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

A View from a College of Education

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Engineering Deans Institute 2012
Student Academic Performance (International)
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

Shanghai-China 1
Finland 2
Hong Kong-China 2
Singapore 4
Japan 4
Korea 4
New Zealand 6
Canada 7
Estonia 7
Australia 7
Netherlands 7
Chinese Taipei 7
Germany 10
Liechtenstein 10
Switzerland 10
United Kingdom 12
Slovenia 14
Macao-China 14
Poland 16
Ireland 16
Belgium 16
Hungary 17
United States 18
Czech Republic 19

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

Scale score

Year

'90  '92  '96  '00  '03  '05  '07  '09  '11

263*  268*  272*  270*  273*  278*  279*  281*  283*  284

* Significantly different ($p < .05$) from 2011.

Accommodations not permitted

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

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
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

<table>
<thead>
<tr>
<th>Year</th>
<th>Multiple subject</th>
<th>Single subject</th>
<th>Education specialist</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001-02</td>
<td>77,705</td>
<td>10,169</td>
<td>9,241</td>
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<tr>
<td>2002-03</td>
<td>74,203</td>
<td>10,276</td>
<td>9,156</td>
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<tr>
<td>2003-04</td>
<td>67,595</td>
<td>10,208</td>
<td>9,992</td>
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<tr>
<td>2004-05</td>
<td>64,753</td>
<td>10,772</td>
<td>8,911</td>
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<tr>
<td>2005-06</td>
<td>59,962</td>
<td>11,122</td>
<td>8,158</td>
</tr>
<tr>
<td>2006-07</td>
<td>51,744</td>
<td>10,312</td>
<td>8,376</td>
</tr>
<tr>
<td>2007-08</td>
<td>44,558</td>
<td>9,690</td>
<td>6,764</td>
</tr>
</tbody>
</table>

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

- 50% Sci Major/Sci Cert
- 25% No Sci Major/Sci Cert
- 14% Sci Major/Multi Cert
- 11% No Sci Major/Multi Cert

Source: 2011 Statewide Science Education Survey of Middle School Teachers.
Math and Science Teacher 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
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
### Table 1. CSU Mathematics and Science Teacher Credential Production by Subject: 2002-03 to 2009-10

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
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<tbody>
<tr>
<td>Regular Mathematics</td>
<td>349</td>
<td>447</td>
<td>405</td>
<td>402</td>
<td>525</td>
<td>479</td>
<td>452</td>
<td>382</td>
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<tr>
<td>Foundational Mathematics</td>
<td>0</td>
<td>28</td>
<td>119</td>
<td>170</td>
<td>258</td>
<td>307</td>
<td>321</td>
<td>336</td>
</tr>
<tr>
<td>Mathematics Sub-total</td>
<td>349</td>
<td>475</td>
<td>524</td>
<td>572</td>
<td>783</td>
<td>786</td>
<td>773</td>
<td>718</td>
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<tr>
<td>Science: Biology</td>
<td>296</td>
<td>404</td>
<td>347</td>
<td>310</td>
<td>316</td>
<td>367</td>
<td>343</td>
<td>331</td>
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<tr>
<td>Science: Chemistry</td>
<td>56</td>
<td>89</td>
<td>66</td>
<td>82</td>
<td>96</td>
<td>91</td>
<td>129</td>
<td>135</td>
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<tr>
<td>Science: Geosciences</td>
<td>37</td>
<td>45</td>
<td>40</td>
<td>53</td>
<td>54</td>
<td>73</td>
<td>73</td>
<td>84</td>
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<tr>
<td>Science: Physics</td>
<td>30</td>
<td>43</td>
<td>34</td>
<td>40</td>
<td>39</td>
<td>39</td>
<td>43</td>
<td>49</td>
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<tr>
<td>Foundational Science</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>6</td>
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<tr>
<td>Science Sub-total</td>
<td>419</td>
<td>581</td>
<td>487</td>
<td>485</td>
<td>505</td>
<td>570</td>
<td>594</td>
<td>660</td>
</tr>
<tr>
<td>Math and Science Sub-total</td>
<td>768</td>
<td>1056</td>
<td>1011</td>
<td>1057</td>
<td>1288</td>
<td>1356</td>
<td>1367</td>
<td>1378</td>
</tr>
</tbody>
</table>

#### 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

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*Data on new credentials are provided by the California Commission on Teacher Credentialing (CCTC).*

*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

<table>
<thead>
<tr>
<th>Students' Schedule</th>
<th>8:00–9:45</th>
<th>10:00–11:45</th>
<th>12:15–2:55</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math course</td>
<td>Math course (<em>{(Algebra Readiness)}</em>)</td>
<td>Robotics course</td>
<td>English course</td>
</tr>
<tr>
<td>Math teachers</td>
<td>Teach math</td>
<td>RTC Professional Collaboration</td>
<td></td>
</tr>
<tr>
<td>English teachers</td>
<td>RTC Professional Collaboration</td>
<td>Teach English</td>
<td></td>
</tr>
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## Developing Resources and Engaging Activities to Motivate Students (DREAMS) Project

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<th>English teachers</th>
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<td>Math course (Algebra Readiness)</td>
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<td>RTC Professional Collaboration</td>
</tr>
<tr>
<td>10:00–11:45</td>
<td>Robotics course</td>
<td>RTC Professional Collaboration</td>
<td></td>
</tr>
<tr>
<td>12:15–2:55</td>
<td>English course</td>
<td>Teach English</td>
<td></td>
</tr>
</tbody>
</table>

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**California State University Northridge**
DREAMS Project Results—Middle School

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

- LAUSD
- Hispanics
- RTC Schools

California State University Northridge
DREAMS Project Results—High School

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

- **2009 District**: 9.1% Prof. & Adv., 16.6% Basic
- **2009 School**: 5.6% Prof. & Adv., 16.9% Basic
- **2010 District**: 10.2% Prof. & Adv., 18.6% Basic
- **2010 School**: 5.8% Prof. & Adv., 16.6% Basic
- **2010 RTC**: 9.9% Prof. & Adv., 23.8% Basic

California State University
Northridge
An Agenda for American Education
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.
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

Percent of new teachers drawn from top third

<table>
<thead>
<tr>
<th></th>
<th>Current situation</th>
<th>After applying levers</th>
</tr>
</thead>
<tbody>
<tr>
<td>High needs schools</td>
<td>14</td>
<td>68</td>
</tr>
<tr>
<td>STEM teachers</td>
<td>35</td>
<td>70</td>
</tr>
<tr>
<td>All teachers in all schools</td>
<td>23</td>
<td>49</td>
</tr>
</tbody>
</table>

Levers

- Marketing campaign
- Paid training
- School leadership
- Professional development
- Working environment
- 20% performance bonus
- Starting salary of $65K
- Max salary of $150K

SOURCE: Market research; NCES; OECD; McKinsey analysis