

Plenary Session - Update on Engineering in K-12 Education:

A View from a College of Education

Michael E. Spagna, Ph.D.

Dean, Michael D. Eisner College of Education
California State University, Northridge

Engineering Deans Institute 2012

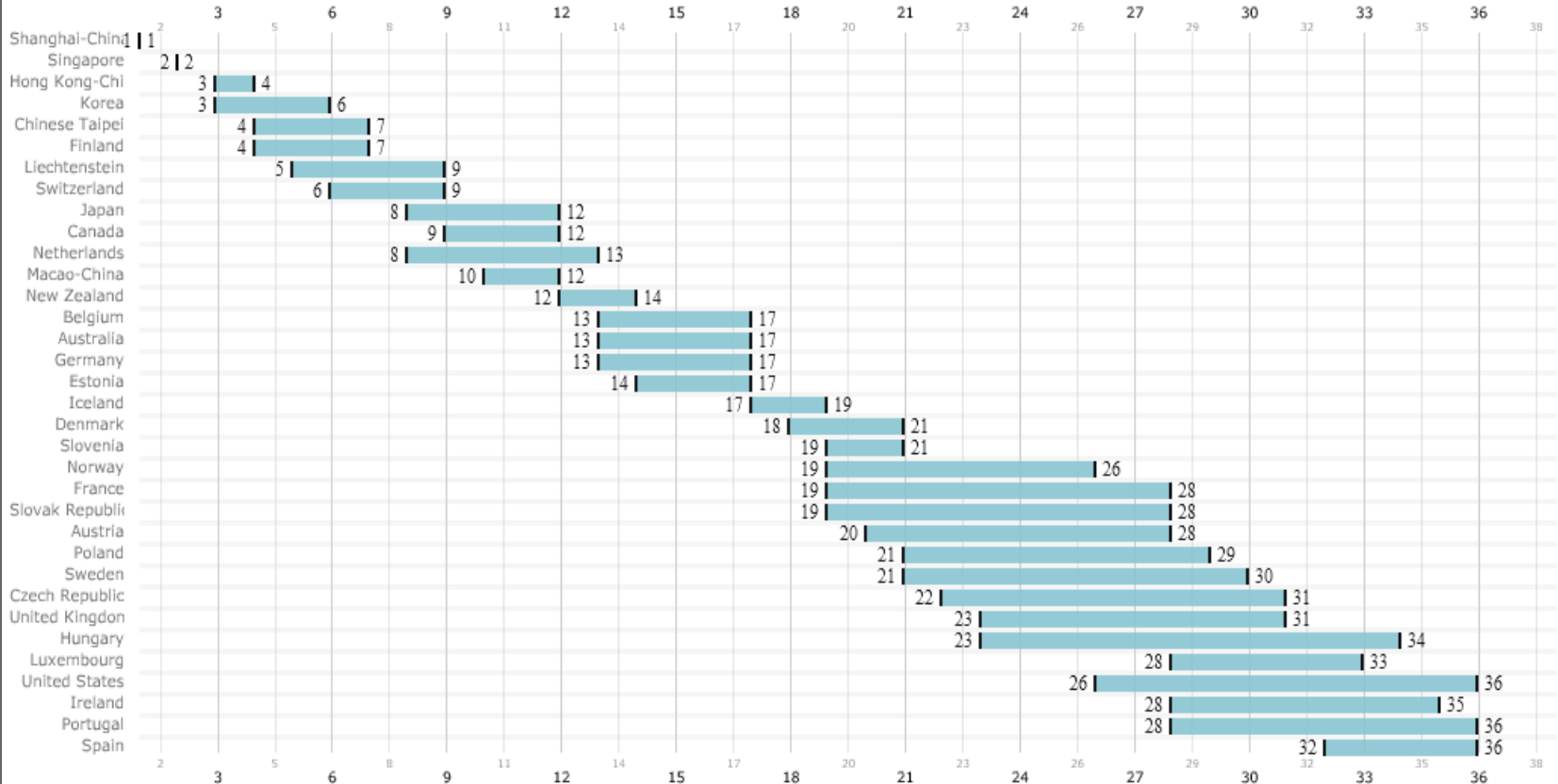
Student Academic Performance (International)



Mathematics

Range of Rank

Rank on the Mathematics scale



Focus OFF 0 - 33 of 66 bars

Because data are based on samples, it is not possible to report exact rank order positions for countries.

