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**CSU Mathematics and Science Teacher  
Recruitment and Preparation Summit  
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TOPIC: Alliances among K-16 educators, professionals and local communities in support of recruiting and preparing mathematics and science teachers and advancing math and science teach as a career.

The problem of insufficient mathematics and science teachers is not simply defined nor simply resolved.

- As we know, there is no magnetic attraction for students to study mathematics and science—and there is little incentive for them to stay in the teaching profession in these fields when the private sector offers more resources.
- In a recent survey of students who took the SAT, only 17% of boys planned a career in the Science, Technology, Engineering and Mathematics (STEM) areas, and, even worse, only 7 % of girls.
  - This does not indicate an inability to do the work or an aversion to all science.
    - For example, last year, 80% of the students at UC Davis School of Veterinary Medicine were women and this year 100 of 122 (82%) are women. Clearly, there is an attraction to veterinary science.

Thus, I suggest, if there is a realized attraction to STEM, the numbers will grow.

You have heard President Gordon's and President Baker's presentations about essential elements in addressing this issue.

- The other leg of the stool involves all of us who teach these disciplines, who recruit and motivate students, and who support these career choices.
- There has been much talk for years about seamless education from P-16—now we must be sure to implement it.
  - To solve this problem of a dearth of mathematics and science educators we must put away our separate identities and all take on the shared mantle of educators.
  - We must put aside any inclination to point fingers or lay blame, clearly unproductive—it is time to pull together and focus our collective efforts.

A recent Rand Corporation study of 10th graders found that while most expected to graduate from college, only half took a college preparatory academic program. The vast majority of students could perform simple arithmetic, but just two-thirds showed mastery of decimals and fractions. When it came to more advanced math, only one percent of the students demonstrated proficiency.

Consider also the following:

- Many high schools are resource poor, lacking the teachers and courses to prepare students in advanced mathematics and science.
- In 2003 American 12th graders ranked near the bottom of 21 nations participating in the Third International Mathematics and Science Survey.
- Only 40% of American workers have the technical skills and understanding required by employers.
- U.S. Business spends \$62 billion per year to upgrade basic skills.

Combine these data with the increasing international pressure on fluency in STEM disciplines for success in the 21<sup>st</sup> Century world and the problem is clearly identified.

So, how might we go about forming alliances?

- Attitude—all of us in the educational community need to leave our egos and our turf at the door and focus on our mission: improved mathematics and science skills.

- And, secondly, reaching out—Universities often can be seen as intimidating factors, so it is advisable for us to take first steps, respecting our partners in community colleges and school districts and even building on their initiatives as well.

I'll offer two illustrations from several of how we at California State University Channel Islands (CSUCI) are trying to form effective alliances.

The first illustration comes with the support of the Boeing Company. It is a new proposal for a Center for Science and Mathematics Education, a coordinated effort to develop new and expedited pathways, to increase the numbers of math and science candidates in existing programs and to increase candidates from traditionally underrepresented groups. The Center has targeted three groups: undergraduates and transfer students; credential holders of multiple subject and single subject credentials; and career changers.

To accomplish this, CSUCI has established successful partnerships with regional community colleges for the content preparation of math and science educators through yearly meetings hosted on our campus for community college faculty to meet with CSUCI faculty in the same disciplines, through the Ventura County Community College Life Science Outreach Program, as well as through jointly created courses in Education

In addition, CSUCI's partnerships with industry such as the Boeing Company and regional biomedical companies for resources and educational partnerships for state of the art technology and applications will benefit this program.

1. We will coordinate outreach and recruiting efforts to disseminate information to current CSUCI students, local high schools, community colleges, and science industry and retiring military professionals; and will do this utilizing current students, our Business and Technology Partnership Advisory Board, and the California Lutheran University-CSUCI Mathematics Project which provides advanced training to high school teachers in mathematics.
2. We'll also develop awareness of financial incentives for first generation students and for underrepresented students and help them apply for these funds. Through these efforts we find that among our math program graduates to date, 57% are from traditionally underrepresented groups

(Mexican and African American). Many of these students have entered or are preparing to enter the credential program.

