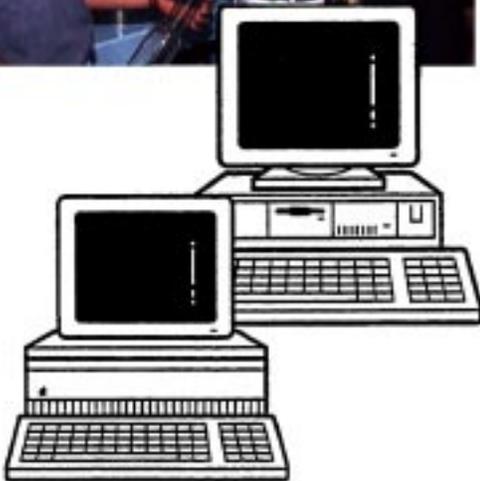

Los Alamos National Laboratory
Science Education Program

Progress Report
October 1 –December 31, 1996



Los Alamos
NATIONAL LABORATORY

**LOS ALAMOS NATIONAL LABORATORY
SCIENCE EDUCATION PROGRAMS
PROGRESS REPORT**

October 1 – December 31, 1996

Los Alamos National Laboratory
Mail Stop F671

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LOS ALAMOS NATIONAL LABORATORY

SCIENCE EDUCATION PROGRAM

PROGRESS REPORT

October 1 – December 31, 1996

TEACHER ENHANCEMENT

Teacher Opportunities to Promote Science (TOPS)

Connie Witt, STB/SE

TOPS (Teacher Opportunities to Promote Science) conducted the fall workshop for its third cohort of teachers. The workshop, "Integrating the Microcosmos into the Middle School Curriculum", was held at the Albuquerque Academy on October 24-25, 1996. TOPS alumnus, Peggy McCracken, presented the workshop along with two other staff members from the Microcosmos Southwest Center.

Recruitment for the fourth cohort of TOPS (Teacher Opportunities to Promote Science) and the first cohort of RTEP (Regional Teacher Enhancement Program) is being conducted jointly. Application packets were sent to schools across Northern New Mexico in December. The application forms are due February 15, 1997.

Regional Teacher Enhancement Project

Connie Witt, STB/SE

This is a new program just starting in FY97. Recruitment for the first cohort of teachers is being done jointly with the TOPS Program. Application packets were sent to schools across Northern New Mexico in December. The application forms are due February 15, 1997.

Science 2000 Summer Institute for Teachers

Bill Robertson, STB/SE

Science 2000 is a new project for high school science and math teachers. The first cadre of teachers will be those who were part of the TEAM Project (Teacher Environmental Assessment and Monitoring). Science 2000 will concentrate on technology modeling and problem solving, in technical areas closely related to DOE/DP interests.

Sixteen teachers from the 1996-97 cadre attended the first follow-up workshop held on November 14-15 at the Canyon School complex. Each team presented progress reports, demonstrated the use of Stella modeling software, and worked to develop a rubric for evaluating student presentations for the EXPO to be held at the Laboratory in early May.

The second follow-up workshop has been planned for March 13-14, 1997 in Los Alamos. Potential topics include additional work with folks from the Advanced Computer Laboratory, refining the design of the student EXPO, discussing how we will display teacher program portfolios at the EXPO, and going through a dry-run of judging the modeling EXPO using the rubric developed at the first workshop. Each teacher is expected to bring a copy of their students' model to the second workshop so it can be displayed and used to refine the model-evaluation rubric developed at the first workshop.

The program coordinator was invited to present a paper on the program at the Association for Supervision and Curriculum Development (ASCD) National Conference to be held in Baltimore, Maryland on March 22-25, 1997.

CURRICULUM IMPROVEMENT

Risks, Rewards, and Responsibilities Curriculum Development

Andy Andrews, TSA-9

The Risks, Rewards, and Responsibilities project entails a curriculum developed over the past 18 months. The essence of the curriculum is a methodology for evaluating situations and making choices. The concept is that you take risks to attain rewards but have responsibilities at both personal and societal levels. The vehicle for exploring the concept is radiation and questions such as what to do with radioactive waste.

During this quarter, there were two major activities. First, distribution of the curriculum continued such that by the end of the quarter over 270 copies of the package had been distributed. Further, inquiries for the curriculum showed that at least one teaching journal had publicized the curriculum. This was unsolicited. As of the end of the quarter, copies of the curriculum had been distributed to over 35 states, Canada, and an American high school in Germany.

The other major activity was the presentation of a workshop at the South Carolina Science Conference. This was done because of interest by the DOE in the Carolinas, particularly South Carolina, because of the reception of high level radioactive waste through the Port of Charleston for movement to the Savannah River Plant. This first workshop provided experience for other workshops both within the New Mexico area and possibly the San Francisco Bay area should additional funding be received. A request for a workshop has also been received from West Virginia too. The San Francisco area is of interest because shipments of high level waste from the Pacific region are expected to begin through Concord, California this summer.

Some observations about the workshop and the conference are appropriate. First, attendance was small, a point to be discussed in more detail later. Second, of those attending, interest was high including a primary school teacher who attended by mistake. It was clear from the responses that even science teachers have little concept regarding risk and its evaluation. Further, more participatory exercises showing teachers what to do in the classroom would be valuable. Finally, demonstrating background radiation with an inexpensive counter is indicated. Regarding this point, appropriate instrumentation has been acquired - the SWOOPE Rad Meter previously provided schools under the SWOOPE Program.

Regarding the attendance, the workshop given by the Westinghouse/University of South Carolina at Aiken was also poorly attended. In contrast, a session on boomerangs had a very large drawing. The teachers seem to be looking for fun things for the classroom as a supplement to the standard materials in order to develop interest and generate enthusiasm. This is a significant point for the Risks, Rewards, and Responsibilities curriculum in that it provides guidance for post-beta editions and

for announcements (effectively advertisements) to attract teachers to the workshops. Further, the workshop needs to prepare the teacher to take the material to the classroom with little additional effort.

Rayleigh-Taylor Instability Demonstrations for Pre-College Education

Robert F. Benjamin, DX-3

During a four-day visit to the AIMS Educational Foundation (Fresno, CA), two articles on Rayleigh-Taylor Instability (RTI) for grades 5-9 were completed and two additional articles were drafted to about 75% completion, in collaboration with AIMS directors and research fellows. The completed articles, scheduled for publication in the AIMS Newsletter this spring, are "Flow Fingers," showing the dramatic flow patterns characteristic of RTI, and "Soapy Spills," showing the effect of reduced surface tension on instability-inhibiting barriers. In addition, these ideas for the AIMS initiative in pattern-based math were provided. Three activities based on these ideas are scheduled for publication during coming months, and the ideas will be field-tested for possible inclusion in AIMS summer workshops for teachers.

The "Rayleigh-Taylor" hands-on demonstration has been further developed and two invited presentations were made at teacher workshops: (1) National Educators Workshop: Update 96 (October 1996 at Los Alamos), focusing on education in materials science; (2) High-School Physics Teacher Day at the annual Fluid Dynamics Meeting sponsored by the American Physical Society (November 1996 at Syracuse, NY), focusing on high school education in physics, chemistry and physical science.

STUDENT SUPPORT

Summer Experience for the Economically Disadvantaged (SEED)

Dolores Jacobs, STB/SE

Project SEED, a student program for eligible high school juniors and seniors, is slated to run in the summer of 1997. Application materials are being prepared to be sent to all area high schools, and site visits are being planned in order to encourage more involvement by students in Northern New Mexico. In addition, program materials were made available to all Native American student programs through contacts provided by the Laboratory coordinator for Native American education programs.

Summer of Applied Geophysical Experience (SAGE)

Scott Baldwin, EES-1

The support and guidance of the geophysical industry is important for maintaining the success and vitality of the SAGE program. To this end, Prof. George Jiracek, SAGE Co-Director, attended the annual meeting of the Society of Exploration Geophysicists (SEG) in Denver, where he reported to the Academic Liaison Committee on SAGE 1996 activities. He also presented a poster session at the annual Student/Faculty Reception, hosted by the SEG. Attendance by SAGE personnel at the SEG meeting is a regular activity which helps with recruiting of students and with raising of funds and "in kind" support from companies. It also provides an opportunity for industry representatives to tell us what activities they regard as important.

