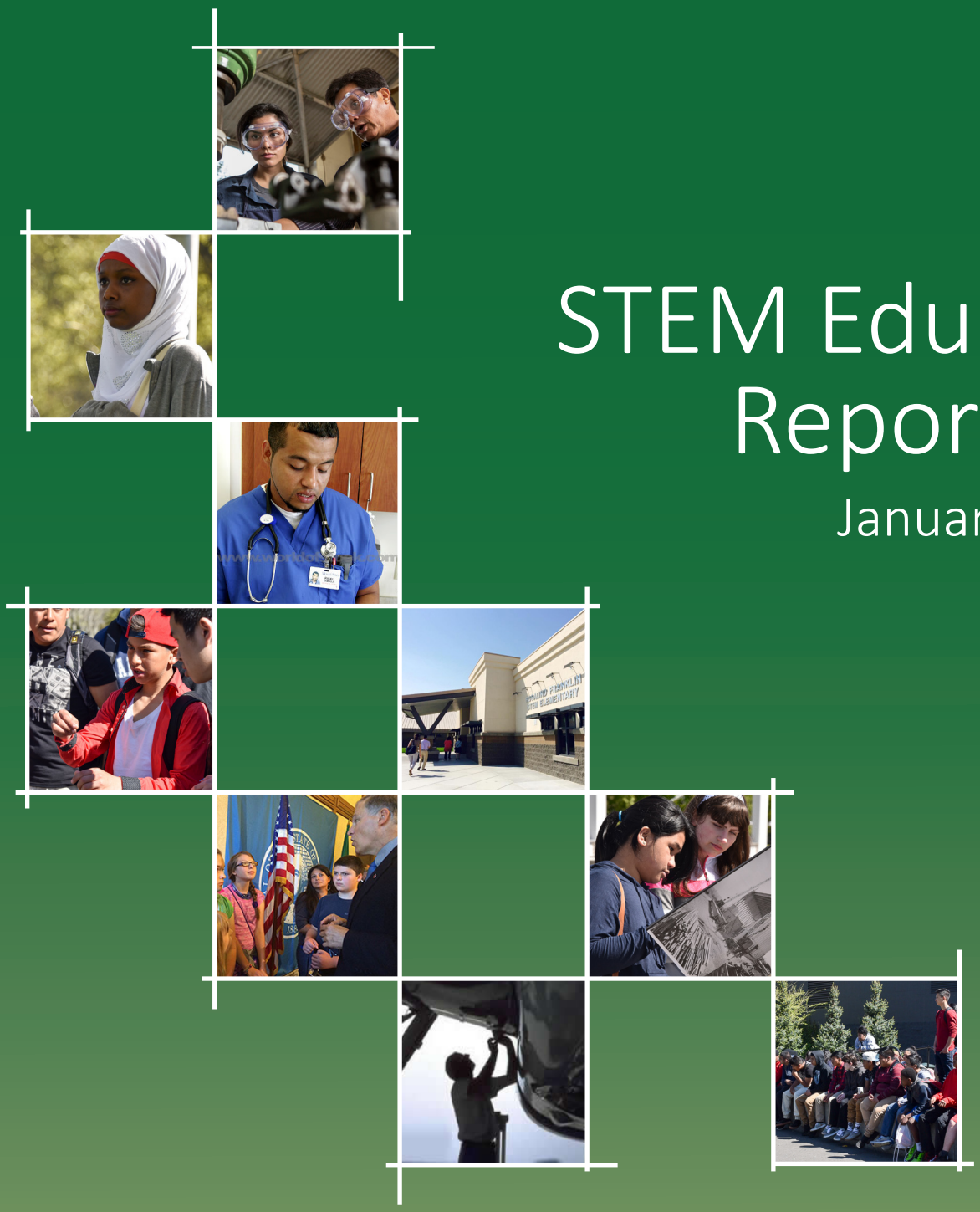
STEM EDUCATION INNOVATION ALLIANCE



STEM Education Report Card

January 10, 2016

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The Honorable Members of the Senate and House of Representatives:

On behalf of the STEM Education Innovation Alliance, I am pleased to submit to you the second annual STEM Education Report Card. The Alliance brings together some of the best minds in the State from business, industry, labor, and education to focus on STEM education and the workforce. This year the Alliance has provided valuable advice and guidance on a spectrum of educational matters that I am confident will enhance educational achievement for students in our state and prepare them for opportunities in Washington's twenty-first century, technology-based work landscape.

With Washington State's economy booming in industries that require skills ranging from basic STEM literacy to complex applications in computer science, engineering and health care, Washington State urgently needs to prepare its students to take on these great high-paying jobs. In the past year, we've seen important advances in STEM opportunities thanks, in part, to your support of programs to increase access to STEM education. Forward steps have been taken in the key areas of kindergarten readiness, new state learning standards, computer science education programs, and others. But we still have more steps to take to ensure that all of Washington's students have access to STEM educational opportunities.

The Report Card provides recommendations for improving STEM opportunities for all residents in our state. We urgently need to increase student preparation in early childhood math, continue to expand access to computer science classes, align STEM education programs with workforce needs, and ensure we are graduating enough STEM students from post-secondary degree programs to meet our state's workforce needs.

I strongly encourage the Legislature to consider moving forward on the following Alliance recommendations:

1. Fund College in the High School courses with a priority on STEM-related courses and low-income students.
2. Increase MESA funding and expand the program to increase its outreach to underrepresented minorities and women in STEM studies.
3. Invest in educators' endorsements in computer science teaching by providing professional development opportunities.
4. Fund the Washington Student Achievement Council's request to continue building and supporting the STEM Education Innovation Alliance and associated STEM Talent Supply and Demand Data Dashboard.