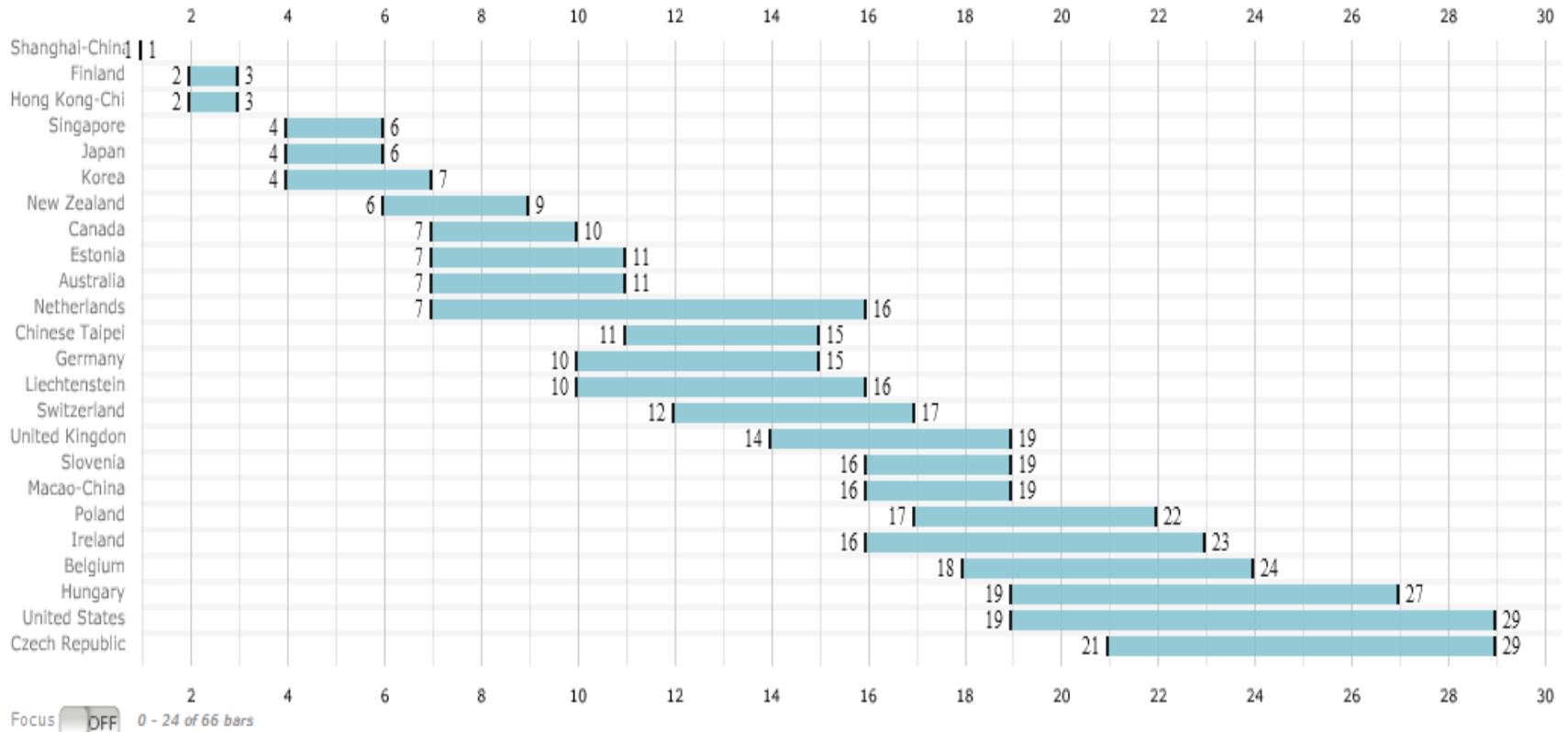
However, it is possible to report the range of rank order positions within which the country mean lies with 95% likelihood.



Science

Range of Rank

Rank on the Science scale



Because data are based on samples, it is not possible to report exact rank order positions for countries.

However, it is possible to report the range of rank order positions within which the country mean lies with 95% likelihood.

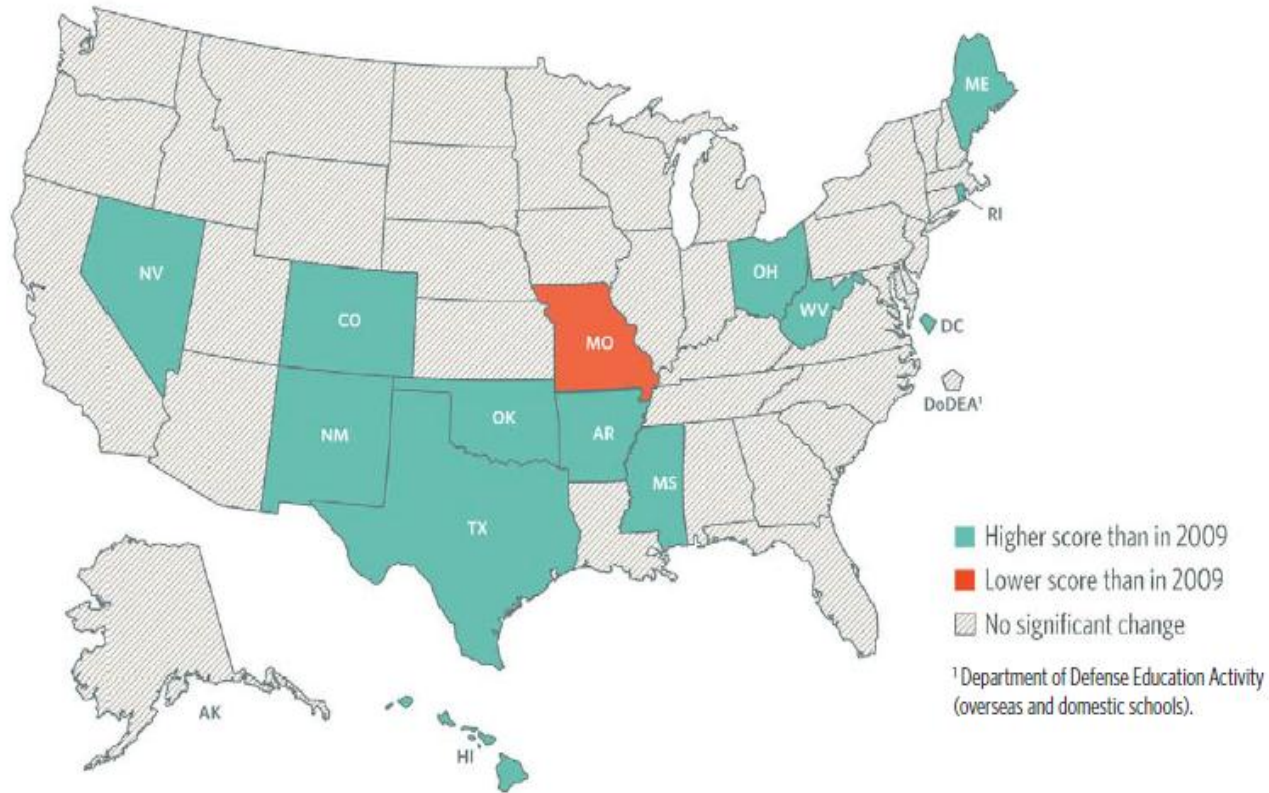
Student Academic Performance (United States)