During this quarter we also organized two independent but coordinated workshops for REU "undergraduate" students from SAGE 1996. REU "undergraduates" are students who were enrolled as undergraduates, or who had just received their Bachelors degrees but were not yet enrolled in graduate programs, at the time they attended SAGE 1996. Their participation in SAGE is partially supported by the Research Experiences for Undergraduates (REU) Program of the National Science Foundation. The workshops, one in seismic data processing and the other in interpretation and modeling of gravity data, are to be held simultaneously at San Diego State University. The workshops are coordinated in that students attending the separate workshops will come together near the end to exchange ideas and integrate their interpretations. The workshops are very important in allowing students to gain extra experience in processing and interpreting of geophysical data. They provide students with the opportunity to go into their respective projects in more depth than is possible during the main (summer) SAGE program.

Other activities this quarter included preliminary planning for SAGE 1997, and making contact, generally through letters, with some of the companies that help with SAGE. Also, contact with students, former and prospective, is an ongoing activity, and this quarter was no exception.

Critical Issues Forum

Rick Alexander, Bill Robertson, STB/SE

The Critical Issues Forum 1997 began the academic year component with 9 participating New Mexico high schools, each with a team consisting of 10 - 15 students, a sponsoring teacher and a cooperating administrator. Each team was helped to enhance its telecommunications access. The Forum is using a central web page as a means of conducting the program statewide.

STB/Science Education is partnering with the Nuclear Materials and Stockpile Management Programs (NMSM), and has linked the Forum to the Laboratory's Global Nuclear Vision Project. NMSM is helping in the development of the curriculum for the second semester and providing a pool of scientists to serve as electronic mentors who will interact with the participating teams.

Each participating school was visited by the program coordinators in order to meet with team members involved in the program and to discuss the program timeline and expectations. A pre-survey was administered to all program participants. During the first semester, all 9 teams successfully completed the 9 benchmark assignments.

To involve a greater number of participants in the program, 4 regional workshops were held, with 2 in the south (Las Cruces) and 2 in the north (Albuquerque). The southern workshops were held on October 4 and November 22, while the northern workshops were held on October 11 and November 15. A total of 226 participants attended the 4 workshops. The first workshops included instruction in electronic communications, research, questioning strategies and effective team building. In the second workshops, teams were briefed on the Global Nuclear Visions Project by the director of NMSM and instructed in web page design by CIC-6.

The program coordinators presented the Critical Issues Forum 1997 at the National Science Teachers Association regional conference held in Phoenix, Arizona on October 17.

New Mexico Supercomputing Challenge

David Kratzer, CIC-6

During the four months prior to the Challenge Kickoff Conference at Glorieta the last week of October, we acquired about 30 Macs, on their way to salvage, for use in a MAC lab at Glorieta. Judy Deaguero and Eddie Serna, CIC-2, worked very hard to get them ready by putting the same operating system and the NESP software on them. We ended up with 20 good systems. We will be storing the 20 Macs from Glorieta for future use.

The Challenge Handbook was reviewed and edited for Marilyn Foster, New Mexico Technet, and additional information was supplied for it. Once completed, we had it reproduced.

An article about the Challenge Kickoff Conference was placed in the LANL daily news.

In preparation for the beginning of the 7th Challenge, kerberos passwords were created, pi accounts were created, default charge codes were established, and e-mail list-pointers from lanl.gov for all the Challenge participants were established.

Despite bad weather, a 16-hour power outage, and very slow response time on pi.lanl.gov, the 7th Annual New Mexico High School Supercomputing Challenge Kickoff Conference happened. Many LANL people were involved and about 600 students and their teachers participated.

Four teams from Cimarron were not allowed to attend the Kickoff Conference by their principal due to the weather so we made a special trip to Cimarron a week after the Glorieta Conference and got them started.

To alleviate the response time problem on pi.lanl.gov, two students from Los Alamos High School (that we had brought to Glorieta as lab aids) took one of the IBM pentium pro computers that Intel had provided for a lab and replaced the Windows NT operating system with Linux, which is Unix for a PC. They created accounts for all participants and the Unix classes were taught on that machine for the rest of the Conference.

Approximately 475 students and 125 teachers attended the Kickoff Conference at Glorieta. This is about 200 fewer attendees than last year because of a rule change that only allows 4 teams from each school. We are hoping that fewer numbers up front will mean more commitment and a larger percentage finishing the Challenge.

At Glorieta, we received applications from about 50 teachers interested in the 1997 Summer Teachers Training Session.

David Kratzer attended Supercomputing '96 where he gave a talk about the Challenge during the Educational Sessions. The talk described the first 6 years of the Challenge and is available at:

<http://www.supercomp.org/sc96/proceedings/SC96PROC/KRATZER/INDEX.HTM>

Challenge information was displayed at the LANL booth on the exhibit floor.

November and December were busy with school visits to: Calvary Christian in Los Alamos, Santa Fe High, Española High, Santa Fe Indian School, Los Alamos High, and Santa Fe EDGE Academy. We went around to make sure there were no problems and to address them if there were, and we encouraged the teams with their projects.

The new pentium pro computer arrived and we started preparing it to be the new front end for pi and expect to put it into production in January.

Historically Black Colleges and Universities (HBCU)

Pamela Bivens, STB/UP

The Historically Black College and University (HBCU) Program was funded by the Department of Energy (DOE) for fiscal year 1997. We are planning a productive and exciting summer with approximately 15 interns in science and engineering. Both undergraduate students (UGS) and graduate research assistants (GRA) are being

recruited. The major objectives will be to provide a quality program that enhances Los Alamos National Laboratory's Mission of effective stockpile stewardship. This will be done through a cooperative effort of relationship building, mentors, and cost sharing of participant's expenses.

Activities we have been involved in from October 1 through December 31, 1996 were:

- Made sure African-American students who remained at LANL were supported by sources other than the HBCU Program.
- Worked with the University Program Team Leader to honor outstanding HBCU contract obligations.
- Wrote a letter of thanks to HBCU and S&TA mentors.
- Hosted Business and Professional Women's Briefing with Dr. Hecker and LANL organization representatives.
- Sent out a request for mentors.
- Did a Chemistry presentation at Sombrillo Elementary School for National Chemistry Week.
- Began work on the joint LANL and Southern University Fuel Cell Project.
- Presented workshop, judged research projects, and gave an overview of internship at LANL at a DOE/EPSCoR Conference.

Mentored Collaborative Research With Resident University Teams

Abad Sandoval, STB/UP

- This program (MRCP) was piloted in the summer of FY96 and was designed to develop connections between universities and technologies that are important to the stockpile stewardship program. In MCRP, a multilevel team of students came to the Laboratory during the summer to work with research staff. The FY96 project brought four students together researching the mechanical and structural properties of polycrystalline and single-crystal erbium oxides, materials that play an important role in stockpile stewardship. One of the students is a graduate student and has continued on the project for one year.
- Plans are underway to expand the MRCP to two projects. The second project being considered is an advanced manufacturing project working with weapons engineering technical staff.

Underrepresented Minority/Female Initiative

Abad Sandoval, STB/UP

- Currently there are four GRA students on board. Three of the four are on a 50/50 salary cost-share basis with their host technical organization and the URM/F program
- Plans are underway with UNM-LA to develop this summer's (1997) eight-week summer institute. About 20 students are anticipated as participants.

- The coordinator recruited at three major minority conferences for summer internships: Mexican American Engineering Society (MAES), the Society of American Chicanos and Native American Studies (SACNAS), and the American Indian Science & Engineering Society (AISES).

