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Shoumen Palit Austin Datta

The San Francisco Years

1996-1998
Special Assistant XIV to the Mayor
City and County of San Francisco
Appointed as Special Assistant to
Superintendent of Schools
San Francisco Unified School District
San Francisco, California

This PDF is a collection of a few news items and select public education milestones which may be viewed as my "accomplishments" in the public education domain. It must be noted that all tasks and goals were achieved through multi-member teams and several school district collaborations, school-university science education partnerships as well as various school district initiatives with industry, private foundations and applying for various government support through grants. Many other important items are not included (in PDF).

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Connecting Schools to the Internet – California Net Day

– Net Day 1996 (Organizer) **https://en.wikipedia.org/wiki/NetDay**

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Connecting Schools to the Internet

– Computers for Schools

– Cover Story in US News & World Report 1996
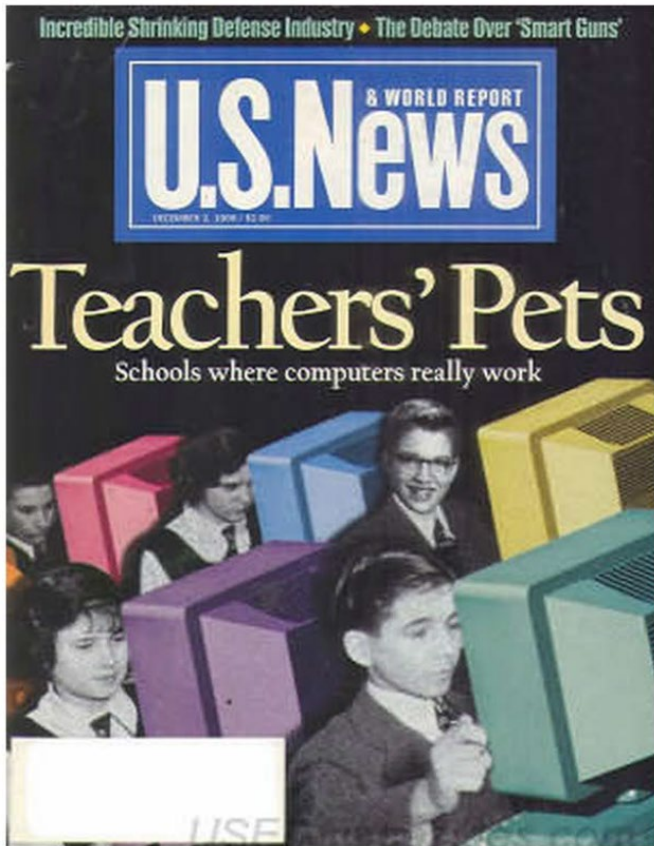
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Connecting Students to the Future

– Developing the FIRST

– CISCO NETWORKING ACADEMY in SFUSD High School with CISCO SYSTEMS

Cisco Networking Academies Program

Through an innovative partnership with school districts across the U.S., Cisco Systems is preparing students for the demands and enormous opportunities of the information economy while creating a qualified talent pool for building and maintaining education networks.

Network switches. Routers. Patch cables and punch-down blocks. RJ-45 jacks. Not your ordinary list of back-to-school supplies. Then again, for students across the country in a unique new curriculum known as Cisco Networking Academies, the Fall '97 semester was anything but your ordinary back-to-school experience.

Now in the early stages of a nationwide rollout leading to international participation, the Networking Academies is a cooperative venture between school districts and Cisco, the world leader in networking for the Internet. In a lab setting that closely corresponds to the real world, students get their hands on the building blocks of today's global information networks, learning by doing as they design and bring to life local and wide-area networks.

This innovative program is a prime example of private industry creating a mutually beneficial relationship with schools—not a short-term fix, but a relationship designed to last because of the lasting benefits it can provide. For Cisco and private industry, the program is a meaningful step toward developing sorely needed technology skills in the next generation of workers. For the schools, Cisco Networking Academies represents vital technology support and resources to supplement limited funds. And for students, Networking Academies is highly relevant preparation for the increasingly technology-dependent economy into which they will emerge.

The Challenge

The information economy will demand an unprecedented level of technology literacy from tomorrow's workers. A few statistics foreshadow a potential crisis in the American workplace:

- Currently, mid- to large-sized companies in the U.S. alone have about 190,000 unfilled technology jobs. And 82 percent of technology companies expect to increase their information technology (IT) staffs in the next several years.
- Nearly 70 percent of technology companies cite a lack of skilled IT workers as a barrier to growth.
- As teachers around the world begin to integrate the vast resources available to them on the Internet and as networks become an important tool for boosting administrative efficiency and communication, education institutions face the same shortage of network-support personnel.
- Schools are under pressure to prepare students with the necessary skills to be successful in the 21st century. Eighty-six percent of America's classrooms lack a direct Internet connection.

CISCO SYSTEMS

Background

In 1993, Cisco embarked on an initiative to design practical, cost-effective networks for schools. It quickly became apparent that designing and installing the networks was not enough—the schools also needed some way to maintain the networks after they were up and running. Cisco Senior Consulting Engineer George Ward developed training for teachers and staff for maintenance of school networks. He soon discovered that the personnel lacked the time required to learn the material, so he moved to the next population of learners in the school—the students themselves. The success of these student seminars led to requests from participating schools across the country for Cisco to develop a curriculum that could be integrated as elective courses taught in a semester format. The formalized curriculum and support activities evolved into the Cisco Networking Academies program.

The concept proved to be a powerful draw for students, many of whom initially volunteered for classes outside normal school hours. Today, thousands of students coast to coast are pioneering a school-to-work program engineered for a new global economy.

The Solution

Through the Cisco Networking Academies program, high school and college students can learn the information needed to prepare them for the Cisco Certified Networking Associate exam. This certification positions them for immediate openings in a talent-hungry job market or for engineering- and science-focused college studies. In a nutshell, Cisco Networking Academies is a complete, four-semester program on the principles and practice of designing, building, and maintaining networks capable of supporting national and global organizations.

Cisco provides course work for a complete range of basic through advanced networking concepts—from pulling cable through such complex concepts as subnet masking rules and strategies.

The program uses Regional Academies as hubs, each of which supports a minimum of ten Local Academies. These Regional Academies teach the teachers who oversee programs at the Local Academies under their jurisdiction. The Regional Academies funnel input to Cisco on topics such as individual school performance, curriculum quality and effectiveness, and student progress.

The format for the classes reflects the content: interactive lessons stored largely on the classroom's Cisco MicroWeb server. The academy design also accommodates diverse learning styles. For those who learn by reading, text is available. More-visual learners can focus on the course material's extensive graphics and QuickTime movies. To promote development of the personal skills that underpin successful careers, projects require students not only to resolve technical issues, but also to successfully address network users' needs.

Local Academies receive mentoring and technical support from the Regional Academies and are backed by SMARTnet™ services, a service and support program that provides a round-the-clock access to assistance from Cisco's Technical Assistance Center (TAC) and the Cisco Connection Online (CCO) Web site, plus major software and maintenance releases, product documentation updates and next-day delivery of replacement parts.

EXECUTIVE SUMMARY

Challenge
The American economy runs on information—yet companies today face a shortage of information workers. And although America's schools are struggling to supply the needed skills, more than 80 percent of our nation's classrooms lack the basic technology tool of a direct Internet connection.

Solution
The Cisco Networking Academies program is a revolutionary partnership between Cisco Systems and schools across the nation. Through a range of information-age teaching media and methods, the Networking Academies goes beyond traditional computer-based education, helping students develop practical computer networking knowledge and skills in a hands-on environment.

Results
In its first full year, the fast-growing program will be giving thousands of students across the nation the school-to-work experience they need to take immediate positions in networking—along with a solid foundation for further study at the college level in highly sought-after technical disciplines.

Benefits and Results

The Cisco Networking Academies program is in its first full year at schools. The pilot semester at one site, Thurgood Marshall Academic High School in San Francisco, provides an indication of the potential impact: more than 15 percent of the students involved in the school's semester program in spring 1997 secured summer jobs as a direct result of their one-semester experience.

And for teachers who have seen the early impact on students and their futures, the Academy stands as a model for school-to-work programs.

Dennis Frezzo, technology instructor at Thurgood Marshall, says, "In one leap, Cisco has helped us have the most effective school-to-work program I've seen locally, and we're proud of that."

"The energy level of these students is so high, it's hard to find the words to describe it," says Barry Williams, who oversees Regional activities for the Round Valley School District in Springerville, Arizona. "Once, about half of my students had permission to leave school about 20 minutes early. But not a single one left. I talked topologies and media for 90 minutes without a break."

Close-Up: Thurgood Marshall Academic High School Section

San Francisco, California

Thurgood Marshall Academic High School (TMAHS) was established in 1994 in the economically underdeveloped southeast corner of San Francisco. Focusing on a math, science, and engineering curriculum, the school gives students a rigorous course of academic study with an abundance of college-prep math, science, and English classes, plus three semesters of computer and technology electives.