Figure 18. Trend in eighth-grade NAEP mathematics average scores



Figure 30. Changes in eighth-grade NAEP mathematics average scores between 2009 and 2011



SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2009 and 2011 Mathematics Assessments.

Student Academic Performance in California



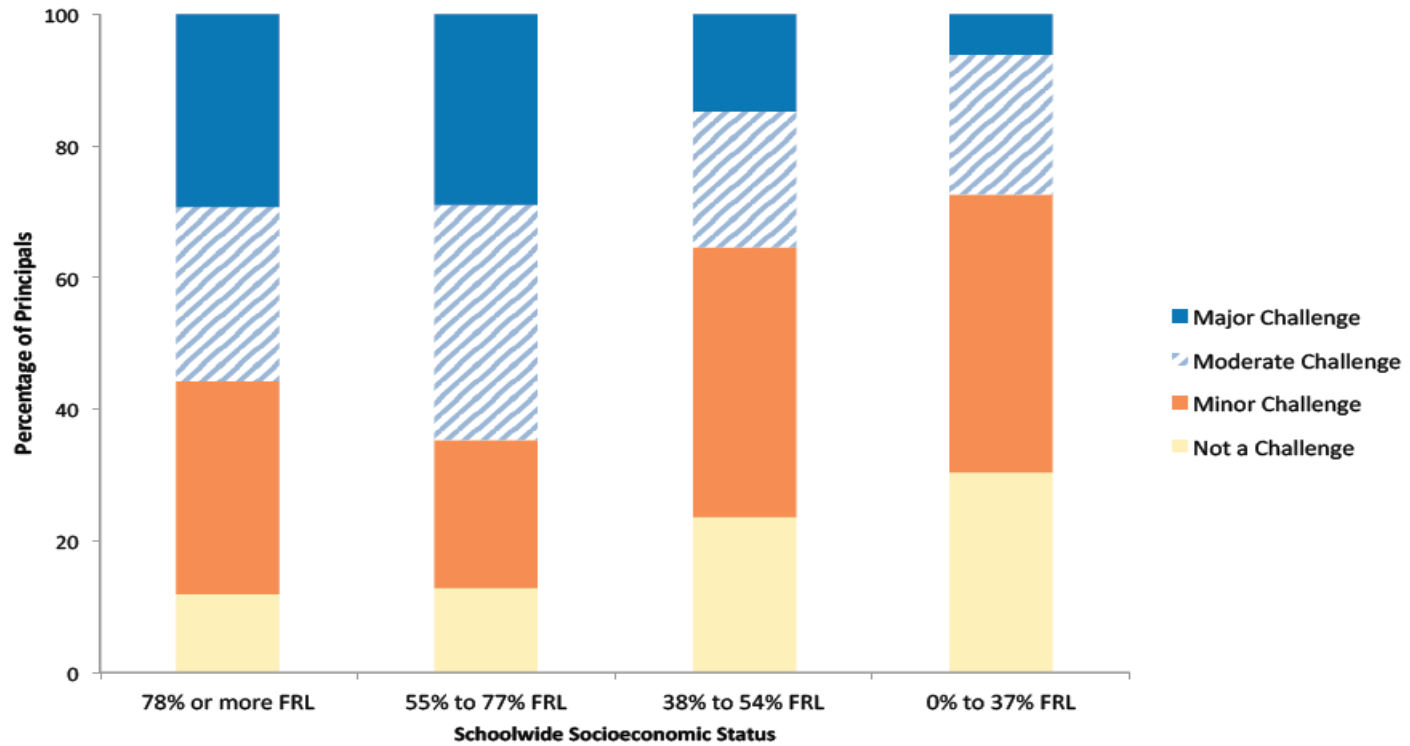
Student Proficiency in Science

Only 62% of California students scored proficient in science on the most recent eighth--grade California Standards Test (CST).

Even more alarming, only 20% of California students were proficient on the eighth-- grade National Assessment of Educational Progress (NAEP) science exam in 2009.



Exhibit 2-2
Principals' Assessment of the Degree of Challenge in Students Not Being Prepared for Middle School Science



FRL: Participates in federal free or reduced-price lunch program

Source: 2011 Statewide Science Education Survey of Middle School Principals.

Science Experiences in Elementary Schools

Only about 10% of California public elementary school students regularly experience opportunities for high-quality science learning.

Moreover, 40% of elementary teachers in grades K–5 reported that their students receive 60 minutes or less of science instruction per week.



