Promoting Pre-College Science Education

P.L. Taylor, R.L. Lee, General Atomics - for the Fusion Education Team

Overview

The Fusion Education Program, with continued support from DOE and General Atomics, has strengthened its interactions with educators in promoting pre-college science education.

Projects aggressively pursued this year include:

Plasma Institute 2000
An on-site, college credited, laboratory-based 10-day educator workshop on plasma and fusion science.

Scientist in the Classroom
Expansion of scientist visits to classrooms.

Tours
Enhancements to the tours of the DIII-D facility.

Physics Olympiad
Broadened participation in an internet-based science olympiad.

Starpower
Completion of Starpower, a fusion power plant simulation on interactive CD.

Continuing educational outreach efforts include:

Curriculum materials
posters, notebook,
lab material, fusion video

Curriculum materials.

Poster.

Teacher workshops
9 teacher workshops

Participation in science expositions
2 expositions with 60000 students attending

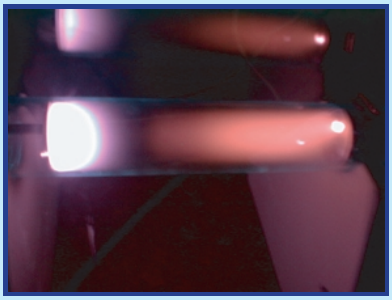
Educational Web Site
fusioned.gat.com


Educator workshops provide teachers with direct interaction with scientists.

Educator workshops provide teachers with direct interaction with scientists.

Plasma Institute 2000 (PI2000) Provided In Depth Exposure of Laboratory Based Science to Teachers

- An on-site, college credited, laboratory-based, 10-day educator workshop on plasma and fusion science with emphasis on material that can be used in the classroom.
- PI2000 was planned by educator and scientist teams.
- 12 teachers from San Diego County participated.
- 2 college credits were issued through San Diego State University.
- $500 for science supplies given to each teacher.
- Institute topics included:
  - Basic plasma physics and fusion energy physics (lecture & lab)
  - Computer aided drafting (CAD) (lab)
  - Build - It day - 3 gadgets were made & taken home for use in the teachers classroom (fluorescent tube, vacuum chamber, Kelvin water drop generator)
  - Radiation, Radioactivity, and Risk Assessment (lecture & lab)
  - Tokamak simulation modeling (lab)
  - Safety orientation and lab orientation (lecture & lab)
  - Visit to a University Physics lab
  - Visit to the San Diego Super Computer Center
  - Lunch time lectures by scientists
- The PI2000 session will be followed up by 3 Saturday workshops during the school year. These workshops will provide topical reinforcement and assessment of the techniques and materials used in the classroom.



For futher details see poster HP1.126

The Scientist in the Classroom Program Efficiently Reaches Many Students

- A scientist visits a number classes in a local school to give lectures and demonstrations on plasma and fusion science.

- This program provides for direct interaction between students and scientists in the student s own classroom.

- Students have the opportunity to explore ideas & concepts with equipment not normally found in their classroom.

- The activities are fun and educational.

During the 1999-2000 year :

23	schools visited
1	college
6	high schools
11	middle schools
5	elementary schools
2332	students participated
35	scientist presenter days
280	scientist man hours

Scientist in the Class Room Program

- Saves the school the cost of transporting all the students to a remote site.
- Allows more students to interact with the scientist as he can visit more than 1 class.

- For futher details see poster HP1.127

Tour Program Stimulates and Reinforces Science Learning

Tour Consists of Several Steps :

Introduction to Plasma Science

- Teacher inquires about a tour.
- Pre-tour information packet sent to teacher for classroom use prior to the tour. (includes fusion literature & video, fusion education notebook, & assessment forms)
- Students visit the DIII-D National Fusion facility in San Diego for a 3 hour tour. Tour includes a lecture followed by small group interactive stations on plasma, radiation, data acquisition, computer aided design, and the DIII-D tokamak.
- Students return to class and have optional post-program reports or projects.


Radiation, Radioactivity, & Risk Assessment

Enhancements to the tour program this year include a permanent location for the computer aided drafting station, and changes to the data acquisition station to include demonstration of web based video.


DIII-D Tokamak & Machine Hall Diagnostics


Control Room


Computer Technology

During the 1999-2000 year :

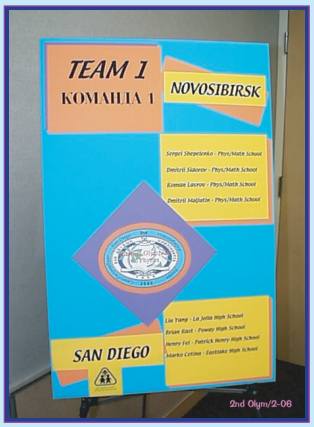
18	educational tours given of DIII-D facility
18	different schools or group affiliations attended
566	students participated
5	fusion personnel participate with each tour
3	hours / tour
~30	different fusion personnel assisted with tour program

International Physics Olympiad Demonstrates How Technology Can Bring Students, Teachers, and Scientists Together from Around the World

- More students from more sites formed more teams this year. Eight teams of 8 to 10 students from two Russian sites (Novosibirsk and St. Petersburg) and two US sites (Seattle and San Diego) were formed and were half Russian and half American.

- Each pair of team halves were linked for private consulting on the problems.

- Teams were presented with questions and then submitted their answers through an internet based platform to a panel of judges that were also located separately in the US and Russia.



- For futher details see poster HP1.129

StarPower Interactive CD Provides Fun Learning Experience

- Interactive simulation of operating a fusion power plant provides a fun learning experience in game format.
- Students have to complete several learning stations to become qualified to operate the fusion power plant.
- Simulation of the real plasma physics conditions and limits that are required to obtain a 1000 MW power generating plasma offers a challenging task for students as they choose the plasma shape, the confining magnetic field strength, the auxiliary heating power, and the fueling rate.

- For futher details see poster HP1.128

Summary

The Fusion Education Program at General Atomics continues to promote pre-college science education through a variety of efforts.

- Through the program s diversity, efforts are made to reach out to both students and teachers.
- Students and teachers have the opportunity to interact with scientists individually and as a group.
  - Group interactions have the advantage of being able to reach a large number while individual interactions have the advantage of being more stimulating.
- Self directed opportunities for learning are also pursued through development of the interactive CD simulation Starpower.
- Using high technology equipment from the DIII-D program to demonstrate basic science principles gives students and teachers a learning experience that is not available in the classroom.
- Student career awareness is enhanced by interactions with scientists and by tours of the industrial research laboratory.
- The program provides students with an appreciation for science and how science relates to the world and the environment.