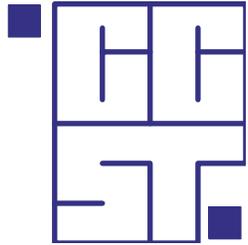




This workforce solution was funded by a grant awarded under Workforce Innovation in Regional Economic Development (WIRED) as implemented by the U.S. Department of Labor's Employment and Training Administration. The solution was created by the grantee and does not necessarily reflect the official position of the U.S. Department of Labor. The Department of Labor makes no guarantees, warranties, or assurances of any kind, express or implied, with respect to such information, including any information on linked sites and including, but not limited to, accuracy of the information or its completeness, timeliness, usefulness, adequacy, continued availability, or ownership. This solution is copyrighted by the institution that created it. Internal use by an organization and/or personal use by an individual for non-commercial purposes is permissible. All other uses require the prior authorization of the copyright owner.



California STEM Education and the American Competitiveness Agenda

Susan Hackwood

California Council on Science and Technology

June 28, 2006

RISING ABOVE THE GATHERING STORM

Experts recognize a serious problem...

Employing America

for a Brighter

Economic Future

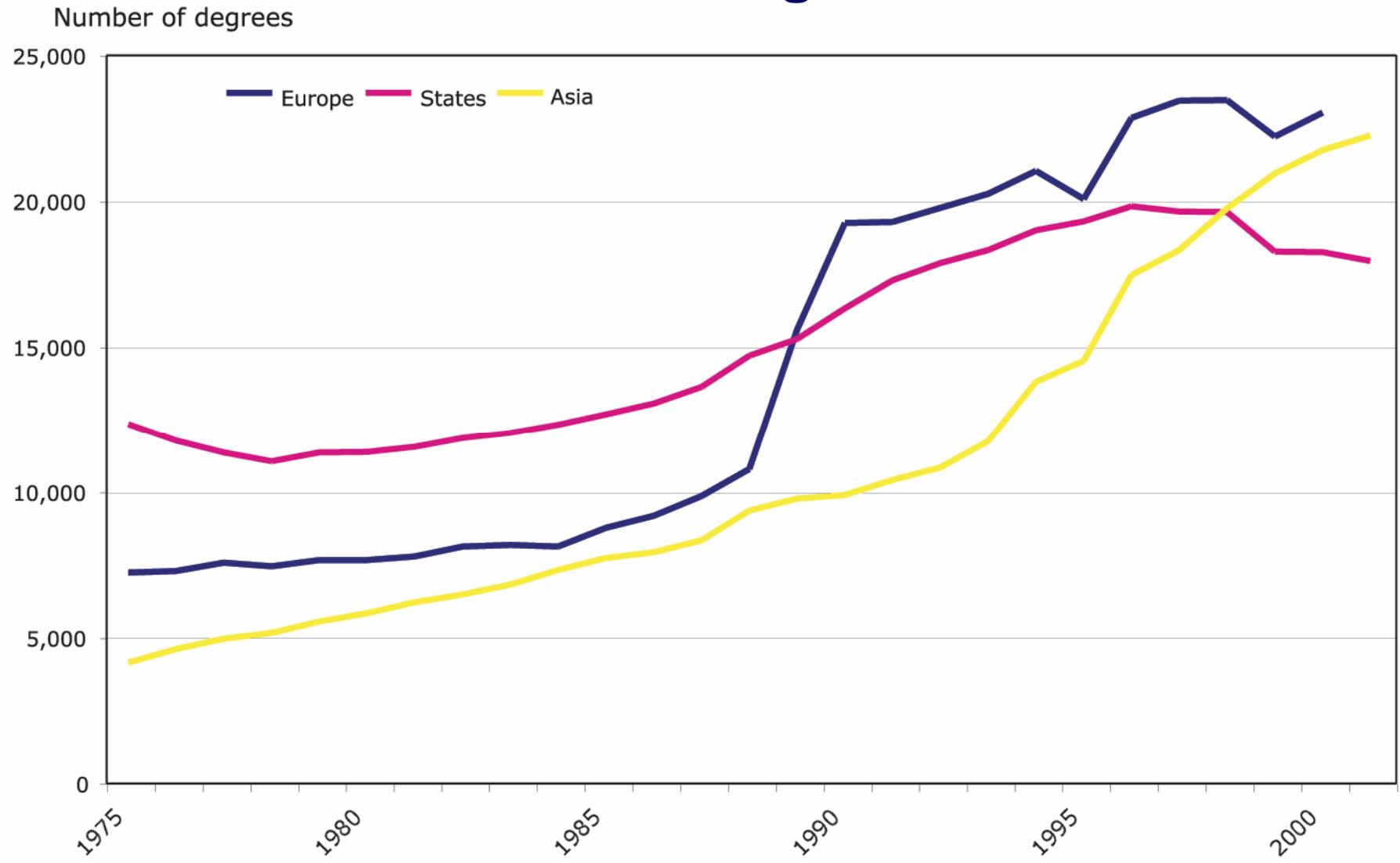
“...Many people assume that the United States will always be a world leader in science and technology, [but] this may not continue to be the case... We fear the abruptness with which a lead in science and technology can be lost -- and the difficulty of recovering a lead once lost, if indeed it can be regained at all.”