I have included recommendations two and four in my current budget proposal and suggest we should move forward immediately to take advantage of their potential for key impact and excellent return on investment. I anticipate a great session this year, working with you to pass legislation that allows Washington's students to seize the opportunities an education rich in STEM-related curriculum provides.

Very truly yours,

Jay Inslee
Governor

EXECUTIVE SUMMARY

Washington state's economy is booming, producing great jobs that offer competitive salaries in world-class technology, aerospace, clean-energy, and biomedical companies. But there is a critical shortage of workers needed to fill these jobs, and it is most acute in the state's high demand jobs in science, technology, engineering, and math – collectively known as STEM.

In response to Washington's STEM challenge, Governor Inslee proposed the creation of the STEM Education Innovation Alliance. Formed in 2014, its members are to represent a broad range of business, labor, non-profit, and educational organizations, with the role of advising the governor on strategic planning and the formation of effective partnerships in support of STEM initiatives in the state. In addition, the STEM Education Innovation Alliance is charged with submitting a STEM Education Report Card to the Legislature each January in order to report on STEM economic and workforce trends, measure progress in improving STEM education in Washington, and communicate strategic priorities.

The following report serves as the STEM Education Innovation Alliance's second annual STEM Education Report Card to the Legislature to summarize the STEM Talent Supply and Demand Dashboard results and provide recommendations for improving STEM opportunities for all residents of our state.

STEM TALENT SUPPLY AND DEMAND DASHBOARD RESULTS:

- Raising awareness about STEM opportunities is key to STEM literacy and access to economic opportunities in our state; the good news is that knowledge of the term STEM has been growing in the last two years.
- Interest in STEM fields at early ages, an important key to increasing the number of students pursuing STEM-related fields, has increased slightly since 2010.
- Success in education, particularly in STEM subjects such as math, is affected by preparedness, especially in the early stages, but Washington has a ways to go to ensure that all students are meeting standards.

- Readiness for post-high school training and education is also key to meeting the demand for STEM-trained workers. In particular, readiness in the field of computer science is of critical importance to meeting future employer demands. Today, only about 27 districts in the state offer Advanced Placement (AP) computer science.
- Ensuring the supply of graduates from postsecondary institutions with degrees and credentials in STEM fields is critical to our state's future success. In our state, less than 20 percent of college graduates have a STEM degree.
- Aligning STEM education programs with workforce needs of key economic sectors is necessary for the growth of our economy. This includes ensuring that we have an adequate supply of STEM-trained workers in Washington to meet the demand of employers and understanding the potential gaps. Today, the answer is clear: there isn't enough supply of STEM workers to fill employer demand for these skills, and the gap is especially acute for employers seeking individuals with computer science degrees and skills.

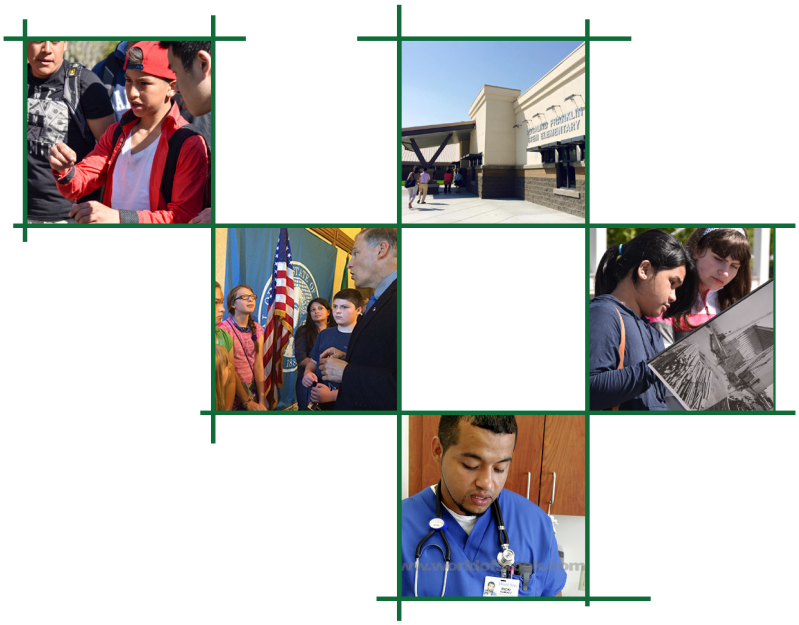
RECOMMENDATIONS:

This report details several budget and policy recommendations that we urge you to act upon because we strongly believe they are critical to our state's economic future and build upon current successful state-wide efforts.

Important work underway, which we support, includes career and college readiness efforts such as: kindergarten readiness, Common Core State Standards, Next Generation Science Standards, Smarter Balanced assessments, dual credit/dual enrollment coursework, and computer science education programs. We believe these reforms move our state towards rigorous expectations and opportunities for all our students. Our recommendations are as follows:

1. Fund College in the High School courses with a priority on STEM-related courses and low-income students.
2. Increase the funding and expand the MESA (mathematics, engineering, science and achievement) program from six community colleges to 12 community and technical colleges (CTC) this session, then to 34 CTCs in the following biennium.
3. Invest in educators' endorsements in computer science teaching by providing professional development opportunities so they can nurture student interest in computational thinking in preparation for postsecondary programs and good jobs in this high demand field. Our specific recommendation is to consider accelerating the path to provide computer science opportunities for all students in Washington by investing more in the computer science endorsement scholarships for educators legislated last year. Our goal is for every student to experience computer science learning as a part of his/her education. As well, we recommend that EVERY classroom in the state participate in the Hour of Code during Computer Science Education week in December.
4. Endorse the Washington Student Achievement Council's (WSAC) request to sustain the STEM Education Innovation Alliance and the STEM Talent Supply and Demand Data Dashboard.

