

Section 5

Kindergarten through College Partnerships in Science, Engineering, and Technology



Introduction

Los Alamos National Laboratory (the Laboratory) supports innovative and partnership-driven programs in science, mathematics, engineering, and technology for kindergarten through graduate school (K-20).

These programs are designed to improve teaching significantly and to increase student achievement in science and mathematics throughout northern New Mexico and the nation.

The security of the Laboratory and the United States depends on an increasing awareness and understanding of the importance of science. To this end, the successful K-20 partnerships shown in this section serve as models to improve achievement in mathematics and science and to identify and develop potential for success in science, engineering, and technology at all levels in society.

Certificate in Environmental Monitoring Program

Program Description. During fiscal year 2003 (FY03), Los Alamos National Laboratory (LANL, the Laboratory), in cooperation with Northern New Mexico Community College (NNMCC), developed the Certificate in Environmental Monitoring Program specifically to provide environmental training for members of the four pueblos adjacent to the Laboratory. These pueblos (Cochiti, Jemez, San Ildefonso, and Santa Clara) have signed cooperative agreements with the Laboratory and have a special interest in monitoring the environmental impact of Laboratory operations on their lands.

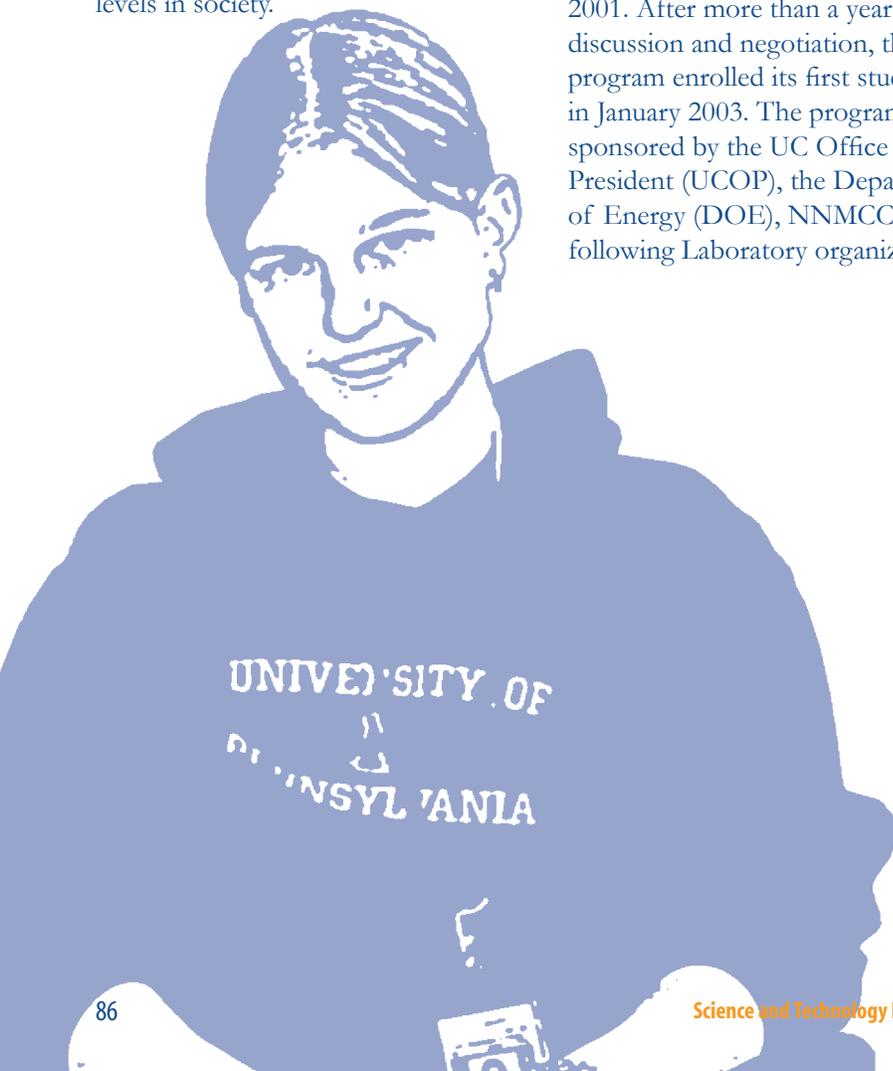
The governors of the four pueblos presented an initial request to the University of California (UC) Environment, Safety and Health Panel at its annual meeting in August 2001. After more than a year of discussion and negotiation, the new program enrolled its first students in January 2003. The program is sponsored by the UC Office of the President (UCOP), the Department of Energy (DOE), NNMCC, and the following Laboratory organizations:

the Government Relations Tribal Relations Team, the Environmental Safety and Health (ES&H) Training Group (PS-13), the Health Physics Operations Group (HSR-1), and the Risk Reduction and Environmental Stewardship Division (RRES).

The Certificate in Environmental Monitoring Program seeks to strengthen the existing environmental monitoring activities in the four pueblos by building on programs already in place in the pueblos. It also builds on the special relationship of the Laboratory with the four pueblos and draws on the community spirit of NNMCC. To ensure that interested pueblo students have an opportunity to participate in the program, one slot in each course is reserved for each of the four pueblos.