-The National Academies

“Rising Above the Gathering Storm”

NATIONAL ACADEMY OF SCIENCES,
NATIONAL ACADEMY OF ENGINEERING, AND
INSTITUTE OF MEDICINE
2005
OF THE NATIONAL ACADEMIES

United States lags Europe and Asia in producing advanced degrees



Source: Science and Engineering Indicators, National Science Board, Figure 2.38, (2004).

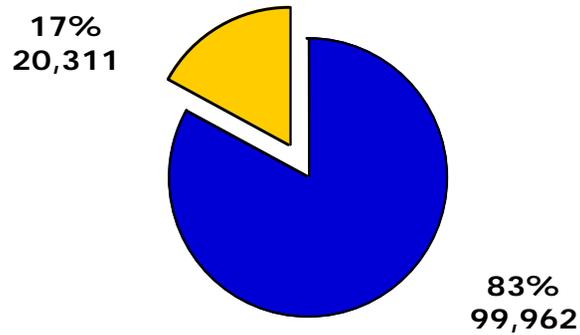
California: a serious situation.....

America's science and math education system a major problem, especially acute for an S&T leader such as California.

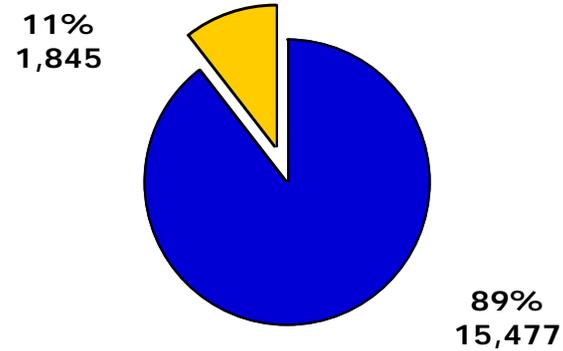
- **2003, CA economy was the fifth largest in the world - now slipping China (including Hong Kong) is catching up.**
- **Forty years ago, public education system was the envy of the nation and world**
- **Today, CA ranks**
 - **Bottom quartile of bachelor's degrees conferred per 1,000 18 to 24 year olds**
 - **72% of high school graduates took biology, 39% chemistry; 18% physics; 13 percent took earth science.**

Total Overall Degrees vs. SMET Degrees and Total Overall Latino Degrees vs. Latino SMET Degrees 2000 and 2004

