

GA-C22430
FINAL REPORT

PROGRESS REPORT:

ADVANCING PRECOLLEGE SCIENCE AND MATHEMATICS EDUCATION IN SAN DIEGO COUNTY

Period of Time:
March 1, 1995 through June 30, 1996

Principle Investigator:
David P. Schissel

Recipient Organization:
Department of Energy
Office of Fusion Energy Sciences

Prepared under
Grant No. DE-FG03-95ER54310
for the U.S. Department of Energy

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AUGUST 1996

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**GENERAL ATOMICS PROJECT 3735
AUGUST 1996**



PROGRESS REPORT: ADVANCING PRECOLLEGE SCIENCE AND MATHEMATICS EDUCATION IN SAN DIEGO COUNTY

Principle Investigator: D.P. Schissel

General Atomics, P.O. Box 85608, San Diego, CA 92186-9784

I. INTRODUCTION

This progress report covers the time period March 1, 1995 to June 30, 1996 for DOE Grant Number DE-FG03-95ER54310. Results of work to date have been previously submitted to DOE and are not included in this report.

The following project milestones were all completed on time.

Milestone No.	Milestone Title
1	Curriculum Finished
2	Draft VHS Tape Distributed
3	Final VHS Tape Completed
4	Radiation Station Completed
5	Summary Poster Completed
6	Case Studies Completed
7	Evaluation Assessment Completed
8	Final Curriculum Delivered

II. Curriculum and Teacher Development

A replacement curriculum unit (Milestone No. 1) on the electromagnetic spectrum has been developed by a team of General Atomics (GA) scientific staff and local San Diego county science teachers. This 92-page unit consists of 23 distinct laboratory exercises covering the visible, infrared, ultraviolet, radio, and microwave parts of the electromagnetic spectrum. Four identical resource boxes have been assembled which contain hard-to-find equipment that will be needed for the laboratory exercises. These resource boxes have been distributed around San Diego county for use by area teachers.

Teacher development workshops have been held at GA and at the San Diego Science Educators Annual Conference. These workshops explained the concept of fusion energy and introduced teachers to our educational tour. To help answer technical questions that might arise after the teacher has attended our workshop, a special electronic mail account has been created. This account, known as "Ask the Wizard," cycles questions through 25 volunteer GA "wizards" so that any one wizard answers 1/25th of the total number of questions.

III. Pre-Tour Material

A 21-minute VHS tape has been completed (Milestone Nos. 2 and 3) that explains the fusion process. This tape has replaced the 35 mm slide show in our teacher resource notebook. An overview or summary poster has been created (Milestone No. 5) that is ideal for classroom decoration. This poster contains some basic information on fusion and energy, our educational Web address, and the wizard electronic mail address.

Interactive multimedia has been investigated to aid in the learning process. The DIII-D lobby kiosk, available for use before our tour, represents a classic example of interactive learning. Another method of interactive learning is utilizing Apple Computer's Quicktime VR (Virtual Reality) technology. A Quicktime VR tour of the DIII-D control room is currently under development. This control room tour represents the starting point for a complete facility tour which could include an interactive view of inside the tokamak. Such a VR tour can be made easily available over the Internet. However, making a complex interactive experience like the DIII-D kiosk available over the Internet is not practical. It makes sense to distribute all of our material via CD-ROM and include this with our teacher resource notebook. Teachers at our workshops have stated that such a CD-ROM would be very valuable.

IV. Facility Tour

An educational learning station on radiation and risk assessment has been added (Milestone No. 4) to our facility tour. As part of this station, a large graphic panel has been created that summarizes the key points to be demonstrated at the station. This station focuses on explaining what is radiation, what is radioactivity, and what is risk assessment. Demonstrations include a Geiger counter used with various radioactive sources and with different materials acting as a radiation shield.

A total number of 2151 individuals toured the DIII-D facility from March 1, 1995 to June 30, 1996. For the 1995-1996 school year, 1206 students from 38 different K-12 San Diego county science classes took part in our educational tour.

V. Student Workbook

A 35-page student workbook has been created (Milestone No. 6) and placed in the teacher resource notebook (Milestone No. 8). This workbook is centered around our educational tour and includes a background section on fusion, questions on each of the six educational learning stations, and a fusion glossary. There are both multiple choice and discussion type questions complete with an answer sheet for the teacher. The workbook has been loosely bound in the resource notebook so that teachers may easily make copies for distribution to students.

VI. Evaluation and Assessment

Likert-scale surveys were developed for 264 participating students and 16 teachers. The purpose of these surveys was to assess these individuals' perceptions of the new material developed under the grant. This information was utilized to refine existing materials and to

develop new products. Copies of each survey have been previously sent to DOE/OFES upon completion of Milestone No. 7.

Participating students and teachers had a favorable perception of our work. Eighty-six percent "strongly agreed" with the statements that "Our grant work and educational materials were a worthwhile program" and "believed that without these materials, the interest in science would have been weaker." The majority of the students also agreed that "At the beginning of the semester, they had very little knowledge about fusion energy as compared to the perception of their knowledge at the end of the program."

VII. Internet Access

Work is currently underway to enhance our existing fusion education World Wide Web site. Presently, a section on teacher resources has been added so that a teacher may download the electromagnetic curriculum and the 35-mm slide show with narration. Additionally, the Wizard electronic mail answer system is available via our Web site.

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