Unless much more is done to address the need for a STEM workforce, the skills gap will only increase in the years ahead. Many students will continue to leave Washington to pursue higher education elsewhere, and employers will continue to seek out-of-state and international STEM talent to fill their workforce needs. Without improvement, leading companies may be driven to locate more and more jobs outside of the state. But, with focused effort, our state could be a national leader in STEM education. Washington should seize this opportunity to lead its residents into high-paying jobs and economic prosperity in the future. Action is needed now, and the recommendations set forth in this report are critical to making progress to advance STEM education and a STEM-trained workforce in our state.



INTRODUCTION

Washington state's economy is booming, producing great jobs that offer competitive salaries in world-class technology, aerospace, clean-energy, and biomedical and natural resource based companies. But there is a critical shortage of workers needed to fill these jobs, and it is most acute in the state's most high demand jobs in science, technology, engineering, and math – collectively known as STEM.

- A 2013 joint report by the Boston Consulting Group and the Washington Roundtable calculated that, even after importing highly educated workers from out-of-state and abroad, Washington is missing out on an opportunity to fill as many as 25,000 high-skill jobs – a number that could double by 2017.
- Only nine out of 100 children born in Washington will ultimately end up as employees in a STEM-related field in the state – far fewer than the number needed to fill Washington jobs requiring STEM-related skills. The situation is worse for low-income students, who are less academically prepared for the STEM workforce than their more affluent peers. Currently, only 40 percent of high school students in Washington graduate with competency in STEM topics. [1]

STEM fields hold the jobs of tomorrow – and Washingtonians need to be ready to seize them.

In response to Washington's STEM challenge, Governor Inslee proposed the creation of the STEM Education Innovation Alliance, which was approved by the Washington State Legislature in 2013 in Engrossed Second Substitute House Bill 1872 (E2SHB 1872). Its members were to represent a broad range of business, labor, non-profit, and educational organizations, with the role of advising the Governor on strategic planning and the formation of effective partnerships in support of STEM education initiatives. In addition, the STEM Education Innovation Alliance is charged with submitting a STEM Education Report Card to the Legislature each January in order to report on STEM economic and workforce trends, measure progress in improving STEM education in Washington, and communicate strategic priorities.

The following report serves as the STEM Education Innovation Alliance's second annual STEM Education Report Card to the Legislature to provide recommendations for improving STEM opportunities for all residents of our state. This report is submitted by Matt Steuerwalt, Executive Director of Policy, Office of the Governor, and Gene Sharratt, Executive Director of the Washington Student Achievement Council, on behalf of the STEM Education Innovation Alliance.

In addition to the preparation of this report, key accomplishments of the STEM Education Innovation Alliance to date are as follows:

- In March 2015, the STEM Education Innovation Alliance met with the Governor and formed a metrics sub-group committee to help in the development of state-wide STEM measures to track STEM education and workforce opportunities in the state.
- In May and August 2015, the metrics sub-group committee met to discuss and operationalize the measures that are reported in this STEM Education Report Card.
- In September 2015, the development of an on-line STEM Talent Supply and Demand Dashboard for reporting progress on state-wide STEM measures began. Completion is expected in late December 2015.
- In November 2015, the STEM Education Innovation Alliance issued four priority policy recommendations to Governor Inslee; these are detailed in the Recommendations section of this report.

1 Boston Consulting Group, Opportunity for All: Investing in Washington States' STEM Education Pipeline, 2014

In Washington, only about 27 Districts in the state offer **Advanced Placement (AP) computer science courses.**

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- In December 2015, an Education and Industry partnership sub-group committee was formed to promote greater coordination of STEM activities.

Current funding to support the activities of the STEM Education Innovation Alliance is being provided by a National Governors Association (NGA) Center for Best Practices grant. This grant program supports states in planning and taking action to better align their education and training systems to meet the needs and employment opportunities in their states. Washington was one of eight states to earn a full award beginning in 2014. The two-year NGA-STEM grant provides $170,000 in funding and other resources to advance the STEM Education Innovation Alliance agenda. Funding has been supplemented by significant in-kind contributions from WSAC, Office of Financial Management, Education Research Data Center (ERDC), and Washington STEM.

BACKGROUND

Washington sits at the top of many state rankings in the areas of innovation-related human capital and research development.[2] Focusing on the technology sector, we find that among a sample of states with significant technology sectors, Washington is the largest importer of technology degrees as a proportion of the population. The state has one of the highest proportions of STEM jobs in the nation.[3] However, the state ranks low in the production of computer science and engineering degrees relative to job openings in those fields. And it ranks last among high-tech-intensive states in the proportion of high school graduates who go directly to college.

Washington currently cannot meet the demand for STEM talent with qualified local employees. [4] Nationally there are two and a half times as many entry-level, STEM-related job postings as there are STEM graduates.[5] If the education "pipeline" supplying STEM workers is not fixed in Washington, the state will not be able to preserve and expand the number of jobs in this innovative sector. Already Washington employers rely heavily on talent from other states and nations to meet demand for this dynamic sector. Without progress in this area, STEM employers may begin to look to other parts of the country for more fertile ground on which to develop their companies.