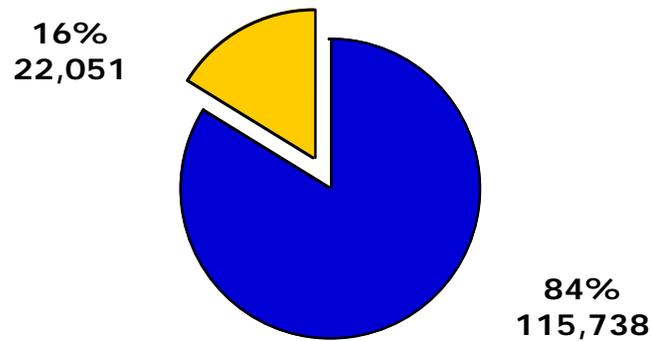
SMET Degrees - 2000



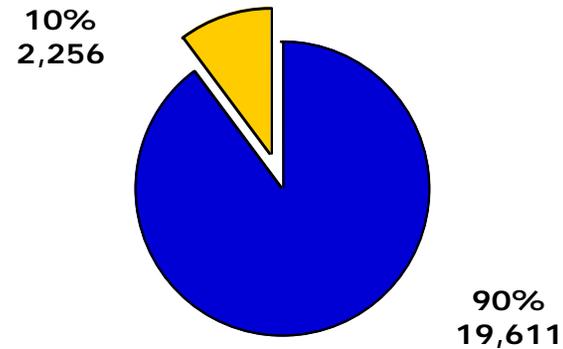
Latino SMET Degrees - 2000



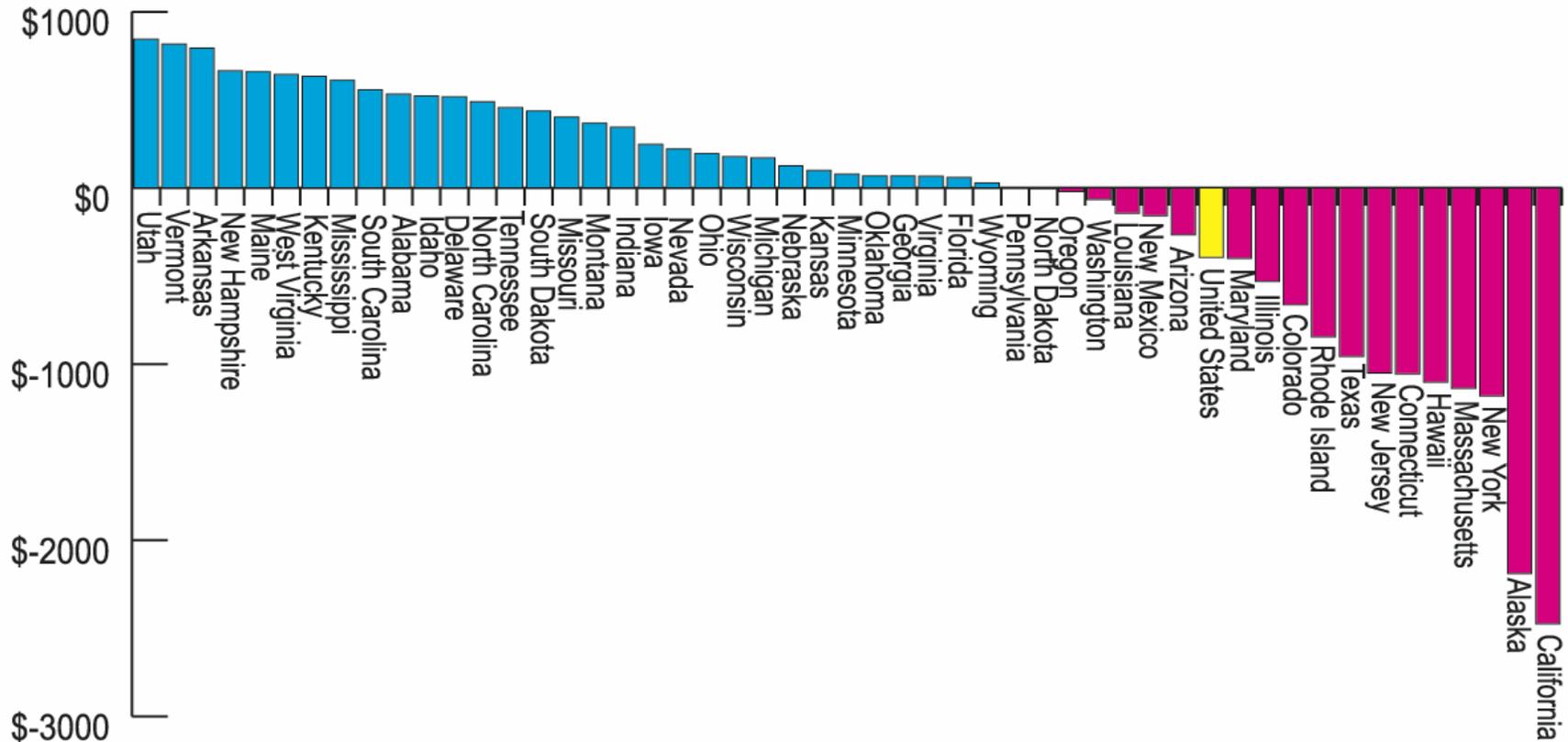
SMET Degrees - 2004



Latino SMET Degrees - 2004



Projected Change* in Personal Income Per Capita, 2000-20 (In 2000 Dollars)



*Projected change in personal income is based on the annual personal income by age group (15 years and older) and race/ethnicity in 2000 and the population projections by age group and race/ethnicity in 2020.

Source: U.S. Census Bureau, 2000 Census and 1995 population projections

American Competitiveness Initiative - ACI

- **President Bush introduced the ACI to keep American strong and secure by ensuring that the U.S. continues to lead the world in science and technology**
- **FY07 - commits \$5.9B including \$1.3B in new funding and \$4.6B in tax incentives**
 - **Doubles, over 10 years, funding for innovation-enabling research at NSF, DOE Office of Science and NIST**
 - **Modernizes the research and experimentation tax credit - making it permanent**
 - **Strengthens K-12 math and science education**
 - **Reforms workforce training**
 - **Supports comprehensive immigration reform**

Protecting America's Competitive Edge - PACE

- **Comprehensive package of legislation focused on maintaining the U.S. competitive edge**
- **Would greatly increase federal investment in math and science education, basic science and energy research, and R&D tax incentives**
- **Incorporated in 3 bills:**
 - **S2197 PACE Energy Act**
 - **S2198 PACE Education**
 - **S2199 PACE Finance**
- **PACE Acts implement the 20 recommendations contained in the National Academies' *Rising Above the Gathering Storm* report**

PACE Education

- **Primarily aimed at the Department of Education and the NSF**