The Cisco Networking Academies curriculum has been integrated into one of three areas for concentrated study selected by all TMAHS students after they reach their junior year. Juniors take Cisco I and II, and seniors complete the program with Cisco III and IV, supplemented by projects and courses in related engineering disciplines. "This is above and beyond what we normally do, but we thought this was an incredible opportunity for the kids," says Frezzo.

According to Jai Gosine, another Academy teacher at TMAHS, "Certification is the biggest benefit" for the school's nearly 70 Cisco Networking Academies students, who are spread among three classes. "Potential employers of students who earn their Cisco Certified Networking Associate status will feel comfortable hiring them," he says, "because they'll know these students have acquired a set of practical, valuable skills."

The Networking Academies program is also project-based, with students addressing challenges drawn from the real world of networking and finding solutions that work, not only in theory but in the model networks built and tested in the lab.

"A lot of people use these clichés, but they're really true," says Frezzo, "The old style of teaching was 'the sage on the stage.' Now we're trying to be the 'guide on the side,' helping in counseling and problem solving."

Senior Ricky Jackson notes, "The lessons aren't based on homework or tests so much. We do more hands-on work."

The project-based learning format helps truly instill skills that otherwise might be forgotten soon after the final exam, Jai Gosine explains. "A student's level of learning is determined by the form of assessment. In our case, it's not how much they can regurgitate, but how much they can do." Adds Frezzo: "Projects provide the ultimate in performance assessments. Was the job complete? Did the network work, with no excuses?"

For Jenica Lee, a TMAHS senior with tentative plans to pursue computer science in college, the interactive, project-based format of Networking Academies helps students develop into problem solvers. "I think you learn more, because you encounter problems and have to work through them to figure out the solution," Lee observes. "It's also more fun."

The pride is evident in Ricky Jackson's voice as he describes how, during their first full semester in the Academy, he and 23 fellow team members wired the San Jose Convention Center for the California Community Colleges in Education Foundation Technology Conference. Die-hard students on the project began early on a Sunday, working eight hours with teachers and Cisco mentors to provide state-of-the-art, high-speed Internet access to vendor booths and seminar rooms.

"Vendors, presenters, and the Foundation found it to be an invaluable service," remarked David Springett, the foundation's president. "Cisco's partnership with the high school students demonstrated how private industry's active involvement in education can advance students' skills and future prospects."

"In the advanced courses, the spirit of the curriculum is to make the network self-sustaining and apprentice students to the school district," Gosine says. "There's no way school districts have enough money to hire the expertise they're going to need to maintain stable networks. This is a way to accomplish that goal. It's a win for everyone involved."

Academy students also will be applying their skills in local middle and elementary schools, which "makes the vision of 'Internet everywhere' more attainable," Frezzo says.

Close-Up: Lakes County Service Cooperative, Fergus Falls, Minnesota

Through Lakes County Service Cooperative, an association serving some 35 districts in nine counties in West-Central Minnesota, Networking Academies is finding a home in some fairly out-of-the-way places.

"Most of the Local Academies are at small-town schools like Parker's Prairie, with 350 students in K-12 and about 120 in high school," says Rick Vogt, media coordinator for Lakes County. "It's a tremendous opportunity for them to learn about and experience this technology, which might not otherwise be available—whether they get a job in networking or not."

A can-do attitude took the Networking Academies program from possibility to reality quickly.

"There are lots of reasons you could find not to do something like this," Vogt says. "The attitude of the schools was that they were willing to do what it takes because they felt it was that important. Local Academies found a teacher that they could spare, and they managed to fit the class into their curriculum—some after school, some before school. Some of the teachers even donated time to come for training."

As a major plus, Vogt points to the fact that the curriculum is designed "to industry standards," giving students the real-world networking know-how that institutions need most today.

"The instructional method is at the forefront of technology," he says. "There aren't textbooks that have to be changed all the time. The networked multimedia curriculum shows what's possible with a properly designed network. The exchange of information between Academy instructors, facilitated by Internet connectivity, builds a sense of community and allows the best ideas for teaching the curriculum to be shared nationwide."

"I think it's an exciting program, and the teachers have said the same thing," Vogt reports. "Everybody sees great possibilities."

For students of New Hanover County Schools in Wilmington, North Carolina, the Networking Academies program is both college and career prep.

"There's an immediate benefit for students who just want to go out and get jobs," says Kevin Johnston, a technology instructor at New Hanover High School, who also does double duty as his area's Regional mentor. "They've got a sought-after skill. The second benefit is for students who plan on going to college."

Within Raleigh, North Carolina, is Research Triangle Park, a hotbed for technology companies and home to several universities that welcome Hanover students each year.

"Even if they're going into accounting, Networking Academies students can get better part-time jobs in the summer," he says. "They've got a really good background to start with."

The students also become a "home-grown resource" for designing, building, and maintaining the networks for Hanover itself, Johnston said. On NetDay, the Academy students will fan out across the district to help install networks in middle schools and elementary schools.

Technology-enabled learning is a familiar concept at Hanover, which receives federal funding to participate in the national "virtual school" program for distance learning and Internet communications. Becoming part of the Cisco Networking Academies program was an easy "next step."

For further information on the Cisco Networking Academies program or Cisco support for education networks, visit: www.cisco.com/edu.

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Connecting Students to the Future

– National Commission on Workforce Development

– TECHNOLOGY & ECONOMICS, US Department of Commerce

National Task Force on Basic Mathematics and Science Competencies

US Department of Commerce

Chair: Dr Shoumen Datta

15 September 1998

REPORT

Co-Chairs:

Professor Glenn T. Seaborg, Nobel Prize for Chemistry, University of California, Berkeley

Professor Charles H. Townes, Nobel Prize for Physics, University of California, Berkeley

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Implement Rigorous K-12 Mathematics and Science Education

<u>Solution To America's New Deficit</u>

National Information Technology Workforce Convocation
[12-13 January 1998]

Convocation Sponsored by:

US Departments of Commerce
US Department of Education
US Department of Labor
White House Council of Economic Advisors
Information Technology Association of America
Microsoft
Oracle
Cisco
TRW
AT&T
University of California, Berkeley
<u>EXECUTIVE SUMMARY</u>

A thorough understanding of the principles of mathematics and science are essential to individuals who aim to contribute as a skilled workforce in the interconnected fields represented by Information Technology [IT]. The task force examined the challenge of strengthening mathematics and science skills for potential IT workforce entrants. What level of achievement is necessary for varying job categories within the IT industry? Is there a minimum level of mathematics and science competency necessary for every worker? The report "A Splintered Vision" summarizes the confusion and lack of focus in US mathematics and science education. The following observations appears to be consistent from a preliminary review of K-12 teachers who responded to an ITAA survey:

♦ Very few teachers have access to instructional technology in the classroom [Q #7-10]
♦ Elementary and middle school mathematics were identified as highly important [Q #13]
♦ Reading comprehension, problem solving and analytical skills were highlighted [Q #15]
♦ Mathematics was the focus for IT related professions [Q #16-17]

To address the shortcomings of US mathematics and science education and to address concerns raised by teachers, the task force raises the following issues:

- **Teacher Qualifications:** From elementary school to high school, teachers must be required to have earned at least a bachelor's degree in mathematics or science to qualify as a math or science teacher.
- **Credentialing:** Schools of Education must change their credentialing process in order to better prepare teachers for the classroom.
- **Increased Salaries for Qualified Mathematics and Science Instructors**: To attract, encourage, recruit and retain qualified candidates in the K-12 teaching profession it is essential to increase starting salaries for qualified teachers.
- **Professional Development for Mathematics and Science Teachers:** University based professional development partnerships must be encouraged to improve "content" of in-service teachers.
- **Rigorous Curricular Standards**: To implement the proposed competencies, elected officials, parents, educators and business leaders must insist on rigorous curricular standards in mathematics and science and clear, logical instructional methods to implement those standards by qualified teachers.
- **Project-Based Learning:** Approaches linked to application in business or industry are necessary to stimulate entrepreneurial innovation.
- **Carefully-targeted Corporate and Business Donations:** Corporate and business contributions for community activities may best serve the children by structuring gifts for public K-12 education in a manner that focuses on priority reforms.

In summary, educators, industry leaders and elected leaders need to understand that poor quality of mathematics and science preparation does have an immediate and negative impact. They should use lessons learned from the IT workforce shortage as a welcome impetus to create the type of serious curricular, instructional and structural reforms in mathematics and science education that are long overdue. The negative economic impact from a poorly trained workforce is not an option.

How Well are US Students Performing in Math and Science?

According to a 1992 National Assessment of Educational Progress (NAEP) only 19% of America's 8th graders performed mathematics at a proficient or advanced level. By 1996, the level had risen to 22% only. These 8th graders have now finished high school and are facing a rapidly changing job market where information is the major driving force. Unless something changed radically for these students between 8th grade and graduation, 79% of these students, about 4 out of 5 students probably do not possess the level of mathematics and science competencies needed to participate successfully in the IT job market.