The certificate consists of 17 credit hours (17 semester hours) and 360 contact hours of lectures combined with on-the-job training at the Laboratory. The program begins with a strong ES&H emphasis, requiring 40 hours of ES&H training provided by PS-13. The students are also enrolled in the Student Guest Program at the Laboratory and trained in the standard environmental-monitoring procedures used by the technicians at the Laboratory to monitor air, water, soil, and food. All training is under the supervision of experienced Laboratory staff members and technicians.

Participants must be high school graduates and must be registered at NNMCC. The program is most appropriate for students who are working toward an associate degree. Pueblo participants are nominated by the directors of the environmental departments of the individual pueblos.



Performance. The goal for this program is to provide candidates with the necessary training to monitor their local environments effectively and to understand and interpret their measurements. The strategic objectives for the 2002-2003 academic year were to create and launch the program. The associated milestones were to establish the program, define the curriculum, and complete a trial semester with four students—one from each of the cooperative-agreement pueblos.

Highlights of This Year's Accomplishments.

The program was established during a series of meetings at Santa Fe Indian School with representatives of the four pueblos, UC, DOE, NNMCC, and the Laboratory. Additional meetings with the pueblo environment departments helped representatives draft the curriculum for the program. The draft curriculum was then approved by representatives of the four pueblos, UCOP, DOE, and the Laboratory.

The proposed curriculum was next approved by the NNMCC Curriculum Committee for a Certificate in Environmental Monitoring under the umbrella of the Environmental Sciences (ES) associate degree. The committee approved five specific courses:

- ES-101: Radiological Worker
- ES-102: ES&H
- ES-121: Environmental Air Monitoring
- ES-122: Environmental Radioactivity
- ES-123: Environmental Hydrology and Ecology

The first four program participants were nominated by their respective environment departments and enrolled as students at NNMCC in the spring semester of 2003. All four students successfully completed their first semester and received credit for ES-101, ES-102, and ES-121.

The Certificate in Environmental Monitoring Program demonstrates the Laboratory's commitment to a strong program of environmental stewardship. To be successful, the Laboratory needs the participation and support of the surrounding communities. Strong environmental programs in the communities enhance mutual understanding and trust between the communities and the Laboratory.

Creation of the Certificate in Environmental Monitoring Program helped fulfill the commitment of both the Laboratory and the pueblos, specified in the cooperative agreements, to “develop and implement educational opportunities that will enhance and strengthen the future relationship.” The new program enhances people-to-people connections between the Laboratory and the pueblos. In addition, the academic setting helps strengthen participants' understanding of the environmental procedures being demonstrated. Laboratory technicians benefit by providing instruction, because the best way to learn is to teach.



Shown left to right, measuring radioactive material on an AIRNET filter, are: Raymond Martinez (San Ildefonso Pueblo), Kevin Tafoya (Santa Clara Pueblo), Tom Lucero (Jemez Pueblo) and Aaron Pecos (Cochiti Pueblo).

Electromechanical Technician Training Program

Program Description. The Electromechanical Technician Training Program (EMTTP) is co-sponsored by the University of New Mexico-Los Alamos (UNM-LA) and Los Alamos National Laboratory (LANL, the Laboratory). It is a “grow-your-own,” work-study program designed to reach out to young men and women from local communities, providing opportunities to develop lifelong careers.

Application information and materials are delivered to participating high schools during scheduled campus visits each year.

Applicants are screened and interviewed by a joint UNM-LA and LANL selection committee for aptitude, academic ability, and interest. Placement testing is completed by UNM-LA before admission. Individuals must commit to a two-year program.

Each selected applicant is placed at the Laboratory in a limited-term Electromechanical Technician I student employee job (an entry-level position). Selected individuals are assigned to work under the guidance of Laboratory technical staff members or senior technicians. They assist Laboratory personnel with routine tasks and basic projects requiring electromechanical skills and they perform other duties as required. The Laboratory mentors evaluate all program participants for content knowledge, work performance, and progress.

A portion of each student employee’s workday is spent on the UNM-LA campus attending academic courses specifically designed for and related to the employee’s Laboratory position. Students must maintain a grade point average (GPA) of 2.0 (on a scale of 4.0) to continue in the program. The Laboratory, in accordance with the LANL Tuition-Reimbursement Policy, pays students for the costs of tuition, books, and fees at the end of each semester.

Upon successful completion of the two-year training program, students are awarded a Certificate in Electromechanical Technology. Once a student completes the program, continued employment at the Laboratory is a possibility, but it is dependent upon position availability, funding, and evaluations. Students wishing to continue their education toward an associate degree are encouraged to do so.

For further information, please consult the program’s website at <http://education.lanl.gov/emtp/>.

Performance. EMTTP strives to build the Laboratory’s workforce employment pipeline by achieving the following goals:

- Developing employability skills in individuals to make them marketable in local communities, northern New Mexico, and the entire state;
- Promoting the concept of and providing access to higher education opportunities for new members of the workforce in New Mexico; and
- Creating a pool of qualified individuals from which the Laboratory can draw applicants for technical positions.

The program was designed to accomplish these goals by carrying out the following objectives:

- Developing collaborative relationships between UNM-LA and various divisions at the Laboratory;
- Exposing students to meaningful work projects for the duration of their work-study programs;
- Providing mechanisms for identifying exceptional mentors with skills to help students complete the transition from school to work; and
- Providing program coordination mechanisms, thus allowing the sponsoring divisions to focus on the work component of the program.