- **Creates new scholarships for students studying math and science -- especially new teachers**
- **Promotes AP-IB math and science courses in high schools**
- **Creates new research grants**
- **Development of Science Parks**
- **Immigration/Visas for doctoral students**
- **Strengthen basic research at DoD**

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GOVERNOR ARNOLD SCHWARZENEGGER

April 27, 2006

Karl Pister, Ph.D.
Board Chair
Lawrence Papay, Sc.D.
Council Chair
California Council on Science and Technology
1130 K Street, Suite 280
Sacramento, California 95814

Dear Dr. Pister and Dr. Papay,

The Strategic Growth Plan described in my State of the State address laid out ambitious goals for California. My intent was to offer leadership for the state to move forward in key areas to both revitalize our economy and ensure that strong physical and educational infrastructures are in place to innovate, compete, and meet the challenges that lie ahead.

My vision for California is complementary in several important ways to the recommendations put forward by the National Academies in its report "Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future," wherein the National Academies recommended to the nation specific actions that can best strengthen the quality of life in America.

The California Council on Science and Technology (CCST) is especially well positioned to help the State understand its capabilities and to recommend strategies to meet these goals.

To that end, I would like to request that CCST use its resources – experts in all fields of science and technology who are committed to a strong and vibrant California economy – and report back to me on how the State can better understand and use the assets at its disposal to build the infrastructure needed to lead the economy of the future.