From the 1996 Third International Mathematics and Science Study (TIMMS) we extrapolate that American students are on equivalent levels with students from England and Germany, but nations like Singapore (643), Korea (607) and Japan (605) scored significantly better in mathematics than the average US student (500) or the international average (513). In science, US students (534) were significantly outperformed by students from Singapore (607), the Czech Republic (574), Japan (571) and Korea (565). Even though the US average is far behind these competitor nations, the total school-age population in the US far exceeds these smaller nations. Therefore, in aggregate numbers, US is still able to produce a large pool of graduates with excellent qualifications in mathematics and science. However, our economic engine is also exponentially larger than most competitor nations and the demand for qualified entrants in the IT workforce is almost overwhelming in its scale.

From the data collected by Information Technology Association of America (ITAA) in the report "Help Wanted: IT Workforce Gap at the Dawn of a New Century" and reflected by the experiences of task force members, there are far too few students exiting US secondary education that have the requisite skills and aptitudes to fill the IT workforce shortage.

Definition of IT Worker

The ITAA defines IT as the study, design, development, implementation, support or management of computer-based information systems, particularly software applications and computer hardware. The Task Force used the following definitions from the US Department of Commerce recent report: "America's New Deficit: The Shortage of Information Technology Workers"

- Computer Scientists: Scientists designing computers and conduct research to improve their design, use, development and adapt principles for applying computers to new uses. They are distinguished from other computer professional by the higher level of theoretical expertise and innovation they apply to complex programs and the application of emerging technology.
- Computer Engineers: Engineers working with hardware and software aspects of systems design and development.
- Systems Analysts: Individuals using their knowledge and skills in a problem solving capacity, implementing the means for computer technology to meet the needs of organizations.
- Computer Programmers: People who write and maintain the detailed instructions, called "programs" or "software" that list in logical order the steps that computers must execute to perform their functions.

Areas of IT Workforce Shortage

According to the ITAA report, the shortage of IT workers is spread across a wide array of job categories, each requiring a differing level of mathematics and science expertise and preparation. Respondents did not provide number of positions open in each category, but identified the following job categories with critical vacancies: (1) Operating systems, (2) Database RDBMS (3) Networking and (4) Language applications.

Matching Mathematics and Science Competencies with Job Categories

The task force explored the challenge of strengthening mathematics and science skills for potential IT workforce entrants. What level of achievement is necessary for varying job categories in the IT industry? Is there a minimum level of mathematics and science competency necessary for every worker in the IT industry, for example, a network manager or programmer? The depth of math and science competencies required for specific fields, such as computer science or systems analysis?

From discussion with high school teachers who are well versed in IT and possess university degrees [in engineering, computer science, physics and mathematics] a partial list of skills and related areas were identified as helpful to those high school students preparing for the IT workforce. Teachers highly recommended integration of project-based learning while repeatedly emphasizing need for understanding of "basics" in mathematics and physical sciences as a critical pre-requisite for students who may wish to be a part of the IT workforce that can successfully weather with the rapid pace of technological innovation and subsequent job changes. Thus, for each skill-related area below, we include a brief description of the academic foundation* necessary.

- **Project-based Pre-engineering shop** [eg: applications of robotics]:
  Geometry, simple machines and mechanics, lego designs; chemistry of materials; energy

- **Computer Programming Languages**
  Number theory, set theory, matrices, logic, Boolean algebra, algorithms

- **Internetworking Technologies**
  Algebra, calculus, rate of flow problems, topology; computer communications; optics

- **Analog/digital electronics**
  Trigonometry; electricity, magnetism, heat transfer

- **Database, Spreadsheet Programs; Multimedia Web-applications**
  Statistics; multiple algebraic variables; classification of information; programming

- **Computer-Assisted Design**
  Topology, spatial relationships, visual thinking; circuits

* These and other detailed description of skill standards for information technology for post-secondary candidates are contained in the NSF report *Building a Foundation for Tomorrow* from Northwest Center for Emerging Technologies.

How Much More Mathematics Achievement is Needed to fill the Preparation Gap?

According to the 1996 NAEP mathematics scores, 22 percent of 8th graders performed at a proficient or advanced level. If they *continue* to remain mathematics proficient, these 8th graders will complete high school in 2000 and will represent about 580,000 of the 2,630,000 expected graduates (NCES). Using this graduation rate for 2000-2001, each additional percentile of students that are able to perform mathematics at a proficient or advanced level represents 26,000 students. In order to fill the existing shortfall of 191,000 IT jobs, assuming that all mathematics proficient students opted to enter the IT training pipeline upon graduation, over 29% of graduates would need to perform mathematics at a proficient or advanced level. If you make a modest assumption that half of mathematics proficient students may enter the IT field, then we must produce 382,000 new mathematics proficient performers, a total of 36% graduates performing at the proficient or advanced level on the NAEP tests. These estimates indicate the dramatic degree to which mathematics performance in US schools must improve to adequately address the gap that is fueling the IT workforce shortage. The average mathematics score for 13 year-olds has remained almost constant since 1986, varying between 269 and 273 [1996 score: 272]. Without significant and focused curricular and instructional reform, it is difficult to imagine students improving in mathematics and science performance to the degree needed to fill the IT workforce shortage. An in-depth analysis of science and mathematics education from the 3rd International Math and Science study [TIMSS] echos the concerns of the Task Force about the lack of focus in US education.

COMPETENCIES

With the possibility of a million new jobs created in the area of information technology by 2005, the desired level of competencies are in flux. Just a few years ago, Java was coffee, C was a passing grade and [the only] web masters [were spiders who] had eight legs. Today, experts in Java computing and C programming command the labor market and an army of human web masters keeps information updated on the rapidly expanding World Wide Web.

In 1994 only 1% of women and 3% of men earned bachelor's degrees in computer science. The numbers reflect a 42% *decrease* between 1986 and 1994. One reason for this decline may be found in the Carnegie Foundation survey indicating that 51% of mathematics teachers in public high schools did not take any course in mathematics during their years in college. Elementary and middle school teachers in USA teach mathematics and science, legally, with non-content based, general credentials. The National Center for Education Statistics revealed an almost identical situation among the nation's science teachers who teach science without even having had a minor in science.

Project-based learning particularly in areas of engineering, computer science and technology are essential to understand the application of theory to practice. High school "hands-on" learning experiences provided by the Cisco Networking Academy is a prime example of the combination of academic rigor with real world application beginning at the 9th grade. Cisco Networking Academy was initiated by Cisco Systems at the Thurgood Marshall High School for Science and Mathematics in the San Francisco Unified School District of the City and County of San Francisco, California.

Case Study: Cisco Networking Academy

One particularly appropriate model for creating skilled IT workers is a program developed by Cisco Systems Inc., [San Jose, California] which spans high school and junior colleges. At all levels, students simultaneously proceed through a two-year rigorous academic and "hands-on" training program which makes them eligible to appear for an industry-certified qualifying examination. This program is in operation at several sites including the site of initiation at the Thurgood Marshall Academic High School in San Francisco where students who succeed in the exam will be awarded a certificate from the Cisco Networking Academy. The value of this training is without a parallel.

In the view of this Task Force, it is futile to propose expected competencies, to address the shortage of skilled workforce, without articulating the **KEY** changes that must occur in order to implement the rigorous standards. Without such changes, we may be far from achieving proposed competencies in mathematics and science. In addition, there are several other subjects [geography, economics, music] which are equally important but outside the scope of this report. However, we wish to emphasize the need for advanced reading skills, verbal communication, writing and comprehension.

Areas of Focus to Achieve Competencies

It is well nigh impossible to provide suggestions, which, if adequately implemented, may solve all the problems of K-12 public education and approach the proposed level of competencies. However, in the view of this Task Force, the following **KEY** changes, if implemented, may provide solutions to a significant number of core problems and help stem the deficit of skilled workforce.

- **Teacher Qualifications:** From elementary school to high school, teachers must be required to have earned at least a bachelor's degree in mathematics or science to qualify as a mathematics or science teacher. Knowledge of content and expertise in subject must be an uncompromising pre-requisite for any teacher. Methods and process are important but second to content. Subject credentials granted by schools of education cannot be substituted in lieu of subject area degree. Pedagogical training offered by schools of education may be required in addition to subject area degree for elementary school teacher certification. The latter may not be mandatory pre-requisite for middle and high school teachers.

- **Credentialing:** Schools of Education must change their credentialing process in collaboration with math and science departments. The emphasis on methods and process should be replaced only with essentials of pedagogy that students may acquire while pursuing their bachelor's or master's degree in specific subject area. Classroom management, multi-cultural sensitivity and social issues, essential as they are to create an atmosphere conducive to learning, are best addressed during student teaching in a classroom with support from "mentor" teachers.

- **Increased Salaries for Qualified Mathematics and Science Instructors**: It is vital to increase starting salaries for subject qualified teachers [$30K bachelor's; $45K master's; $55K doctorate's]. Hiring teachers through correspondence with academic institutions and selective advertisement through academic societies are approaches that must be a part of HR recruitment.
- **Professional Development for Mathematics and Science Teachers in the Workforce:** University based professional development partnerships must be encouraged to improve the content base of in-service teachers. Effective classroom teachers who lack adequate training in

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content must be allowed release time to receive training in local colleges or universities to boost the knowledge of the subject they teach. School district operated professional development measures must be restructured to provide meaningful and useful assistance for teachers.

