All – OPAS Workshop
November 17, 2006
OMSI Auditorium

Information Packet

Framing the Problem:

Selected quotes:

- *Thomas L. Friedman:* "If the jobs of the new middle [class] require you to be a good collaborator, leverager, adapter, explainer, synthesizer, model builder, localizer, or personalizer, and these approaches require you, among other things, to be able to learn how to learn, to bring curiosity and passion to your work, to play well with others, and to nurture your right brain skills, what does that mean specifically for education?" *from THE WORLD IS FLAT: UPDATED AND EXPANDED EDITION. Farrar, Straus and Giroux, New York, 2006.*

- *Thomas L. Friedman, "Q and A with Thomas L. Friedman", New York Times TimesSelect, November 5, 2006*: "… in a flat world, certain kinds of work will migrate faster, and for the first time that work is skilled, white-collar work, not just blue-collar manufacturing.

  But there is only one answer and that is entrepreneurship and education. Look how many engineers and math experts Google has hired - in America and abroad. Growing businesses now grow businesses everywhere. I can't believe that someone with sound engineering skills cannot get a job today in America - but you may have to relocate to a different city or a different industry to do it. The job market is changing rapidly, and that is why the ability to learn how to learn is the single most important survival skill anyone can have." *(http://select.nytimes.com/2006/11/05/timesselect/06friedman-qa.html?adxnnl=1&adxnnlx=1163034015-VHPPlG0xecXvMn7FbVChwg)*

- *American Society for Engineering Education*: "At a time when the nation needs more engineers to stay competitive, ASEE's new numbers show declining enrollments, particularly among women …engineering graduation and enrollment rates at U.S. universities are not keeping up with the country's increasing demand for engineering talent … on a per-capita basis, less than 5 percent of all undergraduate degrees were awarded to engineers [in 2004-05], compared with almost 8 percent in 1985 …" *("Trouble on the Horizon," ASEE Prism, Volume 16, No. 2, October 2006 - http://www.prism-magazine.org/oct06/feature_trouble.cfm)*

- *National Academies: Rising Above the Gathering Storm*: "The United States takes deserved pride in the vitality of its economy, which forms the foundation of our high quality of life,

our national security, and our hope that our children and grandchildren will inherit ever-greater opportunities. That vitality is derived in large part from the productivity of well-trained people and the steady stream of scientific and technical innovations they produce. Without high-quality, knowledge-intensive jobs and the innovative enterprises that lead to discovery and new technology, our economy will suffer and our people will face a lower standard of living. Economic studies conducted even before the information-technology revolution have shown that as much as 85% of measured growth in US income per capita was due to technological change."

- Recommendation A[1]: Increase America's talent pool by vastly improving K12 science and mathematics education.
  - Implementation Actions: Scholarships; professional development; increase the number of students passing AP and IB science and math courses.

(http://opas.ous.edu/Committees/Resources/Publications/Rising_Above_Gathering_Storm_Execsum.pdf)

- *Association for Career and Technical Education, ACTE Issue Brief: Competitivenes* : "Europe, Canada, South Korea, and many other countries around the world have launched ambitious competitiveness agendas to increase innovation, develop technology, and make it easier for businesses to invest in new research and development to spur economic growth. In order to stay on top of the economic productivity around the world, America must continue to innovate and evolve, as it has many times throughout history ... High-quality CTE [Career and Technical Education] can ensure America's future competitiveness through increased student engagement, the innovative integration of math, science, and literacy skills, and by meeting the needs of both employers and the economy as a whole."

Baselines and Trends

- Occupational Outlook for the US, 2004 - 2014 (*Source: United States Department of Labor, Bureau of Labor Statistics, http://www.bls.gov/emp/*
  - Table 2. Employment by major occupational group, 2004 and projected 2014 (*http://www.bls.gov/news.release/ecopro.t02.htm*) includes
    - Computer and mathematical science occupations are projected to grow 30.7% by 2014, employing an additional 967,000 people.
    - Architecture and engineering occupations are projected to grow 12.5%, employing an additional 314,800 people.
    - Installation, maintenance, and repair occupations are projected to grow 11.4%, employing an additional 657,000 people.
    - Note: Above increases do not include need for replacements to those leaving workforce.
  - Table 3c. The 10 Fastest Growing occupations, 2004 – 2014 *(http://www.bls.gov/news.release/ecopro.t05.htm*) includes
    - 2. Network systems and data communications analysts: 55% (126,000)

[1] The report makes three other recommendations in areas such as research, patent policy, etc.