This highly successful program has been in existence since 1996. It began in one division within the Laboratory and has expanded to serve seven divisions. During the program's existence, coordination has changed hands a number of times. Lapses in following normal business processes developed because of the shifts in responsibility and the rapid expansion of the program. By the time the program was transferred to Science and Technology Base Programs-Education Program Office, these lapses were beginning to affect performance adversely.

With consensus from the program's advisory committee, program coordinators from LANL and UNM-LA decided to delay the start of the fiscal year (FY03) cohort of students for one year. The committee felt that time was needed to identify

and correct serious problems in the program—problems including the lack of a current contract, a statement of work, and an identified way to reimburse the university for back charges.

The time taken to identify and correct problems in the program was well spent.

A completely revised statement of work was developed and submitted to establish a new contract with UNM-LA (at a reduced cost to the Laboratory). A five-year contract is now in place.

In addition to the financial problems that had developed, there was a general misunderstanding about how money was to be disbursed. This lack of communication had to be addressed by the committee before the program could continue successfully. Handbooks were developed for students, mentors, and sponsoring groups. In addition, an orientation session for mentors is scheduled for August 2004, the starting period for the FY04 cohort.

In addition, UNM-LA made changes to the curriculum and sequencing that affected the program. Requirements were increased from 33 hours to 41 hours, and three new classes were added. Appropriate existing courses will be continued.

With these improvements in place, the program will return and be assured of success well into the future.

Performance. Informal evaluation was conducted throughout FY03 as one cohort of students (FY01) graduated in May and the second cohort (FY02) finished its first year.

Program leaders monitored student progress by reviewing transcripts to ensure that the students were fulfilling their part of the program commitment. Four students in the FY01 cohort were dropped from the program for academic reasons after options for successful completion were exhausted.

Of the 11 students in the FY02 cohort, nine graduated and received their certification. Four were converted to regular University of California positions; three continued to pursue their educational goals, seeking associate degrees while continuing to work at the Laboratory; two pursued a higher education at a four-year institution; and two were dropped from the program.

Two students in the FY03 cohort were terminated. The remaining 10 students are continuing in the program after successful completion of their first semester.

Highlights of This Year's Accomplishments.

Major accomplishments from FY03 are listed in the table on the following page.



EMTTP Highlights and Deadlines

Transition of the EMTTP program from Los Alamos Neutron Science Center to STB-EPO.	November, December 2002
Review of previous documentation.	January through March 2003
Identification of unpaid billings from UNM-LA. Processing task given to Human Resources Division representative in charge of reimbursement and payment component.	February through July 2003
Development of new Statement of Work.	March 2003
Establishment of new contract between UNM-LA and LANL.	April 2003
Review of student progress. Termination of two students and placement of two others on probationary status. Development of new documentation regarding student status.	May 2003
Conduct of meetings with EMTTP advisory committee.	2003
Development of process flow charts.	April through May 2003
Development of memo templates for salary increases.	May 2003
Development of a student-selection matrix and interview questions.	May 2003
Development of student-evaluation process.	June through July 2003
Development of a new brochure.	June 2003
Identification of Laboratory forms needed in the program.	June 2003
Provision of input for Laboratory Reimbursement Policy.	July 2003
Development of timeline for program reimplementation.	August 2003
Development of a Student Handbook.	May through June 2003
Development of a Mentor Handbook.	June through July 2003
Development of a Group Handbook.	July through September 2003
Initiation of recruitment for FY04 cohort (College Days).	September 2003
Issuance of call for mentors and sponsors.	Began in September



Expanding Your Horizons in Science and Mathematics Los Alamos Conference

Sponsored by Los Alamos Women in Science, the Northern Chapter, New Mexico Network for Women in Science and Engineering

Program Description. Expanding Your Horizons in Science and Mathematics™ (EYH) conferences, the flagship programs of the Math/Science Network, are designed to nurture girls' interest in science and mathematics courses and to encourage them to consider science- and math-based career options such as engineering, computer science, and biometrics.

The Math/Science Network created the first EYH conference at Mills College in Oakland, California, in 1976. Today, EYH conferences are held in more than 89 locales. More than 600,000 young women have participated in these conferences to date. Many of these conferences conduct concurrent programs for parents and educators so that they may more effectively support young women and their technical aspirations.

A typical conference is attended by young women from middle schools and high schools. Each conference schedule includes two varieties of workshops and a keynote address encouraging girls to persist in mathematics and science courses. In

EYH participants are shown here working on the FY03 team activity, which involved the "archaeology and anthropology of garbage." Volunteers saved "clean" garbage for a month. Groups of students analyzed the "garbage" and tried to draw conclusions about the volunteer households. At the end of the exercise, the participants got to compare their conclusions with the "truth." Student evaluations later showed that the team activity was a hit. The idea for the workshop came from the University of Arizona Garbage Project, in which scientists are studying the content of a landfill to learn about changing American lifestyles and consumption patterns.

some of the workshops, young women participate in hands-on learning experiences led by women scientists, mathematicians, and engineers. In other workshops, role models share career awareness information and discuss job satisfaction, necessary education, and descriptions of a typical day on the job.

The Math/Science Network licenses and coordinates this network of EYH conferences. It initiates local-site conferences and provides them with technical assistance and conference and planning materials as well as support services including coordinated publicity and public relations posters and buttons. The network also provides a "networking" link between sites.

In 2004, the Math/Science Network will mark its 30-year anniversary.

