# The Governor's STEM Education Innovation Alliance

## STEM Benchmark Report Card – First Annual Report
## January 10, 2015

**REPORT SUMMARY**

In 2013, the Legislature passed Engrossed Second Substitute House Bill 1872 (E2SHB 1872), calling for the creation of the Governor's STEM Education Innovation Alliance (the "Governor's STEM Alliance"). Its members were to represent a broad range of business, labor, nonprofit, 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 Alliance was charged with submitting an annual STEM Benchmark Report Card to the Legislature in order to report on STEM economic and workforce trends, measure progress in improving STEM education in Washington, and communicate strategic priorities.

The following document serves as the Governor's STEM Alliance's first report to the Legislature. The report is submitted by the Governor's representatives on the Governor's STEM Alliance: Marcie Maxwell, Senior Policy Advisor to Governor Inslee for K-12 Education, Early Learning, Higher Education, Workforce Development; and Gene Sharratt, Executive Director of the Washington Student Achievement Council.

**OVERVIEW OF ACCOMPLISHMENTS TO DATE AND KEY DOCUMENTS IN THIS REPORT**

- Governor Inslee formally appointed members of the STEM Education Innovation Alliance in August 2014. (See **Appendix A** for a summary of the enabling legislation E2SHB 1872 and **Appendix B** for a list of STEM Alliance members.)

- Through a highly competitive Request for Proposals (RFP), the National Governors Association awarded Governor Inslee's administration one of only eight state-level grants in August 2014 to assist states in strengthening the alignment of their education and workforce training systems with the economy. Washington's successful application focused on STEM education and advancing the work of the Governor's STEM Alliance.

- In December 2014, the Boston Consulting Group released a new report *Opportunity for All: Investing in Washington State's STEM Education Pipeline* at Washington STEM's third annual statewide STEM Summit (attended by the Governor and the Governor's STEM Alliance). The BCG report (included in **Appendix D**) outlines critical chokepoints in the state's education and workforce pipeline and recommends strategic investments. According to BCG, a $650 million state investment in STEM would create 8,000 jobs and generate $4.5 billion in returns per year.

- In December 2014, the Governor's STEM Alliance formally adopted the Washington STEM Framework for Action and Accountability to guide policy development and the creation of a dashboard for tracking progress, on which future STEM Benchmark Report Cards will be based. (See **Appendix E** for a summary of the Framework.)

- As part of the Alliance's strategic plan for 2015, a sub-group of members will form a Metrics Work Group, which will select and refine a set of progress measures for tracking progress and preparing future STEM Benchmark Report Cards for the Legislature. (See **Appendix F** for a timeline of the Governor's STEM Alliance's future activities.)

## Purpose of the Report - Summary of Work Completed Thus Far and an Overview of Strategic Plans to Guide Future Activity

Engrossed Second Substitute House Bill 1872 (E2SHB 1872), passed by the Legislature in 2013, called for the creation of the Governor's STEM Education Innovation Alliance. Its members represent a broad range of business, labor, nonprofit, 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 Alliance is charged with submitting an annual STEM Benchmark Report Card for the purpose of monitoring progress in aligning Washington's education system with the workforce needs of its technology-driven economy and preparing students for postsecondary STEM programs and STEM-related jobs and careers.

The document serves as the Governor's STEM Alliance's first report to the Legislature. The report is submitted by the Governor's representatives on the Governor's STEM Alliance: Marcie Maxwell, Senior Policy Advisor to Governor Inslee for K-12 Education, Early Learning, Higher Education, Workforce Development; and Gene Sharratt, Executive Director of the Washington Student Achievement Council.

The report briefly outlines the background history, the state challenges that motivated the legislation, the foundational work that has been completed thus far, and the strategic plan that will guide future activity.