- 5. Computer software engineers, applications: 48% (222,000)
- 8. Computer software engineers, systems software: 43% (146,000)

- Occupational Outlook for Oregon, 2004 - 2014 *(Source: Brenda Turner, Occupational Economist, Oregon Employment Department. For more complete data, http://opas.ous.edu/Committees/Resources/Data/OR_Occupational_Outlook_2004_2014.xls, http://opas.ous.edu/Committees/Resources/Data/OR_Occupational_Outlook_2004_2014.pdf and http://www.qualityinfo.org/olmisj/OlmisZine?zineid=00000001f)*

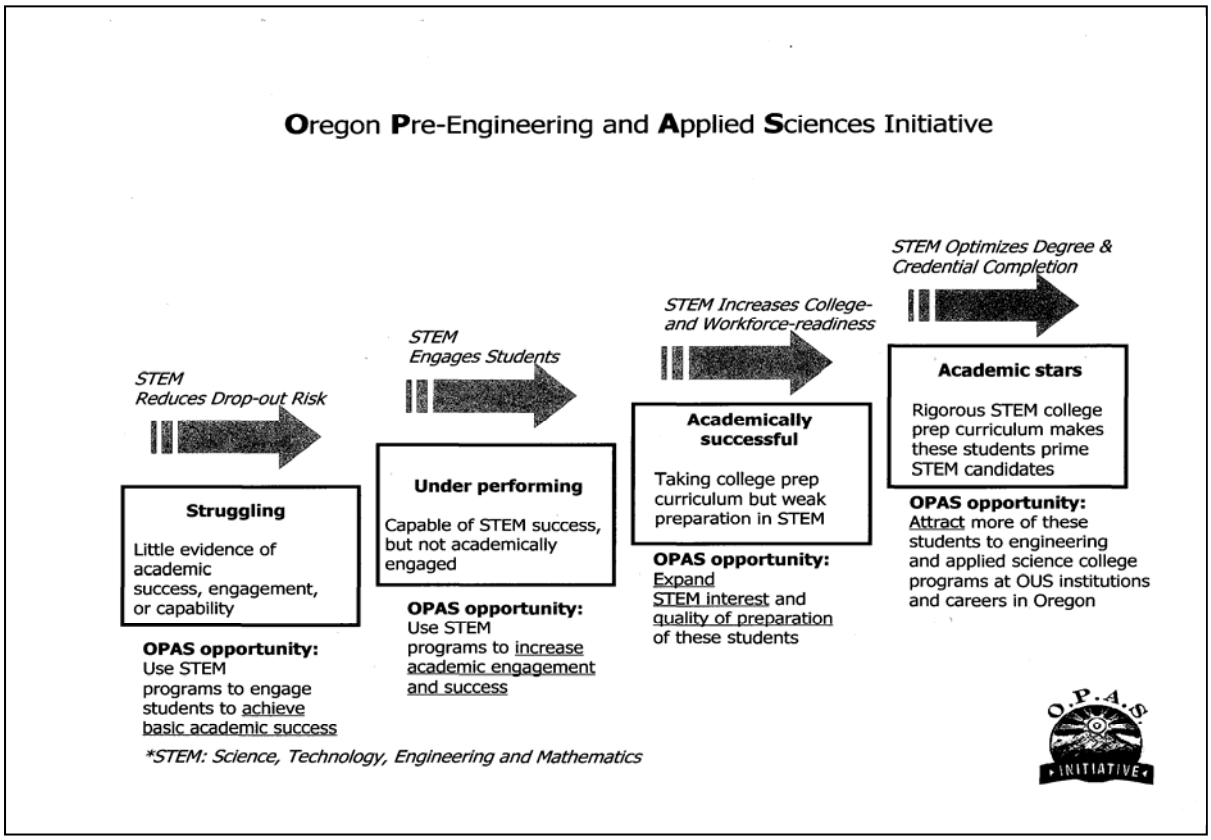
Recommended Education	2004 Employment	2014 Employment	Growth	Growth + Replacement Openings	Needed vs 20004
All	93,829	107,166	14.2%	32,461	34.6%
Doctorate	39	45	15.4%	20	51.3%
Master's	27,482	30,750	11.9%	9,444	34.4%
Bachelor's	39,505	46,685	18.2%	13,600	34.4%
Associate	19,689	21,583	9.6%	6,620	33.6%
Post-secondary Training	7,114	8,103	13.9%	2,777	39.0%