Performance. The purpose of EYH is to educate and inspire girls in junior high school and high school to get involved in mathematics, science, and technical fields. The workshops are designed to provide students with an opportunity to meet and form personal contacts with women already working in these fields.

All students who attend an EYH conference are required to have an adult sponsor. However, the sponsor is not required to accompany the student to the conference. Sponsors who do accompany students may not attend the student workshops (unless they are needed to assist a student with a disability or similar exceptional circumstances). EYH wants to allow more room for the participants. A separate Teacher Conference is provided.

To recruit students for the annual EYH conference in Los Alamos, organizers send a complete package of registration materials to each of the public and private schools in northern New Mexico that serve grades eight through 10. In addition, all registration information is run on the website of the Northern Chapter, Los Alamos Women in Science (LAWIS), and advertisements are placed in local newspapers.

The evaluation forms for the 2003 EYH Conference posed two questions intended to make it possible to assess whether the program met its goals.



The first question asked, “Did this conference positively influence or positively reinforce your decisions concerning the number of math and science classes you plan to take in the future?” Eighty-three percent confirmed that it had; only 17% indicated that it had not.

The second question asked, “Did this conference positively influence your attitude toward math and science?” Ninety-two percent of the students confirmed that it had; 8% said it had not.

The responses to evaluation questions proved that the 2003 EYH Conference was a success. The teenage girls who attended said the program expanded their scientific horizons.

Highlights of This Year’s Accomplishments.

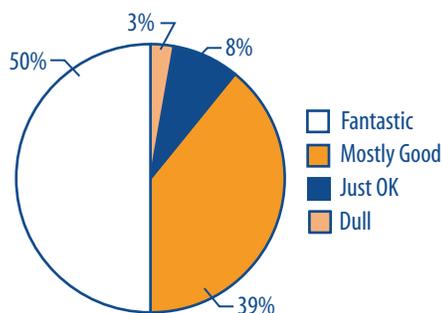
The Northern Chapter of the New Mexico Network for Women in Science and Engineering (also known as Los Alamos Women in Science [LAWIS]) held its annual Expanding Your Horizons Conference on March 11, 2003, at the Immaculate Heart Catholic Church in Los Alamos. A total of 20 schools—including home schools—from throughout northern New Mexico participated. More than 106 girls registered, and 100 attended.

The FY03 conference produced successes in many areas. The following list shows just a few of these achievements:

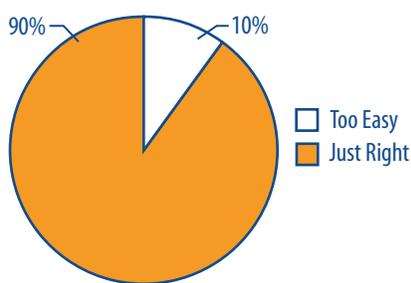
- The conference drew a record number of attendance requests.
- Seventeen workshops were scheduled, and approximately half of the workshops were new and involved new presenters. (LAWIS tries to give the conference new life each year and avoid the “same-old” syndrome. This tradition also allows devoted presenters a chance to take a year or two off or to volunteer for other EYH tasks.)
- Since the program had surplus money from the previous year’s effort, it emphasized external and community support. Internal funding was used for allowable expenses such as transportation costs for attendees, refreshments and lunch, administrative (conference) supplies, printing and editing, and miscellaneous setup and personnel expenses. External funding was used to purchase thank-you gifts for presenters and committee members, career pamphlets, and prizes for Team Activity winners.

- Each workshop was limited to eight to 10 girls so that participants could have a hands-on experience. The girls were randomly placed in groups. Each group was assigned to make a functioning boat out of foil and to create an advertisement to market the product.
- Each group attended two workshops, one in the morning and one in the afternoon.

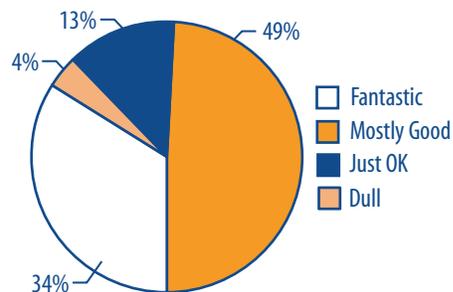
The FY03 team activity was a hit. It was entitled “Trash = Rubbish! Or... Wonderful Things? The Archaeology and Anthropology of Garbage.” This workshop involved drawing inferences from garbage. It provided a lesson about the kind of clues that material culture provides to archaeologists and anthropologists. Volunteers, from a variety of geographic locations, ages, family sizes, and interests, were asked to spend a month putting together a collection of “clean” garbage. They were also asked to answer simple questions about their lifestyles, their families, their geographic location, their hobbies, their pets, and where they shopped for groceries. The workshop required one bag of garbage per group of five girls—approximately 30 bags of garbage.



Student Evaluations of Workshop Content



Student Evaluations of Workshop Difficulty



Student Evaluations of Team Activity Content

The workshop participants went through the garbage and tried to describe the household from which each bag had come. The participants were also asked to consider what garbage says about a society—for example, about its trading networks, its level of technological development, and its economy. At the end of the workshop, participants compared their scenarios with the “truth.”

The idea for the workshop came from the University of Arizona Garbage Project, in which researchers are studying landfill garbage as a clue to Americans’ changing lifestyles and consumption patterns. The Arizona project is discussed in the book “Rubbish!: The Archaeology of Garbage,” by William L. Rathje and Cullen Murphy.