### The Governor's STEM Education Innovation Alliance – A Brief History

**Background: Washington's dynamic STEM-based economy.** Washington is fortunate to possess a vital and dynamic environment for business and industry, with many employers centered in the technology sector. Science, technology, engineering, and math (STEM) industries—including aerospace, agriculture, clean energy, high-tech, health and life sciences, and manufacturing—form the backbone of the state's innovation economy. Washington is a leader in STEM-related businesses and occupations. Nationally, it ranks first in the concentration of STEM jobs,[1] first in the creation of software companies,[2] and second in the "New Economy" index for innovation and entrepreneurship.[3]

A 2011 study by the Georgetown University Center on Education and the Workforce projected that this trend is likely to persist, with Washington's STEM economy continuing to expand and experiencing a 24 percent increase in STEM jobs by 2018. This rate of increase is seven points above the national average, and 94 percent of these jobs will require some postsecondary education.[4]

**The Challenge: aligning the education system with employers' needs for STEM-educated workers.** Washington's dynamic and growing high-technology economy creates many high-skill and high-wage job opportunities for its residents. However, it also creates challenges for the state's postsecondary education and training system. For example, a 2013 report by the Washington Roundtable, an organization representing business and industry leaders, revealed that there were 25,000 unfilled jobs in Washington due to a lack of qualified candidates. Eighty

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[1] Enterprising States: Recovery and renewal for the 21st century, U.S. Chamber of Commerce, 2011.
[2] Cyberstates 2010: The Definitive State-by-State Analysis of the U.S. High-Tech Industry, Tech-America Foundation, 2010.
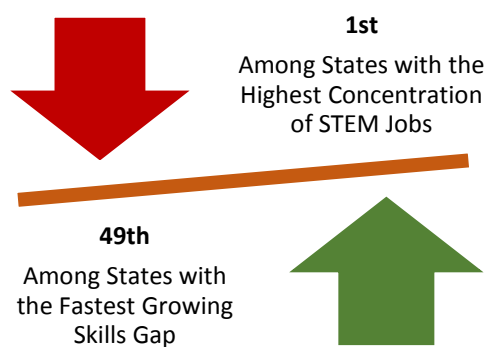[3] Kauffman Foundation and the Information Technology and Innovation Foundation (ITIF) The 2010 State New Economy Index, 2010.
[4] Georgetown University Center on Education and the Workforce, 2011.

percent of those jobs were in high-demand health care and STEM fields like computer science and engineering.[5]

This same report projected that, if this trend continues, local companies will experience approximately 50,000 vacancies by 2017 due to skill gaps in key fields. STEM and health care jobs account for 90 percent of these projected vacancies. The other side of this statistic suggests that significant numbers of native Washingtonians cannot find good-paying jobs, or any job, because they do not have the requisite skills. As a result, employers in Washington have relied heavily on candidates trained in other states and nations.[6] Filling jobs, increasing the state's competiveness for new jobs, and fostering opportunity for all Washingtonians requires a world-class education, training, and workforce system aligned to the state's technology-based economy.
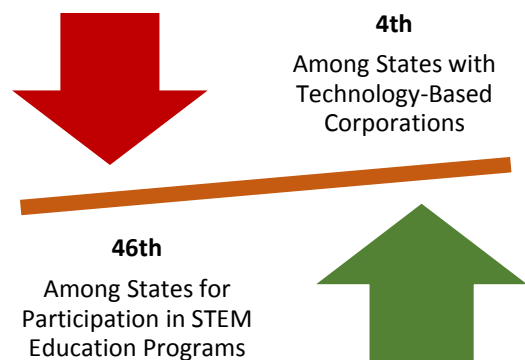
State Comparison One:

**1st**
Among States with the Highest Concentration of STEM Jobs

**49th**
Among States with the Fastest Growing Skills Gap

Aligning the education system with employers' needs in Washington requires a direct focus on STEM education.
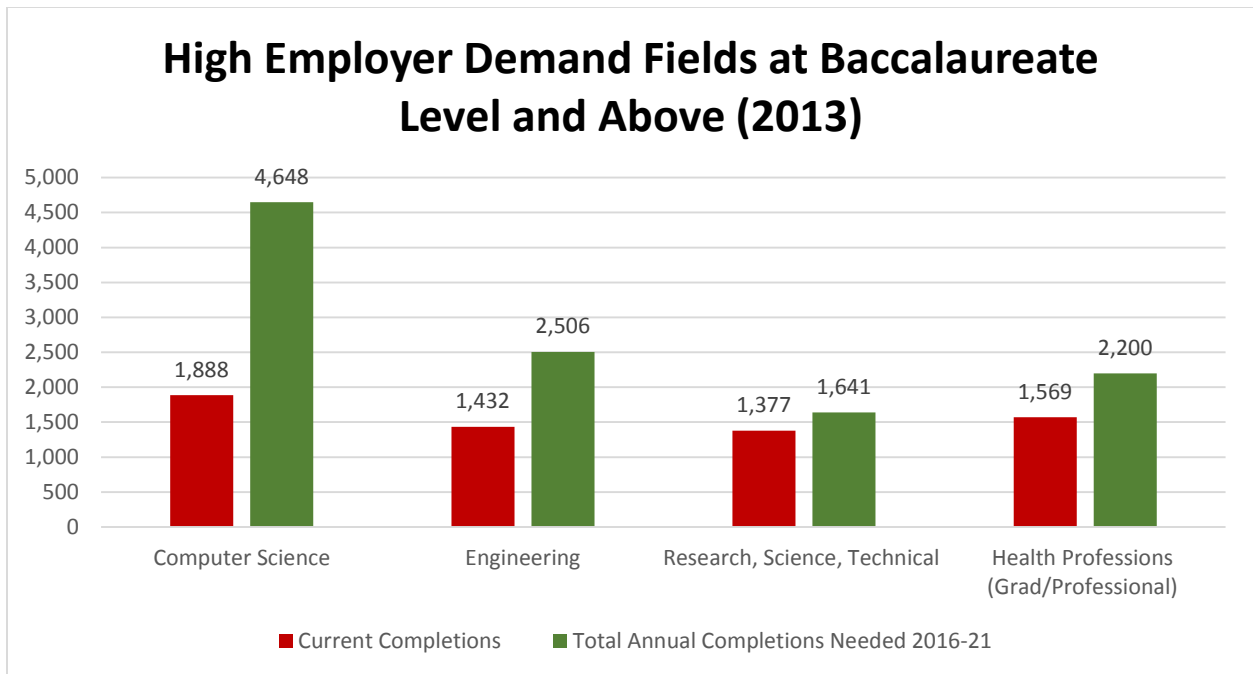
State Comparison Two:

Washington's growing high-tech economy creates high-skill, high-wage jobs, putting pressure on the state's postsecondary education and training system to keep pace with employer demand.

**4th**
Among States with Technology-Based Corporations

**46th**
Among States for Participation in STEM Education Programs

[5] Great Jobs Within Our Reach: Solving the Problem of Washington state's growing job skills gap. The Boston Consulting Group and the Washington Roundtable. March 2013.
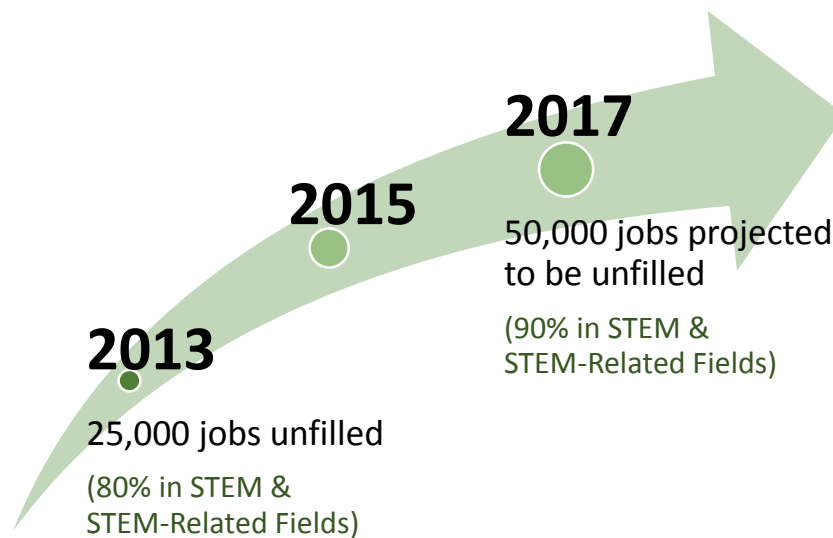[6] Washington Student Achievement Council, Workforce Training and Education Coordinating Board, and State Board for Community and Technical Colleges. *A Skilled and Educated Workforce, 2013 Update*. Olympia, WA: Washington Student Achievement Council.

Employment gaps are present in a range of STEM fields vital to Washington's economy.