Student Academic Performance in Los Angeles



LAUSD Educational Pipeline

Out of every 100 LAUSD 9th graders:



66 are "on track" to graduate from high school



52 students graduate from high school in 4 years



32 of these students enroll in college



14 of these students receive a degree



Measurement

Baseline Data

4-Year graduation rate

52%

9th graders “on track”
to graduate

66%

4-Year and 5-Year
dropout rates

30%

Students at grade level
(proficient and above)
in English language arts
and math

Elementary School
(ELA/Math) Grade Level:

44% / 57%

Middle School
(ELA/Math) Grade Level:

35% / 30%

High School
(ELA/Math) Grade Level:

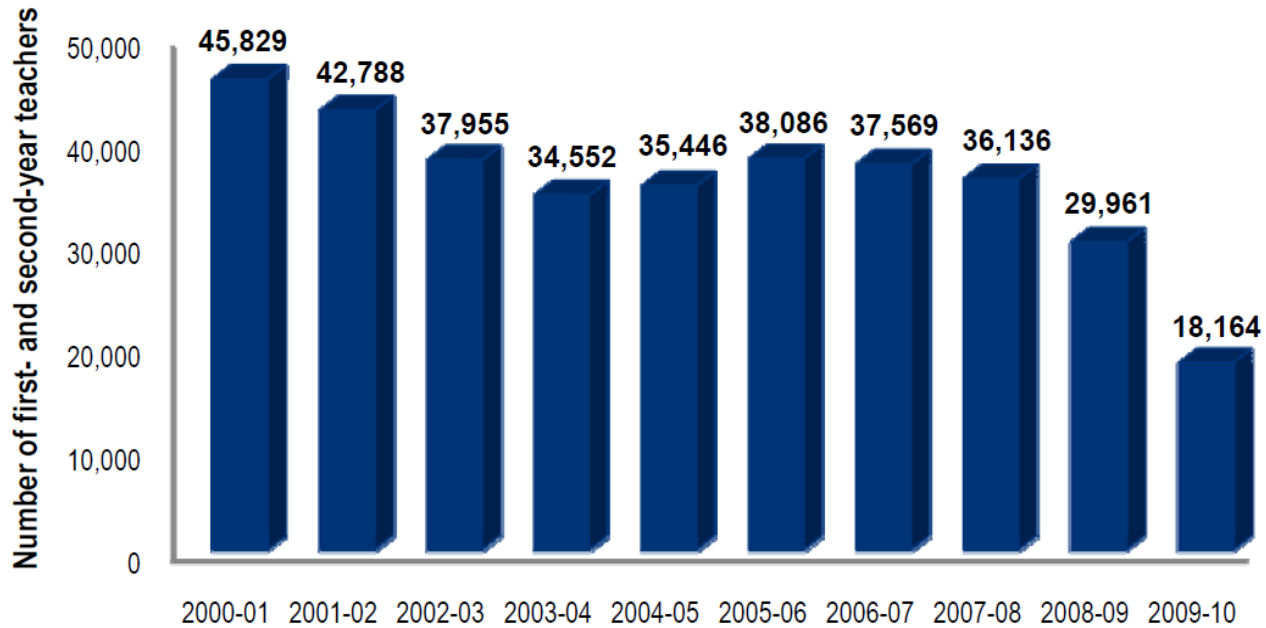
33% / 13%



Current State of Teacher Preparation in California

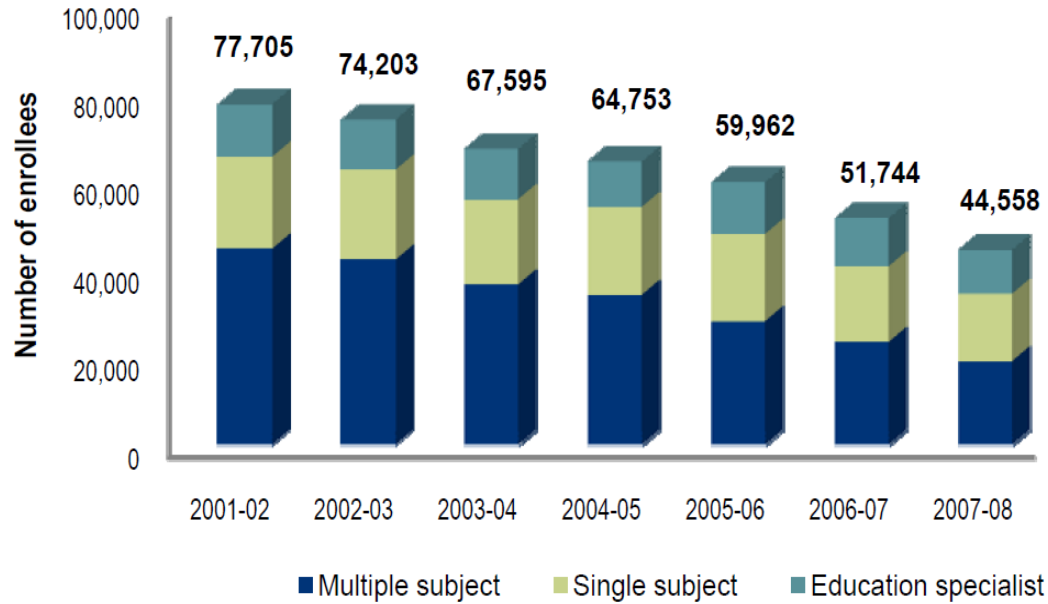


Exhibit 2.1
Number of First- and Second-Year Teachers, 2000–01 to 2009–10



See Appendix A for source and technical information.