Overall student evaluations of “workshop content” and “workshop difficulty” appear in charts shown elsewhere in this section. A majority of the girls gave the “team-activity content” grades of “mostly good” or “fantastic.”

The demographics of this student program have been similar for the past several years, varying only by a small percentage. Most of the girls who participated were in the eighth grade (43%), ninth grade (26%), or 10th grade (28%). The remaining students were in the seventh and 11th grade (3%).

The keynote speaker for the FY03 conference was Julie Canepa, who was a staff member, at that time, in the Health, Safety, and Radiation Protection Division at Los Alamos National Laboratory (LANL, the Laboratory). Her talk, “From Chemistry to Cleanup,” discussed her journey through traditional science study to leading large, complex environmental projects. She used her career to illustrate the successes and pitfalls of being a woman in science.

The Laboratory places a high value on the influence of teachers on career choices made by students. In recognition of that value, teachers who accompanied their students to the FY03 conference were invited to participate in “Teacher Conference 2003,” a separate, same-day event. The Laboratory’s Education Program Office sponsored this event. Fourteen teachers participated.

The teacher conference featured a variety of informative demonstrations, discussions, and hands-on workshops presented by Laboratory technical staff members and community educators and professionals. The teacher conference featured workshops on “Splash with Flash” (holding students’ attention with a multimedia approach), “Materials Science of Sports Equipment” (how the performance of the equipment is linked to the structure of the materials

used in the design of the equipment), and “Bugs and Other Cool Creatures.” The participants also learned about the Laboratory’s “Adventures in Supercomputing Challenge” program and the “New Mexico Math Counts” program. At the completion of the planned activities, the adult sponsors rejoined their students for the keynote address.

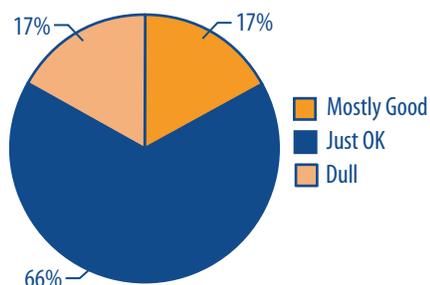
The declared ethnic/gender breakdown for those attending the teacher conference was as follows: one Hispanic male; six Hispanic females; and seven Anglo females. Those attending were asked to rate the presentations and the overall conference on a scale of one to 10, with one being low (didn’t meet expectations at all) and 10 being high (exceeded expectations). The overall rating for the conference was 9.5.

Following are some of the comments teacher participants made about the program:

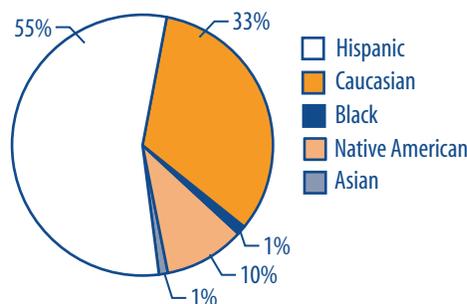
“The conference was very informative and interesting!”

“Always lots of fun. Thank you!”

“I would like to see more hands-on activities—maybe something outdoors. The speakers today did really well involving the audience, but maybe we could do more active, moving-around participation.”



Student Evaluations of Team Activity Difficulty



2003 EYH Ethnicity of Students

Los Alamos National Laboratory's Educational Equipment Gift Program

Program Description. The fiscal year 2003 (FY03) Laboratory Educational Equipment Gift Program (LEEG) at Los Alamos National Laboratory (LANL, the Laboratory) was a successful joint effort linking LANL and the national educational and nonprofit communities.

The purpose of this ongoing program is to donate equipment that is no longer needed (by LANL and the National Nuclear Security Administration [NNSA] of the Department of Energy [DOE]) to educational institutions and nonprofit organizations for the conduct of technical and scientific education or research. The program complements the DOE Energy-Related Laboratory Equipment (ERLE) Program, the New Mexico Federal Surplus Program, and the Laboratory's K-12 Equipment Gift Program.

The LEEG enables the Laboratory and NNSA/DOE to assist all educational organizations in a fair and efficient manner. Program implementation and administration in FY03 followed the approach and guidelines developed for, and effectively implemented by, the Laboratory's successful K-12 (kindergarten through high school) Equipment Gift Program.

The Science and Technology Base Programs-Education Program Office (STB/EPO) is the LEEG's primary coordinator and point of contact. STB-EPO and the Supply Chain Management Division jointly manage the LEEG. The LEEG administrator, a Property Management Group (SUP-2) member, has the following responsibilities:

- Receive all gift requests.
- Conduct initial request reviews.
- Be responsible for all reporting requirements, statistical information gathering, record keeping, and document retention.
- Act as subject-matter expert on all matters related to the LEEG.
- Inform and instruct Laboratory workers about the program's objectives and guidelines.
- Inform interested institutions about the program.
- Notify institutions, by letter, about the "intent to gift."

Performance. The LEEG seeks to leverage the Laboratory's scientific capabilities and resources by providing excess equipment to enhance educational activities in the scientific, mathematical, and engineering fields. The LEEG Committee is the governing body for the program. Members include representatives of STB-EPO, SUP-2, the Services Property Management organization of KSL (the Laboratory's support subcontractor), and, when necessary, a technical subject matter expert. The committee is the sole Laboratory organization that awards gifts through the program. The committee is responsible for the following tasks:

- Ensuring that requests for gifts are complete;
- Reviewing requests for eligibility;
- Awarding equipment in response to requests;
- Documenting justification for gifts;
- Developing and administering an awards initiative for the program;
- Recognizing organizations for support of the program;
- Ensuring fairness; and
- Ensuring program compliance with established guidelines.