3. To address the obstacle of preparation we'll expand subject matter preparation options by providing foundational-level mathematics, CSET preparation courses in math and the sciences (general science, biology, chemistry, and physics) and offer these courses in a variety of formats including face-to-face, hybrid, and on-line during summers and the regular semester.
4. We're also creating a blended undergraduate credential program model as an expedited pathway for traditional undergraduate students to receive their credentials.
5. As a basis for this program, CSUCI has created a professional mathematics and science education community to stimulate mentoring, role modeling, and research, sharing best teaching practices in the local K-16 community through:
  - California Lutheran University-CSUCI Mathematics Project.
  - Special workshops planned in conjunction with the Ventura County Superintendent of Schools Office and in consultation with teachers throughout the county.
  - Business and Technology Partnerships' Advisory Board.

The second illustration is the Amgen Alliance of Educational Partnerships. Hands on use of exciting and state of the art equipment can help pique students interest in sciences and begin to move them toward careers in this area and in education.

CSUCI was interested in addressing the inadequate access of science students enrolled at regional two-year and four-year institutions to state-of-the-art instrumentation for the visualization and characterization of chemical and biological species. Specifically, none of the local community colleges is able to provide students with access to X-Ray Crystallography (X-Ray), Nuclear Magnetic Resonance Spectroscopy (NMR), Gas Chromatography-Mass Spectrometry (GC-MS), and Computer-Aided Molecular Visualization (CAMV). These four techniques are used extensively by biologists, chemists, and biochemists hired into regional technology, pharmaceutical, and biotechnology companies and other high-technology industries and are essential in the contemporary curriculum.

Since nearly two-thirds of CSU Channel Islands students transfer from local community colleges, students who attend the local community colleges do not receive the high technology exposure that might attract them to science and the teaching of science.

So, a partnership among CSUCI, Amgen, and Community Colleges: Oxnard College, Ventura College, Moorpark College, Pierce College, and Santa Barbara City College; Private Colleges/ Universities: California Lutheran University, Westmont College, and Pepperdine University made this happen.

The goals are:

1. To develop a regional facility at CSU Channel Islands for local Educational Partners, consisting of the regional community colleges and private universities, to access state-of-the-art instrumentation;
2. To train community college and private college/ university faculty and students in the use of these instruments and their applications in instruction and research; and
3. To provide community college, private college/ university, and CSU Channel Islands faculty and students with virtual access to the molecular characterization laboratory for at least five years.

In conclusion:

Tomorrow's teachers are in today's classrooms; the skills that these students develop and the attitudes toward math and science that they acquire will help determine not only the educators of the future, but will affect the performance of our economy and the success of our democratic society in the twenty-first century.

The work of these alliances involves networking, cooperating and supporting. Through these efforts the community alliances and community participants will germinate programs that support new approaches to education. CSU Channel Islands, and others in the CSU system are here to help nurture these efforts and to work as partners in the state and local community.

Finally, I suggest two priorities for CSU campuses:

- Strengthen the pipeline by working with our educational partners and alliances so that students are prepared to become fluent in mathematics and science.
- Re-frame the attraction of mathematics and science:
  - 2006 –We need to frame the opportunities in mathematics and science in a way that motivates.

There are two significant issues facing California in expanding the number of highly qualified mathematics and science teachers:

A new poll shows that parents don't share the corporate community's sense of urgency about improving science and math education in the U.S.

Business, government and education leaders have identified more rigorous math and science education as crucial to the nation's economic competitiveness. In the survey, however, 57 percent of parents say the amount of math and science taught in their child's public school is "fine." At the high school level, 70 percent of parents are satisfied with the amount of science and math education.

In elementary schools, far from seeing shortcomings in math and science education, parents believe that schooling has improved in those areas. In a 1994 poll, 52 percent of parents identified a lack of math and science as a serious problem in their local schools. Now, only 32 percent perceive such a problem—and that is a problem.

To solve this problem, we must:

- Educate the parents
- Restore the wonder. When children are very small, the world around them is wondrous. However, as they progress through the years of education, they lose it and find mathematics and science forbidding instead of exciting. Together, in California, through our alliances and partnerships we need to foster the wonder and excitement that lies in discovering and understanding the world—of science—and the reward of teaching others to find their wonder rewarding.