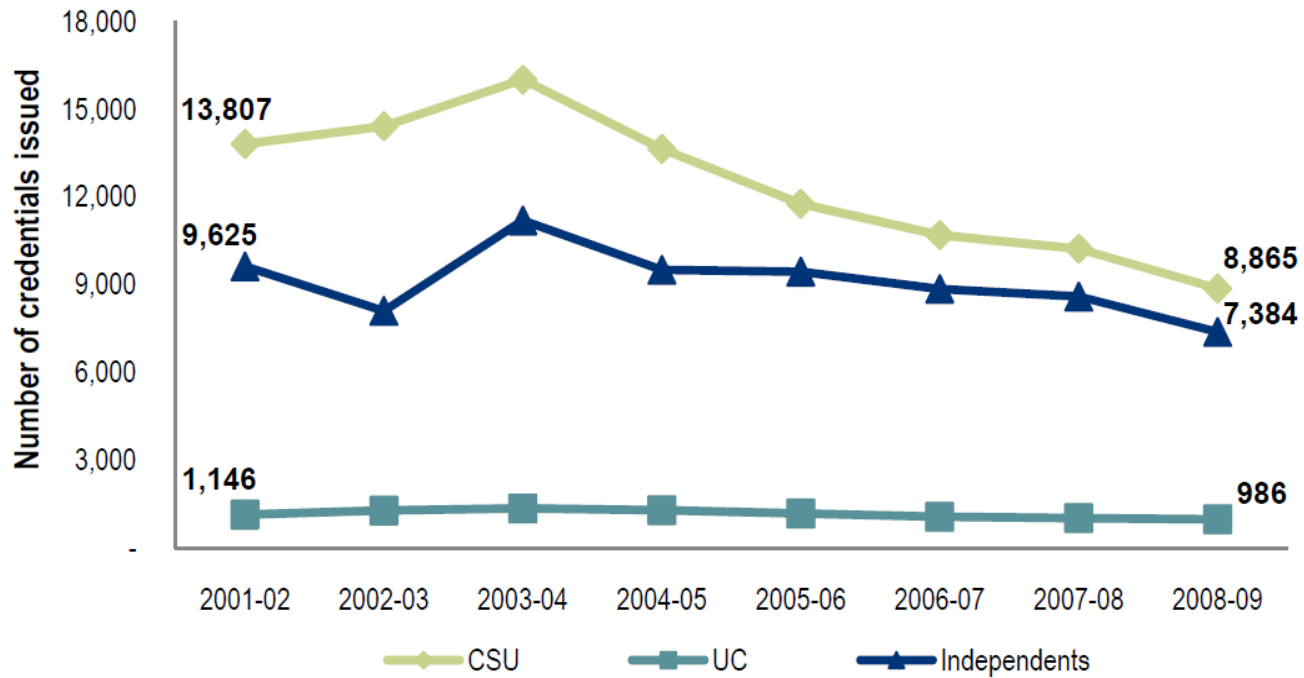
Exhibit 2.2
Number of Enrollees in Teacher Preparation Programs, 2001-02 to 2007-08



See Appendix A for source and technical information.

Note: 2007-08 is the most recent year for which statewide data are available.

Exhibit 2.4 Multiple- and Single-Subject Preliminary and Intern Credentials Issued by University Sector, 2001-02 to 2008-09



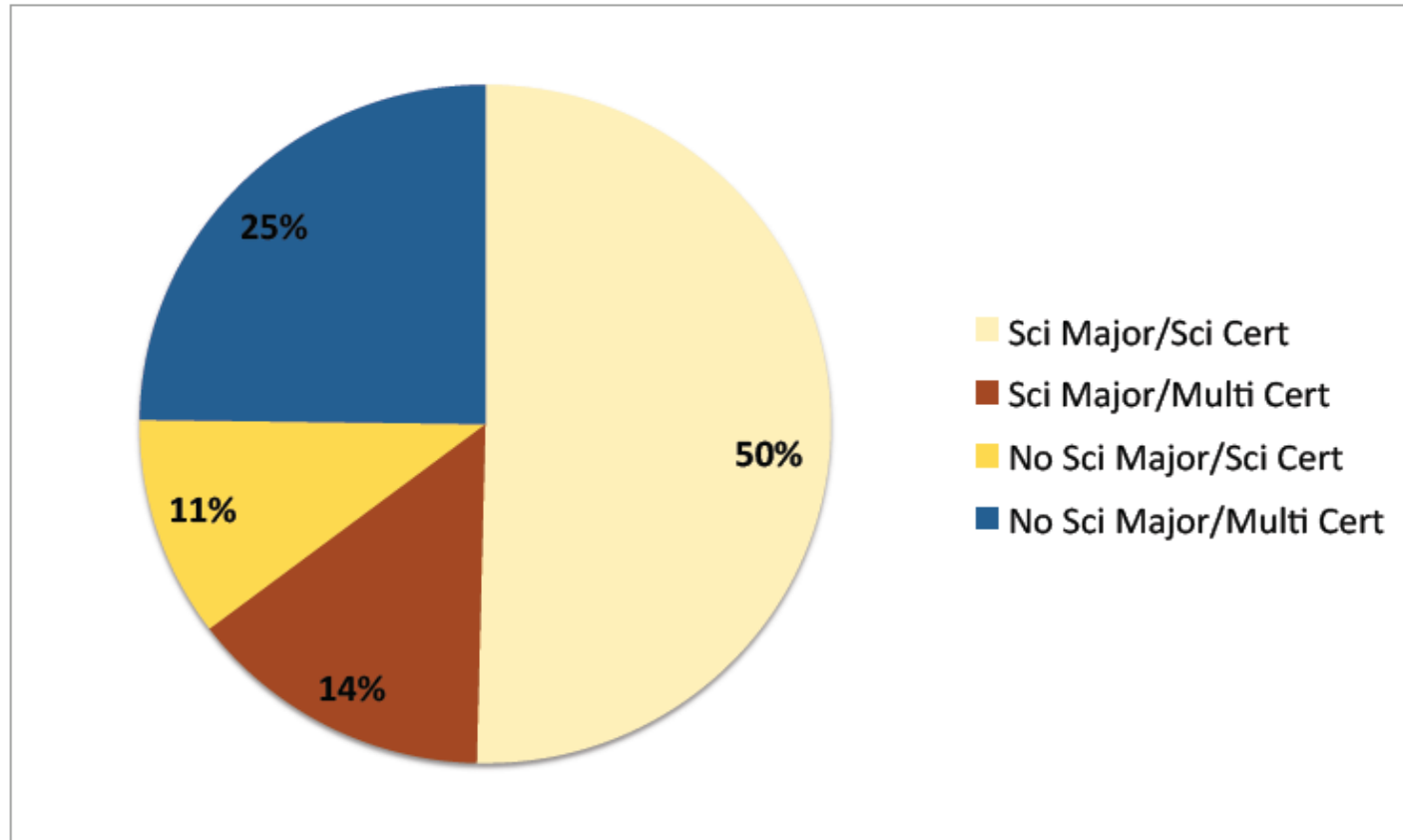
See Appendix A for source and technical information.