During FY03, Laboratory managers ensured that their organizations actively participated in, supported, and endorsed the LEEG by means of the following activities:

- Informing the committee of available equipment that should be considered for the program;
- Notifying the program administrator or the committee of any scheduled project shutdown; and
- Identifying a technical representative who could assist the committee in determining availability, condition, capabilities, and appropriateness of property for giving. (The technical representative must gather and keep all operating manuals associated with designated gift equipment.)

Questions about the LEEG may be directed to leeg@lanl.gov.

Highlights of this Year's Accomplishments.

Equipment gifts handled by the LEEG in FY03 totaled \$3,034,901. More than 25 organizations received equipment from the program.

Breakdown of Equipment and Acquired Cost for New Mexico Schools/Nonprofits in FY03

Organization	City/State	Acquired Cost(in Dollars)	Equipment Name
Española Middle School East	Española, New Mexico (N.M.)	9,719	computer equipment
Hands Across Cultures	Española	21,501	computer equipment
Holy Cross School	Santa Cruz, N.M.	24,428	computer equipment
Manzano High School	Albuquerque, N.M.	11,165	computers, printers
New Mexico Institute of Mining and Technology	Socorro, N.M.	502,454	machine tools, furnace, optical polisher, and trailer
New Mexico State University	Las Cruces, N.M.	412,334	laboratory equipment, laser, computers, lathe, and plotter
Northern New Mexico Community College	Española	13,900	spectrometer
Ranchos de Taos Elementary School	Taos, N.M.	2,475	computer equipment
Santa Fe Business Incubator	Santa Fe, N.M.	162,744	assorted laboratory equipment
Santa Maria El Mirador	Santa Fe	54,305	computer equipment
Thoreau Middle School	Thoreau, N.M.	29,481	computers, microscopes
University of New Mexico	Albuquerque	962,160	assorted laboratory equipment, laser system
TOTAL		\$2,206,666	

Breakdown of Equipment and Acquired Cost for Out-of-State Schools in FY03

Organization	City/State	Acquired Cost(in Dollars)	Equipment Name
California Institute of Technology	Pasadena, California	9,600	gamma ray detectors
Case Western Reserve University	Cleveland, Ohio	31,838	glove box system
Colorado School of Mines	Golden, Colorado	74,000	metal-testing equipment
East Georgia College	Swainsboro, Georgia	8,000	gas analyzer
Florida State University	Tallahassee, Florida	37,178	assorted laboratory equipment
Manchester West High School	Manchester, New Hampshire	51,663	computer equipment, oscilloscopes
University of California-Los Angeles	Los Angeles, California	30,000	glove box system
University of Colorado-Boulder	Boulder, Colorado	4,995	remote winged vehicle
University of Illinois	Urbana, Illinois	58,650	computer equipment
University of Missouri-Rolla	Rolla, Missouri	226,383	spectrometers
University of Nevada	Las Vegas, Nevada	7,000	computer equipment
University of Notre Dame	South Bend, Indiana	25,000	transformer tank
University of Oklahoma	Oklahoma City, Oklahoma	127,998	health-science equipment
Utah State University	Logan, Utah	30,084	assorted laboratory equipment
Villanova University	Villanova, Pennsylvania	27,175	assorted laboratory equipment
Washington and Jefferson College	Washington, Pennsylvania	78,671	chromatographs
TOTAL		\$828,235	

Los Alamos Space Science Outreach Program

Program Description. The Los Alamos Space Science Outreach Program (LASSO) is a collaborative effort involving both the technical community (the Space and Atmospheric Sciences Group, NIS-1) and the Education Program Office (EPO) at Los Alamos National Laboratory (LANL, the Laboratory).

New Mexico and Texas have significant populations of Hispanic and Native American people—people who are traditionally underrepresented in scientific and technical vocations. LASSO contributes directly to LANL efforts to reach out effectively to these populations. The teachers selected for participation in LASSO in fiscal year 2003 (FY03) represented rural communities with high-minority populations—places such as Bernalillo and Mora in New Mexico, for example—as well as schools in larger metropolitan areas that serve high-minority populations.

Focusing on National Aeronautics and Space Administration (NASA) projects exploring the composition of the solar system, LASSO assisted the educational community of New Mexico and the nation in FY03 by enhancing science knowledge, providing current science curricula, and decreasing the isolation of teachers in rural areas. (Please see the LASSO web site at <http://education.lanl.gov/programs/lasso/>.)

LASSO engaged master teachers in sustained learning activities directly tied to the NASA-LANL space-science programs, thus supporting improved knowledge in science, math, and technology while developing skills essential to life-long learning.

Master teachers from elementary and secondary schools helped to develop multidisciplinary/multilevel classroom lessons and activities that made use of collaborative distance learning to focus on the NASA projects.

The teachers interacted with LANL mentors throughout the program.

They investigated NASA's projects by examining the basic and advanced science concepts that lay behind their goals. LANL mentors from NIS-1 worked with them, providing science content, motivation, and support. The teachers learned how scientific information is collected, analyzed, and interpreted, and they learned instructional methods that were incorporated into effective, standards-based lessons and activities subsequently published in a 238-page document and made available on the LASSO web site.