- Data on SAT-takers from 1996 – 2006 who intended to become CS, Engineering, and Biological Sciences majors show that Oregon students choose engineering and biological sciences much like their peers across the nation; Oregon students have been less likely to choose Computer Science since 1997. *http://opas.ous.edu/Committees/Resources/Data/SATCollegeBound06.xls)*

- Oregon students who complete two or more courses in the same approved Professional Technical Education (PTE) program have outperformed other students in meeting or exceeding state standards for Reading/Literature, Writing, and Math Multiple Choice from 2001 to 2005; while the number of PTE students is slowly rising, the total number of credits they earn is falling. *(2006 data not yet available – 2004-2005 Oregon PTE Statistical Snapshot - http://opas.ous.edu/Committees/Resources/Data/ODE_PTE_2004_Stat_Snapshot.pdf).*

- The percentage of students enrolled in high school who are also enrolled in upper-level college-preparatory track mathematics and physical sciences varies widely in an informal sampling of high schools in and around Portland metropolitan area. The highest enrollment number for 2005-2006 Academic year for pre-calculus was 14.2% in Corbett. (*http://opas.ous.edu/Committees/Resources/Data/ACSW_HS_CPrep_STEM.pdf).*

Framing our Common Understanding



- **OPAS Vision for the year 2020**: All Oregonians have the opportunity to choose and successfully pursue engineering or applied science as their field of study and career, thereby helping Oregon's industries contribute to state economic needs, and innovate and prosper in the global economy.

- **OPAS Mission**: To increase the number of work-ready engineers and applied scientists in Oregon through collaboration of education sectors, industry, and government stakeholders that ensures that all K-12 students have access to high quality education and career exploration opportunities that prepare them for postsecondary and workplace opportunities and success.

- **Committee Reports**:

    - **Diversity Committee: "Fostering Stem Diversity", by Eda Davis-Butts** *(copy enclosed in your registration folder)*
      Abstract: Diversity is important to STEM fields to increase the pool of students and the availability and vitality of viewpoints and solutions in these fields. Much research identifies barriers that limit the participation and success of female and minority students, non-academic and academic best practices that engage student in STEM,

and vital components of STEM experiences for students, parents, and teachers. Effective STEM diversity programming should include :

- building sustained, supportive learning environments to help youth move along the STEM educational and career pathways;
- fostering more positive youth attitudes toward school and learning;
- encouraging youth's intrinsic motivation to learn;
- building visions for entering higher education, and support the learning of academic knowledge and skills to prepare for higher education STEM study and careers; and
- maintaining a strong, ongoing professional development component enabling both content knowledge and classroom practice.

- **Standards, Courses, and Curricula (SCC) Position Statement** *(copy enclosed in your registration folder)*
  Abstract: The SCC Committee believes engineering problem-solving and processes must be made part of standards, assessments, and curricula for math and science. Several states and national organizations have developed good models. Partnerships between K-12, higher education, and industry must be developed to incorporate applied and active learning into the classroom. Professional and Career Technical Education (PTE/CTE), AP, IB, respect for rigorous academic content and technical literacy (not technology use) and career counseling can play a vital role in ensuring that all high school students have the opportunity to graduate ready for any pre-engineering program.

- **Alignment and Coordination: System-Wide and Career Pathways (ACSW/CPTH): Flyover Career Pathways Template**. The committee envisions a career pathways diagram that shows when choices between courses limit future options, especially for high school students, and can be used as the basis for the universal career pathways website originally envisioned at the OPAS summit, which then links to the more institute-and-program specific career pathways diagrams (sometimes called roadmaps), some of which are currently available on the web. A somewhat crude mockup of our vision is enclosed in your packet. On the mockup, within the text boxes, we envision additional links to more detailed information. The top-to-bottom gradient represents increasing depth of study; the left-to-right progression represents years of study.

- **Student Success: Access, Motivation, Retention**: the "Sparking an Interest in Engineering" survey closes November 13; preliminary results will be available at the Workshop. The survey asks three populations (high school students, college students, working professionala) when they decided they had an interest in STEM, and what triggered and/or nurtured it, among other things.

Most materials cited here are also available on the OPAS Master Resources List at http://opas.ous.edu/Committees/Resources/, a sortable, searchable table of articles, publications, working papers, and data of interest to OPAS stakeholders.