**STEM: Preparing Students for Work, Growing Oregon’s Economy**

**STEM Fuels Oregon’s Economy**

From industries across the country to the federal government to Oregon’s top state economists, all say the same thing: **the economic prosperity of every state and the country is reliant on increasing the number of students with higher education degrees**, especially those in Science, Technology, Engineering and Math, also known as STEM. Economists agree that more than half of the economic growth since WWII has come from technological innovation, which makes our industries competitive, drives exports, and supports high-quality jobs. This is why demand for STEM workers has increased, even in non-STEM fields, due to the wide spread use of technology across industries and occupations.

 **“A rich innovation pipeline plays a pivotal role in a region’s industrial development, commercialization, competitiveness, and ability to sustain long-term growth.”**

*From Milken Institute’s Best Performing Cities 2010*

**States without a rich supply of STEM-skilled individuals are seeing flat or even decreasing prosperity** because they are not able to compete in the national and global economy, where an understanding of how to use technology, research, innovation, and adapt to rapid change are key elements for success. In other words, increasing the number of high school, college and university students majoring and graduating in STEM subjects is critical for Oregon’s economic growth and stability.

**STEM: Providing Direct Benefits to Oregon**

The common need across Oregon right now is jobs, jobs, jobs. How do we attract the companies we need in all parts of Oregon to reignite rural and urban communities hard hit by the recession, and impacted by changes in traditional industry sectors? **STEM jobs can anchor Oregon’s local and regional economies** in ways which have multiplier effects that help grow healthy, stable communities. Over the last decade, STEM jobs grew three times faster than non-STEM jobs; and are expected to increase by 17% between 2008 and 2018, compared to 9.8% growth for non-STEM jobs. In 2010 the national unemployment rate for STEM workers was 5.3%; for all other occupations it was double that figure.

Catalyzing growth in high-wage STEM jobs filled by Oregonians who pay above-average income tax is a win for everybody, especially in a state so dependent on income-tax revenues. It keeps and brings in companies and jobs that contribute to family-wage jobs and provides Oregonians with work that would otherwise go to employees imported from other states or countries. The average annual wage for all STEM occupations was $77,880 in May 2009, well above the national average of $43,460 for non-STEM occupations.

**Addressing Oregon’s Skills Mismatch**

In Oregon, like the rest of the country, businesses remain frustrated by the skills mismatch: jobs which go vacant because available workers do not have the skills to fill them. While some countries provide high levels of support for generating a STEM workforce – with 40% of Chinese college graduates holding a STEM degree – in the U.S. only 13% of our graduates have degrees in STEM.

The number of bachelor of science degrees in engineering awarded over the past 15 years has barely grown nationally. In Oregon, we have seen growth in engineering and technology related degrees during the years when investments have been directly into university degree programs through Education & General funding, and through investments made in the programs of the Engineering and Technology Industry Council (ETIC).

**Filling the STEM Gap**

To continue to gain from the social, economic and other benefits that come with critical mass in STEM areas, experts estimate that the U.S. must produce approximately 1 million more STEM professionals over the next ten years, an increase of 30%. **For Oregon, this means increasing annual STEM graduates from about 3,800 to about 5,000**. The payoff: states with a strong STEM workforce are insulated to a much greater extent from the economic ups and downs that Oregon has faced because our workforce cannot attract enough large, medium and small companies who need engineering and technology-capable workers for many different types of positions.

**ETIC Pre-College STEM Programs: Building a Bridge**

**STEM: Aligned with Oregon’s Education Reform Efforts**

**STEM is critical to and aligned with many education reforms being undertaken today in Oregon, from the Achievement Compacts to Common Core State Standards to the innovative pre-college programs for K-12 students breaking new ground in effective teaching and learning that are sponsored by Oregon University System campuses, nonprofits, and state and federal grants to K-12. Helping students make the connections between STEM and their future career opportunities is a key outcome of programs engaged in narrowing the STEM gap.**

Given rapid STEM job growth and the difficulties that businesses are experiencing in filling STEM openings, it is imperative that Oregon support efforts to ensure the state increases the number of degree and certificate holders who are qualified to enter STEM fields.

This continues to be the focus of ETIC, and its pre-college initiative called the Oregon Pre-engineering & Science Initiative (OPAS), which is a collaboration of industry, non-profit, and public educators and leaders. OPAS is helping achieve ETIC's goal of increasing the number and diversity of Oregon students pursuing engineering and similar fields at colleges and universities. OPAS develops and implements strategies that expand formal and informal educational opportunities in pre-engineering, computer science, and other applied sciences for students in middle and high school.