I believe that with concerted effort supported by higher education, business, industry, CCST and its affiliates, California will achieve the goals of my Strategic Growth Plan and at the same time, lead the nation in responding to the issues raised by the National Academies.

My staff will contact you shortly to talk about ways that CCST might help to move this ambitious agenda forward in a timely way.

Sincerely yours,

Arnold Schwarzenegger

STATE CAPITOL • SACRAMENTO, CALIFORNIA 95814 • (916) 445-2841

Role in mobilizing a California response to *Rising Above the Gathering Storm*

Governor has requested that CCST help California respond to the National Academies report

“I would like to request that CCST use its resources – experts in all fields of science and technology who are committed to a strong and vibrant California economy – and report back to me on how the State can better understand and use the assets at its disposal to build the infrastructure needed to lead the economy of the future.”

CEO-Lead Task Forces to focus on *Gathering Storm* recommendations

- **A:** Increase California's talent pool by vastly **improving K-12 science and math education**
- **B:** Sustain and **strengthen California's commitment to long-term basic research** with the potential to maintain the flow of new ideas that fuel the state's economy, provide security, and enhance quality of life
- **C:** Make California the most attractive setting in which to study and perform research so that we can develop, **recruit, and retain the best and brightest**
- **D:** Ensure that California is the **premier place in the world to innovate**; invest in downstream activities such as manufacturing and marketing; and create high-paying jobs by modernizing intellectual property policies, realigning tax policies to encourage innovation, and ensuring affordable broadband access

“Rising Above the Gathering Storm” recommendations

- **Education the first recommendation**
- **Actions recommended:**
 - **Annually recruit 10,000 science and math teachers by awarding 4-year scholarships**
 - **Strengthen the skills of 250,000 teachers through training and education programs at summer institutes, in master’s programs, and AP and IB training programs**
 - **Enlarge the pipeline by increasing the number of students who take AP and IB science and math courses**

PARTNERS



- **First state-level teacher advisory council, working in cooperation with National Teacher Advisory Council**
- **Valuable and previously absent connection between teaching community and policymakers**

