Problems & Research to Integrate Science & Mathematics

Pat Marsteller,
Jordan Rose and Jay Justice

NSF GK-12 Projects Annual Meeting
February 29-March 2, 2008

http://www.prism.emory.edu
What is PRISM?

http://www.prism.emory.edu
PRI SM Goals

• Build collaborative teams of K-12 teachers, graduate students, and undergraduates to develop and implement innovative precollege science lessons using PBL/ICBL.
• Provide opportunities for graduate and undergraduate students to practice communication, teamwork, and teaching skills.
• Provide opportunities for middle and high school teachers to develop new content knowledge and pedagogy.
• Provide young scientist role models for middle/high school students, increasing their interest in SMET careers and performance in SMET classes and tests.

http://www.prism.emory.edu
Key Features

- PBL: transforming grad students, teachers, and students
- Professional Development Seminar
- Equal Partnership: Grad Student & Teacher
- Unanticipated Value Added
- Dissemination

http://www.prism.emory.edu
problems & research to integrate science & mathematics
emory university & clark atlanta university, atlanta, ga

http://www.prism.emory.edu
Problem-Based Learning
and Investigative Case-Based Learning

- *Pioneering* PBL in K-12
- authentic problems and cases to *engage* students in learning
- *active, collaborative, student-centered*
- used across *many disciplines*

http://www.prism.emory.edu
Why use PBL and ICBL in K-12?

- To apply abstract ideas to complex problems
- To initiate investigations
- To assess knowledge and skills
- To contextualize subject matter
- To develop global and multicultural perspectives
- To see value of interdisciplinarity
- To develop metacognitive skills
- To foster lifelong learning
- To build learning communities
Equal Partnership

• Teachers & Grads working side-by-side
  - attend Summer Institute together
  - develop new materials together
  - reflect on experiences together

http://www.prism.emory.edu
PRISM
Problems & Research to Integrate Science & Mathematics
Emory University & Clark Atlanta University, Atlanta, GA

Partnership begins at Summer Institute
Professional Development for graduate students

- Reflective practice
- Publishing your work
- Teaching philosophy statements
- Career options
- Jobs: searching, applying, interviewing, negotiating
- Science Education Journal club

http://www.prism.emory.edu
Toward sustainability

- Workshops led by our teachers and grads for other teachers in school/district

- Workshops in Peru and Mexico

- 3 of our partner schools implementing PBL across the curriculum

- Lead Teacher and Graduate Fellows

http://www.prism.emory.edu
Sustaining PRISM

• Support from Provost and Graduate School
• Alignment with University Strategic Plan: Engaged Scholars
• MetLife Grant
• Arthur M. Blank Grant for New Schools Of Carver
• Collaboration with Center for Chemical Bonding and UCSD GK12
• Clark Atlanta partnership
  – Partnership written into Track II proposal
  – CREST Center for Functional Nanoscale Materials

http://www.prism.emory.edu
Building Mentor Support

- Advisory Board
- Improved Graduate communication Skills
- Graduates that get great postdocs and jobs
- Graduate Dean as new co-PI
- Challenge?: Funding contributions

http://www.prism.emory.edu
Value Added

- Grads and mentors using PBL, transforming *undergraduate* education
- Dean’s Teaching Fellowships
- Former fellows as postdocs or faculty involved in education reform

http://www.prism.emory.edu
PRISM
Problems & Research to Integrate Science & Mathematics
Emory University & Clark Atlanta University, Atlanta, GA

PBL 2008
International Conference
PRISM
Problems & Research to Integrate Science & Mathematics
Emory University & Clark Atlanta University, Atlanta, GA

http://www.prism.emory.edu
Dissemination

• **CASES Online:** Creating Active Student Engagement in the Sciences

  - Searchable database
  - Downloadable materials
    - teacher guide
    - student materials
    - sample student products
  - ~70 complete cases
  - ~80 more on their way
  - Free registration!
  - [http://www.cse.emory.edu/cases](http://www.cse.emory.edu/cases)
PRISM: K-12 Cases

PRISM, the Problems and Research to Integrate Science and Mathematics program, offers annual fellowships to Emory University graduate students, undergraduates, and middle/high school teachers to develop and implement innovative K-12 lessons using problem-based learning (PBL) and investigative case-based learning (ICBL) pedagogies. The Fellows form collaborative teams to infuse preservice students with a compelling need to know about the science and math behind real-world problems. Our Fellows facilitate small groups of students as they use a combination of teamwork and self-directed learning to investigate the problems and cases we have developed. We hope students will develop life-long problem-solving strategies based on asking appropriate questions, uncovering answers through investigation, and sharing knowledge with peers.

PRISM intends to influence the next generation of scientists by providing them with opportunities to practice teaching, communication, and research dissemination skills, and by fostering scientific literacy in public school students. Through this effort we will make changes across the continuum of K-12, undergraduate, and graduate education.

Products
Discover the amazing cases, presentations, publications, and reports that PRISM participants have developed.

Methods
Find out how PRISM recruits and develops its participants, develops and implements its lessons, and evaluates the program.

Resources
Explore our recommended links to case repositories, guidance on case development and implementation, national and state standards, education reform, evaluating Web resources, and more.

Participants
Meet our Fellows! Read their bios! Aren't they wonderful? You can be that wonderful, too. Apply here.

Calendar
What we do and when we do it.

http://www.prism.emory.edu
Dissemination

• Publications:

• Presentations:
  - PIs/staff/grads/tchrs gave ~40 presentations at AAAS, GA Science Teacher Assoc., Am. Soc. for Microbiol., Experimental Bio., PBL conferences

• Workshops:
  - At school/district teacher professional development days (led by our teachers and grads) and PBL International 2006 and 2008
  - For Nursing School, College, Medical School faculty

http://www.prism.emory.edu
Rethinking PBL: Flexible Implementation Models

• Roving facilitator
• Peer facilitators
• Alternate whole class and small group
• Short, targeted problems for specific objectives
• Large class with IT support

http://www.prism.emory.edu
Problems & Research to Integrate Science & Mathematics (PRISM), a NSF Graduate Teaching Fellows in K-12 Education (GK-12) program
If you are planning for a year, sow rice.
If you are planning for a decade, plant trees.
If you are planning for a lifetime, educate people.

http://www.prism.emory.edu
PRISM
Problems & Research to Integrate Science & Mathematics
Emory University & Clark Atlanta University, Atlanta, GA

http://www.prism.emory.edu
Contact Info

• Pat Marsteller
  pmars@learnlink.emory.edu

• Jordan Rose
  jrose14@emory.edu

• http://www.cse.emory.edu
PRISM
Problems & Research to Integrate Science & Mathematics
Emory University & Clark Atlanta University, Atlanta, GA

http://www.prism.emory.edu
PRISM
Problems & Research to Integrate Science & Mathematics
Emory University & Clark Atlanta University, Atlanta, GA

http://www.prism.emory.edu

What Makes A Good Case?

DIALOGUE
A Good Story Line
Interactive

ACTION
Real Life Relevance
Controversy/Drama
Real (not made up) story
Short & sweet
Current story no more than 5 yrs old
Hook

# FactCheck
ME