



Joint Interim Task Force on STEM Access and Success (HB 4056) Report

Membership:

Rep. Chris Harker, Chair
Sen. Fred Girod
Sen. Elizabeth Steiner Hayward
Rep. Shawn Lindsay
Dr. William Becker
Ms. Aubrey Clark
Dr. Lisa Graham
Dr. Jeri Janowsky
Ms. Brynn Livesay
Ms. Savannah Loberger
Mr. Eric Meslow
Ms. Deb Mumm-Hill
Dr. Sabah Randhawa
Dr. Todd Sanders
Mr. Terrel Smith
Ms. Nancy Stueber
Ms. Carla Wade

Staff:

Channa Newell
Committee Administrator

Sue Hampton
Committee Assistant

Adopted : December 6th, 2012

EXECUTIVE SUMMARY

Oregon's role in the global economy is defined by its citizens' flexibility to respond to an ever-changing employment climate. Being competitive in the global market means that citizens are literate in the sciences, technologies, engineering, and mathematics: the STEM disciplines. Current statistics show that there are 1.7 STEM jobs for every unemployed American. Jobs sit open in high tech and healthcare fields. Yet Oregon's P – 20 students are unprepared to pursue certificates and degrees that lead to these high-wage, secure, and innovative jobs. Our high school, community college and higher education students are not receiving the support they need to pursue advanced STEM education. The Task Force believes there is not a brain to waste in Oregon and so proposes a pipeline of resources that will engage P – 20 students, teachers, industry partners, and the community as a whole to build and support STEM learning in Oregon. Now is the hour. Oregon must get serious about investing in STEM.

The Oregon Education Investment Board has made pursuit of career and technical certification and post-secondary degrees a priority of its 40-40-20 plan. Similarly, the Oregon Workforce Investment Board (OWIB) Manufacturing Workforce Committee has identified inadequate STEM knowledge and skills as one of their four priority challenge areas. Currently, only 40 percent of students who enter a STEM program complete a STEM degree, which suggests the need for a wide range of remedies to keep students in the STEM pipeline.

Summary of Recommendations: The Task Force urges the Legislative Assembly to begin in the 2013 session the immediate and long-term efforts necessary to increase STEM education in Oregon by (1) appointing a permanent council to develop STEM education, (2) funding STEM Hub and other programs, and (3) providing greater resources to educational and infrastructure improvements. This effort will result in Oregon students standing first in line for Oregon STEM jobs.

THE TASK FORCE

House Bill 4056 (2012) established the Joint Interim Task Force on STEM Access and Success (Task Force) to encourage students to study STEM subjects: science, technology, engineering, and mathematics. House Bill 4056 required the Task Force to submit a report and recommendations to the interim legislative committee on education no later than October 1st, 2012.

House Bill 4056 passed the House and Senate on March 5th, 2012, and was signed into law by Governor Kitzhaber on April 11th, 2012. The Task Force has 17 members, including four Legislators and members from industry, education, STEM organizations and students. Representative Chris Harker is Chair.

House Bill 4056 (2011) gave the Task Force nine charges:

- Identify obstacles to success for students in the STEM disciplines and recommend strategies for removing these obstacles;
- Identify opportunities for improving coordination among existing programs for students involving STEM subjects;
- Assess the status of education in STEM subjects in Oregon’s public and private K-20 schools;
- Identify existing and recommend new programs that build student skills in STEM and that encourage students to become involved in STEM careers;
- Recommend strategies that allow students in low-income and underrepresented populations to have access to and success in STEM programs;
- Assess and make recommendations for improving the way that students transition between educational institutions as relates to STEM education;
- Identify strategies for encouraging mentorships, internships, and partnerships with industries involved in STEM;
- Identify existing and recommend new funding sources to support programs for students in STEM and to provide scholarships to attract and retain students in STEM subjects; and
- Identify ways to engage families and communities in support of STEM education.

LEGISLATIVE RECOMMENDATIONS

The Task Force recommends a variety of legislation to fulfill its charge.

I. STEM COUNCIL

The Task Force recommends the establishment of an entity within the office of the Chief Education Officer responsible for developing, coordinating and advancing STEM learning and industry engagement in Oregon. In this report, we refer to the entity as the STEM Council, which is envisioned as a partnership between the public and private sectors with responsibility for:

- Adopting and advancing an ambitious agenda for STEM education, including clearly articulating goals for K-12 and post-secondary education systems;
- Developing and managing the infrastructure for STEM Hubs, which are described below;
- Administering money appropriated from the general fund for STEM development; and

- Ensuring appropriate resource distribution and accountability for STEM Hubs and other programs funded to advance STEM education through a competitive grant process.

