STEM Education in Washington: The Facts of the Matter

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With huge thanks to

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Director of Policy & Communications
Technology Alliance
“Innovation is in our nature”
This is true of our economy and our population.
By any measure, Washington is a leader in America’s innovation economy.

2010 Kauffman Foundation New Economy Index:*  
1. Massachusetts  
2. Washington  
3. Maryland  
4. New Jersey  
5. Connecticut  
7. California  
8. Virginia  
9. Colorado  
10. New York  
12. Utah  

* Index #6 Delaware and #11 New Hampshire intentionally omitted.
Employment in our private sector technology industries has quadrupled since 1974.

Source: Technology Alliance: The Economic Impact of Technology-based Industries in Washington State, 2010
Technology industries are a major driver of Washington trade.

Source: Technology Alliance: *The Economic Impact of Technology-based Industries in Washington State, 2010*
Robust research and development underpins our state economy.

Washington’s National Rankings

R&D Activity (2007): Absolute $, and Indexed to Gross State Product

Source: Technology Alliance: The Economic Impact of Technology-based Industries in Washington State, 2010/National Science Foundation
An economy driven by a highly educated, innovative workforce.

Washington’s National Rankings

<table>
<thead>
<tr>
<th>Human Capital</th>
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<tbody>
<tr>
<td>#2</td>
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</tbody>
</table>

NAICS codes

Sources: National Science Foundation: Science & Engineering Indicators, 2010; Milken Institute: State Technology and Science Index: Enduring Lessons for the Intangible Economy, 2011
So, who are these people?

It turns out that they are not our own children!
Washington is the 2nd largest importer of degrees among tech states (and 1st, by far, as a proportion of population).

Net Migration: 22-39 Year Olds, Bachelor's Degree or Higher (2007)

Source: National Center for Higher Education Management Systems/U.S. Census Bureau
We rank very low in engineering degree production relative to engineering occupations.

Source: NCHEMS/U.S. Census Bureau
It’s the same story in computer science.

In-state Computer Science Degree Production per 1,000 Computer Science Occupations (2005)

- Utah: 55.7
- New York
- Maryland
- Colorado
- California
- New Jersey
- Washington: 21.0
- Massachusetts
- Virginia
- Connecticut

Source: NCHEMS/U.S. Census Bureau
Is this inevitable, given the vibrancy of our technology sector?

Or do we have pipeline and/or capacity issues?
A mismatch between economic opportunity and our educational output.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity of S&amp;E workforce</td>
<td>2</td>
</tr>
<tr>
<td>Intensity of Engineers</td>
<td>2</td>
</tr>
<tr>
<td>Intensity of Computer specialists</td>
<td>5</td>
</tr>
<tr>
<td>% of payroll in high tech NAICS codes</td>
<td>1</td>
</tr>
<tr>
<td>NS&amp;E bachelor’s production</td>
<td>31</td>
</tr>
<tr>
<td>Total bachelor’s production</td>
<td>35</td>
</tr>
<tr>
<td>S&amp;E graduate program participation</td>
<td>46</td>
</tr>
</tbody>
</table>

Sources: ITIF/Kauffman Foundation: *The 2010 State New Economy Index*; National Science Foundation: *Science & Engineering Indicators 2010*; NCHEMS/Postsecondary Opportunity (all indexed to age-range population)
We lag in S&E degree production not only as a function of workforce, but also as a function of population.

Natural Science & Engineering Bachelor’s Degrees Per 1,000 18-24 Year Olds

Source: NSF, *Science & Engineering Indicators 2010*
Note: NS&E degrees include physical, computer, agricultural, biological, earth, atmospheric, and ocean sciences; mathematics; and engineering.
Same for total bachelor’s degree production.

Source: NSF, Science & Engineering Indicators 2010
We rank last among tech states in S&E graduate program participation.

Science & Engineering Graduate Students Per 1,000 Population 25-34 Years of Age (2007)

Source: NSF, Science & Engineering Indicators 2010
Note: S&E includes physical, computer, agricultural, biological, earth, atmospheric, ocean, and social sciences; psychology; mathematics; and engineering.
There are pipeline issues from secondary to postsecondary.

To deal with the gathering storm, we need to stop the leaks.
Our kids’ futures are leaking!

100 students enter 9th grade

31 students don’t graduate high school on time

34 graduates don’t enroll directly in college

10 don’t return sophomore year

7 don’t graduate within 150% time

18 obtain a degree within 150% time

Source: NCHEMS
Note: Data for high school graduation doesn’t account for transfers to private high schools and out-of-state. The calculation for college graduation doesn’t account for transfers across institutions.
Overall, our pipeline is the leakiest among the tech states.

Source: NCHEMS/Tom Mortenson, Postsecondary Opportunity
We are last among tech states in the proportion of high school graduates who move directly to college.

College-going Rates of Recent High School Graduates (2008)

Source: NCHEMS/Tom Mortenson, Postsecondary Opportunity
Of the ones who do move directly to college, too many are unprepared for college-level work.

A Math Problem:

Only 23% of 2008 high school graduates entering our 2-year colleges enrolled in college-level math or already had the math required for their degree.

Reducing the leaks in the pipeline is critical for our citizens, our economy, and our society.

But it begins much earlier...

And it is a national issue.
As a nation, we are not adequately preparing our K-8 students for high school math…

Source: National Assessment of Educational Progress (NAEP), 2009
And we must make science more of a priority nationally and here at home!

Source: NAEP, 2009
Data on specific student groups in our state paints an even more troubling picture.

