**Dr. Fred Goldberg** is Professor of Physics at San Diego State University.

For the past twenty-three years he has been involved in research and development in physics education. Initially his group did detailed studies of student understanding in various topical areas of physics, and later studied students’ epistemological beliefs (beliefs about physics knowledge and about learning). They then focused on developing instructional strategies that addressed the student difficulties observed by their group and by others in the field. Many of these strategies involved the use of computer technology, including videodisks, animations, graphics programs and simulations. Over the past nine years his group has focused on studying how students learn in a technology-rich collaborative learning environment, with a particular interest in studying ways that computer simulations can be used to complement and extend hands-on experiences of students and scaffold their development of target physics models.

From 1995-2000 Goldberg directed a large team of physics educators (University and high school) and software design experts in developing pedagogy, curriculum materials and computer software to support a classroom environment where students have primary responsibility for developing robust and valid ideas in physics ([http://cpuproject.sdsu.edu](http://cpuproject.sdsu.edu/)). More recently he has helped direct projects involving the development of a year-long physical science course for middle school students (<http://cpucips.sdsu.edu/web/cips/>) and a physics course for prospective and practicing elementary teachers (<http://cpucips.sdsu.edu/web/pet/>). Each of these projects incorporates the use of computer technology in a constructivist-oriented learning environment. They also provide the context for rich research studies of how students learn and how teachers teach.  As part of the CIPS and PET projects, his group has developed both workshop and robust web-based materials to help teachers implement the curricula with high fidelity.

Presentation abstracts:

Monday morning: “Research-based Curriculum Design in Physics: Examples from two projects.”

Dr. Goldberg will describe some general pedagogical principles that can promote meaningful learning, and then provide examples from two major materials development projects: Constructing Ideas in Physical Science (CIPS), a middle-school curriculum, and Physics for Elementary Teachers (PET), a college or workshop curriculum.

Monday evening: “Which falls faster, a soccer ball or a bowling ball? How curriculum, social interaction and classroom norms can promote meaningful learning”.  In this talk conference participants will view and discuss a video example of a small group of college students trying to understand the phenomenon of dropping objects.  The video serves as a context for how student learning is facilitated by research-informed curriculum, social interaction, and appropriate classroom norms.

[Back to Top](http://umaine.edu/risecenter/conferences-workshops/nqlb/nqlb-2005/2005-nqlb-presenter-biographies/#Top)

Teaching Inquiry and Teaching As Inquiry

**Dr. Michelle Stephan, Lawton Chiles Middle School and The University of Central Florida.**

Michelle Stephan is a professor of mathematics education at the University of Central Florida and a full-time middle school mathematics teacher in the Florida public school system. Her research has included investigating first, third, eighth and college students’ understanding of mathematics. She has been involved in developing curricula that are reform oriented for linear measurement, place value, statistics, and differential equations. Currently, she is developing a reform curriculum by writing, testing, and revising materials as she teaches 8th grade pre-algebra. Her curriculum involves a student-centered approach in which students solve problems and invent solution strategies and formulas for solving problems. She is interested in teaching as an inquiry process for students and teaching as a profession in which teachers inquire as well.

Presentation abstract:

Mathematics is fundamentally a discipline of inquiry in which mathematicians conjecture, prove and communicate their results to their peers. Yet, traditional K-16 instruction tends to present our discipline as a body of pre-made mathematical rules, formulas and relationships to be memorized. In addition, the student is characterized as the passive recipient of mathematical knowledge with the teacher possessing the authority and responsibility to impart such knowledge. Such a cultural system has been passed down through education for a number of years with students learning that mathematics is a dull, complicated subject that bears no relation to everyday life. In contrast, many teachers and researchers believe that school mathematics should more resemble the practice of mathematicians. We believe that school mathematics should be an activity in which students (not the teacher) organize and structure their worlds mathematically. One current teaching approach that places the students at the center of instruction is called Inquiry Mathematics. Briefly, Inquiry Mathematics is a problem-centered method of teaching in which the teacher presents students with carefully designed sequences of open-ended problems that students solve drawing upon a variety of resources: tools/manipulatives, other students, and their own ideas. Inquiry Mathematics is characterized by students creating unique solutions to problems, developing mathematical conjectures, and communicating their results to a classroom of their peers so they can judge the accuracy and legitimacy of their solutions and conjectures. What would a classroom look like if an Inquiry Mathematics approach were used on a daily basis? Would such an approach be acceptable to the administration, to the students, and to their parents? What are some of the challenges that teachers face as they try to change their practice to reflect inquiry?  Is teaching using an Inquiry approach feasible in this day of standardized testing and No Child Left Behind? Dr. Stephan will draw on her experiences using an Inquiry approach as a full-time middle-school math teacher to address these and other questions.

[Back to Top](http://umaine.edu/risecenter/conferences-workshops/nqlb/nqlb-2005/2005-nqlb-presenter-biographies/#Top)

Skowhegan Area High School Environmental Chemistry Project.

**Mary Finnemore**: Chemistry teacher at Skowhegan Area High School in Skowhegan, Maine, since 1988.  Received a B.S. in Chemistry and an M.Ed from the University of Lowell in 1987.

**John Sterling**: Chemistry teacher at Skowhegan Area High School in Skowhegan, Maine, since 1973.  Received a B.S. in Biology from the University of Maine in 1973.

Presentation abstract:

In 1996 we began looking for ways to answer a recurring question posed by many of our students: “When are we ever going to use what we’re being taught in Chemistry?”  We felt that students needed to see how chemistry could be applied to real-world problems and issues.  With this as an objective, we developed the Environmental Water Project curriculum.  In this Project, students work with their teachers and mentors from Sappi Fine Paper to solve hypothetical water quality issues based on realistic scenarios. Students work in teams, solving their assigned problems from an economic and scientific point of view and present their findings to their peers.

Within the last few years, the project was expanded to include actual testing of a local watershed, Cold Brook Pond. Our students worked in conjunction with the Skowhegan Conservation Commission and Sappi Fine Paper.  The findings related to this real-world analysis have been published and are available upon request.  Recently Sappi Fine Paper received the Governor’s Award for Excellence in Environmental Outreach for their role in the Project.  For more information about the Environmental Water Project, go to:

<http://www.msad54.k12.me.us/MSAD54Pages/skow/CurrProjects/EnvirChemProjWebsite/index.htm>

[Back to Top](http://umaine.edu/risecenter/conferences-workshops/nqlb/nqlb-2005/2005-nqlb-presenter-biographies/#Top)

**Dr. Joseph L. Polman**

Dr. Polman is Assistant Professor of Educational Technology in the Division of Teaching and Learning. He investigates inquiry-based learning involving computers and the Internet as tools, viewed from a sociocultural perspective.

Dr. Polman’s book, Designing Project-based Science: Connecting Learners through Guided Inquiry, explores the complexity of changing teaching practice, detailing the conflicts that emerge when a teacher challenges traditional approaches to teaching and learning.  Dr. Polman provides lively examples of what it means to “learn by doing,” describing strategies that educators can use to move beyond traditional textbook approaches and interact with their students in ways that encourage them to become active science learners.  He has worked with children and teachers in schools and in non-school settings such as after school clubs, on projects involving subject areas including science, history, and foreign languages.  Presently Dr. Polman is working with a team at UM-St. Louis to help create the E. Desmond Lee Technology and Learning Center, a Center for researching the use of technology in education.