative, standards-based professional development.

FURTHER INFORMATION CONCERNING SEEING MATH:

http://www.concord.org/seeing_math

SEEING MATH CONTACT

Dr. Alvaro GALVIS,
Senior Scientist
Project co-director

alvaro@concord.org
(978) 371 3341 voice
(978) 371 3354 fax