The Task Force has compiled an extensive list of general and specific approaches to Oregon’s STEM challenge. The Task Force encourages the recommended STEM Council to utilize the work of the Task Force as outlined in Appendix A to develop its agenda.

II. STEM HUBS

The Task Force recommends the Legislature establish regional STEM Hubs: centers to channel and coordinate community, regional and state resources for P – 20 students, teachers, and industry professionals. This network of 4-7 regional STEM Hubs will be established with the goal of increasing student STEM access and success by initiating and managing STEM investment programming with K-12 schools.

- Each Hub, operating in partnership with a university or a community college site, will advance STEM education through partnerships that involve P-20 public and private institutions, industry, and other appropriate public and private foundations and organizations;
- Each Hub will align private and public assets to increase student access to, and success in, STEM disciplines as measured with a common set of assessments, thus leveraging targeted state investment in STEM education;
- Programs offered by each Hub will utilize outcomes-based design with a clear plan to advance targeted metrics associated with statewide P-20 goals including, but not limited to, assessments associated with declared learning outcomes;
- Expenditures for support and administration of the Hubs should be kept to a minimum so that the funds available to the program provide direct benefit to the students to the greatest extent possible;
- Each Hub will increase participation in STEM activities and professional development in STEM fields; and
- Each Hub will encourage out-of-school learning opportunities and will offer such opportunities to the students it serves through a competitive grant process.

III. EDUCATION AND INFRASTRUCTURE IMPROVEMENTS

The Task Force wishes to emphasize the role strong STEM education can play in growing Oregon’s capacity to innovate, create, and build a healthy economy. The Task Force also recognizes the critical supporting role played by the arts in developing innovative technologies that capture the imagination of students and consumers alike. See Appendix B, § V. With a robust Information Technology (IT) infrastructure (internet, broadband, computers), these types

of learning can happen anytime and anywhere, whether in school or out of school. For these reasons, it is essential that the State, in conjunction with targeted investments for sections I and II above, and in partnership with industry and other providers, make investments to:

- Ensure that the appropriate IT infrastructure is in place to provide reliable broadband internet access, online delivery systems, and computers and technology in schools and at home, throughout the state;
- Provide targeted tuition support for Oregon residents who are in a STEM undergraduate associate degree or bachelor degree program; and
- Provide appropriate base funding to ensure success of students in the STEM pipeline, including financial support for dual-credit courses.

IV. INDUSTRY PARTNERSHIPS

The Task Force recognizes the tremendously important relationship between Oregon students and educators, on the one hand, and Oregon businesses on the other. It is important that participation of industry STEM partners in the training and development of tomorrow's workforce should increase concurrently with increasing the STEM student pipeline. The Task Force recommends increasing participation by offering:

- Potential limited liability coverage for STEM employers who host STEM program participants on their premises or when their employees work within schools; and
- A pathway for industry and other professionals to provide their STEM expertise both during and in out of school time periods.

TRANSFORMATIVE RECOMMENDATIONS

The Task Force recognizes that pursuit of STEM excellence requires systematic changes in Oregon's education system. We believe some of those changes are being planned now as a result of recent legislative actions including the creation of the office of Chief Education Officer. Some long-term, transformative goals of the Task Force are outlined below. The specific recommendations above should be considered as *complementary* to those goals, not as alternatives which would be sufficient on their own.

- Through development of STEM Hubs as collective impact partnerships:
 - Eliminate the silo mentality of STEM programming and encourage stakeholders to collaborate rather than compete for access to community-based resources and state funding,
 - Work with existing data systems and district planning tools for documenting, monitoring, and managing the change progress. The data must inform stakeholders of progress toward, and achievement of, shared STEM outcomes. The data also need to be used in assessment and evaluation of STEM

- programming throughout the P-20 STEM education system,
- Support collaboration between STEM education researchers from K-12, higher education, and business to create and disseminate new knowledge about effective educational practices. Oregon needs to establish a STEM education research and development cooperative that engages STEM education providers as co-investigators and enables them to implement evidenced-based best practices, and
 - Build on effective engagement and partnership with all relevant sectors of industry, including government agencies and STEM education providers.
 - Oregon’s colleges and universities need to increase their capacity to enroll more students in certificate and degree programs that lead to STEM careers in Oregon. There is a particular need to dramatically increase the participation of underrepresented student populations in Oregon’s STEM career pathways. Funding this effort needs to be a responsibility shared by the Oregon legislature, STEM businesses, and higher education.
 - In order to successfully reach underserved populations and communities as a whole, STEM education must involve families. Family involvement would include education of families on the importance of STEM for career success, opportunities for families to participate in STEM activities and programs, and education for families on STEM education opportunities and scholarships.