Atomic, Molecular, and Optical Physics Summer School (AMO)

Lee Collins, T-4

This quarter our activity centers on recruiting for the summer session (June 9 - August 1, 1997). We have continued our extremely successful three-pronged recruiting approach: (1) color posters sent to all physics and some chemistry departments within the United States; (2) a flier sent to all members of the Division of Atomic, Molecular, and Optical Physics of the American Physical Society, reaching an audience of thousands of scientists, and (3) a Web Page on the Internet from which students can directly apply. We have systematically added new "hot links" to our site from other related Web pages around the country. In addition, we have posted announcements in the Newsletters of various professional societies as well as on electronic bulletin boards of topical interest. The University of New Mexico-North at Santa Fe principally handles this phase of the School. The deadline for application is February 15, and applications have started to roll in.

Planning has also begun for the summer session itself in regard to student housing, lecturers, mentors, and computer resources.

In 1996, we expanded a pilot program, initiated in the 1995 session, for providing a platform for young postgraduates to obtain experience working with students. This is very beneficial also to the students as it provides them with first-hand, current knowledge of the graduate-school experience. Last summer, we had three participants: Dr. D. James and Dr. M. Murillo, both postdoctoral fellows at Los Alamos, and Dr. E. Timmerminns, a postdoctoral fellow at the Institute for Theoretical Atomic and Molecular Physics at Harvard. This program has received enthusiastic support from both students and lecturers and complements our traditional lecture component given by distinguished senior scientists.

This coming session marks our third year under a National Science Foundation Research Experience for Undergraduates (REU) grant at a level of \$50,000 that supplements our grant from DP Educational Programs.

Undergraduate Research Semester (URS replaces SERS)

Dolores Jacobs, STB/SE

The fall 1996 SERS Program came to a close on December 13, 1996 with the final Poster Session which was held at the Bradbury Science Museum. Bill Wadt, from the Director's office, handed out the certificates of accomplishment to the students. Twenty-five students completed the 16-week semester. Funding was made available by DOE/DP to begin selection of the spring 1997 cohort of SERS students. Twenty-one students have been selected for the Spring 1997 semester and will arrive on January 21, 1997. We will now call the program Undergraduate Research Semester to distinguish it from the DOE/ER-funded SERS. We will continue to use the national infrastructure of the SERS Program.

Regional Two-Year College Initiative

Abad Sandoval, STB/UP

- We have been working with the Northern New Mexico Rural Educators Network to pilot six-month on-line classes for credit program, using the University Online system. Eight school districts are expected to participate offering a total of 100 credit courses.
- We have been working with LANL property staff in trying to get surplus equipment out to some of the postsecondary schools. The LLNL model of equipment donation is being discussed with the DOE/LAAO and the DOE/ALO to see if we can use the same procedures for equipment donations.
- Four students have been working as part time UGS students. One graduate student has been an offsite student, teaching courses at the School of Education at New Mexico Highlands University, as well as developing curricula on technology. He is teaching four technology education classes and providing technical assistance to the regional two-year postsecondary institutions.
- Preliminary collaborations with New Mexico State University (NMSU) and twelve two-year postsecondary institutions have begun in a joint effort to develop a New Mexico advanced manufacturing technology consortium. This consortium plans to establish technology centers of excellence in New Mexico. A preliminary proposal has been drafted and is being reviewed by participating institutions.
- A Northern New Mexico Consortium for Advanced technologies (NNMCAT) NSF/ATE proposal is being drafted and will be submitted to meet the 1997 deadline.
- We have been working with three of the Montana tribal colleges discussing the continuation of their reservation's groundwater contamination research projects that were started under the Science and Technology Alliance Project.
- Plans are underway to involve a student/faculty team to participate at the Laboratory this summer as part of the Tribal College Initiative (TCI). DOE has provided some support to the TCI with regard to assisting them develop science, mathematics, engineering and technology curricula that will impact K-14 education. Participating two-year tribal colleges are the Navajo Community College, Crownpoint Institute of Technology, and the Southwestern Indian Polytechnic Institute.

Faculty and Student Teams (FAST)

Dolores Jacobs, STB/SE

The call for proposals for the summer FAST Program went out and approximately six PI's have expressed interest in hosting a team for the summer. The universities that have been identified to date are: New Mexico Highlands University, University of California-Irvine, University of Alabama, New Mexico State University, and California State University-Hayward. Faculty at these universities are currently working to form their team to participate. Four teams will be selected to participate during the next quarter.

EDUCATIONAL TECHNOLOGY

Teaching Hearing-Impaired Students to Speak

George Papcun, CIC-3

We have two major developments to report: (1) Computational developments that provide the basis for dealing with consonants in the ADAM system, (2) A new interactive “puzzle” for teaching articulatory configurations needed to pronounce words.

1. Computational Developments in the Creation of ADAM: (The Animated Display of Articulatory Motion) — The animated display of articulatory motion (ADAM) is designed as a teaching tool for the hearing-impaired. Due to their disability, hearing-impaired children do not receive sufficient acoustic feedback of their speech production process to learn to speak effectively. The goal of this device is to provide visual feedback of vocal tract motion that is driven by a given student’s actual speech acoustics. From a strictly acoustical point of view, this inverse problem is impossible because it is not unique. However, by focusing on the empirical data of what people actually do, the inverse problem can be sufficiently constrained to be feasible. Acoustic information is sampled by a digital signal processing board (DSP) and converted to a set of acoustic features. These features are then passed through feed-forward neural networks trained on paired acoustic-articulatory data. The networks’ outputs are vocal tract configuration parameters, which drive an animated vocal tract on a PC monitor. This system is being developed at the Los Alamos National Laboratory for use at and with the guidance of the New Mexico School for the Deaf.

While teachers at the School for the Deaf are already extremely excited about the performance of ADAM, the current system has several severe limitations to be overcome, the most important of which is that it is currently trained on vowels, but not to any reasonable degree on consonants.

2. Articulatory Representation for Consonants — In previous work (Nix et al, 1996), we have shown that the parallel factors (PARAFAC) model provides an accurate, speaker-independent, two-dimensional parameterization of tongue configurations for vowels across languages. However, preliminary experiments suggest that this low-dimensional linear model may not adequately represent the more extreme deformations of the tongue that occur during consonant articulation. Kaburagi and Honda (1996) applied principal component analysis (PCA) to tongue data of a single Japanese speaker and conclude that a four-dimensional solution is required to model the Japanese vowel space as well as the consonants /k/, /s/, /t/, and /n/. However, we are interested in a solution that can accurately model continuous speech with minimal dimensionality and that is also as speaker-independent as possible. In an attempt to obtain a more speaker-independent solution than is possible with PCA, we apply the PARAFAC model to tongue data from multiple speakers. The current implementation of PARAFAC places a strong restriction on the input data in that correspondences across subjects must be explicitly stated. For example, an extreme /i/ tongue configuration must be labeled as being “the same /i/” across all subjects, an immensely time-consuming task. However, a novel imple-

mentation of the same mathematical model in a connectionist framework frees us from this restriction. Additionally, to minimize the dimensionality of the parameterization, we can implement a novel connectionist non-linear form of PARAFAC to see if non-linear manifolds can provide either a lower-dimensional solution at the same accuracy level or a more accurate representation at the same dimensionality.

Therefore, we are implementing PARAFAC in a connectionist framework as both a linear and non-linear model. Considerable tongue data from six subjects is available for this experiment, and the resulting representation will be used in the ADAM system. We will compare the following representations of the tongue data:

1. PCA
2. Linear PARAFAC
3. Non-linear PARAFAC

The comparison measures will be plots of rms error and percent variance captures vs. number of extracted representational dimensions in a leave-one-out jackknife paradigm. The validity of any given solution will be verified by split-half experiments.

Since we desire a display of the full tongue outline akin to what has already been produced for vowels (instead of just the three or four measured points along the tongue outline), we will use the method of Kaburagi and Honda (1994) to convert the available data to full tongue outlines.

Because current articulatory phonetics theory speculates that consonants and vowels actually occur simultaneously with consonants superimposed over a stream of vowels, the comparison will be performed using two forms of the data for tongue motion:

1. The raw data as described above.
2. The consonant residuals after the tongue data has first been represented in terms of the two PARAFAC factors already derived for vowels (Nixet *al.*, 1996).