Preparation of Science Teachers



Exhibit 3-1 Teacher Science Background



Source: 2011 Statewide Science Education Survey of Middle School Teachers.



Math and Science Teacher Initiative

California State University
Northridge



CSU System Initiative

The Math and Science Teacher Initiative (MSTI) includes a systemwide plan of action that consists of six primary strategies:

- 1. The creation of new credential pathways**
- 2. Provision of financial support to students**
- 3. Recruitment with intent to expand the number and diversity of candidates**



CSU System Initiative

4. Collaboration between CSU campuses and their local community colleges
5. Internet-supported delivery of instruction and resources
6. Partnerships with corporate sponsors and federal laboratories



MSTI Goals

- ✓ Meet projected need for new math and science teachers in California over the next 10 years
- ✓ Baseline of 750 teachers produced in 2003
- ✓ CSU commitment to double production of teachers by 2010-11 (1,500 teacher target)



MSTI Activities

- **CSET: Mathematics and General Science Preparation Workshops**
- **Scholarships and stipends for CSET workshop completers**
- **Paid tutoring opportunities and additional scholarships and/or stipends**
- **Advertising Campaign**
- **Efforts by the faculty liaison in the Engineering**



Data Tables

Table 1. CSU Mathematics and Science Teacher Credential Production by Subject: 2002-03 to 2009-10^{a,b}

	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10
Subject								
Regular Mathematics	349	447	405	402	525	479	452	382
Foundational Mathematics	0	28	119	170	258	307	321	336
Mathematics Sub-total	349	475	524	572	783	786	773	718
Science: Biology	296	404	347	310	316	367	343	331
Science: Chemistry	56	89	66	82	96	91	129	135
Science: Geosciences	37	45	40	53	54	73	73	84
Science: Physics	30	43	34	40	39	39	43	49
Foundational Science	0	0	0	0	0	0	6	61
Science Sub-total	419	581	487	485	505	570	594	660
Math and Science Sub-total Secondary Authorizations	768	1056	1011	1057	1288	1356	1367	1378
Supplemental Authorizations Preparing Elementary Teachers in Science or Mathematics								74
Additional Science or Mathematics Authorizations Among Current Secondary Teachers								50
Math and Science Grand Total Across CSU Campuses								1502
^a Data on new credentials are provided by the California Commission on Teacher Credentialing (CCTC).								
^b Data include total CSU mathematics and science teacher credentials and authorizations in 2009-10.								

This table presents California Commission on Teacher Credentialing data from 2002-03 through 2009-10 for mathematics and science Credentials recommended by California State University campuses. The calculations are based on the count of math and science credential authorizations that have been recommended for (a) regular credential candidates and (b) intern credential candidates since both are compliant with federal No Child Left Behind (NCLB) requirements.

CSUN Partnership Activities



Developing Resources and Engaging Activities to Motivate Students (DREAMS) Project

	8:00–9:45	10:00–11:45	12:15–2:55
Students' Schedule	Math course (<i>Algebra Readiness</i>)	Robotics course	English course
Math teachers	Teach math	RTC Professional Collaboration	
English teachers		RTC Professional Collaboration	Teach English