Particular emphasis is required for teacher training in curricular integration of technology. Installing wires and acquiring computers will not improve student outcome or solve the problem of content-poor curricula and systemic lack of rigor. Technology is merely a tool and effective only in the hands of instructors who are core knowledge experts as well as proficient in use of technology. Dual characteristics are difficult to acquire. It requires training contributed by experts in content, multi-media, software, hardware and veteran teachers skilled in delivery and management in the classroom. Resources are required to make effective use of instructional technology suitable for the delivery of content to improve student performance metrics.

- **Rigorous Curricular Standards**: To implement the proposed competencies, elected officials, parents, educators and business leaders must insist on rigorous standards in mathematics and science as well as clear, logical instructional methods to implement those standards by qualified teachers. In the opinion of this National Task Force Committee, the national standards of excellence in mathematics and science advocated by NAS (National Academy of Sciences, US) and AAAS (American Association for the Advancement of Science) are not challenging enough to produce the level of performance among US students that renders them internationally competitive, as reported in "A Nation At Risk" in 1983. Unfortunately, this assessment from 15 years ago [and recent analysis from TIMSS] still rings true: curricula in secondary schools are diluted and homogenized to the point where it has lost its academic purpose. To measure expected competencies and proper implementation of the required curricula, a rigorous national assessment of reading and writing in English, mathematics and science is essential to test the preparedness of K-12 students.

- **Project-Based Learning:** Project-based learning approaches linked to application in business or industry are necessary. Mentorships and internships are helpful to stimulate entrepreneurial innovation and research talent that may be latent in students. Lab-based curricula is also helpful.

- **Corporate and Business Donations:** Corporate and business contributions for community activities may best serve the children by structuring gifts for public K-12 education in a manner that focuses on:
  [a] retaining qualified teachers [summer stipends; creating "chair" positions]
  [b] supporting teachers who return to the university for professional development
  [c] upgrade technology by installing wires, switches, hubs [no cash contributions]
  [d] in-kind hardware and software contributions for access to information technology
  [e] support full-time on-site technology resource for curricular integration
  [f] stipends for tutors in mathematics, science and technology literacy
  [g] install science, engineering, and computer laboratories for project based learning
  [h] fund academic guidance counselors and defined educational field-trips

Case Study: Thomas Jefferson High School

An excellent example of a school that exemplifies some of the ideals identified by the Task Force is Thomas Jefferson High School for Science and Technology, a magnet school in Fairfax, Virginia.

Established in 1985, Jefferson is the result of a partnership between businesses led by the Fairfax County Public School Education Foundation and the school system. This unique public school offers a comprehensive college preparatory program emphasizing science, mathematics and technology. Student selection is a competitive process based on aptitude, test scores, academic achievement, teacher recommendations, essays and self-reported interests and activities. Students entering the program are required to have at least 26 credits for graduation: including five in mathematics, four in science, two in technology, one in computer science and one elective in either mathematics, science, technology or computer science. The school has a lab-based curricula in addition to an active outreach program with local universities, training teachers, student tutoring in elementary schools, web building for businesses and video broadcasts, to name a few.

Curricular Reforms in Science

Physics
It is imperative that teaching of core physics must begin from the 8th or 9th grade. All students must have completed a four year graduation requirement in physics. These competencies will never be achieved if we continue the current practice of teaching physics mostly at the 12th grade. At present, less than 25% of graduating seniors take physics in high school and less than 20% of high school physics teachers possess a bachelor's degree in physics. The proposed competency guide and curricular outline may be based on Feynman lectures [I & II]. It is assumed that students will have adequate foundation in mathematics in order to learn the topics over four years [9-12] of high school physics. Integration of physics with astronomy, cosmology, mathematics, chemistry, biology, medicine and geology is highly recommended. Interesting "hands-on" physics curricula is available from the American Association of Physics Teachers to start the reform process without delay.

Chemistry
Chemistry is the bridge between physical and biological sciences. From rocket fuel to Alzheimer's disease and everything in between has chemistry at its core. It is imperative that teaching of chemistry must begin from middle school or 5th grade. Demonstrations of chemistry must be included in general science teaching from as early as the 3rd grade. At present, few graduating seniors take chemistry and fewer chemistry teachers possess a degree in chemistry. Rigorous mathematics is a necessary and parallel competency that is key to understand chemistry.

Biology
Biology is dependent on biochemistry and biophysics for most of its research. Genetics and medicine, in addition, rely on mathematics and instrumentation (physics). Development of bio-technology has its roots in molecular biology and recombinant DNA technology requires chemical engineering for its commercial success. Biology is an amalgam of physical sciences. It is for this reason the physical sciences must be taught ahead of biology but that is not the current practice. Biology is viewed as an "easy" descriptive subject to "satisfy" science credits. This poor perspective must be replaced with biology championed as the key to exciting frontiers in molecular medicine.

Conclusion

Suggestions made in this report are not new, nor is the analysis of the deficiencies in mathematics and science education original or unique. The impact that these deficiencies on the economy translates to 191,000 unfilled jobs in IT alone and over 2 million high school graduates unable to seize this opportunity because they have been poorly prepared in mathematics and science This lesson from the IT workforce shortage serve as a welcome impetus to create the type of serious curricular, instructional and structural reforms in mathematics and science education that are overdue and necessary for economic growth in USA as well as its role as innovation leader.

National Task Force on Basic Mathematics and Science Competencies

Chairman

Shoumen Datta, President, Associated Scientists

Co-Chairs

Glenn T. Seaborg, Nobel Prize for Chemistry, University of California, Berkeley

Charles H. Townes, Nobel Prize for Physics, University of California, Berkeley

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Acknowledgements

Hundreds of members of the National Task Force and teachers who participated in the effort.

Cisco Networking Academies Program

Through an innovative partnership with school districts across the U.S., Cisco Systems is preparing students for the demands and enormous opportunities of the information economy while creating a qualified talent pool for building and maintaining education networks.

Network switches. Routers. Patch cables and punch-down blocks. RJ-45 jacks. Not your ordinary list of back-to-school supplies. Then again, for students across the country in a unique new curriculum known as Cisco Networking Academies, the Fall '97 semester was anything but your ordinary back-to-school experience.

Now in the early stages of a nationwide rollout leading to international participation, the Networking Academies is a cooperative venture between school districts and Cisco, the world leader in networking for the Internet. In a lab setting that closely corresponds to the real world, students get their hands on the building blocks of today's global information networks, learning by doing as they design and bring to life local and wide-area networks.

This innovative program is a prime example of private industry creating a mutually beneficial relationship with schools—not a short-term fix, but a relationship designed to last because of the lasting benefits it can provide. For Cisco and private industry, the program is a meaningful step toward developing sorely needed technology skills in the next generation of workers. For the schools, Cisco Networking Academies represents vital technology support and resources to supplement limited funds. And for students, Networking Academies is highly relevant preparation for the increasingly technology-dependent economy into which they will emerge.

The Challenge

The information economy will demand an unprecedented level of technology literacy from tomorrow's workers. A few statistics foreshadow a potential crisis in the American workplace:

• Currently, mid- to large-sized companies in the U.S. alone have about 190,000 unfilled technology jobs. And 82 percent of technology companies expect to increase their information technology (IT) staffs in the next several years.

• Nearly 70 percent of technology companies cite a lack of skilled IT workers as a barrier to growth.

• As teachers around the world begin to integrate the vast resources available to them on the Internet and as networks become an important tool for boosting administrative efficiency and communication, education institutions face the same shortage of network-support personnel.

• Schools are under pressure to prepare students with the necessary skills to be successful in the 21st century. Eighty-six percent of America's classrooms lack a direct Internet connection.

CISCO SYSTEMS

Background

In 1993, Cisco embarked on an initiative to design practical, cost-effective networks for schools. It quickly became apparent that designing and installing the networks was not enough—the schools also needed some way to maintain the networks after they were up and running. Cisco Senior Consulting Engineer George Ward developed training for teachers and staff for maintenance of school networks. He soon discovered that the personnel lacked the time required to learn the material, so he moved to the next population of learners in the school—the students themselves. The success of these student seminars led to requests from participating schools across the country for Cisco to develop a curriculum that could be integrated as elective courses taught in a semester format. The formalized curriculum and support activities evolved into the Cisco Networking Academies program.

The concept proved to be a powerful draw for students, many of whom initially volunteered for classes outside normal school hours. Today, thousands of students coast to coast are pioneering a school-to-work program engineered for a new global economy.

The Solution

Through the Cisco Networking Academies program, high school and college students can learn the information needed to prepare them for the Cisco Certified Networking Associate exam. This certification positions them for immediate openings in a talent-hungry job market or for engineering- and science-focused college studies. In a nutshell, Cisco Networking Academies is a complete, four-semester program on the principles and practice of designing, building, and maintaining networks capable of supporting national and global organizations.