If representation 2 models the data as well as representation 1, animation of tongue motion will be considerably easier because consonants can be modeled as difference functions from the full tongue-outline vowel configurations previously developed. However, if representation 1 is clearly superior, then the method of Kaburagi and Honda (1994) will be used to link the representation to a full tongue outline for animation.

Inferring consonant vocal-tract configuration — Inferring consonant vocal-tract configuration for stop consonants is problematical at our current frame size, which is 23.2 msec. This is because there is acoustic turbulence immediately before and after the stop and total silence during the stop itself (hence the term “stop”). Training a network to accurately infer vocal-tract configurations of /k/, /t/, and /p/ is doomed to failure in that virtually identical acoustic patterns (i.e., silence) are paired with three very different vocal-tract configurations. This silence typically lasts 30–80 msec. A possible approach to this problem is to disambiguate the acoustics with a context window. By creating a context window of multiple frames to surround silence (e.g., 120 msec wide), the context reduces the one-to-many nature of the mapping. However, a 120 msec context window requires 9 frames of acoustic data (recall the 23.2 msec frames overlap by 50%) and results in an 81-dimensional input space. This

input space will require more data to populate it and may not yield as good generalization for the available amount of data. The size of the context window needs to be optimized for generalization performance. Using a context window has been shown to differentiate somewhat between the various stops but possibly not at the accuracy level required for instructional display (Zlokarnik, 1995). Increasing the context window size will disambiguate the acoustics yet reduce the data density in the input space. The effects of this trade-off need to be determined on vowel and consonant regions independently.

A new interactive “puzzle” for teaching articulatory configurations needed to pronounce words — On a lighter note, we have developed, in collaboration with teachers at the New Mexico School for the Deaf, a new interactive puzzle to teach the articulatory configurations needed to pronounce words. On a computer screen, the student is presented a word or a picture representing a word, along with a set of puzzle pieces that show diagrams of vocal tract configurations. The student must put the puzzle pieces in the correct sequence. When he does, an animated figure pronounces the word.

References

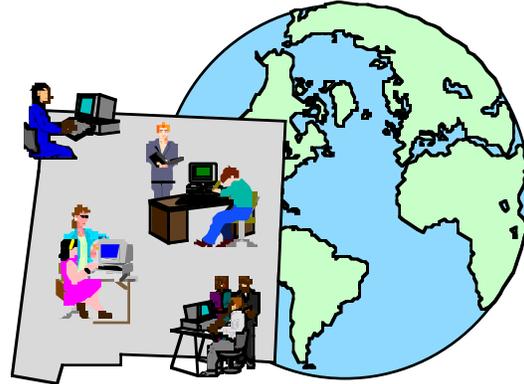
- Kaburagi, T., and Honda, M. (1994). “Determination of sagittal tongue shape from the positions of points on the tongue surface,” *Journal of the Acoustical Society of America*, **96**(3), 1356–1366.
- Kaburagi, T., and Honda, M. (1996). “A model of articulator trajectory formation based on the motor tasks of vocal-tract shapes,” *Journal of the Acoustical Society of America*, **99** (5), 3154–3174.
- Nix, D.A., Papcun, G., Hogden, J., and Zlokarnik, I. (1996). “Two cross-linguistic factors underlying tongue shapes for vowels,” *Journal of the Acoustical Society of America*, **99** (6), 3707–3717.
- Papcun, G., Hochberg, J.G., Thomas, T.R., Laroche, F., and Zacks (1992). “Inferring articulation and recognizing gestures from acoustics with a neural network trained on x-ray microbeam data,” *Journal of the Acoustical Society of America*, **92**, 2207–2217.
- Zlokarnik, I. (1995). “Adding articulatory features feature for automated speech recognition,” *Journal of the Acoustical Society of America*, **97**,3246.

Education Networking Support (EduNets)

Pat Eker, CIC-6

Mission :

To Support the Efforts of Northern New Mexico School Districts and Educational Institutions to Establish Networking Infrastructures and Connect to the Worldwide Resources Available on the Internet ...



Project Description: The LANL Educational Networking Support Program (EduNets) was developed to support the national goal to have every school connected to an "information highway" by the year 2000. Our goal is to help school districts - schools, school classrooms, libraries, and offices - establish connections to Internet resources for science, math, engineering and technology and to provide teachers, administrators, and technical teams training to use and support these resources.

The LANL EduNets project is designed to use Laboratory technical expertise and experience to help school districts plan and implement networking infrastructures for connecting their schools to the Internet and its resources. It is designed to provide a coordinated networking consulting resource for school districts in the program. It is also designed to establish partnerships with and provide support for community colleges, universities and departments of education to help establish Regional Training and Technical Support Centers to ensure continued future support.

The current scope for direct assistance is primarily Northern New Mexico school districts, with some requested advisory and training support for a few districts in Texas, Arizona, and California that are funded through partnership efforts and research grants. Requested advisory, technical, and training support is also provided for BIA and other schools in related LANL networking and support projects for the Northern New Mexico Pueblos, the Navajo Nation, and community networking efforts in New Mexico. Direct Participant Level: Administrators, Teachers, Staff, Faculty. Indirect Participant Level: Students and Teachers in the districts that will be taught by the site's EduNets Internet support teams. Grade and faculty represented: K-14.

Updated EduNets Scope: Sites Supported

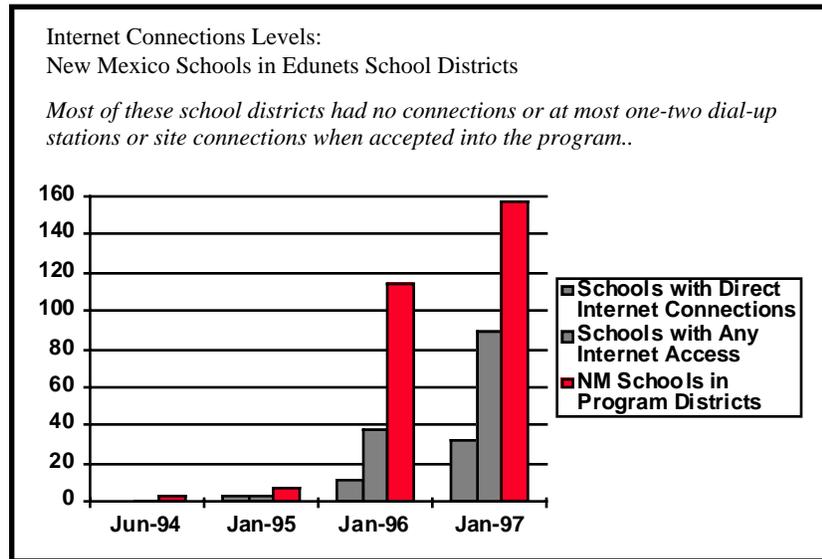
	K-12 Districts in Program	Regional Training and Support "Hubs"	Total Districts, Hubs & Related Programs Sites	K-12 Schools in Program in NM School Districts	K-12 Sites Provided On-site Support
Oct 95	9	5	17	102	> 50
Oct 96	16	11	37	124	> 80
Jan 97	24	16	44	157	> 100

We added eight school districts, three support hubs/partners, and two support partners this quarter. The total increase in districts and hub sites supported by the program was approximately 20%. Current Support and Partnerships Scope:

24 School Districts, 8 community colleges and universities, 12 other (3 departments of education, 3 regional technology centers, 2 support cooperatives, and 4 related LANL networking programs).

Internet Access: New Mexico EduNets School Districts

Our primary goal is to assist schools establish working and reliable Internet access.



Direct lines currently on order this fiscal year:

- Bloomfield (T-1 and multiple 56Kb)
- Crownpoint High School (56Kb)
- Thoreau High School (56Kb)
- Española High School (56Kb)

New direct lines installed so far this quarter:

- Dulce (extended T-1)
- Questa (56Kb)
- St. Bonaventure (56Kb)
- To'Hajilee (56Kb)

Regional Training and Support Centers: We added five new regional support centers and partners this quarter. We work with local community colleges and university sites to help them develop support and training centers and staff for their regions and to combine and coordinate efforts and networking support for the schools in their regions. We provide support for these sites and provide regional training, access, and resource servers for our school districts at most of the hub sites.