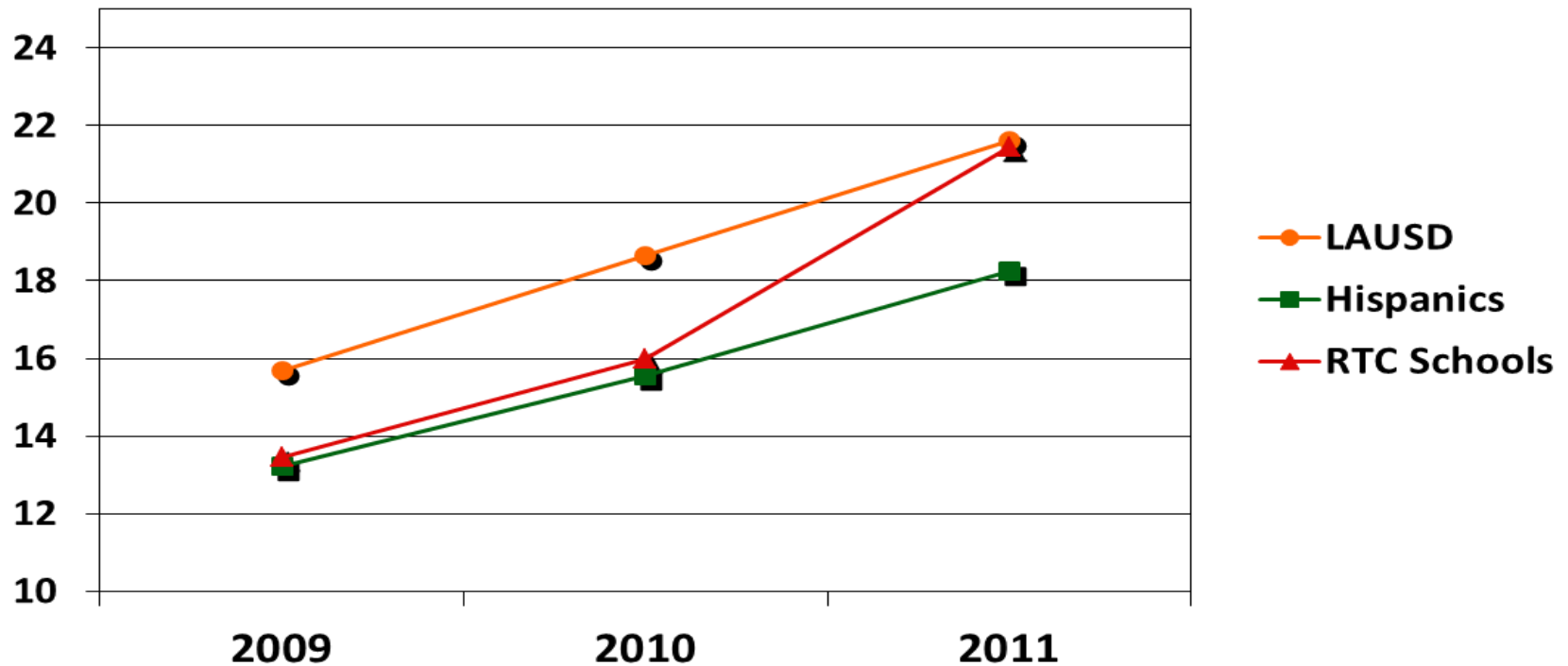
Developing Resources and Engaging Activities to Motivate Students (DREAMS) Project

	8:00–9:45	10:00–11:45	12:15–2:55
Students' Schedule	Math course (<i>Algebra Readiness</i>)	Robotics course	English course
Math teachers	Teach math	<u>RTC Professional Collaboration</u>	
English teachers		<u>RTC Professional Collaboration</u>	Teach English