What is Holding Back Washington? Beginning in the period before kindergarten and up to the time of obtaining full-time employment, many Washingtonians fall off the track for achieving some of the state's greatest economic opportunities. A Boston Consulting Group analysis shows that Washington loses 91 out of every 100 potential STEM employees in its workforce at some point "from cradle to career." Many of the students who are lost in the transition do so because of a lack of academic preparedness and applied experience. Some of the key areas of concern identified in the Boston Consulting Group 2014 report are as follows:

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2 STEM State-Level Analysis, Anthony P. Carnevale, Nicole Smith, and Michelle Melton, Georgetown University Center on Education and the workforce, October 2011, https://cew.georgetown.edu/stem/states.

3 STEM Education in Washington: The Facts of the Matter, Ed Lazowska, University of Washington, March 2013, http://lazowska.cs.washington.edu/STEM.pdf.

4 Washington Roundtable & The Boston Consulting Group. (2013). Great jobs within our reach: Solving the problem of Washington state's growing job skills gap. Retrieved from http://www.pacmtn.org/Impact/ reports/documents/BCGWRTGreatJobsWithinOurStateMarch2013.pdf. And, Washington Student Achievement Council, Washington State Board for Community and Technical Colleges, & Workforce Training and Education Coordinating Board (Forthcoming). A skilled and educated workforce. Olympia, WA: Washington Student Achievement Council.

5 http://burning-glass.com/research/stem/

- **Early Learning:** Nearly one-third of children are not ready for kindergarten (and even fewer are ready for math). They enter the K-12 education system at a disadvantage due to access to affordable high-quality preschool and a lack of STEM learning opportunities.
- **K-12 Education:** Of every 100 children born in Washington, only 40 will graduate high school on track for a STEM-related career. The rest will not be prepared because of poor academic performance, limited proficiency in math and science, a lack of interest in STEM subjects, and limited access to rich community-based experiences that provide the context for STEM.
- **Transition to Postsecondary Education and Training:** Only 22 of every 100 students will pursue STEM-related postsecondary education in Washington. The major factors for this sharp decline include the lack of capacity in the state's higher education system, students' disinterest in STEM or in attending an in-state university, and student inability to afford college and STEM training opportunities.
- **Postsecondary Education:** Of those 22 STEM-major students who do enroll in college, only 13 will graduate from a two- or four-year college with a STEM-related degree. The rest will drop out, switch majors, or fail to complete on time.
- **Career:** Finally, only nine of every 100 students born in Washington will ultimately become employees in a STEM-related field in the state. Many others will take jobs outside the state or in fields unrelated to their major, despite local demand.

Low-income students face particularly strong headwinds. Of these students, only 40 percent are ready for kindergarten at the traditional age, 25 percent are prepared for and have the opportunity to take STEM coursework in K-12, 12 percent are enrolled in STEM majors in postsecondary education, six percent graduate with STEM-related degrees, and four percent enter STEM jobs. Moreover, student aid to help low-income students is underfunded – one third of the eligible students are not funded. There is a potential to at least triple STEM graduation rates among these students by increasing access to high-quality STEM programming which would bring their achievement levels closer to those of all other students. Targeted interventions and access would have the dual effects of reducing the STEM jobs gap in Washington state and helping to break the cycle of poverty for low-income students in the state.

If Washington invests in STEM education, it could change the lives of thousands of students and fuel economic growth in our state. There is no single solution to this problem. Washington must invest in multiple strategies to improve education and training across the spectrum: early learning, K-12, postsecondary and workforce education and training, and career preparation.

STEM FRAMEWORK FOR ACTION AND ACCOUNTABILITY

To address the challenges facing our state with respect to STEM education, a statewide Framework for Action and Accountability ("the Framework") was developed and adopted by the STEM Education Innovation Alliance.[6] The Framework is a research-based tool developed to support greater coordination, smarter investments, and clear results. Under the Framework, the vision is for all Washingtonians to have the STEM skills necessary to live a life of opportunity and success in the state's thriving innovation economy and democratic society. Our goal is for

6 A summary of the Framework for Action and Accountability can be found here: http://www.washingtonstem.org/STEM/media/Media/STEM%20Policy/WASTEM-excSummary-final.pdf

Washington state to lead the nation in STEM literacy for all and to create a diverse, world-class workforce. The Framework was developed to help measure and track progress towards meeting our goals.

The Framework identifies four key areas to show our progress:

- Early learning through high school students;
- Early learning through high school educators;
- Postsecondary, workforce training, and employers; and
- Aligned systems - Washington STEM stakeholders'/partners' capacity to establish and accelerate shared STEM education and workforce goals.

A critical component of the Framework is the ability to track and measure short- and long-term progress toward reaching our goals. A measurement system via a web-based STEM Talent Supply and Demand Data Dashboard is under development to help track our progress over time. The STEM Talent Supply and Demand Data Dashboard will be publically available next year.

The Framework is already being used by stakeholders promoting STEM. The Framework is expected to accelerate the impact in our state by:

- Aligning STEM efforts across the State of Washington against a common vision, shared goals, and clear indicators;
- Improving our return on investment;
- Providing for strategic planning and a measurement tool for STEM stakeholders in the state;
- Creating a common research and development agenda to test, identify, and spread promising practices; and,
- Informing policy development and implementation.

MEASURING OUR PROGRESS

Our governor has been a leader in advancing STEM education in the state. For example, recently issuing Governor Proclamations for Computer Science Week and Environmental Education Week and challenging local schools and youth serving organizations to participate in activities such as the Hour of Code. In addition, Governor Inslee is the current chair of the Education and Workforce Committee with the National Governors Association. In that role he will help shape federal policy in the areas of early childhood, K-12, and postsecondary education and workforce development. We thank the governor for his leadership and encourage continued efforts to engage with key stakeholders to communicate the importance of STEM in Washington.