EduNets New Mexico Regional Training Centers - Hubs

	# Regional Hubs	Internet Connections	Internet Labs
Sep 95	5	2 direct 56Kb	4 at 2 centers
Sep 96	11	5 direct T-1, 5 direct 56Kb, 1 dial-up (CIT)	19 at 8 centers
Jan 97	16	6 direct T-1, 8 direct 56Kb, 1 dial-up (CIT)	26 at 11 centers

Current hubs and partners include: UNM-Gallup, Gallup, NM; Crownpoint Institute of Technology, Crownpoint, NM; Northern New Mexico Community College (NNMCC), Española, NM; Navajo Community College (NCC), Shiprock, NM; Navajo Community

College (NCC), Tsaila, AZ.; UNM-Zuni, Zuni, NM.; Laredo Community College, Laredo, TX.; NM Highlands University; the Jicarilla Apache Department of Education (JADE), Dulce, NM.; La Plaza Telecommunity, Taos, NM; the Technology Learning Center (TLC), Santa Fe, NM.; the Kirtland Technology Center (KTC), Kirtland, NM.; Cooperative Education Services, Albuquerque, NM.; the National Indian Telecommunications Institute, Santa Fe, NM; the Golden Apple Foundation, Albuquerque, NM; and the New Mexico State Department of Education, Santa Fe, NM.

Primary EduNets Support Activities This Quarter

- Networking and Computing Consulting for School Districts
- Providing On-site Support, Troubleshooting, and Training
- Providing Technical Training for District and Hub Technical Support Team Members

Abbreviated quarterly support summary:

School Districts

Bloomfield	Quotes and networking/equipment specs review; WAN and LAN design support; site two-year progress awards and presentation to school board.
Dulce	On-site network and server support; technical support team Novell training; site team formation and planning support; quotes and networking/equipment specs review; current needs assessment; site progress awards and presentation to school board.
Española	Abiquiu, Alcalde, Dixon, Fairview, Velarde, Española Middle, and Española High dial-up support; equipment and line pricing; quotes and specs review; technical support team Novell training; NT server support.
Ft. Wingate	Initial site visit; capabilities and needs assessment; obtained 56Kb pricing.
Gallup-McKinley	Network support for the District Office; Crownpoint High 56Kb pricing; meetings with new administration about program support scope and current site needs.
Las Vegas West	Initial support planning meeting; arranging dial-up accounts for remote schools.
Las Vegas Central	Initial support planning meeting.
Mesa Vista	Technical support team Novell training.
Mora	Obtained new 56Kb pricing; site support team updates.
Pojoaque	Network and server support; technical support team Novell Training; site progress awards and presentation to school board.
Questa	Network support; site needs assessment.

St. Bonaventure	Network, server, and lab set-up support; testing new 56Kb line; quotes and networking/equipment specs review.
To'Hajilee	Initial site visit; site needs assessment and computer labs support.

Regional Support Centers

Highlands University	Initial support planning meeting.
NITI	NT server support (the National Indian Telecommunications Institute).
NNMCC	Network, labs, and server support; training and workshops planning; NT support; Region III planning and awards meeting; team and hub commendations and awards.
UNM-Gallup	Technical support team Novell training; network support; new needs assessment.
UNM-Zuni	NT and modem server support; network support.

Other Project Support

San Juan Pueblo	Network, labs, and server support - LANL Pueblo Project.
LCC	Training Support and Current Needs Assessment; basic Internet faculty workshops - DOE Laredo Energy Research Project .

Workshops and Technical Classes

Basic Internet Workshops - Workshops I and II (modified) - Laredo Community College Faculty Workshops, Laredo, Texas, January 6, 1997.

Basic Novell 3.12 Networking Class - We provided a two-day basic hands-on Novell 3.12 workshop at CES in Albuquerque for ten EduNets site technical support team members from Dulce, Mesa Vista, Pojoaque, and Española school districts and the UNM-Gallup, JADE and CIT support centers December 17-18, 1996.

Partner Projects Support

Laredo Project - We are sharing EduNets materials, lessons learned, and experiences with two school districts and a community college in Laredo, Texas. The EduNets team is also the Laredo project Internet support team that is providing consulting and training support for education sites in that project. In October, we provided input for the DOE project review for the Laredo Energy Research Project (LANL and CSW Communications, Laredo). The Laredo Community College (LCC) Import-Export Building, with Internet access provided through the research project, was dedicated October 30 and we attended the dedication and helped with Internet demonstrations in the labs. The new LCC building is going to be a valuable Internet training center and resource for the community. We plan to hold teacher training sessions at LCC for the Laredo school districts. In November, we provided NT server support and training for the LCC network support staff.

EduNets New Districts, Hubs, and Partners

Las Vegas School Districts and Highlands University - Las Vegas West and Las Vegas City were added to the program. The engineering support team at NM Highlands University requested this and NMHU was also added to the program as a partner and support center for Region IV. We will work with NMHU and both Las Vegas school districts to help troubleshoot and implement networking plans at the school sites. We are helping with a Net Day for the Las Vegas West district in March.

To'Hajilee Community Schools, Shiprock Alternative, and Ft. Wingate BIA Schools - We added these schools to the program this quarter. To'Hajilee, on the Cañoncito Reservation, is installing a 56Kb line, NCC-Shiprock wants to connect nearby Shiprock Alternative through their hub, and we are helping Wingate schools get temporary dial-up stations and accounts set up while we get pricing for direct lines. Wingate school administrators and teachers have been attending our workshops at UNM-Gallup for more than a year and are eager to get on the Internet.

Questa and Peñasco Schools - Questa schools were added this quarter; Peñasco was added last summer. Peñasco and Questa schools are being provided 56Kb lines by La Plaza de Taos Telecommunity Foundation as part of a La Plaza grant. We are helping set up the labs, providing networking and platform support, and providing support team training opportunities for the districts. The Peñasco lab is already operational and is being used for community and teacher training. The line is in at Questa and we are waiting for PCs that have been ordered to complete the lab set-up.

Laredo Community College, New Mexico Highlands University, The National Indian Telecommunications Institute (NITI), and the Golden Apple Foundation were added as community support partners this quarter.

Awards and Progress Recognition

Bloomfield School District Progress and Team Awards - November 12, 1996, we attended the Bloomfield School Board Meeting and presented a plaque to the Bloomfield School District and plaques and certificates of recognition to the Bloomfield EduNets site support team - Sondra Adams and Kathy Price - for the internetworking progress their district has made. The school district has completed wide area networking plans, obtained funding, and has ordered direct T-1 and 56Kb lines that should be installed next quarter. The members of the board and district representatives expressed thanks to all of the LANL EduNets team for the support that we have provided and for the LANL outreach efforts.

Central Consolidated School District (CCSD) Progress and Team Awards - November 19, 1996, we attended the CCSD School Board Meeting and presented a plaque to the CCSD School District and plaques and certificates of recognition to the CCSD EduNets core support team - Dennis Seyfert, Rick Nussbaum, Danny Yap, Chuck Culpepper, James Karlin, Lisa Lucero, Raymond Pinto, Steven Rust, Phil Kasper, Jeff Gilmore, George Johnston, Norm Georgina, Mark Madsen, Carol Frick, Katie Gilbert, Lynda McKensie, Angie Sauk, Judy Stoddard, Danita McDonald, Kelly Palmer, and Diane Tsosie - for the internetworking progress their district has made over the past two years. Special plaques were presented to Stan Bippus, CCSD Superintendent, and Dennis Seyfert, Assistant Superintendent, for outstanding administrative support and leadership. The school district has made fantastic progress in just two years. The

members of the board and district representatives expressed thanks to all of the LANL EduNets team and to LANL for the support that we have provided.