CONCLUSION

The Task Force urges the Legislative Assembly to begin the immediate and long-term effort necessary to improve delivery of STEM education in Oregon by creating a permanent council to develop STEM education, funding STEM Hubs, and providing greater resources for educational and infrastructure improvements. With increased access to high-quality STEM education, Oregonians will have greater opportunities to secure high-wage jobs, the state will see an increase in business development, and students will gain opportunities to pursue in-demand STEM careers. The Task Force calls upon the Legislative Assembly to fill this dire gap in Oregon’s workforce and education for the good of all Oregonians.

APPENDIX A: DETAILED RECOMMENDATIONS OF THE TASK FORCE

The Task Force offers detailed recommendations to the Legislature and the recommended STEM Council for further work in bringing about the necessary changes in STEM education.

I. STEM HUBS

- This network of 4-7 regional STEM Hubs will be established with the goal of increasing student STEM access by initiating and managing STEM investment programming.
- Each Hub will be responsible for coordinating, developing, and encouraging professional development in STEM fields for the region's P-20 educators.
- Each Hub will coordinate and foster industry partnerships.
- Each Hub will align public and private assets to increase student access and success in STEM as measured with a common set of assessments.
- The Hubs will be responsible for developing and awarding contracts with out-of-school community-based STEM programs to deliver enhanced STEM education and/or professional development to students and educators, with particular emphasis on underserved populations.
- The Hubs will promote internship and other STEM education programs that maintain programming across elementary, middle, and high school.
- Support professional development that links educators to industry professionals.
- Work with local workforce investment boards, the Economic Development Commission, industry, and educators to develop career pathways in the STEM fields.

II. EDUCATIONAL IMPROVEMENTS

- Provide supplemental funding for schools and school districts that require a technology credit for graduation from high school.
- Provide supplemental funding for educators who wish to collaborate on integrating STEM curriculum into liberal arts coursework.
- Provide supplemental funding and technology grants for schools wishing to develop thematic STEM schools.
- Offer loan repayment or loan forgiveness for teachers in high-demand/STEM fields.
- Provide scholarships for STEM degree holders to obtain teaching certificates.
- Offer scholarships for professional development in STEM fields for K-12 teachers through the Oregon Opportunity Initiative.
- Develop pathways for industry and other professionals to provide their STEM expertise both during and in out of school time periods.

- Offer industry matched scholarship funds for students pursuing post-secondary STEM coursework.
- Use all available resources for STEM education, including schools, out of school STEM programs, and expertise from government agencies and industry professionals.
- Encourage targeted STEM courses for underserved student groups.
- Standardize credit transfers from high schools to community colleges and universities, from community colleges to Universities, and between community college.
- Increase funding for relevant and essential STEM courses in community college.
- Allow use of technical degree as internship credit at university in four-year STEM degree pursuit and improve use of hands-on internship credits in STEM degrees.
- Coordinate and support efforts to bring high-speed broadband capabilities to all Oregon classrooms.
- Oregon Opportunity Scholarships: The program will provide up to two years of full-time tuition scholarships for Oregon residents who are in the final two years of a STEM undergraduate associate degree or bachelor degree program. Eligible students must be attending school full-time and maintain a 3.0 cumulative grade point average. Each school's scholarship fund is appropriated through an application process that includes a 50% matching requirement from private sources. The scholarship will be need-based as determined by the student's Free Application for Federal Student Aid (FAFSA). Colleges and Universities must have a campus-wide STEM retention program (i.e., no-cost tutoring, peer-to-peer mentoring, industry internships, undergraduate research experiences, first-generation support services etc.) to receive Oregon Opportunity Scholarship funds.

III. INFRASTRUCTURE IMPROVEMENTS

- As rapidly as possible, Oregon should make the appropriate infrastructure enhancements to provide reliable broadband internet access and online delivery systems, both in school and at home, to all Oregon P-20 students.
- The Task Force recommends coordination with the Governor's Advisory Council Report Recommendations and the [West Coast Infrastructure Exchange](#).