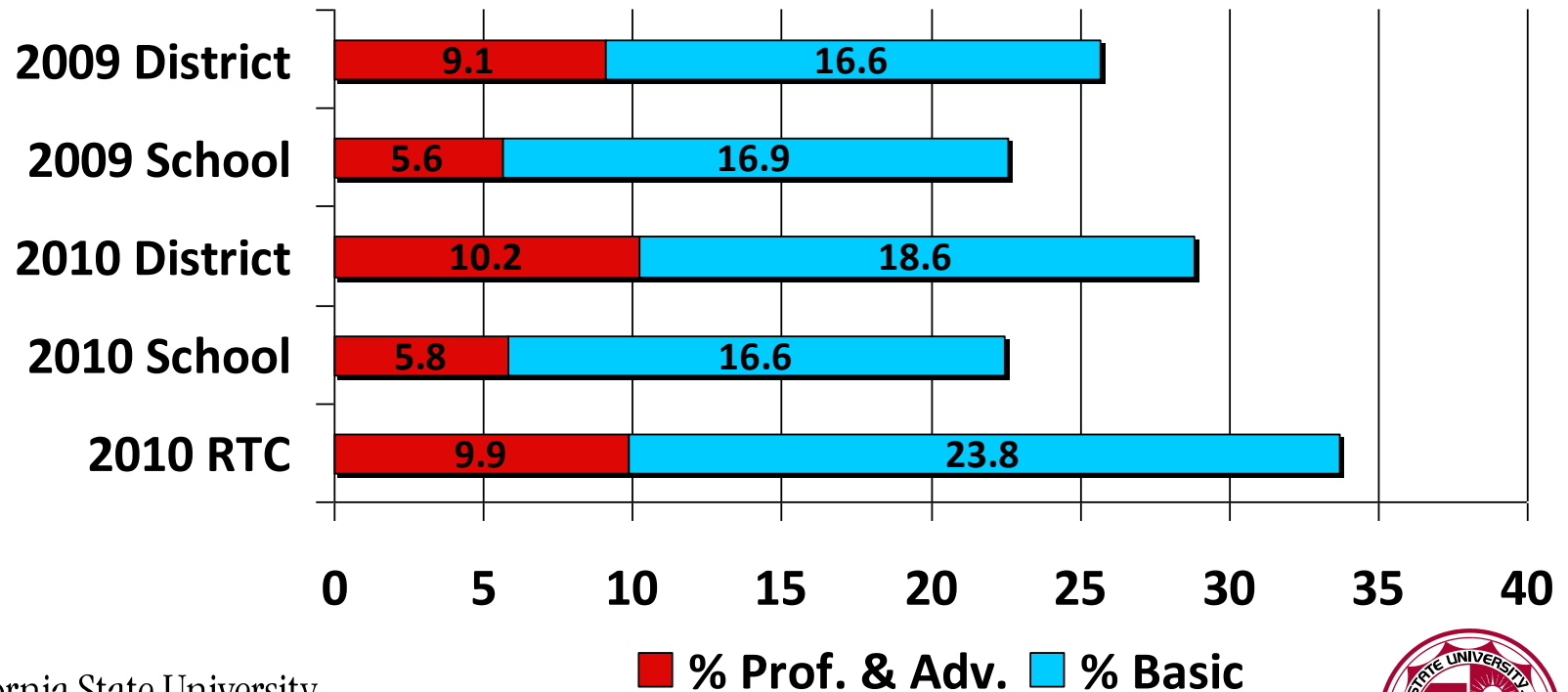
DREAMS Project Results— Middle School

Percentage of 8th graders scoring Proficient or Advanced on Algebra 1 CST



DREAMS Project Results— High School

Percentage of 9th graders scoring Proficient or Advanced on Algebra 1 CST



An Agenda for American Education

California State University
Northridge



Develop a world-class teaching force

- 1. Insist that teachers of all subjects at all levels have a depth and breadth of mastery of the subjects they will teach comparable at the bachelors degree level to that of the people who will go on to graduate education in those fields**
- 2. Design the teacher preparation program on a clinical model, with plenty of clinical experience under the constant supervision of master teachers in real settings**

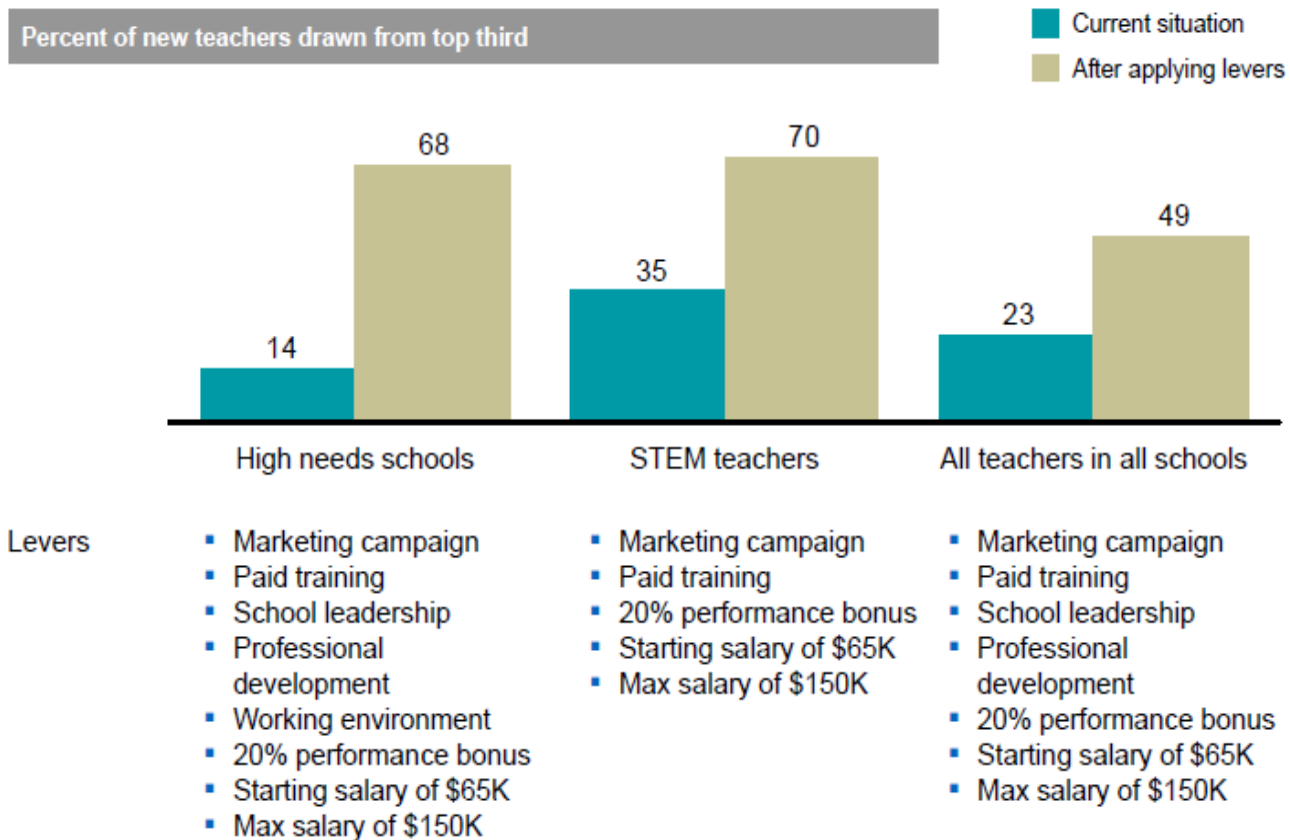


Develop a world-class teaching force

3. Make sure compensation for beginning teachers is and remains comparable to compensation for the other professions; add the amounts necessary to attract capable teachers to hardship locations, and specialties in shortage; tie amounts to steps on the career ladders
4. Provide for an induction period for new teachers of at least a year in which they are supervised by master teachers who are released from full time teaching for this purpose



Exhibit 14: Impact of various scenarios applied to different parts of the system



SOURCE: Market research; NCES; OECD; McKinsey analysis