Dulce School District Progress and Team Awards - November 26, 1996, we attended the Dulce School Board Meeting and presented a plaque to the Dulce School District and to the Jicarilla Apache Department of Education (JADE) for the progress the district and JADE made last year - they secured T-1 access to all schools and administration buildings. We presented special plaques to Felix Gonzales, Dulce Assistant Superintendent, and to M'Hamed Jebbanema, JADE Continuing Education, for outstanding administrative support and leadership at their sites. The members of the board, JADE, and district representatives expressed appreciation for the support that LANL has provided.

Pojoaque School District Progress and Team Awards - January 21, we presented a plaque to the Pojoaque School District and plaques and certificates of recognition to the Pojoaque EduNets site support team - Pancho Guardiola, Susan Quintana, Annette Fox, Yolanda Harrell, and Tom Farrell - for the internetworking progress their district has made over the past two and one-half years. The members of the board and the Superintendent, Art Blea, all thanked the LANL EduNets team for the support that we have given them and praised the outreach efforts of the Lab. The board also directed that special letters from the board be put in the Pojoaque teams' personnel folders recognizing their efforts and accomplishments. It was a very nice meeting.

Region I Awards and Planning Meeting at UNM-Gallup - We held a regional awards and planning meeting for representatives from the school districts and support hubs in EduNets Region I - Central Consolidated, Gallup-McKinley, Zuni, St. Bonaventure, and Wingate Schools and UNM-Gallup, Navajo Community College (NCC)-Shiprock, UNM-Zuni, and Crownpoint Institute of Technology (CIT). All sites were represented by the 29 representatives who attended.

The main theme was "Thanks UNM-Gallup and UNM-Zuni!" with special farewells to Kent Brooks, UNM-Gallup, and other staff who have recently accepted advanced job offers elsewhere. Awards were presented to school districts for achieving internetworking progress levels and special recognition awards were presented to site leaders in Internetworking efforts. The following awards were presented: Campus Networking and Regional Internet Training Support Awards were presented to UNM-Gallup, UNM-Zuni, and NCC-Shiprock for installing dedicated circuits, establishing Internet labs (which we have used for training teachers and others in the region), and providing support for schools and education sites in our program Region I. Robert Carlson, President of UNM-Gallup, accepted the award for his campus. Special individual commendations for Technical Support and Leadership were awarded to Kent Brooks, UNM-Gallup, Ruth Haskie, UNM-Zuni, and Mark Bauer, NCC-Shiprock. EduNets Regional Support Team awards were presented to the UNM-Gallup EduNets team - Ed Allen, Pat Balok, Scott Hoffman, Chris Holden, Lorraine Hood, Roxanne Salvador, and Joann Wright. Achievement level awards in Internet-working presented to the school districts were: EduNets Bronze awards to St. Bonaventure and Zuni School Districts; EduNets Silver awards to Central Consolidated and Gallup-McKinley School Districts. Special recognition awards were presented to Crownpoint Institute of Technology (CIT) and to the Ft. Wingate (BIA) Schools. The awards session was followed by a Region I updates and planning session that was very successful - a lot of valuable information on region needs and resources was obtained and several

"partnerships" were formed between the districts to share resources and expertise. The LANL EduNets team and LANL received a lot of thanks and praise for the support that we have provided and continue to provide the Region.

Connections Update

The School Districts and Regional Hubs in the EduNets Program have been divided into Regions to facilitate scheduling and partnership support efforts.

Region I

Bloomfield Public Schools

T-1 and 56 Kb lines ordered for all district schools. All schools and the Central Office have at least one dial-up workstation now with dial-in access temporarily to the CCSD Kirtland Technology Center.

Central Consolidated Schools

56 Kb to Kirtland Technology Center (KTC) with spread spectrum to the Kirtland Business Office; 2MB line to Shiprock High School (SHS) from NCC-Shiprock. Line being extended from SHS to Tse'Bit'ai Middle and Natanni Nez Elementary in Shiprock. Another 56Kb ordered for Kirtland. The Kirtland Technology Center has three Internet labs with over 100 PCs with direct Internet access, a district WWW server, an e-mail server, and a modem server with two access lines. The Kirtland Middle school and three elementary schools in Kirtland have at least one dial-up workstation with access to the modem server at the KTC. The KTC is also helping Bloomfield schools by providing them temporary dial-in access until the Bloomfield lines are installed. Shiprock High has an Internet training lab with 30 workstations. Newcomb middle and high schools have at least one workstation with dial-up access to NM Technet. The Shiprock district offices and middle school have at least one dial-up workstation with access to NM Technet or the NCC-Shiprock campus.

Gallup-McKinley School District

56Kb line to Gallup High extended to Central Gallup Offices. Twelve district schools and the Educational Development Ctr. have at least one dial-up workstation with access to either NM Technet, a local provider, or a modem server at Gallup High. Orders for multiple lines are in process; bids being evaluated.

Shiprock Alternative School

Fiber connection planned to NCC-Shiprock hub.

St. Bonaventure Mission Schools

New 56Kb line installed at high school. Setting up Internet lab and modem server (they have offered to help with access for other local Gallup-McKinley schools in Thoreau).

Wingate Schools (BIA), Wingate

New district - getting cost estimates, arranging dial-up accounts and helping set up dial-up workstations.

Zuni Public Schools

56Kb line to district office from UNM-Zuni; 56Kb line to Twin Buttes High from UNM-Zuni. At least one dial-up workstation at each school with dial-up access to UNM-Zuni or NM Technet.

Region I Support Hubs

Crownpoint Institute of Technology

Dial-up account and workstation - trying to team up with Crownpoint High for sharing 56Kb access.

Navajo Community College - Shiprock

T-1 line with two Internet labs, e-mail server and modem server with two lines. Collaborative effort with CCSD to combine NASA funds to get 2MB line to Shiprock High and dial-up access for local school sites.

UNM-Gallup

T-1 (upgraded from 56Kb). New Technology Building with four large Internet labs. They have seven campus Internet labs now. Helping with regional training; technical support classes; offering special Internet and networking courses for schools as well as credit classes.

UNM-Zuni

56Kb line installed. Lab set up and running with modem servers for remote access from local schools. First training sessions held in the lab in August; setting up new NT server this month. Ran 56Kb lines to Zuni Schools District Office and to Twin Buttes High.

Region II

Cuba Independent Schools

56Kb connections to all schools; Internet access from every classroom, library, and the district offices; WWW server; e-mail server; Internet lab - all in regular use. Tech support team in place and continuing training.

Dulce Independent Schools

T-1 connections to all schools and the district office; infrastructure at schools being completed; Tech and training support team established.

To'Hajilee Community School (BIA)

56Kb line installed - New! Setting up Internet labs. Forming and training tech support team.

Region II Support Hubs

Jicarilla Apache Department of Education

T-1 line installed; WWW server; e-mail server; Internet training lab; and tech support team all well established and in use. Doing community Internet classes and classes for San Juan College; providing technical support and temporary e-mail services for Dulce schools.

Cooperative Educ. Services (CES)

NA - Networking Training Center

The Golden Apple Foundation

NA - Support Partner - Working with Individuals at sites in northern NM

Region III

Española Municipal Schools

56Kb line to Española Elementary School. 56Kb line ordered for Española High School; infrastructure completed at EHS. Tech team in place and active with accounts on server at NNMCC; first training labs at EES; dial-up workstations set up at seven schools with access to NNMCC.

Mesa Vista Consolidated Schools

Two dial-up workstations at Mesa Vista High school with access to NNMCC; dial-up station at Tres Piedras with access to La Plaza; tech and training team in place and active with accounts on server at NNMCC.

Mora Independent Schools

Dial-up workstation shared by tech team from all schools; tech and training team in place; completing basic training.

Peñasco Independent Schools

56Kb installed from La Plaza. Internet training lab established and in use for school and community training. Tech support team in place and active.

Pojoaque Valley Public Schools

56Kb line to high school and middle school; 56Kb line to elementary and intermediate school. Two Internet labs in operation; libraries on-line; guidance office actively on-line; WWW server; e-mail server; and EduNets tech and training support team in place and active.