Experts cite many reasons that the U.S. is behind in producing STEM graduates: lack of rigorous K-12 math and science standards; lack of qualified teachers; lack of preparation for college-level STEM study; failure to motivate student interest in math and science; and failure of education sectors to meet STEM job demands, often due to funding cutbacks in both K-12 and higher education, as well as low to no targeted STEM funding.

Those states that are working to increase STEM graduates, including Oregon, have done several things to grow the number and quality of their STEM graduates:

* adopted rigorous math/science standards and improved assessments; Oregon is doing this through Common Core State Standards and we’re ahead in this;
* provide more rigorous prep for STEM students, such as pre-college learning, bridge programs between high school and college;
* use informal learning to take math and science beyond the classroom such as out-of-school programs;
* built up the quality and supply of STEM teachers, which continues to be a challenge because of the higher wages and employment opportunities outside of teaching; and
* established goals for postsecondary education to meet STEM job needs.

Oregon has been engaged in all of these, but for some areas, such as pre-college programs, efforts are not to scale because of the small size of many of the outreach programs offered by the universities and through ETIC. As state funding has decreased in recent biennia, campuses have been able to sustain many of these programs, but not always grow their capacity. Despite the growing need for pre-college programs, the resources have been stagnant, compounded by lower overall external grants during the recession. Thus only a small proportion of the students who need pre-college enrichment programs in order to be prepared academically and otherwise for college have access to them.

**OPAS and ETIC Programs and Outreach**

**STEM Gives Students Tools for Life**

**Even for students who eventually pursue non-STEM fields, engaging them in math, science, engineering and technology in K-12 and college has many beneficial learning outcomes applicable no matter what they do in life. Proficiency in STEM helps gives students valuable skills: using critical thinking to recognize a problem; using STEM concepts to evaluate a problem; and correctly identifying the steps needed to solve a problem even if not all the knowledge to complete the steps is available.**

Specific ETIC/OPAS sponsored and supported programs engage students in the instructional practices that research has shown to be more effective in raising STEM achievement:

* Working with K-12 on STEM curricular improvements and standards, inclusion of engineering design at all K-12 levels, and professional development programs for teachers;
* Increasing funding for a variety of STEM programs, both in class and outside of school time that focus on pre-engineering experiences and enrichment, while developing college-going aspirations, including: SuperQuest[[1]](#footnote-1); Engineering Coaching And Mentoring Program[[2]](#footnote-2); Mathematics Engineering Science Achievement[[3]](#footnote-3); Project Lead the Way[[4]](#footnote-4); Saturday Academy Apprentices in Science & Engineering[[5]](#footnote-5); Science & Math Investigative Learning Experiences [[6]](#footnote-6); and Oregon Robotics Tournament and Outreach Programs[[7]](#footnote-7);
* Helping universities, community colleges and high schools align curricula so students have a smooth transition from one level to the next and are academically ready to succeed;
* Increasing under-represented students in engineering and applied sciences, including students of color and women; and using college students to engage K-12 students in engineering (National Engineers Month, and Student Envoys in Engineering);
* Increasing the college freshman retention rate in engineering and computer science so students do not get discouraged or leave the field as this is a critical component in increasing STEM workers; and
* Growing consensus on strategic directions for engineering and applied science education among public and private stakeholders.

**STEM: It’s good for Oregon**

Oregon is making progress on improving the size and quality of our STEM workforce, but it is too slow to meet the needs of our companies, of all sizes and in all parts of the state. Everyone agrees that we need to reach more students, early and often, with engaging STEM curricula and hands-on programming that are meaningful. Research shows us what is working. ETIC, through the OPAS initiative, is helping to move the state forward in meeting STEM workforce needs. With increases in targeted funding, we can truly make headway by offering programs and outreach to more students, and more diverse students, and by building capacity in proven programs that work.

Sources: Building a Science, Technology, Engineering, and Math Education Agenda (2011); Engage to Excel: Producing One Million Additional College Graduates with Degrees in Science, Technology, Engineering, and Mathematics: A Report by the President’s Council of Advisors on Science and Technology (2012); Center on International Education Benchmarking (2012); Increasing the Number of STEM Graduates: Insights from the US STEM Education & Modeling Project (2012); U.S. Congress Joint Economic Committee, STEM Education: Preparing for the Jobs of the Future (2012); Pennsylvania’s Best Investment: The Social and Economic Benefits of Public Education (2011).

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1. www.techstart.org/superquest [↑](#footnote-ref-1)
2. getreal.ous.edu/echamp [↑](#footnote-ref-2)
3. oregonmesa.org [↑](#footnote-ref-3)
4. www.oit.edu/pltw [↑](#footnote-ref-4)
5. www.saturdayacademy.org/ase/default.aspx [↑](#footnote-ref-5)
6. smile.oregonstate.edu [↑](#footnote-ref-6)
7. www.ortop.org [↑](#footnote-ref-7)