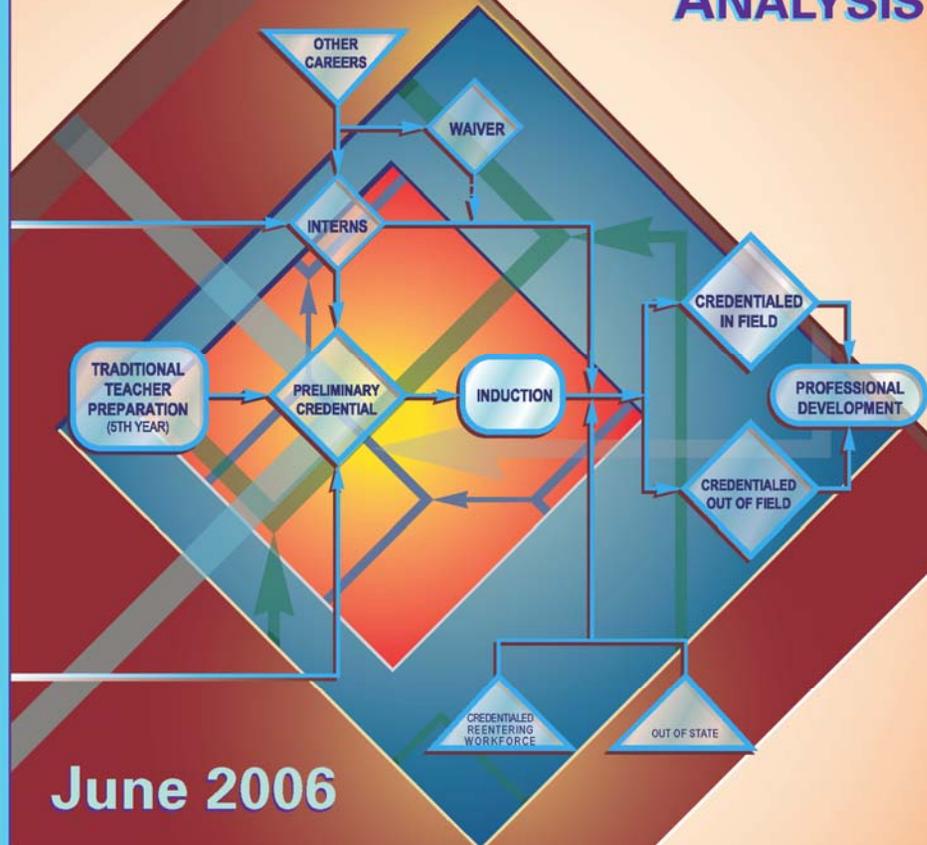


Cal TAC Members:

Stan Hitomi, Chair
Janet English, Vice-Chair
John Peter Arvedson
Anne Marie Bergen
Sandie Gilliam

Javier Gonzalez
Glenn Hunt
Juliana Jones
Suzanne Nakashima
Barbara Shannon
Mark Stefanski