Cisco provides course work for a complete range of basic through advanced networking concepts—from pulling cable through such complex concepts as subnet masking rules and strategies.

The program uses Regional Academies as hubs, each of which supports a minimum of ten Local Academies. These Regional Academies teach the teachers who oversee programs at the Local Academies under their jurisdiction. The Regional Academies funnel input to Cisco on topics such as individual school performance, curriculum quality and effectiveness, and student progress.

The format for the classes reflects the content: interactive lessons stored largely on the classroom's Cisco MicroWeb server. The academy design also accommodates diverse learning styles. For those who learn by reading, text is available. More-visual learners can focus on the course material's extensive graphics and QuickTime movies. To promote development of the personal skills that underpin successful careers, projects require students not only to resolve technical issues, but also to successfully address network users' needs.

Local Academies receive mentoring and technical support from the Regional Academies and are backed by SMARTnet™ services, a service and support program that provides a round-the-clock access to assistance from Cisco's Technical Assistance Center (TAC) and the Cisco Connection Online (CCO) Web site, plus major software and maintenance releases, product documentation updates and next-day delivery of replacement parts.

EXECUTIVE SUMMARY

Challenge
The American economy runs on information—yet companies today face a shortage of information workers. And although America's schools are struggling to supply the needed skills, more than 80 percent of our nation's classrooms lack the basic technology tool of a direct Internet connection.

Solution
The Cisco Networking Academies program is a revolutionary partnership between Cisco Systems and schools across the nation. Through a range of information-age teaching media and methods, the Networking Academies goes beyond traditional computer-based education, helping students develop practical computer networking knowledge and skills in a hands-on environment.

Results
In its first full year, the fast-growing program will be giving thousands of students across the nation the school-to-work experience they need to take immediate positions in networking—along with a solid foundation for further study at the college level in highly sought-after technical disciplines.

Benefits and Results

The Cisco Networking Academies program is in its first full year at schools. The pilot semester at one site, Thurgood Marshall Academic High School in San Francisco, provides an indication of the potential impact: more than 15 percent of the students involved in the school's semester program in spring 1997 secured summer jobs as a direct result of their one-semester experience.

And for teachers who have seen the early impact on students and their futures, the Academy stands as a model for school-to-work programs.

Dennis Frezzo, technology instructor at Thurgood Marshall, says, "In one leap, Cisco has helped us have the most effective school-to-work program I've seen locally, and we're proud of that."

"The energy level of these students is so high, it's hard to find the words to describe it," says Barry Williams, who oversees Regional activities for the Round Valley School District in Springerville, Arizona. "Once, about half of my students had permission to leave school about 20 minutes early. But not a single one left. I talked topologies and media for 90 minutes without a break."

Close-Up: Thurgood Marshall Academic High School Section

San Francisco, California

Thurgood Marshall Academic High School (TMAHS) was established in 1994 in the economically underdeveloped southeast corner of San Francisco. Focusing on a math, science, and engineering curriculum, the school gives students a rigorous course of academic study with an abundance of college-prep math, science, and English classes, plus three semesters of computer and technology electives.

The Cisco Networking Academies curriculum has been integrated into one of three areas for concentrated study selected by all TMAHS students after they reach their junior year. Juniors take Cisco I and II, and seniors complete the program with Cisco III and IV, supplemented by projects and courses in related engineering disciplines. "This is above and beyond what we normally do, but we thought this was an incredible opportunity for the kids," says Frezzo.

According to Jai Gosine, another Academy teacher at TMAHS, "Certification is the biggest benefit" for the school's nearly 70 Cisco Networking Academies students, who are spread among three classes. "Potential employers of students who earn their Cisco Certified Networking Associate status will feel comfortable hiring them," he says, "because they'll know these students have acquired a set of practical, valuable skills."

The Networking Academies program is also project-based, with students addressing challenges drawn from the real world of networking and finding solutions that work, not only in theory but in the model networks built and tested in the lab.

"A lot of people use these clichés, but they're really true," says Frezzo, "The old style of teaching was 'the sage on the stage.' Now we're trying to be the 'guide on the side,' helping in counseling and problem solving."

Senior Ricky Jackson notes, "The lessons aren't based on homework or tests so much. We do more hands-on work."

The project-based learning format helps truly instill skills that otherwise might be forgotten soon after the final exam, Jai Gosine explains. "A student's level of learning is determined by the form of assessment. In our case, it's not how much they can regurgitate, but how much they can do." Adds Frezzo: "Projects provide the ultimate in performance assessments. Was the job complete? Did the network work, with no excuses?"

For Jenica Lee, a TMAHS senior with tentative plans to pursue computer science in college, the interactive, project-based format of Networking Academies helps students develop into problem solvers. "I think you learn more, because you encounter problems and have to work through them to figure out the solution," Lee observes. "It's also more fun."

The pride is evident in Ricky Jackson's voice as he describes how, during their first full semester in the Academy, he and 23 fellow team members wired the San Jose Convention Center for the California Community Colleges in Education Foundation Technology Conference. Die-hard students on the project began early on a Sunday, working eight hours with teachers and Cisco mentors to provide state-of-the-art, high-speed Internet access to vendor booths and seminar rooms.

"Vendors, presenters, and the Foundation found it to be an invaluable service," remarked David Springett, the foundation's president. "Cisco's partnership with the high school students demonstrated how private industry's active involvement in education can advance students' skills and future prospects."

"In the advanced courses, the spirit of the curriculum is to make the network self-sustaining and apprentice students to the school district," Gosine says. "There's no way school districts have enough money to hire the expertise they're going to need to maintain stable networks. This is a way to accomplish that goal. It's a win for everyone involved."

Academy students also will be applying their skills in local middle and elementary schools, which "makes the vision of 'Internet everywhere' more attainable," Frezzo says.

Close-Up: Lakes County Service Cooperative, Fergus Falls, Minnesota

Through Lakes County Service Cooperative, an association serving some 35 districts in nine counties in West-Central Minnesota, Networking Academies is finding a home in some fairly out-of-the-way places.

"Most of the Local Academies are at small-town schools like Parker's Prairie, with 350 students in K-12 and about 120 in high school," says Rick Vogt, media coordinator for Lakes County. "It's a tremendous opportunity for them to learn about and experience this technology, which might not otherwise be available—whether they get a job in networking or not."

A can-do attitude took the Networking Academies program from possibility to reality quickly.

"There are lots of reasons you could find not to do something like this," Vogt says. "The attitude of the schools was that they were willing to do what it takes because they felt it was that important. Local Academies found a teacher that they could spare, and they managed to fit the class into their curriculum—some after school, some before school. Some of the teachers even donated time to come for training."

As a major plus, Vogt points to the fact that the curriculum is designed "to industry standards," giving students the real-world networking know-how that institutions need most today.

"The instructional method is at the forefront of technology," he says. "There aren't textbooks that have to be changed all the time. The networked multimedia curriculum shows what's possible with a properly designed network. The exchange of information between Academy instructors, facilitated by Internet connectivity, builds a sense of community and allows the best ideas for teaching the curriculum to be shared nationwide."

"I think it's an exciting program, and the teachers have said the same thing," Vogt reports. "Everybody sees great possibilities."

Close-Up: New Hanover County Schools, Wilmington, North Carolina

For students of New Hanover County Schools in Wilmington, North Carolina, the Networking Academies program is both college and career prep.

"There's an immediate benefit for students who just want to go out and get jobs," says Kevin Johnston, a technology instructor at New Hanover High School, who also does double duty as his area's Regional mentor. "They've got a sought-after skill. The second benefit is for students who plan on going to college."

Within Raleigh, North Carolina, is Research Triangle Park, a hotbed for technology companies and home to several universities that welcome Hanover students each year.

"Even if they're going into accounting, Networking Academies students can get better part-time jobs in the summer," he says. "They've got a really good background to start with."

The students also become a "home-grown resource" for designing, building, and maintaining the networks for Hanover itself, Johnston said. On NetDay, the Academy students will fan out across the district to help install networks in middle schools and elementary schools.

Technology-enabled learning is a familiar concept at Hanover, which receives federal funding to participate in the national "virtual school" program for distance learning and Internet communications. Becoming part of the Cisco Networking Academies program was an easy "next step."

For further information on the Cisco Networking Academies program or Cisco support for education networks, visit: www.cisco.com/edu.

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NEWSPAPER CLIPPINGS

EDITORIAL -- Tien's Alternative To Affirmative Action

Tuesday, January 2, 1996

IT WOULD HAVE been easy enough to accept the end of affirmative action at the University of California as a bad decision by the board of regents and leave it at that, but UC Berkeley Chancellor Chang- Lin Tien is not one to acquiesce quietly.

The public got a taste of the popular chancellor's polite but fierce determination at the July 20 meeting in which the regents voted 14-10 to abolish university hiring and admissions policies that consider race. Firmly but respectfully, Tien, a strong advocate of affirmative action, addressed Governor Wilson directly, challenging the chief executive's stance against policies that take ethnicity into account.