In addition, we believe, through a variety of budget and policy initiatives, our state is on track to make excellent progress in STEM education and employment opportunities in the future. Important work underway which we support includes career and college readiness efforts such as: kindergarten readiness, Common Core State Standards, Next Generation Science Standards, Smarter Balanced assessments, dual credit/dual enrollment coursework, and computer science education programs. We believe these reforms move our state toward rigorous expectations and opportunities for all of our students.

We have more progress to make if we are to be successful in reaching our goals. The Framework described above and the measurement system built to track its progress (STEM Talent Supply and Demand Data Dashboard – see Appendix A for more details) allow us to present data and trends on STEM education and workforce progress in our state.

Below, we summarize our progress in key areas as well as the challenges that remain:

Raising awareness about STEM is key to STEM literacy and access to economic opportunities in our state. The good news is that knowledge of the term STEM has been growing in the last two years.

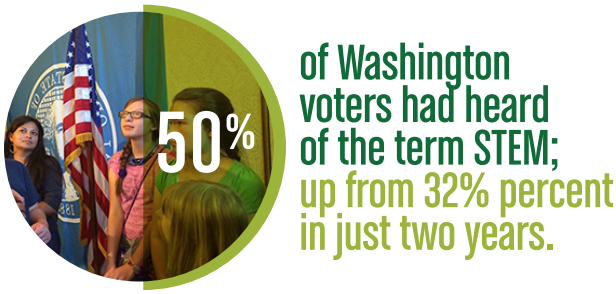
- According to a survey of Washington residents, conducted by Washington STEM in 2015, about 50 percent of Washington voters had heard of the term STEM, up from 32 percent percent in just two years.

Interest in STEM at early ages, an important key to increasing the number of students pursuing STEM-related fields, has increased slightly since 2010.

- Among Washington SAT test takers (high school-age students), about 28 percent indicated an intention to pursue a STEM major or field in 2014, up from 25 percent in 2010.

Success in education, particularly in STEM subjects such as math, is affected by preparedness, especially in the early stages. While Washington is a leader in preparing students in math and other STEM-related subjects, not all students are prepared to meet the next academic challenge. We must make progress to ensure that all students are meeting standards. [7]

- In 2014-2015 about half (52 percent) of Washington's kindergartners met the math standard (from WaKIDS).
- In 2013-2014 about 64 percent of fifth graders met the standard on the MSP math test (WaKIDS), up from about 54 percent in 2009-2010.
- On the newly instituted Smarter Balanced Assessment (SBA), almost half (48.1 percent) of Washington students assessed in fifth grade met the math standard in 2014-2015. While the SBA is new, the results are encouraging as Washington is ahead of other states in the percentage of students meeting standard in math. For low-income populations, however, only 31 percent of low-income children in Washington met the standard on kindergarten math readiness in 2014-2015. More needs to be done to address this disparity.



Readiness for post-high school training and education is also key to meeting the demand for STEM-trained workers. In particular, readiness in the field of computer science is of critical importance to meeting future employer demands. Today, only about 27 districts in the state offer Advanced Placement (AP) computer science.[8]

- In 2015, 11 percent (27) of Washington School Districts (and 47 high schools within those districts) offer AP computer science. Less than 1 percent of students in the high schools where AP Computer Science is offered take the AP course and receive credit. Among those with students who took the AP test in 2014 (1,048 students), about 66 percent scored three or above.[9] Of students participating in AP Computer Science statewide, less than 20 percent are low-income (2015).
- Females and students of color are underrepresented in STEM fields, including computer science. Of all students enrolled in AP computer science in the state, only 22 percent are female (2015). Yet, equal percentages of females and males who take the AP test score three or better on it (66 percent in 2014).

7 In future reports additional metrics in science achievement will be added.
8 In future reports additional AP metrics for science and math will be added.
9 For a score of 3 or above, a student may receive college credit.

- And, there is limited access to AP course work, particularly AP Computer Science in Washington's rural areas: AP Computer Science offerings are heavily focused in the Seattle urban area, with limited availability elsewhere in the state.

Ensuring the supply of graduates from postsecondary institutions with degrees and credentials in STEM fields is critical to our state's future success. In our state, less than 20 percent of college graduates have a STEM degree.

- In 2013-2014 about 18 percent of graduates from postsecondary institutions graduate in a STEM field. Among those graduating in a STEM field, most are male (61 percent) and not low-income (83 percent).

Aligning STEM education programs with workforce needs of key economic sectors is necessary for the growth of our economy. This includes ensuring that we have an adequate supply of STEM-trained workers in Washington to meet the demand of employers and understanding the potential gaps. Today, the answer is clear: there isn't enough supply of STEM workers to fill employer demand for these skills, and the gap is especially acute for employers seeking individuals with computer science degrees and skills.

- In 2015, Washington state employers advertised on average more than 30,000 STEM job postings each month. The vast majority of these jobs were in the Seattle-King County region of the state. The greatest number of STEM openings were in computer and mathematical occupations and health care. (Washington Employment Security Department).

28% *of Washington SAT test takers (high school-age students) indicated an* **intention to pursue a STEM major or field** *in 2014, up from 25% in 2010.*

- At the baccalaureate level, degree production in the health, computer science, engineering, and other STEM fields has increased in the last several years. Health sciences degree completions grew -- increasing by nearly 35 percent from 2007 to 2012. Degree production in the fields of engineering and related technology (27.4 percent), science and mathematics (28.4 percent), and computer science and information technology (13 percent) also grew substantially during this same time period.