CALIFORNIA'S MATH AND SCIENCE TEACHER SHORTAGE: A CRITICAL PATH ANALYSIS

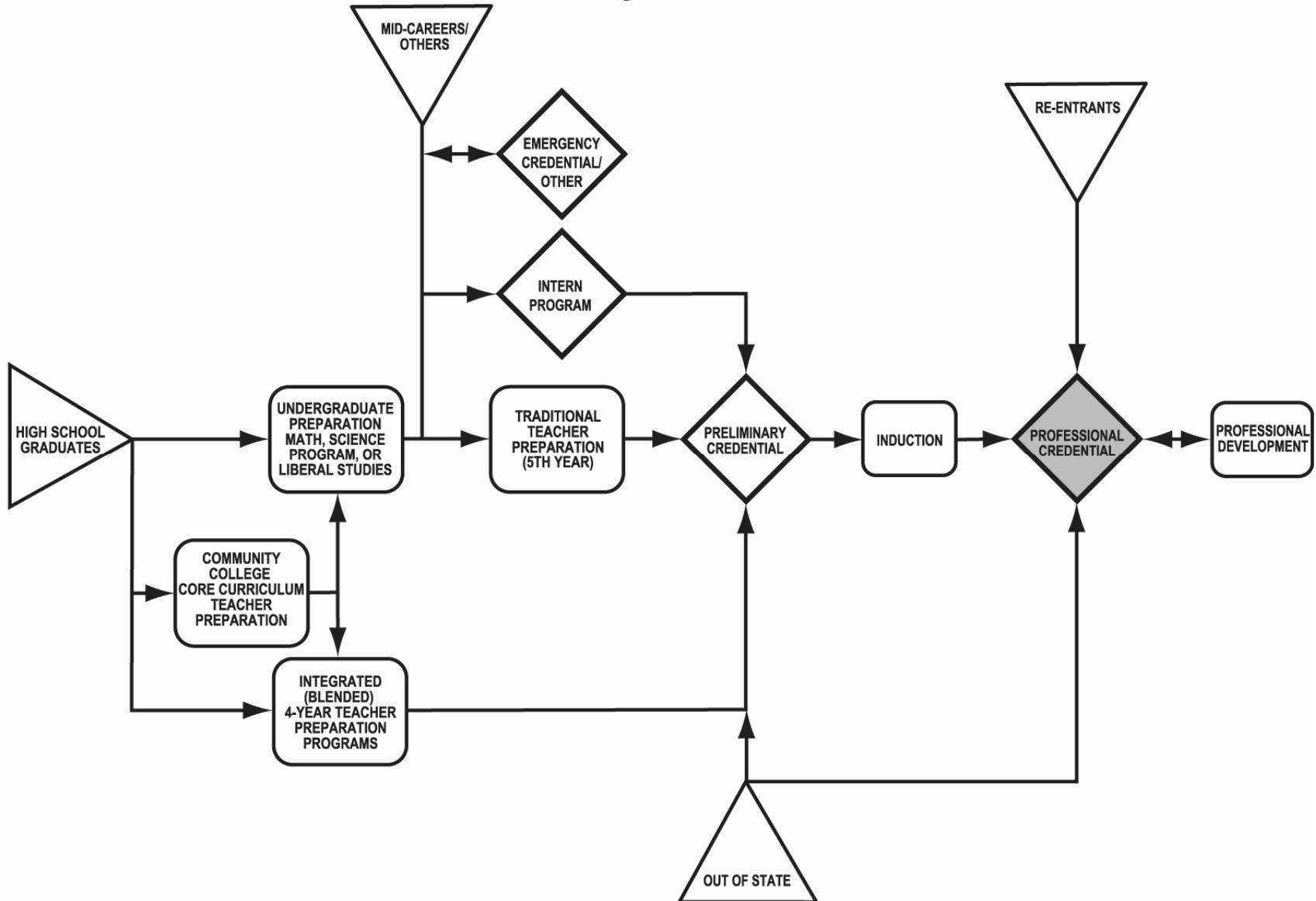


June 2006

CALIFORNIA COUNCIL ON SCIENCE AND TECHNOLOGY

- Assess supply and demand for science and math teachers
- Describe math and science teacher production system
- Current recruitment strategies
- Preparation pathways and certification
- Factors influencing retention
- Professional development

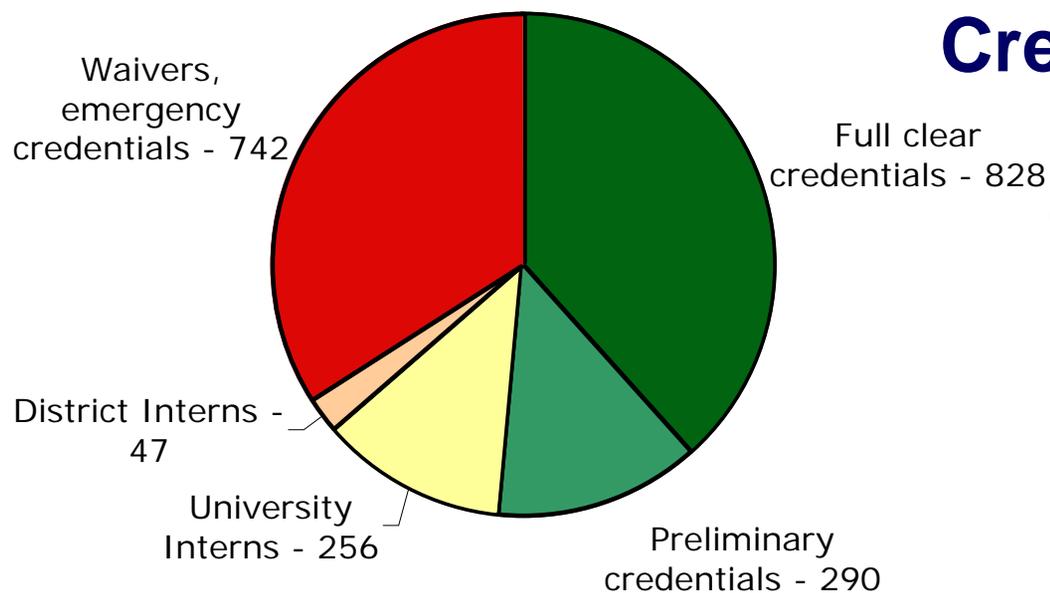
Schematic flow diagram of teacher production system