During the research and development phase of LASSO, the master teachers continued their collaborative efforts by means of telecommunication.

Finally, they participated in a culminating activity in which they delivered their lessons and activities for the LASSO "Getting to Know Our Solar System" activity book.

Performance. LASSO made strong use of the Laboratory's scientific capabilities and resources, integrating current research in the area of space physics into teacher instruction. The program supported the NASA education mission by aligning with the following NASA goals:

- Increase public understanding of the issues relating to the future of space exploration;
- Develop the connections between scientific concepts and everyday life;
- Increase understanding of the scientific process;
- Provide opportunities to develop and apply critical-thinking and problem-solving skills in complex problems of scientific significance; and
- Promote cooperative learning through successful teamwork.

Teachers in LASSO worked with Laboratory scientists to become comfortable using computers so that they could analyze data, share information and educational ideas, and eliminate rural isolation. Shown here, left to right, are Matt Taylor of NIS-1; Priscilla King, a teacher at Navajo Pines High School in Navajo, N.M.; and Roma Rivera, a teacher at Holman Elementary School in Mora, N.M.



LASSO was designed to enhance the overall quality, scope, and realism of science, mathematics, and technology education in New Mexico schools by achieving the following objectives:

- Increasing teachers' and students' knowledge of the science, math, and technology involved in space physics;
- Enhancing teachers' skills in teaching the content of Earth and space sciences and the newest exciting technologies;
- Providing hands-on activities and materials that can be utilized in the schools;
- Exposing teachers and students to the application of Earth and space science to current and future research projects at national laboratories; and
- Providing a mechanism for teachers to encourage students to pursue careers in Earth and space science.

LASSO met all of its milestones for recruiting participants, holding workshops, and reporting accomplishments in FY03.

Implementation. A team of 12 master teachers representing secondary and elementary schools in New Mexico and Texas were selected to participate in space-science workshops held at the Laboratory. They worked with Laboratory scientists to develop appropriate curricula for their educational communities. Scientists participated in the workshops by identifying basic concepts of space and planetary sciences while introducing the new technologies behind current and future explorations. The teachers developed and implemented appropriate activities for their classrooms. The teacher-developed, scientist-directed, student-oriented units were inquiry-driven and modeled on sound pedagogical practices. These practices included

the constructivist learning theory, cooperative and collaborative learning relationships, and the integration of mathematics, science, and technology content. The teacher-prepared materials were published in an activity book, "Getting to Know Our Solar System," and were also made available on the LASSO web site, furthering the impact on a wider community

Program quality was assured in the following ways:

Workshops. The LASSO program was designed to match up Laboratory expertise with the needs of schools in New Mexico, Texas, and the nation to provide a unique educational opportunity tied to the NASA mission. LANL program staff members met with teachers in a series of workshops to develop scientific content and promote effective curricular approaches. The workshops helped teachers sharpen their critical-thinking and problem-solving skills and apply them to current, real, space-science projects.

Products. Each teacher produced products for dissemination based on his/her work on the project areas. The teachers, working in cross-level teams, examined specific projects conducted by NIS-1 and worked to develop related educational products. Among the new lessons and activities developed were: "Modeling the Creation of Plasma," "Measuring the Motion of a Coronal Mass Ejection," "Using Satellite Data," "Solar Wind Data Analysis," "Understanding Cratering on Mars," and "Exploring a Rocket's Propulsion." These and other activities are included in the LASSO publication entitled "Getting to Know Our Solar System" and can also be found on the LASSO web site.

Evaluation. Several tools were used to measure how well the program met its objectives. These tools included feedback forms and teacher surveys. Follow-up activities were conducted throughout the academic year while teachers implemented a variety of LASSO lessons. Teachers were expected to evaluate their implementation through evaluation of student papers, student presentations, and student-prepared products. The teachers submitted final reports during the spring semester.

Review of the teacher surveys showed that the project was successful in meeting its overall goals. The teachers enjoyed interacting while conducting their research and completing their LASSO lessons and activities.

Evaluation of the program using a variety of tools and methods revealed that the teachers demonstrated positive increases in the following areas:

- Understanding of space physics;
- Understanding of the monitoring of space phenomena;
- Understanding of telecommunications;
- Use of technology for research purposes;
- Ability to use the computer to communicate and share information with others;
- Ability to do in-depth research on a complex issue;
- Use of concept mapping; and
- Understanding of content through use of a problem-based approach.

Highlights of This Year's Accomplishments.

The program in FY03 involved three workshops, all held at the Laboratory.

The first was held the week of July 7, 2003. Twelve master teachers developed classroom lessons and activities that supported the LASSO curriculum efforts in space physics. Teachers were immersed in NIS-1 projects. Project scientists discussed basic concepts in their research, and further studies provided background for advanced sessions on the solar wind and Earth's magnetosphere.

The second workshop was held the week of July 14, 2003. Twelve master teachers representing 10 New Mexico school districts and one district in Texas participated, working on the development of curricula as well as establishing a communications network to reduce their isolation and to share and disseminate ideas. Laboratory scientists participated as content mentors and offered opinions and experiences in space physics. They gave lectures and demonstrations on radiation effects, data processing, analysis of auroras, remote sensing, micromachines, simulation and modeling, imaging (and the instruments involved), lunar and planetary studies, asteroids, solar system evolution, solar wind, the magnetosphere, space weather, and nuclear power and propulsion.