Questa Independent Schools

56Kb installed from La Plaza. Internet training lab being established .

Region III Support Hubs

Northern New Mexico Community College

T-1 line; five Internet labs; regional training support; WWW server; e-mail servers; tech and training support teams in place and active; 56Kb line to the El Rito campus.

La Plaza de Taos Telecommunity

NA - ISP Partnership support efforts.

Region IV

Las Vegas City Public Schools

56Kb to high school; 56Kb to middle school; lines ordered for elementary schools. Middle school networked (Net Day project).

Las Vegas West Public Schools

56Kb to high school; 56Kb to middle school; lines ordered for elementary schools. Middle school Net Day project set for March.

Pecos Independent Schools

56Kb to High School

Santa Fe Public Schools

56Kb lines (11) to schools - Academy, Alvord, Atalaya , Capital High, Capshaw Middle, Chavez, Devargas JHS, Ortiz Middle, Santa Fe High, Sweeney, Tesuque; 56Kb to central office; 56Kb to Technology Learning Center (TLC)

Region IV Support Hubs

New Mexico State Department of Education

56Kb; approximately 10 staff offices connected; WWW server.

Technology Learning Center, Santa Fe

56Kb; Internet training lab; SFPS collaborative project with NM State Department of Education, LANL EduNets, Computerland of Santa Fe and Apple computers support. Provides training access for SFPS, ReLearning, SIMSE, and other programs.

National Indian Telecom. Institute (NITI)

56Kb; Internet training labs; WWW server; e-mail server; modem server with 800 access; training and access support for BIA and other Native American schools and institutions.

New Mexico Highlands University

T-1. Partnership support efforts. Working with Las Cruces schools through a NASA grant.

Extra Research and Test Schools

Las Cruces Public Schools*
Los Alamos Public Schools*

T-1 to Oñate HS test site
10 MB to Los Alamos HS test site;
56Kb to Los Alamos Middle School

*Partial District Support: 1-2 Schools

Outside New Mexico

Laredo Indep. Schools, Laredo, TX	ISDN
United Indep. Schools, Laredo, TX	ISDN
Laredo Community College, TX	T-1 and ISDN
Navajo Community College, Tsaile, AZ	56 Kb

District progress levels:

We have established a rough set of achievement levels to allow us to recognize New Mexico Districts in our program for progress in Internetworking their schools and to help us target needs areas to reach goals. Current school district achievement levels are:

- Bronze:** First connections (usually dial-up); site support team and contacts established; basic training for core support team completed
- Bronze & Coral:** Bronze with 50% or more district sites connected some way
- Silver:** Bronze plus at least one direct connection; Internet training lab(s) established and in use
- Silver & Turquoise:** Silver with 50% or more district sites connected some way with at least one Internet workstation per site
- Gold:** Direct connections to all schools, Internet labs, web and/or mail and/or modem server
- Gold & Turquoise:** Gold plus 50% or more district classrooms and offices connected some way
- Platinum:** Gold plus direct connections to at least 95% of all classrooms and offices; web and mail servers; basic Internet training completed for all teachers and staff

January 1997 District Levels:

Bloomfield Public Schools	Bronze & Coral
Central Consolidated Schools	Silver & Turquoise
Cuba Independent Schools	Platinum
Dulce Independent Schools	Silver & Turquoise
Española Municipal Schools	Silver & Turquoise
Gallup-McKinley School District	Silver
Las Vegas City Public Schools	Silver
Las Vegas West Public Schools	Silver
Mesa Vista Consolidated Schools	Bronze
Mora Independent Schools	Bronze
Pecos Independent Schools	Silver
Peñasco Independent Schools	Silver & Turquoise
Pojoaque Valley Public Schools	Gold
Questa Independent Schools	Bronze
St. Bonaventure Mission Schools	Bronze & Coral
To'Hajilee Community School (BIA)	Bronze & Coral
Zuni Public Schools	Bronze & Coral
Santa Fe Public Schools	Silver & Turquoise
Shiprock Alternative School, Shiprock	Just added to Program
Wingate Schools (BIA), Wingate	Just added to Program

Views of The Solar System

Views of the Solar System by Calvin Hamilton is sponsored, partially funded, and housed on the LANL WWW server "bang.lanl.gov" by EduNets. We haven't done an update on this site in several months, but it has been extremely busy! When this project support started in 1994, we needed an application for teachers in our first districts to use in the classroom; we never dreamed what a wonderful site Calvin would create. Our teachers in the Cuba district were some of the first to test out and provide input on the web site. Check out <http://bang.lanl.gov/solarsys> for a popular science education resource. During December 1996, we had 81,521 accesses recorded to the main page, making a total of 716, 274 total accesses for 1996. The

total access counts for all pages and images was 3,983,038 for December and a total of 32,717,565 for 1996.

Systems Modeling for Education

Sharon Dogruel, STB/SE

Systems Modeling has accelerated into a full team effort led by Dave Modl, CIC-8 with three GRA students and one university faculty member (Jim Dix) from the State University of New York at Binghamton. We have laid out a model of the development of the technology product that includes the following major components: (at the lowest level) the infrastructure built upon JAVA that allows all store/retrieve functions and interfaces with the administrative components, i.e. class lists, assignments, reports, user log in, and (moving upward) the contextual processing functions. In the store/retrieve function we are developing the list of materials, shapes, units of measure and simulations to connect with the data acquisition tools needed to run the simulations. At this point, we are focusing on the simulation product, expecting to have that ready for field testing in this coming quarter. At the same time, we are also working on the user interface that connects to the control processing features. The intent is to develop each layer, appropriately integrating that capability as it takes shape. A web page (<http://bay.lanl.gov/heatxfer/index.html>) helps team members communicate and summarizes the project. It will be expanded as the project matures.

BEAM Robotics Workshop

Paul Argo, NIS-1

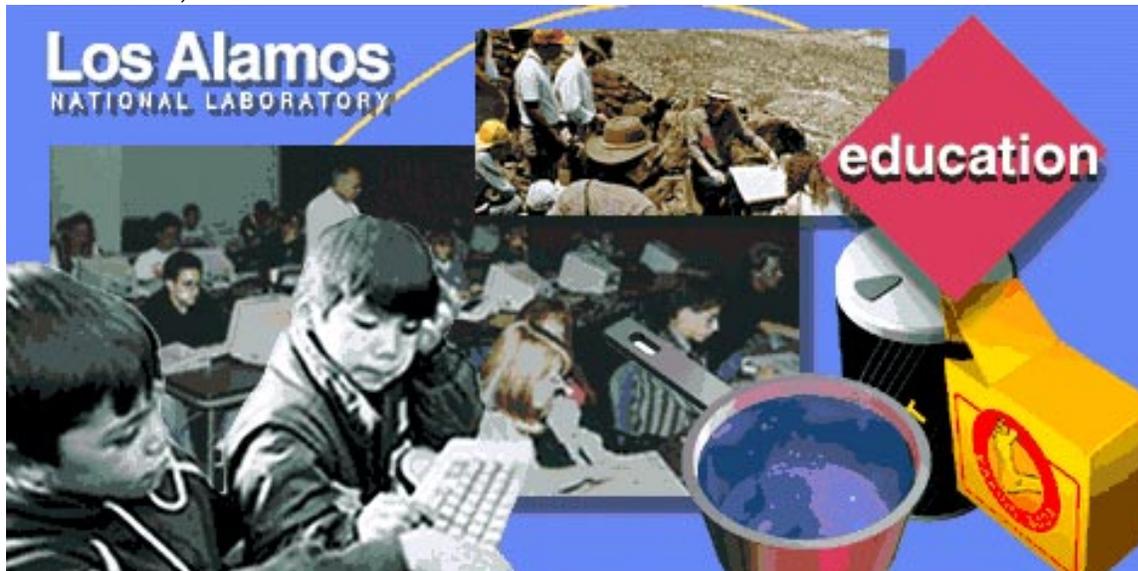
The BEAM Robotics Workshop is off to a great start in it's third year. We have scheduled the Workshop for April 17-19, 1997. The first two days will be purely workshop, and we are hoping to have more than 100 students attend. We have purchased sollarollers, sollarflappers, photopoppers, and several walkers for distribution at the workshop. On the third day (Saturday morning) we will have a small scale competition, with entries from both the workshop and external participants.

