



Great

PROMISING PROGRAM

Explorations in
MATH AND SCIENCE
(GEMS)

GREAT EXPLORATIONS IN MATH AND SCIENCE (GEMS)

Great Explorations in Math and Science is designated as a **Promising** science program.

PROGRAM DESCRIPTION

Great Explorations in Math and Science (GEMS) is a supplemental enrichment program for students from preschool through 8th grade. *GEMS* provides teachers with more than 70 teacher's guides, support documents, and pedagogical handbooks; professional development opportunities; an active Web site; and a national support network of *GEMS* Leaders and Associates and over 45 regional sites. More than 600,000 teachers and 8 million students have experienced *GEMS* activities over the past 15 years. *GEMS* uses readily accessible materials. The program's units, presented as flexible enhancements or in curriculum sequence, are designed to help all teachers reach all students and feature clear step-by-step teacher instructions.

Many *GEMS* units focus on science and exemplify the integration of science and mathematics. Science content reflects life science, physical science, earth science, and science as inquiry. In addition to the specific subject matter learning goals taken from the National Science Education Standards (NSES) and standards-based content conveyed, there is a strong emphasis on cooperative learning and problem-solving, literature/language arts connections, and real world relevance. *GEMS* units feature an inquiry-based, guided-discovery, student-centered approach to learning. An assessment component is in place for the entire series.

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Professional Development Resources and Program Costs

GEMS offers a wide spectrum of professional development opportunities, including awareness, leader's, associate's, and assessment workshops, as well as other customized or specialized presentations, workshops, and institutes. Professional development sessions are presented at national and regional conferences through the national network of over 45 *GEMS* sites and by *GEMS* Associates and Leaders. All workshops and institutes are inquiry-based in both practice and theory and include strong emphasis on both scientific content and effective pedagogical approaches.

GEMS guides range in price from under \$10 to several that are in the \$30 or \$40 range, with an average retail price of approximately \$15. Optional *GEMS* Kits range in cost from under \$50 to \$450, depending on complexity. Costs for professional development workshops and institutes vary, depending on length of training and other factors. The cost estimate for a 3-day *GEMS* Leader's or Associate's workshop is under \$400 per person, and both include a large number of *GEMS* guides and handbooks as part of the fee.

PROGRAM QUALITY

The *GEMS* activities and investigations are based on research and best practices, including programs based on the constructivist theory of learning. The content is aligned with learning goals representing scientific ideas, processes, and the nature of scientific inquiry. *GEMS* activities take an in-depth approach by showing connections within and across disciplines. The units provide ample activities for the development of both skills and knowledge, and the overarching themes allow students to make connections between science disciplines and within specific areas of science.

Reviewers noted that the instructional design is appropriate, engaging, and motivating. The design promotes multiple and effective approaches to learning by suggesting many and varied ways to achieve understanding. Students are involved in discussions, report their observations, engage in collaborative work, and reflect on their experiences throughout the activities. They apply new knowledge in the design and completion of experiments and investigations. Assessment is an integral and frequent part of instruction.

PROGRAM EFFECTIVENESS AND SUCCESS

Reviewers reported that statistically significant results from multiple evaluation studies provided evidence of the effectiveness of several *GEMS* units or groups of units. Evidence was based on evaluations that were well designed and generally utilized control groups, pre-post assessments, appropriate sample sizes, and tests of significance to validate differences in outcomes for student learning. Results of the evaluation studies yielded evidence of gains in understanding of science in favor of *GEMS* students for four units based on pre-post test, questionnaire, interview, and performance assessment data, and gains in inquiry, reasoning, and problem-solving skills in favor of *GEMS* students for two units based on pre-post performance assessment data.

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Usefulness to Others

Reviewers found that the program covers a variety of topics and provides easy to follow, step-by-step instructions in each manual. Strong support for implementing and adapting the program comes from the training available and the handbook, *The Architecture of Reform: GEMS and National Standards*, which reviews the process of identifying curriculum goals and integrating *GEMS* modules into either new or existing curriculum. The extensive national network of sites and trainers provides continuous support to teachers and others implementing the program.

Educational Significance

Reviewers indicated that the program is aligned with the national standards for content and classroom assessment. By aligning the materials with the national standards, *GEMS* ensures that the content and skills presented are important for all students to know and be able to do. *GEMS* encourages and supports the introduction of activity-based science into the classroom. The program demonstrates the belief that science is for all students and displays a strong commitment to equity and diversity.

FOR FURTHER INFORMATION CONTACT:

Jacqueline Barber
Lawrence Hall of Science
University of California
1 Centennial Drive
Berkeley, CA 94720-5200

Telephone: (510) 642-7771
Fax: (510) 643-0309

Contact E-mail: jbarber@uclink4.berkeley.edu
Program E-mail: gems@uclink4.berkeley.edu

Web Site: <http://www.lhs.berkeley.edu/GEMS>

The program also provided evidence of success in the form of teachers' self-reports of improvements in their science knowledge and teaching practices. Three evaluations, using teacher and sometimes student data based on follow-up surveys and interviews of the effectiveness of some of the *GEMS* units, showed that teachers perceived the particular unit being evaluated to be effective in helping students learn, influencing teaching behaviors, and influencing teacher and student attitudes. Effects of the units were shown to have lasted over time.