That confrontation may have hurt Tien's chances to be named the new UC president, but it held intact his well-earned reputation for valuing principle over expediency.

Keeping in character, Tien also did not wait for orders from on high before developing a plan to maintain a commitment to ethnic diversity at the prestigious Berkeley campus in spite of the regents' decision.

Two months after the regents' vote, Tien unveiled The Berkeley Pledge, a program designed to ensure that minority or low-income public school students will be eligible to attend Berkeley. Besides committing $1 million of university money to the program, Tien pledged $10,000 a year of his own salary, for at least three years.

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In addition, the Pledge calls for principals of elementary and high schools to identify promising students for whom UC Berkeley outreach efforts

--such as special summer sessions, mentoring by professors and vigorous recruitment -- could make the difference between eligibility or ineligibility for admission to Berkeley.

And it includes a promise to try to raise $60 million for scholarships as well as to make sure that minority and poor students recruited and admitted to Berkeley get the academic support they need to prevent them from dropping out.

As reported by Chronicle staff writer Nanette Asimov, the philosophy behind the Pledge already is showing signs of working in San Francisco schools, thanks to Shoumen Datta, the district's creative director of development. Datta has created a board of 23 scholars -- including 17 Nobel Laureates -- to act as academic guides for both teachers and students. Taking the idea of the Pledge, Datta is molding it to the needs of San Francisco students who might otherwise have fallen through the cracks.

Officials at other UC campuses, as well as administrators and teachers at the elementary and secondary level, would do well to follow the examples of Tien and Datta, who are demonstrating a commitment to finding opportunities for minorities who are underrepresented at UC -- even while others make their jobs more difficult.

PAGE ONE -- UC Berkeley Is Taking The `Pledge'
An alternative to affirmative action

Monday, December 25, 1995

[Nanette Asimov, Chronicle Staff Writer](#)

``Education,'' writes Nelson Mandela, ``is the great engine of personal development. It is through education that the daughter of a peasant can become a doctor, that the son of a mine worker can become the head of the mine, that a child of farmworkers can become the president of a great nation.''

The freedom-fighter-turned- president is discussing his native South Africa, but his words describe a universal truth with special meaning in California.

Since the University of California regents voted in July to end affirmative action in student admissions by 1997, many educators have come to fear that the ``great engine of personal development'' will sputter and stall for thousands who would have relied on affirmative action as a means of entering the prestigious university system.

To help them -- and to hold on to the diversity that affirmative action ensured -- Bay Area educators are coming together to offer students a different kind of leg up: opening the doors of one campus, UC Berkeley, and lending the expertise of its professors to students and teachers through mentorships, summer school, vigorous recruitment, scholarships, Internet resources and teacher-training fellowships.

UC Berkeley Chancellor Chang-Lin Tien calls the plan the ``Berkeley Pledge'' and has committed $1 million a year, including $10,000 of his salary, for at least three years.

The money will not fatten school budgets, said Vice Chancellor Carol Christ, but will go directly into programs meant to whet the academic appetites of students of all backgrounds.

``The use of racial and ethnic preferences was a very efficient way of creating diversity on campus and is a tool that we wish we still had,'' Christ said.

But without it, Pledge developers want to create alternatives to help disadvantaged students compete for university admission on equal footing.

By using the money for science workshops, chemistry clubs, math groups, writing projects and other programs that lend university smarts to public school classrooms, educators say the Pledge will also improve learning itself.

``We have no illusions that Berkeley is going to go out there and resolve the problems that permeate kindergarten through 12th grade,'' said Jesus Mena, the university spokesman. ``But we do think that Berkeley can spark that change.''

S.F. AHEAD OF THE GAME

Several Bay Area school districts -- including Oakland, West Contra Costa and Berkeley -- have expressed interest in joining with the university under the Berkeley Pledge. But Christ and others said San Francisco is already far ahead in this area, even though the details of the Pledge have not yet been worked out.

That is because San Francisco has a secret weapon: a molecular biologist named Shoumen Datta. Hired as the district's development director in March, Datta's goals coincide with those of the Berkeley Pledge: ``To bridge the gap between university culture and public school culture,'' he said.

Born in Calcutta, where he lived on the same block as

Mother Teresa, Datta grew up to study at Princeton and Rutgers, and to teach at Harvard and the Massachusetts Institute of Technology.

American universities are world-renowned, he said, but they rarely share their brains and resources with their country cousins, the public schools. Nor do schools, in desperate need of a scholarly infusion, take advantage often enough of a university's treasures.

``It is as if we have a golden dome with wobbly pillars,'' said Datta.

To help strengthen those pillars, the scientist has forsaken a lucrative career in industry.

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``Doing this is not my job,'' he said. ``This is my mission.''

ADVISORY BOARD

The Berkeley Pledge is providing support, but Datta is helping to invent the Pledge as he goes along.

For example, he created an academic advisory board for San Francisco schools like none the district has ever had. Twenty-three noted scholars make up the list -- including 17 Nobel Laureates, from economist Kenneth Arrow of Stanford to physicist Kenneth Wilson of Ohio State.

This constellation of the nation's greatest brains comes straight from Datta's personal address book. Through him, all have agreed to make themselves available to teachers needing scholarly advice. And through him, teachers seeking grant money and curriculum assistance now have valuable friends directly connected to such academic societies as the American Physical Society and the National Academy of Sciences.

The challenge, said Datta, will be for urban teachers to

take advantage of the offerings of these groups, as wealthy suburban school districts routinely do.

``You should see what they're doing with physics in the Palo Alto schools!'' Datta said. ``We can do that, too.''

NOBEL LAUREATE'S VISIT

Professor Charles Townes of UC Berkeley has already spent two days in San Francisco schools talking to students, teachers and parents about the work of physicists and astronomers. Townes won the Nobel Prize for Physics in 1964 for his work in developing the laser. Today, he believes that urban schools are brimming with unrealized potential.

``If students are well-prepared, they will not be discriminated against in entering college,'' Townes said. ``But that puts a lot of pressure on the public schools -- and on parents, teachers, you and me -- to help them.''

Under the Berkeley Pledge, busy professors have agreed to help by becoming the mentors of teenagers. Datta calls the program the ``Interactive University,'' because students and experts will be able to communicate by e-mail.

Teenagers may be considered reluctant pupils, but Datta said it was sometimes easier to get them to participate than the adults. After phoning ``400 or 500'' professors, Datta came away with a stable of 75 scholarly volunteers from UC Berkeley. Now he is trying Stanford University, which has so far declined to participate.

STUDENT SURVEY

Meanwhile, the students are enthusiastic. At Thurgood Marshall High in San Francisco's multicultural neighborhood of Bayview Hunters Point, the Class of '98 filled out a survey asking which of 35 academic

areas intrigued them enough to seek a mentor in that field. Oddly, teaching was not on the list.

The most popular area was medicine, attracting 32 of 147 students. Other favorites were engineering, law, music, computers and science of all kinds.

Fifteen-year-old Eric Estipona chose mechanical and civil engineering. No one in Eric's family is an engineer, so having professional advice will help, he said.

``I'll ask my mentor, `What does a mechanical engineer do?' and `What type of skills do they need?' '' Eric said.

``I'll probably also ask what they earn.''

. . . .

Top-Notch Teachers Are Key to Better Schools

Joanne Jacobs

The student came from a low-income Mexican immigrant family. She grew up in a Los Angeles barrio.

"How did you get to UC–Santa Barbara?" her roommate asked.

"It was my third-grade teacher, Mrs. Menzer," she replied. Then she wrote a letter of thanks to Diana Menzer.

The student will graduate in June with a degree in Spanish. She's not sure about a career, except that teaching is out. She doesn't have it in her to be a teacher, the letter said.

Menzer will retire at the end of the year. Who will replace her?

California schools already can't find enough qualified people to teach reading in elementary classrooms of 20 students, or to teach math, chemistry, and physics to middle and high school students. With rising enrollments and retirements, we'll need 250,000 new teachers in the next 10 years.

Furthermore, teachers will need to know more and do more than ever before to help students meet the state's demanding new academic standards. So we need smart, educated teachers.

"The largest predictor of student achievement is teacher expertise and qualifications," says Stanford Education Professor Linda Darling-Hammond, who chairs the National Commission on Teaching and America's Future. "It's not rocket science. What the teacher knows and can do has an effect on what the student will be able to learn."

Researchers have looked at scores on licensing exams, units of teacher training completed, and whether the teacher has a bachelor's or master's degree in the field taught. Consistently, teachers with more education in their subject, and in how to teach, have students with higher achievement scores.

In short, teachers can't teach what they don't know. And they can't teach what they do know until they've learned how to manage a classroom, motivate students, and break down concepts so students with limited English, learning problems, and poor preparation can understand.

Educating teachers—both in subject matter and in teaching strategies—is "the single most effective use of an additional dollar," Darling-Hammond says, citing research results. It's far more effective than reducing class size.

So what are California's leaders doing? To lengthen the school year by a few days, the Legislature cut time for teacher training.