IV. INDUSTRY PARTNERSHIPS

- Identify points of entry for industry partners and their employees to engage in STEM education, including STEM programming and collaborative and informative professional development.
- Offer potential limited liability for STEM employers who host STEM program participants on their premises.
- Develop pathways for industry and other professionals to provide their STEM expertise during both in and out of school time periods.

APPENDIX B: THE CRITICAL IMPORTANCE OF MAKING THESE CHANGES NOW

I. EMPLOYMENT

The unemployment rate for teens and young adults has reached record levels. The Employment Department projects nearly one-third of Oregon's job openings through 2020 will require workers with post-secondary training, college, or advanced degrees.

As Oregon moves toward its 40-40-20 goal (40% of students obtain a bachelor's degree or higher, 40% of students obtain an associate's degree or certificate, with the remaining 20% graduating from high school) it is critical that we remain aware that just having enough people with degrees does not imply there are enough of the right types of degrees. New graduates face an extremely tough job market. The Oregon Employment Department's most recent job vacancy survey revealed that the unemployed outnumbered available jobs by a ratio of six-to-one in the fall of 2011. Given the current economic climate, college graduates who chose the "right" degree are far more likely to find jobs.

Furthermore, just having the degree is not enough to land these jobs. Workers also need to have the right skill set, which is formed by a mix of education, related work experience, and other training. The partnerships developed between industry partners and the students in these programs go a long way towards ensuring the students get these other skills.

Oregon's list of STEM careers is broad and encompasses a diversity of occupations. In 2010, about 95,000 Oregonians worked in STEM occupations, representing 5.8 percent of all workers. According to estimates from the Bureau of Labor Statistics, employment in STEM occupations is expected to grow about 17.8 percent between 2010 and 2020, which is a slightly lower rate than all occupations (18.1%). Further information on in-demand STEM careers can be found at http://www.esa.doc.gov/sites/default/files/reports/documents/stemfinaljuly14_1.pdf and http://www.qualityinfo.org/olmisj/ArticleReader?p_search=STEM&searchtech=1&itemid=00007234#Graph.

Most of the job opportunities in STEM occupations will come from replacement openings, which occur when workers change jobs or retire. About two out of every five STEM job opportunities will come from the creation of new jobs at new or expanding companies. The ratio of new-job openings to replacement openings is about the same for STEM occupations as it is for all

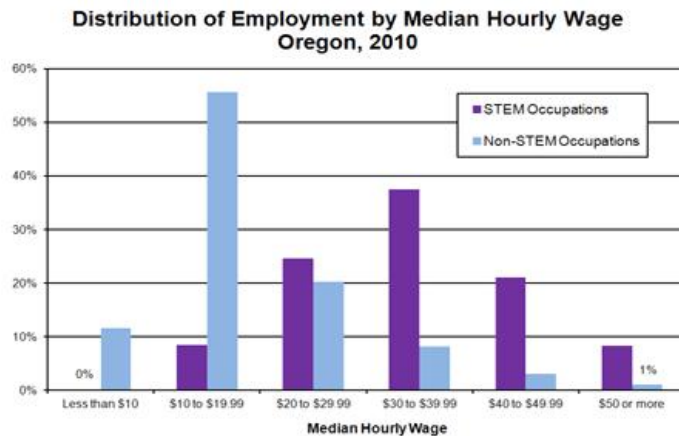
occupations.

II. MORE EDUCATION AND HIGHER AVERAGE WAGES

Nevertheless, STEM occupations differ from non-STEM occupations in a number of ways. One such area is education. Most non-STEM workers (66%) need only related work experience or on-the-job training for their occupation, while most STEM workers (86%) need at least an associate's degree. In fact, two out of every three STEM workers need a bachelor's degree or higher for their occupation, compared with one out of every five non-STEM workers.

The income gap that separates Oregon's richest families from everyone else has increased over the past three decades. Many of those in the upper tier are employed in STEM fields. In Oregon, the median wage for all occupations is nearly \$17 per hour. For STEM occupations, the median is closer to \$30 per hour.

The lowest median wage for a STEM worker is \$15.27 an hour, for forest and conservation technicians. The highest-paid STEM occupation is engineering manager, with a median wage of nearly \$60 an hour. Most STEM workers have a median wage between \$20 and \$50 an hour, see Graph 1.