Despite progress in recent years, the largest gaps between degree production and employer demand at the baccalaureate and graduate levels are in the fields of computer science and engineering. In computer science, demand exceeds the current rate of degree production by 142 percent.

RECOMMENDATIONS

This section outlines the priority recommendations from the STEM Education Innovation Alliance for improving STEM in our state for the 2017 short legislative session. Important work underway in our state which we support includes career and college readiness efforts such as: kindergarten readiness, Common Core State Standards, Next Generation Science Standards, Smarter Balanced assessments, dual credit/dual enrollment coursework, and computer science education programs. We believe these reforms move our state towards rigorous expectations and opportunities for all of our students. Our recommendations are as follows:

1 Fund College in the High School courses with a priority on STEM-related courses and low-income students [BUDGET REQUEST: $5M].[10]

10 SPI's estimate is $7,462,975 to fully fund the college in the high school program authorized in HB 1546 in the current year. $2,864,000 was provided in the budget so the gap in the current year would be approximately $5M if to fund this next year (16-17 academic year).

Students in our state need to be prepared for college-level course work in STEM fields. One mechanism for achieving this is providing for dual credit /dual enrollment coursework. Dual credit allows high school students in our state to enroll in college courses for credit prior to graduation, and the credits earned can be applied toward high school and college graduation and can be transferred to other colleges or universities. Students who complete dual credit courses are more likely to complete high school and continue on successfully to college. We support the College in the High School policy passed last year in House Bill 1546. We are aware of budget constraints, however, so if additional funding is available, we strongly support (in the following order of priority): 1) funding for dual credit for all students in the state; 2) funding for dual credit for all students in STEM-related courses; and 3) funding for students receiving free- and reduced lunch for all dual credit courses available.

52% *of Washington's kindergartners in 2014-15* **met the math standard** *(from WaKIDS).*

2 Increase funding for the MESA program and expand it from six community colleges to 12 community and technical colleges (CTCs) this session [BUDGET REQUEST: $1.5M], then to 34 CTCs in the following biennium [BUDGET REQUEST: $4.3M].

The MESA program has successfully provided community college students with innovative, hands-on opportunities in mathematics, basic and applied science, and engineering in both formal and informal settings. With a STEM training focus, MESA successfully targets underrepresented minorities and women and provides this support and enrichment to at-risk and economically disadvantaged students leading to higher rates of enrollment in and completion of STEM courses and degrees. Specifically, we support increasing the amount for MESA college sites to $125,000 (from $58,000) and doubling MESA from six community colleges to 12 community and technical colleges this session **[BUDGET REQUEST: $1.5M]**. In addition, we endorse the State Board of Community and Technical Colleges' request to increase the amount for MESA college sites to $125,000 for all 34 community and technical colleges in the following biennium **[BUDGET REQUEST: $4.3M]**.

3 Invest in educators' endorsements in computer science teaching by providing professional development opportunities so educators can nurture student interest in computational thinking in preparation for postsecondary programs and good jobs in this high demand field [BUDGET REQUEST: $1M].

Employers in our state know that the demand for computer science graduates is at an all-time high, yet they lack the ability to fill these jobs with graduates from our state's top programs. Moreover, computer science skills and computational thinking are critical to enabling Washington state citizens to be part of a 21st century STEM capable workforce and to reach our goal of building STEM literacy for all. Meeting this demand will require investments, including exposing K-12 students to computer science and computational thinking. Our goal is for every student to experience computer science learning as a part of his/her education. As well, we recommend that EVERY classroom in the state participate in the Hour of Code during Computer Science Education week in December 2016. Previous efforts have made good progress towards this end, and we recommend building on these efforts. Recently-enacted legislation has included the following advances:

- Two years ago, schools were required to give academic credit for AP Computer Science.
- Career and Technology Education (CTE) credit equivalencies that earn students math or science credits were also implemented.
- This past session, House Bill 1813 directed development of computer science learning standards and teacher preparation.

We can build upon these successes by supporting our educators in computer science with professional development opportunities. Teachers with computer science endorsements are key to introducing our students to computer science. We advocate for funding computer science educator grants and scholarships as incentives for teacher preparatory programs in higher education to create courses for pre-service and certificated teachers to learn computer science, with targeted support for teachers who are working in schools serving low-income and underrepresented students in STEM. Our specific recommendation is to consider accelerating the path to expand computer science opportunities for all students in Washington by investing more in the computer science endorsement educator scholarships. The legislature invested $2M in 2015-2017 with the assumption that with a 1:1 match and $2M every biennium, all students would be reached by 2025. We recommend accelerating that path by investing an additional $1M now in this supplemental budget.

4 Endorse the Washington Student Achievement Council's (WSAC) request to sustain the STEM Education Innovation Alliance and the STEM Talent Supply and Demand Data Dashboard [BUDGET REQUEST: $155,000].

To date, the activities of the STEM Education Innovation Alliance and the development of the STEM Demand Data Dashboard have been supported through a National Governors Association grant and contributions from the WSAC and Washington STEM. A supplemental budget request has been submitted for $155,000. This funding will allow the WSAC team to continue providing necessary guidance for the work of the STEM Education Innovation Alliance, workgroups, and the STEM Talent Supply and Demand Data Dashboard. The funds will support salary, benefits, and expenses for one FTE policy associate ($115,000); and provide for Service Contract Expenses for collaborative work with Washington STEM, a nonprofit organization focused on advancing STEM education in the state, which will continue to develop and refine a STEM Demand Data Dashboard and foster the creation of robust and sustainable industry-education partnerships ($40,000). We support WSAC's request to sustain this important work.