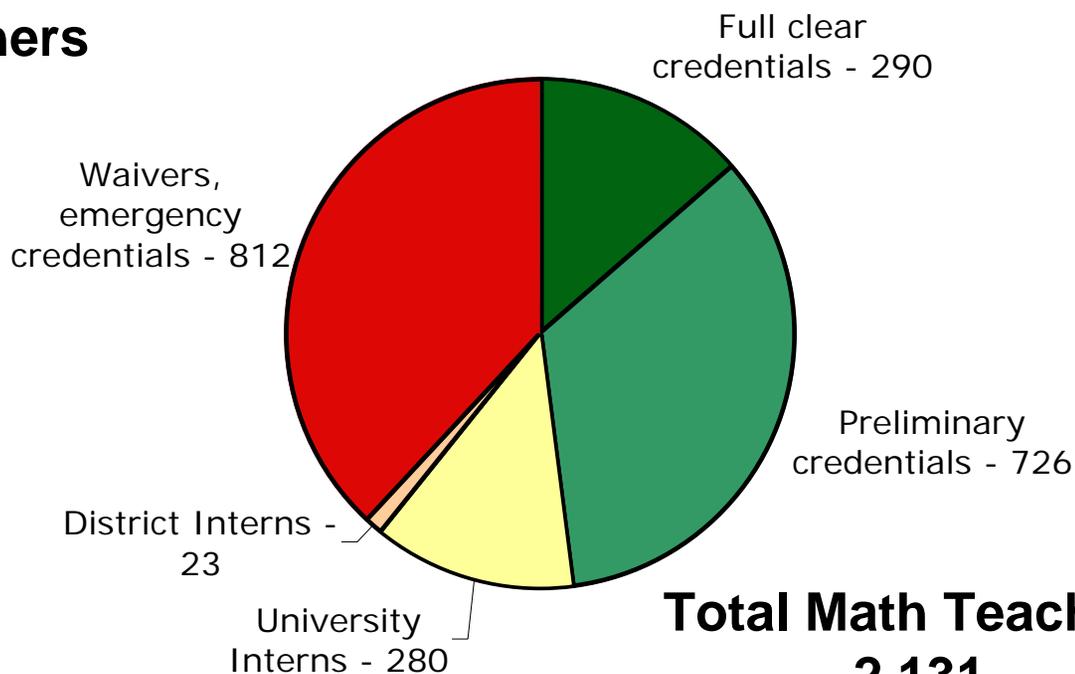
What the data say

- **On average, 25% of science and math teachers in California schools are not qualified to teach their assigned subjects**
- **However, 50% of incoming science and math teachers are not fully qualified; the overall percentage of underprepared science and math teachers is growing**
- **California currently needs over 4,000 new math and science teachers a year**
- **Annual demand could double with impending wave of retirement - 1/3 of teaching force (100,000 teachers) older than 50**

Credential breakdown of math and science teachers in California hired in 2003-04



Total Science Teachers
2,163



Total Math Teachers
2,131

Industry and Federal Labs have a crucial role to play

- **Professional development programs**
- **Teacher education programs - opportunities to fund proposals in CSU, UC teacher preparation**
- **Industry and Lab's voices can give state-level policy reforms the impetus they need**
- **Industry and Labs can help bring together funding for outreach - missing element in 2003 effort**

Developing a Dual Employment Track for Math and Science Teachers

- **Summer internship, co-op and employment opportunities in industry and federal labs for math and science students, student teachers and teachers**
- **Workshops and field trips**
- **Mentoring by industry and federal lab professionals**
- **Assistance in developing lab experiences for students**

Examples of Business Support for Math and Science Teachers

- **Scholarships for undergraduate students in STEM fields and for math and science teacher candidates.**
- **Programs through which scientists and engineers mentor new teachers.**
- **Professional development programs for math and science teachers.**
- **Scholarships for experienced teachers to obtain National Board Certification.**

PARTNERS

These facilities already impact CA education



Examples:

- **Lawrence Livermore: Collaboration with 816 faculty (half from California), 500 students**
- **Lawrence Berkeley: Collaboration with 212 faculty, 343 students**
- **JPL: Collaboration with 523 faculty and students**
- **Summer training courses and internships for high school students (Livermore, Sandia, Berkeley, Ames)**
- **Curriculum materials (all six)**