At the same time, California is pouring money into reducing class sizes in kindergarten through third grade, increasing the demand for elementary teachers, and making it even harder for urban schools to find qualified teachers.

Enthusiasts for class-size reduction point to Tennessee, where lowering class size to 15 raised achievement. But there was no teacher shortage in Tennessee, no need to compromise on teacher quality to put an adult in every classroom.

"Good teachers produce good students" is the motto of the newly created San Francisco–based Endowment for Excellence in Education (e-mail: gates2excellence@hotmail.com).

Director Shoumen Datta envisions offering stipends to math and science graduates to raise entry-level teaching pay to $36,000 for a bachelor's degree, $40,000 for a master's. The endowment also would pay to send teachers who never studied what they're teaching back to college to strengthen their understanding of the subject matter.

But, so far, the corporate donations aren't flowing in.

Datta was a university scientist and teacher before working in San Francisco Unified as special assistant to the superintendent. He chaired the task force on math and science education for the National Information Technology Workforce Convocation, and formed Associated Scientists, with Nobel laureate Glenn Seaborg, to develop state science standards.

Knowing how challenging the new standards are, Datta is especially worried about elementary teachers' science mastery. Teaching the parts of a flower and the life cycle of the butterfly won't cut it anymore.

Half of California's math and physical science teachers didn't major or minor in the subject. How can schools hire college graduates with math and science degrees when the booming high-tech economy is of-

fering more money, more recognition, more control over their work? After all, schools don't give stock options.

Money isn't the primary issue, says Datta. He lured talented young scientists into teaching in San Francisco. But frustration with bureaucracy drove them out of the classroom and into high-tech industry.

More important than raising teacher pay is raising teachers' ability to be effective, says Darling-Hammond. "The challenge is to create school environments where teachers can do the job well."

The good news is that Gray Davis, who longs to be California's education governor, has named a former teacher, Gary Hart, as his chief education adviser. After serving in the Legislature, where he chaired the Senate Education Committee, Hart became co-director of the California State University Institute for Education Reform, which has focused on ways to recruit, train, retain, and retrain good teachers.

Hart understands that teacher quality is job one for California schools. He will back credentialing reforms, funding for on-the-job help for new teachers, intensive training for experienced teachers.

The hardest challenge will be to make public schools places where the best and brightest can put their talents to use.

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School Unions Shortchange Students

La Rae G. Munk

"When school children start paying union dues, that's when I'll start representing the interests of school children." These candid words attributed to the late Al Shanker, longtime president of the American Federation of Teachers, remind us of an important but often-forgotten

SFGate.com

PAGE ONE -- School Speaker Series Has Nobel Intentions

Nanette Asimov, Chronicle Staff Writer

Monday, February 5, 1996

Glenn Seaborg, who went from a poor corner of Los Angeles to Berkeley and collected a Nobel Prize along the way, sees no reason why other inner-city students cannot do the same.

``It's easy! Try it!'' urged Seaborg, a towering octogenarian who in 1951 shared the world's most prestigious science prize with Edwin McMillan for their discovery of plutonium -- the stuff of nuclear weapons and interplanetary space exploration.

The famed University of California at Berkeley chemist spoke recently to an auditorium of restless 14- and 15-year-olds at San Francisco's Thurgood Marshall High School as part of the ``Distinguished Speakers Series,'' California's first program to bring Nobel laureates into the schools.

Although most of the scientific references Seaborg laid on the teenagers flew by them at the speed of electrons in a linear accelerator, educators believe his presence alone can inspire students in scholarly directions.

``The content may sometimes seem lofty, but some of it will rub off,'' said Principal Sam Butscher of Marshall High, where science and math reign supreme.

Sparkling with Nobel laureates and other accomplished academics, the free lectures that began quietly last September are open to the public.

A year of speakers

A dozen speakers hailing from Stanford to Harvard are scheduled to visit city schools over the next year to tell true-life tales of working with recombinant DNA, subatomic physics, world peace and more.

Educators would prefer to tout the series with bullhorns and ticker-tape, but there is no money to pay the speakers much less advertisers, said Shoumen Datta, a molecular biologist who created the program in his role as development director for city schools.

``The achievements and vision of the individuals in this series are beyond the yardstick of human measure,'' said Datta, who has also brought in Nobel laureates Charles Townes, who discovered the laser, and Kenneth Arrow, developer of the ``impossibility theorem'' of economics, as well as William Fletcher, a U.S. appellate court judge who was President Clinton's roommate at Oxford.

``In a society where sports and entertainment preoccupy most adolescents, it may be worthwhile

to infuse some enthusiasm for less glamorous but vital forces of civilization -- like education,'' he said.

Lineup of brilliance

Few educators even dream of scoring a lineup that includes some of the most brilliant brains of this century. But Datta, 35, has done it before: He started a smaller version at one Boston school before bringing his ideas for a grander program to San Francisco.

He simply opens his personal address book and contacts the friends he acquired along his own academic journey through Cambridge, Harvard and the Massachusetts Institute of Technology -- as well as Princeton and Rutgers, where he earned his doctorate in molecular biology in 1989.

Datta's association with Nobel laureates goes back even further. Born in Calcutta, he grew up down the street from Nobel Prize-winner Mother Teresa, a friend.

`faith, optimism and wisdom'

``I went to these people seeking personal inspiration and got faith and optimism and wisdom,'' said Datta of the Nobel laureates he has met. ``When they relate to you as human beings, that's a tremendous driving force. And that's what I want to bring to these students.''

Yet most American teenagers seek inspiration in television, not in rubbing elbows with, say, an 83-year-old scientist. Seaborg showed where they could be wrong.

At Marshall High he offered the drama of a treasure hunter: He had co-discovered 10 chemical elements. He offered celebrity: ``Seaborgium'' -- element 106 -- was named for the chemist, who has advised every president since Franklin D. Roosevelt. He offered heroism: His mother was dying of thyroid disease when he discovered iodine-131, a radioisotope that saved her life and that of countless others. And he offered controversy: His discovery of plutonium has placed the world on nuclear tenterhooks for more than half a century.

`meeting the presidents'

``The part about the elements was a little confusing,'' admitted Cynthia Guerrero, 15, who like most people doesn't know her cyclotrons from her cycasins. ``But it got interesting when he showed the slides about meeting the presidents.''

Robert Watson, a tall 14-year- old, said he had no trouble following Seaborg's talk. ``I learned more about the periodic table.''

``I was asleep,'' said a classmate.

Although many teachers are impressed with Datta's efforts, not all teachers welcome them.

In heralding Seaborg's visit, for example, Datta broadcast via e- mail that Seaborg co-wrote the seminal education report ``A Nation at Risk'' in 1983, was chancellor of UC Berkeley and headed the Lawrence Berkeley Laboratory and Lawrence Hall of Science. And he mentioned that Seaborg discovered plutonium.

One teacher shot back this message: ``Nuclear power plants, etc. (are) a horrible threat to the environment. Why would I want to see somebody speak who is involved with that?''

Datta shot back a message of his own: ``Your ignorance is frightening!'' He sent the teacher a thick packet about Seaborg and invited her to attend the talk and evaluate the scientist for herself.

For all his boldness, though, Datta read the teacher's response to the material with some trepidation.

``I'm glad you took the time to inform me,'' she told him. ``This is what education is about.''

About the lectures

To find out about future lectures in the ``Distinguished Speakers Series'' of the San Francisco public schools, call Shoumen Datta at (415) 759-2950, or send a note to sdatta@sfusd.k12.ca.us by e-mail.

http://sfgate.com/cgi-bin/article.cgi?f=/chronicle/archive/1996/02/05/MN46432.DTL

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New Twist in Science Panel Furor Glenn Seaborg will help state set standards

Thursday, January 29, 1998

[Pamela Burdman, Chronicle Staff Writer](#)

SACRAMENTO -- In an apparent attempt to quiet the furor over science standards for California's public schools, Governor Pete Wilson has named Nobel-winning chemist Glenn Seaborg to a state commission that will choose the standards.

Seaborg, past head of the Atomic Energy Commission and a former University of California at Berkeley chancellor, became mixed up in the debate last November. That's when he and two other Nobel laureates joined a team of scientists who were offering to write the standards for free.

But the state's Commission for the Establishment of Academic Content and Performance Standards rejected their offer in favor of a $178,000 bid from a competing team that also boasted top scientists

--and one Nobel winner -- but was heavy on educators.

The groups had competing philosophies, with the Nobel-studded team focused on science basics and the other team more concerned with teaching methods.

After a complaint from the Nobel team, the commission decided last month to revisit its decision. Rather than choose one team, last Friday the commission said it was asking the two groups to work together.

Wilson's appointment of Seaborg appears to strengthen

the hand of those advocating a nuts- and-bolts approach to teaching science. But the governor's announcement didn't mention the controversy, instead focusing on Seaborg's long list of accomplishments as a scientist.

Seaborg, a Lafayette resident, is the associate director-at-large of the Lawrence Berkeley National Laboratory and chairman of the Lawrence Hall of Science since 1984. He has been teaching at UC Berkeley since 1939, and served as chancellor for three years.