RECOMMENDATIONS

Unless much more is done to address the STEM education and workforce training needs, the gap in STEM-trained individuals will only increase in the years ahead. Many students will not be adequately prepared for STEM fields, and those who are prepared will continue to leave Washington to pursue higher education elsewhere. Employers will continue to seek out-of-state and international STEM talent to fill their workforce. Without improvement, leading companies may be driven to locate more and more jobs outside of the state. But, with focused effort, our state could be a national leader in STEM education. Washington should seize this opportunity to lead its residents into high-paying jobs and economic prosperity in the future. Action is needed now, and the recommendations set forth in this Benchmark Report Card are critical to making progress in our state.

Appendix A: Washington's STEM Talent Supply and Demand Dashboard

Framework Indicator	Key Questions	Measure	Results
1 STEM awareness in Washington	Are Washington state residents aware of the term and meaning of "STEM?"	**[MEASURE 1] STEM Awareness** **Definition:** Percentage of Washington residents indicating "yes" they have heard of the acronym STEM at the time of the survey, out of a random telephone sample of voters in Washington. **Source:** WA STEM Survey	**Raising awareness about STEM is key to STEM literacy and access to economic opportunities in our state; the good news is that knowledge of the term STEM has been growing in the last two years.** According to a survey of Washington state residents conducted by the Washington STEM organization, in 2015 about 50% of Washington voters had heard of the term STEM; up from 32% percent in just two years.

Framework Indicator	Key Questions	Measure	Results
2 Student interest in STEM fields	Are Washington high school students interested in pursuing majors that lead to STEM careers?	**[MEASURE 2] Student Interest in STEM** **Definition:** SAT test-takers indicating intended college major in a STEM field out of all SAT test-takers that indicated an intended college major. **Source: College Board**	**Interest in STEM at early ages, an important key to increasing the number of students pursuing STEM-related fields, has increased slightly since 2010.** Among Washington SAT test takers (high school-age students), about 28% indicated an intention to pursue a STEM major or field in 2014, up from 25% in 2010.

Framework Indicator	Key Questions	Measure	Results
3 Student interest in STEM fields	Are Washington high school students interested in pursuing majors that lead to STEM careers?	**[MEASURE 3] Early Learning: Kindergarten Readiness [a]** **[MEASURE 4] K-12: Passing Grade 5 Math [b]*** **[MEASURE 5] Smarter Balanced Assessment Math (3rd – 8th and 11th grade) [c]*** **[a]** Number of students meeting standard for readiness in math on WaKIDS out of the number of students assessed for readiness in math on WaKIDS. **[b]** Number of students meeting standard on the Measurements of Student Progress (MSP) for math in grade 5, out of the total number of students taking the MSP for math in grade 5, including those with "No Score." **Source: OSPI** **[c]** Number of students meeting standard for math on Smarter Balanced Assessment for grades 3-8 in 2014-15. **Source:** OSPI	**Success in education, particularly in STEM subjects such as math, is affected by preparedness, especially in the early stages, but Washington has a ways to go to ensure that all students are meeting standards.** In 2014-15 about half (52%) of Washington's kindergartners met the math standard (from WAKIDS). In 2013-2014 about 64% of 5th graders met the standard on the MSP math test (WaKIDS); up from about 54% in 2009-10. On the Smarter Balanced Assessment, a little less than half (48.1%) of Washington students assessed at 5th grade met the math standard in 2014-2015. And, at 8th grade 46.1% of students assessed met the math standard. For low-income populations, the problem is especially acute: Only 31% of low-income children met the standard on kindergarten math readiness in 2014-2015. At 5th grade, about half of low-income children met the math standard on the MSP compared to children who are not low-income (76% in 2013-2014). *Note: Additional metrics for K-12 in science will be added in future reports.

Framework Indicator	Key Questions	Measure	Results
4 Student readiness for college-level study in STEM	How well are we preparing Washington high school students academically to pursue STEM at the postsecondary-level?	**[MEASURE 6] AP Computer Science:*** **Availability in Washington Districts [d]; Availability in Washington High Schools [e]; Completion [f]; Score 3 or Above [g].** **[d]** Number of school districts containing a high school with students receiving credit from an AP Computer Science program, based on having at least one student receiving credit in AP Computer Science in a given year, out of the number of school districts in the state with high schools. **[e]** Number of high schools with an AP Computer Science program, based on having at least one student receiving credit in AP Computer Science in a given year, out of the number of high schools in the state. **[f]** Number of students receiving credit for AP Computer Science from OSPI Grade History. **[g]** Number of students passing with a score of 3 or higher in AP Computer Science out of the total number of students taking the AP Computer Science exam. **Source:** OSPI and College Board	**Readiness for post-High School training and education is also key to meeting the demand for STEM-trained workers.** In particular, readiness in the field of computer science is of critical importance to meeting future employer demands. Today, only about 27 Districts in the state offer Advanced Placement (AP) computer science: In 2015 about 11% (27) of Washington School Districts (and 47 high schools within those Districts) offer AP Computer Science. Less than 1% of students in the high schools where AP Computer science is offered take the AP course and receive credit. Among those with students who took the AP test in 2014 (1,048 students), about 66% scored 3 or above (a student may receive college credit). Of students participating in AP Computer Science state-wide, less than 20% are low-income (2015). Females are underrepresented in STEM fields, including computer science. Of all students enrolled in AP Computer Science in the state, only 22% are female (2015). Yet, equal percentages of females and males who take the AP test score 3 or better on it (66% in 2014). And, there is limited access to AP Computer Science in Washington's rural areas: AP Computer Science offerings are heavily focused in the Seattle urban area, with limited availability elsewhere in the state. *Note: Additional AP metrics in STEM subjects other than computer science such as science-related AP course will be added in the future.