Source: Change the Equation/NAEP, 2009
Quality early learning:
A pre-requisite for student success, but...
More than 1/3 of eligible low-income kids in Washington are not served by early learning programs.

Source: League of Education Voters/Washington Department of Early Learning, 2010
Behind the numbers…

A human tragedy is unfolding in our state.
The mismatch between the skills required for available jobs and the skills people have is growing.

In the last 3 years, Washington’s skills mismatch grew more than that of all but one other state.

% Change in Skills Mismatch Index by State (2007-2010)

- Washington: 41.9%
- Connecticut: 2.5%
- New York
- Massachusetts
- New Jersey
- Virginia
- California
- Colorado
- Utah
- Maryland
- Washington

Source: Marcello and Tsounta, courtesy of Drew DeSilver, Seattle Times.
The people who held the jobs we’re losing aren’t going to get the jobs we’re creating.

57% of the job openings among the top 10 occupations are in computing.

Where the jobs are and aren’t

Some employers are hiring, but the openings don’t overlap much with the jobs most commonly lost to the economic downturn.

<table>
<thead>
<tr>
<th>TOP 10 JOB OPENINGS IN PUGET SOUND REGION*</th>
<th>OPENINGS, JUNE 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer software engineers, applications</td>
<td>2,980</td>
</tr>
<tr>
<td>Registered nurses</td>
<td>1,340</td>
</tr>
<tr>
<td>Computer systems analysts</td>
<td>1,316</td>
</tr>
<tr>
<td>Computer and information systems managers</td>
<td>1,132</td>
</tr>
<tr>
<td>Marketing managers</td>
<td>740</td>
</tr>
<tr>
<td>Customer service representatives</td>
<td>680</td>
</tr>
<tr>
<td>Sales managers</td>
<td>644</td>
</tr>
<tr>
<td>Computer software engineers, systems software</td>
<td>641</td>
</tr>
<tr>
<td>First-line supervisors of retail sales workers</td>
<td>620</td>
</tr>
<tr>
<td>First-line supervisors of food preparation and serving workers</td>
<td>556</td>
</tr>
</tbody>
</table>

* King, Snohomish, Pierce and Kitsap counties

<table>
<thead>
<tr>
<th>TOP 10 JOB CATEGORIES IN WASHINGTON WITH GREATEST LOSSES</th>
<th>JOBS LOST, 2007-2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office clerks, general</td>
<td>-14,690</td>
</tr>
<tr>
<td>Construction laborers</td>
<td>-12,170</td>
</tr>
<tr>
<td>Cashiers</td>
<td>-11,730</td>
</tr>
<tr>
<td>Carpenters</td>
<td>-8,940</td>
</tr>
<tr>
<td>Laborers and freight, stock, and material movers</td>
<td>-7,920</td>
</tr>
<tr>
<td>Combined food preparation and serving workers, including fast food</td>
<td>-7,330</td>
</tr>
<tr>
<td>Waiters and waitresses</td>
<td>-6,870</td>
</tr>
<tr>
<td>Truck drivers, heavy and tractor-trailer</td>
<td>-5,770</td>
</tr>
<tr>
<td>Bookkeeping, accounting and auditing clerks</td>
<td>-5,320</td>
</tr>
<tr>
<td>Customer service representatives</td>
<td>-4,780</td>
</tr>
</tbody>
</table>

Sources: Seattle Times analysis of WorkSource job postings and Occupational Employment Statistics data

Source: Used with permission from the Seattle Times.
Yes, it’s a pipeline issue, but it’s also a capacity issue!

In the race for talent, ideas and economic opportunity...all STEM is important, but all STEM is not created equal!
Nationally, 80% of all STEM jobs are projected to be in computer science and other fields of engineering.

Source: Bureau of Labor Statistics
Nationally, within STEM there is a significant mismatch between jobs and degrees.
In Washington, computer science and other fields of engineering have the largest gap between supply and demand.

Comparison of Current Supply with Future Demand for Baccalaureate & Graduate Degrees

| Field                                      | Current Average Supply | Annual Demand | Additional Supply Needed
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Research scientists, technical</td>
<td>1,655</td>
<td>1,134</td>
<td>2,973</td>
</tr>
<tr>
<td>Human/protective service professionals</td>
<td>1,850</td>
<td>2,493</td>
<td>2,973</td>
</tr>
<tr>
<td>Editors/writers/performers</td>
<td>1,359</td>
<td>1,134</td>
<td>2,973</td>
</tr>
<tr>
<td>Medical professionals</td>
<td>2,052</td>
<td>1,134</td>
<td>2,973</td>
</tr>
<tr>
<td>Computer science</td>
<td>7,805</td>
<td>304</td>
<td>2,973</td>
</tr>
<tr>
<td>Engineering/software engineering/architecture</td>
<td>1,292</td>
<td>1,148</td>
<td>2,973</td>
</tr>
</tbody>
</table>

Analysis of Employment Security Department and IPEDS data.
In Washington, the gap is due to lack of program capacity, not lack of student interest.

In the most recent year, more than 500 undergraduates seeking to major in a UW engineering program had to be turned away. More than 40% of the students that the College of Engineering was unable to accommodate, and more than 60% of the students that the Department of Computer Science & Engineering was unable to accommodate, had college grade point averages of 3.25 or above.

(Additional students – roughly 30% of the total – are admitted to Engineering majors directly from high school or as high-performing freshmen.)
Let’s put the vowel back in STEM!
Questions?

lazowska@cs.washington.edu

http://lazowska.cs.washington.edu/STEM.pdf