He holds more than 40 patents, and with colleagues discovered 10 elements, including number 106, which was named ``seaborgium'' last year.

In addition, Seaborg co-authored the seminal report ``A Nation at Risk'' in 1983, which inspired a decade of educational reforms.

Seaborg will chair the science subcommittee of the standards commission.

He said yesterday he is seeking ``an emphasis on basics and fundamentals . . . not so much emphasis on trying to relate science in unmeaningful ways to modern life and not so much emphasis on educating teachers in methods of teaching rather than in subject matter.''

But he said the controversy over science standards appears to have calmed down.

``I think we're going to coordinate and satisfy both sides,'' he said. ``I think that's perhaps one of the reasons the governor appointed me.''

Freiburg, Kiel and Frankfurt, have now also started going through their files to check for derecognition of doctorates and injustice in general in Nazi times.

Each university is proceeding in a different way, but all are checking every case individually. "We cannot and we do not grant a general rehabilitation," says Christian Winter, the vice-president of Frankfurt University.

"It is most important to discriminate between those who lost their titles on racial or political grounds and those who lost their titles on genuine criminal grounds."

Universities have found that it is not always easy to discriminate between the possibilities. Some cases are clear. For example, if the grounds for divestment of title were given simply as homosexuality or disloyalty to the Nazi regime, no longer crimes today, then rehabilitation would be automatic.

But if an academic was stripped of his or her title because of a financial offence, then the exact nature of the offence becomes important. Genuine criminal grounds were not unusual. Of 59 persons stripped of doctorates by Hamburg University, for example, eight were involved in genuine crime, including murder.

In the eastern part of Germany, some universities remain unaware of the issue — Rostock learned of its involvement only after being contacted by *Nature*. Other universities say they lack the resources to carry out time-consuming investigations.

For most of those affected, the efforts come far too late. Many have died, and it is difficult to track down those who are still alive. Aware of this, Munich University, in its 1996 statement reversing its own derecognition of 135 academic titles, described it as "first of all a gesture for the bereaved" with which the university "faces its responsibilities arising from its history". **Matthias Strobl**

Honour regained: the author Thomas Mann was stripped of his honorary doctorate by the University of Bonn in 1936. It was returned to him on the university's initiative in 1946.

Nobel laureates in bid to revamp science teaching

[SAN FRANCISCO] A group that includes ten Nobel laureates will learn shortly whether it has been successful with its offer to restructure academic standards for California's science curriculum. The move follows a decision last month by a state commission to reopen a process under which the group's bid had earlier been rejected.

The Nobel prizewinners include such well-known names as David Baltimore, Glenn T. Seaborg, Henry Taube, Dudley Herschbach and Paul Berg, and the group is keen to counteract what its members regard as a 'dumbing down' trend in science education. It seeks to emphasize fundamental concepts and to ensure that schools produce competent students who will go on to science studies in colleges and universities.

The group says it would insist on well-written textbooks, scientifically trained teachers, better salaries for instructors, and a focus on basic scientific concepts and mechanisms. It suggests that students should begin physics in ninth grade (at 14 years of age), for example, and graduate with an understanding of Newton's laws of dynamics, elasticity, linear systems, electromagnetic mass, the laws of thermodynamics, and quantum behaviour, among other topics.

The group also proposes that students should start chemistry lessons in fifth grade and learn the periodic table and classification of elements, solubility, chemical equilibrium, atomic structure, chemical kinetics and thermochemistry, as well as other topics. In biology, it says, the emphasis should be on genetics and molecular biology.

The group argues that vague approaches to teaching science that fail to challenge students turn them off science and help create an environment where, for example, only 3 per cent of men and 1 per cent of women graduating from US universities have degrees in computer science.

Over the past decade, the number of students graduating in computer science in the United States has dropped by nearly a half, despite burgeoning job opportunities. Scientists must step forward to improve science education and to help lure more financial backing for better teaching laboratories, according to the group.

"(Scientists) are equipped and motivated to insist on teaching fundamentals and basics," says Seaborg, professor of chemistry at the University of California at Berkeley and a former chairman of the Atomic Energy Commission. Seaborg says that science deserves special attention in schools because so much of the job market now requires scientific or technological expertise.

Seaborg: 'go back to basics in teaching'.

"Technology firms are hurting because they can't find people with elementary scientific knowledge," he says; even those in other fields need a basic understanding of science in order to perform adequately as citizens. Seaborg was the lead author of a 1983 report, *A Nation at Risk*, which detailed educational weaknesses and stimulated a wave of reforms.

The group, which calls itself Associated Scientists, was put together by Shoumen Datta, a molecular biologist who has been active in various education initiatives. Datta says he hopes that curriculum reform in California will stimulate a transformation of teaching methods throughout the country, helping to instil a general standard of excellence in US schools. "We are against the 'process, process' mentality in schools," he says, instead of a focus on accurate content.

Associated Scientists resubmitted its offer to shape academic standards, which it has said it is prepared to do at no cost, shortly before Christmas after a protest had forced the state commission for academic content and standards to rescind the offer of a contract made to another group.

The Institute for Science Education at California State University, San Bernardino, made up primarily of professional educators, had originally won the assignment with a bid costing $178,000. One member of the commission's assessment team had explained its decision to award the contract to this group by saying the Nobel laureates "wouldn't know a classroom if you put it in front of them".

Marci McFadden, spokeswoman for the commission, subsequently argued that Associated Scientists had not included sufficient details about the education experience of its members, or the mechanisms by which they planned to accomplish their work. But when the State General Counsel informed the commission it had acted improperly in offering the contract to the San Bernardino institute, the bid process was reopened.

Final proposals were received in the week before Christmas, and the award to the winning contractor is due to be announced by 15 January. It is widely expected that the two teams will collaborate on the project, combining the San Bernardino group's expertise in education techniques with the Nobel laureates' knowledge of science. **Sally Lehrman**

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Debra Saunders Banner

DEBRA J. SAUNDERS -- New Science: Chill And Kill

Friday, July 4, 1997

DEBRA J. SAUNDERS

PRETEND YOU'RE an educrat drafting science standards for public schools. You know that skeptical parents, wary school board members and pesky columnists believe that you are dumbing down education. You believe these boobs unfairly paste your reforms as trendy mumbo jumbo, while you know that you are pushing students to think for themselves and be more learned than they were in the drill-and-kill era.

Knowing that your many critics believe that your standards are toxic fluff, and yearning to be taken seriously, you:

a. Draft standards based on what you call ``Big Ideas,'' -- read: trite truisms -- such as ``Big Idea 2'' under Inquiry and Nature: ``Science is a human endeavor.''

b. List under ``Big Idea 2'' amorphous, politically-correct standards that have little to do with science, as in: ``Every student demonstrates knowledge that men and women have made contributions to science.'' (grades

K-2)

c. Write a Big Idea 2 grade 3-5 standard: ``Every student demonstrates knowledge that men and women from different cultures have made contributions to science.''

d. For grades 6-8, follow with: ``Every student demonstrates a knowledge of the many individuals and cultures that have contributed to the traditions of science.''

e. Conclude with a non-standard for grades 9-12: ``Scientists are influenced by societal, cultural and personal beliefs and ways of viewing the world. Science is not separate from society but rather science is a part of society.''

f. All of the above.

The answer: F. Witness draft -- I emphasize the word at the request of one of the California Science Education Advisory Committee authors -- science standards compiled for state schools chief Delaine Eastin for her pet ``challenge schools'' project. (A spokesman for Eastin said yesterday that the department has yet to examine them.)

The draft standards aren't all fuzzy. The Life Science draft suggests that 3rd through 5th graders understand human organs and how breathing works and be able to compare how different types of birds feed. Students in grades 6 through 8 might build models of molecules and compare the conductivity of water with salt, baking soda or vinegar.

Of course, science standards ought to specify things students should be able to do at a given grade. Whereas this draft gives only ``examples'' of things students could do, but fails to list which content all should know.

And it is too centered on activities. It's not per se wrong to suggest K-2 students ``observe and describe the changes in popcorn as it is popped,'' but it's awfully time consuming.

Activities, however, rule. K-2 students measure air temperature ``at different times of the day.'' Children

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in grades 3-5 make cookies, then ``describe how hot and cool cookies differ.'' Elementary school students could ``observe and describe the evaporation of a cup of water.'' (That'll really excite the kids about science.) For physics, 3-5 students can ``observe and record the time it takes an ice cube to melt under a variety of conditions.'' That's not exciting exploration, it's watching ice melt -- chill and kill.

Then there's the political correctness. As in the grade 3-5 assignment for kids to look at nearby housing and, ``If there is an endangered species affected by the buildings, discuss whether or not the houses should be built there.''

Or another ``Big Idea:'' ``The high level of our technological capacities and the rapid pace of technological developments challenge human abilities to balance benefits and risks.'' As Dr. Shoumen Datta of San Francisco Unified School District marveled in a letter to Eastin, ``Who wrote this, the Unabomber?''