Framework Indicator	Key Questions	Measure	Results
5 21st century skills	Have students in our state mastered the skills, knowledge, and expertise to succeed in work and life in the 21st century?	**21st century skills** Under development	Not available at this time

Framework Indicator	Key Questions	Measure	Results
6 PreK-12 STEM classes led by effective educators	How effective are educators/ teachers in inspiring and teaching students in STEM subjects?	**PreK-12 STEM classes led by effective educators** Under development	Not available at this time

Framework Indicator	Key Questions	Measure	Results
7 Teachers and school leaders with STEM-related degrees	Do our educators, teachers, and school leaders have the needed degrees and credentials to support student learning in STEM?	**Teachers and school leaders with STEM-related degrees** Under development	Not available at this time

Framework Indicator	Key Questions	Measure	Results
8 Graduates from postsecondary institutions with degrees in STEM fields	What is the supply of STEM graduates from post-secondary institutions?	**[MEASURE 7] Postsecondary: Degree Completion [h]** [h] STEM Degree completions by completion year, out of the total degree completions of all kinds by completion year**.** **Source:** PCHEES - OFM	**Ensuring the supply of graduates from postsecondary institutions with degrees and credentials in STEM fields is critical to our state's future success.** In our state, less than 20% of college graduates have a STEM degree: In 2013-14 about 18% of graduates from postsecondary institutions graduate in a STEM field. Among those graduating in a STEM field, most are male (61%) and not low-income (83%). Only 17% of all STEM degrees awarded are to low-income students (2013-2014) compared to 83% of students who are not low-income. Only 39% of STEM degrees awarded are to females (2013-2014) compared to 61% of males.

Framework Indicator	Key Questions	Measure	Results
9 Alignment of STEM education programs with workforce needs of key economic sectors	Do we have an adequate supply of STEM trained workers in Washington state to meet the demand of employers? If not, how large is the gap now and what is it projected to be in the future? What STEM occupations/fields are in highest demand?	**[MEASURE 8] Skills Gap** **[i] Definition:** Demand for workers in STEM occupations (growth and replacement openings) minus the supply of students expected to enter STEM selected occupations. **Source:** WSAC (IPEDS/ESD)	**Aligning STEM education programs with workforce needs of key economic sectors is necessary for the growth of our economy.** This includes ensuring that we have an adequate supply of STEM-trained workers in Washington to meet the demand of employers and understanding the potential gaps. Today, the answer is clear: there isn't enough supply of STEM workers to fill employer demand for these skills; the gap is especially acute for employers seeking individuals with computer science degrees and skills: Despite progress in recent years, the largest gaps between degree production and employer demand at the baccalaureate and graduate levels are in the fields of computer science and engineering. In computer science, demand exceeds the current rate of degree production by 146%.

Framework Indicator	Key Questions	Measure	Results
	Geographically, where are the STEM job opportunities in the state?	**[MEASURE 9] WA Employment Security Department Jobs, "Gap"** **[j] Definition:** Difference between demand for STEM workers, given by average (across months) the Conference Board's Help Wanted Online (HWOL) job postings, and average (across months) supply of STEM workers, given by WA Employment Security Department unemployment claimants plus WorkSource customers.* **Source:** WA Employment Security Department * Estimated number of claimants and WorkSource customers likely to work in the area based on the labor force's commute patterns using US Census inflow/outflow data. This number subtracts the number of customers who might commute out of the area and adds the number of customers commuting in. "Demand" for an area is not the true demand: HWOL only aggregates online postings. "Supply" is an unduplicated count of current UI claimants and WorkSource customers in an area. "Gap" is the difference between Supply and Demand for a given area and occupation.	**In 2015, Washington state employers advertised on average more than 30,000 STEM job postings each month.** The vast majority of these jobs were in the Seattle-King County region of the state. The greatest number of STEM openings were in computer and mathematical occupations and health care. (WA Employment Security Department).
	What industry sectors should be targeted in order to meet the demand for STEM workers?	**[MEASURE 8] Skills Gap [i] and [MEASURE 9] ESD Jobs [j]** Definition: same as above.	**At the baccalaureate level, degree production in the health, computer science, engineering, and other STEM fields has increased in the last several years.** Health sciences degree completions grew -- increasing by nearly 35% from 2007 to 2012. Degree production in the fields of engineering and related technology (27.4%), science and mathematics (28.4%), and computer science and information technology (13%) also grew substantially during this same time period.

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10 State and local systems to support STEM success Collective Impact	What progress have we made collectively to enact state-wide policy change, disseminate best practices and share data, and leverage funding opportunities?	**State and local systems to support STEM success** Measures (examples) to be developed in the future: **Leveraging Funding:** Evidence of increased funding and alignment of existing resources to support a common agenda and goals **Progress:** Statewide policy change/ enactment; adoption of and effective implementation of evidence-based STEM policies and practices; identification and transfer of best practices across the state. **Systems Change:** Creation and alignment of statewide STEM network to improve student outcomes; shared measurement system **Stakeholder Value:** Satisfaction with progress and backbone organization	Not available at this time