Source: http://www.qualityinfo.org/olmisj/ArticleReader?p_search=STEM&searchtech=1&itemid=00008325

III. THE NEED

There are several signs that STEM education in Oregon needs a boost:

- The Oregon Workforce Investment Board (OWIB) Manufacturing Workforce Committee has identified inadequate STEM knowledge and skills as one of their four priority challenge areas;

- The Oregon STEM Employers Coalition reports that Oregon companies need a larger STEM-educated workforce but there is a gap between the need and the output of STEM proficient students coming out of our education system;
- Only 40 percent of students who enter a STEM program complete a STEM degree; and
- Demographic disparities in achievement persist, with fewer black and Hispanic students performing at the proficient level than white or Asian American students. SAT scores in mathematics remain lower for girls than boys. These achievement gaps mean that girls and students of color are less likely to be prepared to enter STEM-related post-secondary education and training leading to well-paying jobs in high-tech, engineering, mathematics, and science.

Overall, too many Oregon students are not completing high school with the mathematics and science literacy and preparation in STEM required for post-secondary studies, careers, and informed citizenship.

IV. 40-40-20

The 40-40-20 plan is the legislatively enacted realignment of Oregon's graduation goals with a target of 40% of Oregon students achieving a Bachelor's degree or higher, 40% achieving an Associate degree or certificate, and 20% finishing their education with high school graduation. For more information, please see Oregon Education Investment Board's Executive Summary. STEM education in Oregon is essential for achieving the goals of the 40-40-20 plan. It enhances the financial outcomes for the 40% of graduates obtaining a bachelor's degree or higher, as STEM careers are available and often pay substantially more than non-STEM careers. As mentioned above, the median wage for all occupations in Oregon is nearly \$17 per hour. For STEM occupations, the median is closer to \$30/hour and most STEM workers have a median wage between \$20 and \$50 per hour.

Middle-skill jobs are another important component of the 40-40-20 plan and in Oregon's economy. (Middle-skill occupations are defined as those requiring more than high school, but less than a four-year degree.) In other words, middle-skill occupations are 40% of Oregon's targeted graduates under the 40-40-20 plan. In many trades and fields, workers do not need a bachelor's degree to be relevant and successful in the workplace, but they do need more training than a high school diploma. Even in occupations that don't require formal training for entry, such training is often a good bet for a worker's continued progression through their career. Gaining skill is how workers set themselves apart in the job market and at the individual level can lead to increased wages and job stability.

To produce economic stability for all Oregonians, the 40-40-20 plan calls for all Oregonians to graduate from high school. STEM programs assist high school students in achieving technical skills that will propel students into family-supportive wage jobs without the investment in further education. High school programs that integrate STEM skills into the high school curriculum prepare the 20% of high school graduates that will not pursue higher education for well-paid careers right out of school.

For purposes of policy making and planning, some of us have long recommended that Oregon's decision-makers focus mostly on the competitive education requirements. In order to achieve the 40-40-20 goals and improve the economic outlook of our graduates, we must strive towards having *highly* qualified workers, not just minimally qualified ones.

V. OUT-OF-SCHOOL LEARNING

Learning is not limited to the formal education environment; the potential for learning exists at all times and in all places. Oregon has a great opportunity to supplement STEM programs in the out of school time frames. Out-of-school learning programs should focus toward hands-on learning projects that will provide relevance to the rigor taught in the math and sciences and allow a student to grasp innovative thinking around the concept of creative problem solving. These programs may be group-based, where students will have the opportunity to develop soft skills like collaboration, communication, teamwork and project management – all vital skills in the workplace.

Out of school opportunities let students find real world application for in-class teachings, the ability to receive hands-on, focused instruction, and may well develop a passion for a subject that could lead to a potential career path. Collaboration between in-school and out-of-school educators also benefits our K-12 teachers, as out-of-school providers can provide support and information to in-school teachers.

Out of school learning may coordinate or supplement in-class curriculum, but it may also augment STEM education with accelerated pace, project-based learning, career experience and use of technologies that are not possible in school.

VI. THE ARTS

While STEM education is the prominent focus of this Task Force and its recommendations, the Task Force advocates for the role of art education in developing competent STEM graduates. Employers seek creative problem-solvers who use a multidisciplinary approach to push the technology envelope. STEM is not just about academic learning; it's about applying technical

knowledge in a creative way to solve problems.

Ensuring that students become creative thinkers involves an element that's often overlooked: arts and design. Experience with the arts increases our ability to think outside the box and encourages innovative ideas and strategies. The Task Force acknowledges the critical role played by the arts in developing a well-rounded and competitive STEM workforce. By incorporating the arts into STEM education, students will have the foundation to excel at their jobs with innovation and creativity and will provide the well-rounded STEM professionals this state needs for a vibrant economy.