The final workshop was held the week of August 4, 2003. Twelve teachers participated, and six high schools, three middle schools, and three elementary schools were represented. The 12 teachers who came normally supervise approximately 1,530 students. The master teachers used a NASA-developed curriculum model. They became very comfortable using technology and planned to have their students use it as well.

Comments from Teachers. Following are comments made by several of the teachers who participated in the program.

"All great presenters! Are they teachers? They should be!"

"I liked the caliber of scientists, their work, and being able to connect to their fields and their research through the Internet."

"The LASSO program was one of the best-run projects that I have attended. I felt that my time was never wasted because the lessons taught by the NIS scientists were at a level that I could grasp and gradually build upon throughout each session."

"I liked the hands-on activities, the Internet scavenger hunt, the data analysis workshop, and the visit to the clean room."

"(The program was) very informative in all areas of space science. I enjoyed learning about basic science, what is done at the Laboratory, and what it takes to send an instrument into space."

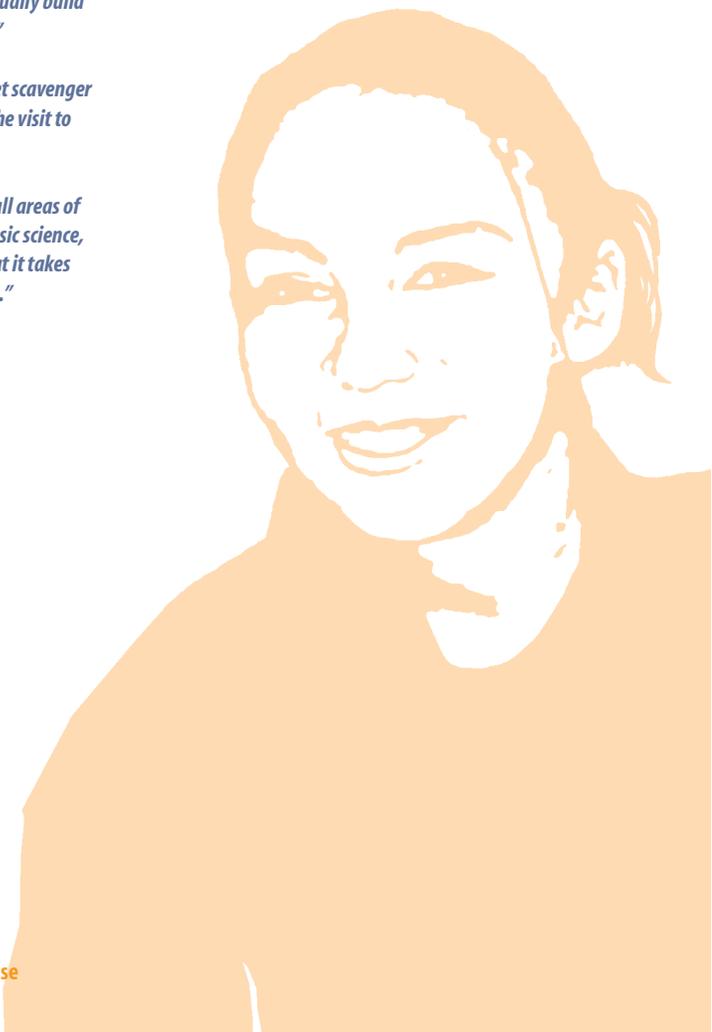
"I'm glad you had this section (Auroras). I've been spreading misconceptions, but now I know what's up!"

"Extremely good! Hands-on and learning directly from the doers!"

"Most of the workshop information can be modified to get general ideas of concepts to elementary students."

"I feel like the enthusiasm portrayed for space science has 'rubbed off' on me, and I hope I can portray this to my students. I feel more competent in my background knowledge in this area now."

"I will be able to do a better job challenging my students to interpret and utilize data and graphs. I will incorporate more and better visuals and lab activities. I feel more capable of taking my students to the 'edge' of current science concepts and theories!"



Demographics of LASSO in FY03

Gender		Number	Percentage
Male Participants		5	41.66%
Female Participants		7	58.33%
Total		12	100%
Ethnicity			
Caucasian		9	75%
Hispanic		2	16.66%
Native American		1	0.833%
Location	Population Served	Education Level	City
Alternative Learning Center	Hispanic, Anglo	Elementary	Austin, Texas
Albuquerque, New Mexico (N.M.), Highland High School	Hispanic, Anglo, Native American, African American	Secondary	Albuquerque, N.M.
Bernalillo, N.M., High School	Hispanic, Native American	Secondary	Bernalillo, N.M.
Gallup, N.M., Middle School	Hispanic, Native American, Anglo	Secondary	Gallup, N.M.
Rio Rancho, N.M., High School	Hispanic, Native American, Anglo	Secondary	Rio Rancho, N.M.
Vista Middle School	Hispanic, Anglo	Secondary	Las Cruces, N.M.
Navajo Pines High School	Native American	Secondary	Navajo, N.M.
Gadsden High School	Hispanic, Anglo	Secondary	Anthony, N.M.
Holman Elementary School	Hispanic	Elementary	Mora, N.M.
Hodgin Elementary School	Hispanic, Native American	Elementary	Albuquerque, N.M.
Roosevelt Middle School	Hispanic, Anglo	Secondary	Tijeras, N.M.
Los Alamos High School	Anglo, Hispanic	Secondary	Los Alamos, N.M.