There have been several workshops throughout Northern New Mexico, instigated by previous participation in the BEAM Workshops. Several schools throughout the area have purchased BEAM kits, and various members of the local robotics club have helped at the workshops.

PUBLIC UNDERSTANDING OF SCIENCE

Science Education Information On-line

Robert Judd, CIC-6



During the first quarter of FY97, the principle project activities included updates to the system and server software, addition of several new CGI capabilities, assistance to the NM State Department of Education and the expansion of information on several programs.

Several different operating system software updates were made to the server. These system software updates from Apple Computer have improved the stability of the server.

Several new CGI interfaces have been added to the server. A simple page counter CGI to indicate how many times a page has been visited was added. The most significant addition was a CGI that will convert the input from a web page form into an electronic mail message. This has improved the ability to gather and process information via WWW pages.

We have been working with the New Mexico State Department of Education (NMSDE) in several areas. These efforts include assistance with their WWW server, implementation of an e-mail list processing program (majordomo), assistance with PPP connections to the Internet via NM Technet and teaching department personnel the Hypertext Markup Language (HTML) so that they may create WWW pages for their server. Two full day workshops on HTML were presented in December to about 35 people from the NM SDE.

The most active programs that are updating information on the Science Education WWW server are the TEAM, Hydrogen Conference, and Critical Issues Forum (CIF) programs

From October 1 through December 31, 1996, there were 32,668 different sites requesting 204,327 requests of information from 1,201 distinct files for an average of 2,221 requests per day. These visitors transferred 97,551 pages representing more than 4 terabytes of data. Each day detailed statistics on access to the server are updated and summaries are available for viewing on the server.

The top eight subject areas of interest on the server for this quarter were:

1. Science Education Program information and status reports
2. Science at Home
3. NM On-line Internet Institute (OII)
4. National Teacher Enhancement Program
5. Science Education Program Status Reports
6. New Mexico Supercomputing Challenge Program
7. Hydrogen Conference
8. Critical Issues Forum

The uniform resource locator (URL) for the WWW server is:

<http://education.lanl.gov/>

The Hydrogen Project

Marcia Zalbowitz, STB/EPO

The Hydrogen Education Outreach Activity has organized and implemented a special conference theme: *Hydrogen and the Materials of a Sustainable Energy Future*. The National Educators' Workshop (NEW): Update '96 was held October 27-30, 1996, and was hosted by LANL. This was the 11th annual workshop/conference aimed at improving the teaching of material science, engineering and technology by updating educators and providing laboratory experiments on emerging technology for teaching fundamental and newly evolving materials concepts. Sponsors included: U. S. Department of Energy, NASA, Norfolk State University -- Schools of Technology and Science (HBCU), and National Institute of Standards and Technology -- Materials Science and Engineering Laboratories.

Over 120 people participated in the conference activities. Conference attendees came from 23 states.

Goals of this special theme were:

- provide educators with up-to-date information about hydrogen production, storage, utilization, and related materials;
- stimulate classroom and informal educational opportunities in the development and diffusion of hydrogen technologies;
- complement the technical mission of the DOE Hydrogen Program; and
- satisfy one of the key mandates of Public Law 101-566 to accelerate wider understanding of hydrogen and to provide a broad approach for information exchange.

The hydrogen component of the NEW:Update '96 offered the opportunity for educators to have direct communication with scientists in laboratory settings, develop mentor relationships with laboratory staff, and bring leading edge materials/technologies into the classroom to upgrade educational curricula. Lack of public education and understanding about hydrogen is a major barrier for initial implementation of hydrogen energy technologies and is an important prerequisite for acceptance of hydrogen outside the scientific/technical research communities.

Program:

Plenary

Hydrogen -- The Fuel of The Future

James MacKenzie, World Resources Institute

Experiments/Demonstrations

NEW participants attended conference sessions in which speakers demonstrated experiments and/or demonstrations that can be duplicated in their classroom.

A Modeling Code for Evaluation of Hydrogen Powered Vehicles

Salvador Aceves-Saborio, Lawrence Livermore National Laboratory and Norman Johnson, Los Alamos National Laboratory

Experimental Investigation of Hydrogen Transport Through Metals

Rob Dye and Tom Moss, Los Alamos National Laboratory

Electrolytic Production Of Hydrogen Utilizing Photovoltaic Cells

Mark Daugherty and Christine Zawodzinski, Los Alamos National Laboratory

Mini-Workshops

State-of-the-art technology at a major research facility was presented by Los Alamos National Laboratory technical staff members.

Materials for Hydride Based Batteries

Ricardo Schwarz

Hydrogen Fuel Cells For Utility and Transportation Applications

Shimshon Gottesfeld

Engineering Materials for Hydrogen Separation

Rob Dye and Tom Moss

Conference Related Deliverables

Experiment Notebook - Preparation of the "experiment notebook" based on the papers presented at the National Educators' Workshop is currently underway. In addition, supplementary materials, viewgraphs, and materials on safe handling of hydrogen will

also be included. This notebook will be distributed to conference attendees and appropriate other mailing lists. The notebook will be completed before the end of January, 1997.

Scholarships - Twelve scholarships were awarded to teachers. This included leveraging of funds from the Science Education Program Office to increase attendance in the Hydrogen Program by New Mexico teachers -- many of whom work with minority students.

In addition, registration fees were paid for 13 students from Los Alamos High School to attend the conference.

The Hydrogen Education Outreach Activity took the initiative to develop several additional activities:

Web Site and Survey

A web site was developed to promote and provide conference materials prior to the event. All available papers and abstracts were put on the web. In addition, a "green links" page, containing links to other hydrogen, technological and/or environmental information was created. Furthermore, the Hydrogen Education Outreach Activity worked with the National Center for Research on Evaluation, Standards and Student Testing at UCLA to create a survey used to identify teachers' skills and knowledge of hydrogen technology.

The web site has recently been revised to become a relevant post-conference educational tool.

WEB address: <http://education.lanl.gov/RESOURCES/h2>

Web Conference

A real-time world-wide web video conference for the hydrogen component of the National Educators' Workshop took place. Each program during the hydrogen component was captured through CU-SeeMe software (made available at no cost to any interested remote participant) and sent out through the Internet. Each conference site had an e-mail address, and many remote participants were identified and some communicated with us. Remote participants were encouraged to down-load conference papers and viewgraphs from the web site in order to better follow the presentations.

The Hydrogen Technology Kit

Staff members at LANL built a solar hydrogen energy generation unit that was demonstrated during the experiment section of the conference. The prototype unit contained a photovoltaic array (built with government surplus solar cells obtained at no cost), an electrolyzer (machine tooled for easy and inexpensive duplication), and a hydrogen storage vessel.

As a way of demonstrating how the renewably generated hydrogen could be utilized, a small, radio-controlled vehicle powered by a proton exchange membrane fuel cell, built at LANL, was shown along with the hydrogen technology kit.

Solar cells are being sent to teachers who have indicated interest in building the hydrogen generation unit.

Local Educational Support

The Hydrogen Education Outreach Activity has been supporting an extra-curricular activity developed by Los Alamos High School. A group of chemistry students are meeting on a weekly basis to learn about hydrogen and prepare to build the hydrogen energy generation unit. We have presented lectures on fuel cells and hydrogen safety at the high school; e-mail messages are exchanged. We provide additional printed materials for the teacher – which includes a curriculum outline *Make Your Own Energy* – specially developed at LANL. The students and their teacher attended the conference on scholarships.

The Hydrogen Education Outreach Activity is currently communicating with the LANL Industrial Partnership Office to explore mechanisms for partnered, cost/shared development of a curriculum and a student vehicle competition. We are hoping to identify industrial partners to work with LANL to ensure the successful implementation of these education outreach tasks. In order to accomplish our goals, we will have to leverage moneys from industry with government resources.