## High Employer Demand Fields at Baccalaureate Level and Above (2013)

Chart showing Current Completions (red) vs. Total Annual Completions Needed 2016-21 (green):

- Computer Science: 1,888 / 4,648
- Engineering: 1,432 / 2,506
- Research, Science, Technical: 1,377 / 1,641
- Health Professions (Grad/Professional): 1,569 / 2,200

Legend: ■ Current Completions   ■ Total Annual Completions Needed 2016-21

Source: *A Skilled & Educated Workforce, 2013 Update*

STEM supply problems go beyond the need for more professional scientists, engineers, computer scientists, and mathematicians. There is also a need for more qualified technicians and skilled STEM workers in a range of occupations and training levels. Washington's employers are experiencing a growing number of unfilled vacancies due to difficulties in finding qualified candidates.

**2013**
25,000 jobs unfilled
(80% in STEM & STEM-Related Fields)

**2015**

**2017**
50,000 jobs projected to be unfilled
(90% in STEM & STEM-Related Fields)

Source: Boston Consulting Group and Washington Roundtable. March 2013

**Taking Action: Creating the Governor's STEM Education Innovation Alliance**

In response to Washington's STEM education challenge, Governor Inslee proposed the creation of the STEM Education Innovation Alliance, which was approved by the Washington State Legislature in 2013 in E2SHB 1872. The STEM Alliance is designed to bring together members from business, labor, nonprofit, and education organizations as partners to advise the Governor and provide vision and guidance in support of STEM education initiatives. Its approach is broad and comprehensive, with a preschool-through-graduate school focus. The alliance is focused on aligning the state's education system resources with the workforce needs and employment opportunities of its largely STEM-driven economy.

A fundamental task of the STEM Alliance was to develop a comprehensive STEM Framework for Action and Accountability. The framework will focus on a select set of measures that are meaningful indicators of progress in improving STEM learning opportunities, student outcomes, and alignment between the state's education system and the employment opportunities reflected in the workforce needs of Washington's dynamic economy.

Members of the STEM Education Innovation Alliance appointed by Governor Inslee are listed in **Appendix B**.

**The NGA-STEM Project – Grant Award Provides Key Resources to Support STEM Alliance Efforts**

In 2014, the National Governors Association (NGA) Center for Best Practices issued a Request for Proposals entitled *NGA Policy Academy on Aligning the Education and Training Pipeline to the Needs of the Economy.* The purpose of this NGA Policy Academy grant program is to support states in planning and taking action to better align their education and training systems to meet the needs and employment opportunities of their economies. Washington was one of eight states to earn a full award in this highly competitive grant program.

The two-year NGA-STEM grant program provides $170,000 in funding and other resources to advance the Governor's STEM Education Innovation Alliance agenda. In this early stage of the effort, it is helping catalyze efforts to bring disparate resources together and promote best practice strategies by leveraging the National Governors Association resources for cross-state exchanges of experience and ideas.

**NGA-STEM Grant Project Leverages the Role of the STEM Alliance to Promote Key Partnerships**

Governor Inslee has asked Dr. Gene Sharratt and the Washington Student Achievement Council to lead the NGA-STEM grant program activities for the state. The operations and management team is responsible for coordinating project planning and activity work together with the Governor's Office and members of the STEM Alliance to promote statewide partnerships from different sectors, including government, education, business, and labor organizations. An organizational chart illustrating the close integration of the efforts and goals of the STEM Alliance with those of the grant project is presented in **Appendix C**.

## Progress in 2014: Setting the Foundations for Future Work

With the funding and resources provided by the NGA-STEM grant award in the fall of 2014, the efforts of the Governor's STEM Education Innovation Alliance to improve alignment of STEM Education with Washington's economy and workforce needs has been moving forward at a brisk pace. The STEM Alliance has accomplished the following during this brief period:

***September 22, 2014: First Meeting of the Governor's STEM Education Innovation Alliance.*** The meeting was held in the Governor's Conference Room on the capitol campus. Governor Inslee attended and addressed the members of the STEM Alliance as a formal start to the group's work. The discussion with staff from the NGA Center for Best Practices centered on emerging research, common challenges and strategies, and sharing of best practices experience across policy academy states.

***October 9-10, 2014: Selected Members of the STEM Alliance Participated in NGA Cross-State Policy Academy meeting.*** NGA selected Washington as the site for the first meeting. Six members of the leadership team represented Washington at this initial meeting of the NGA Policy Academy. Discussions centered on emerging research, common challenges and strategies, and sharing of best practices experience across policy academy states. Attendees developed and refined state action plans, metrics, and NGA-STEM grant budget allocations.
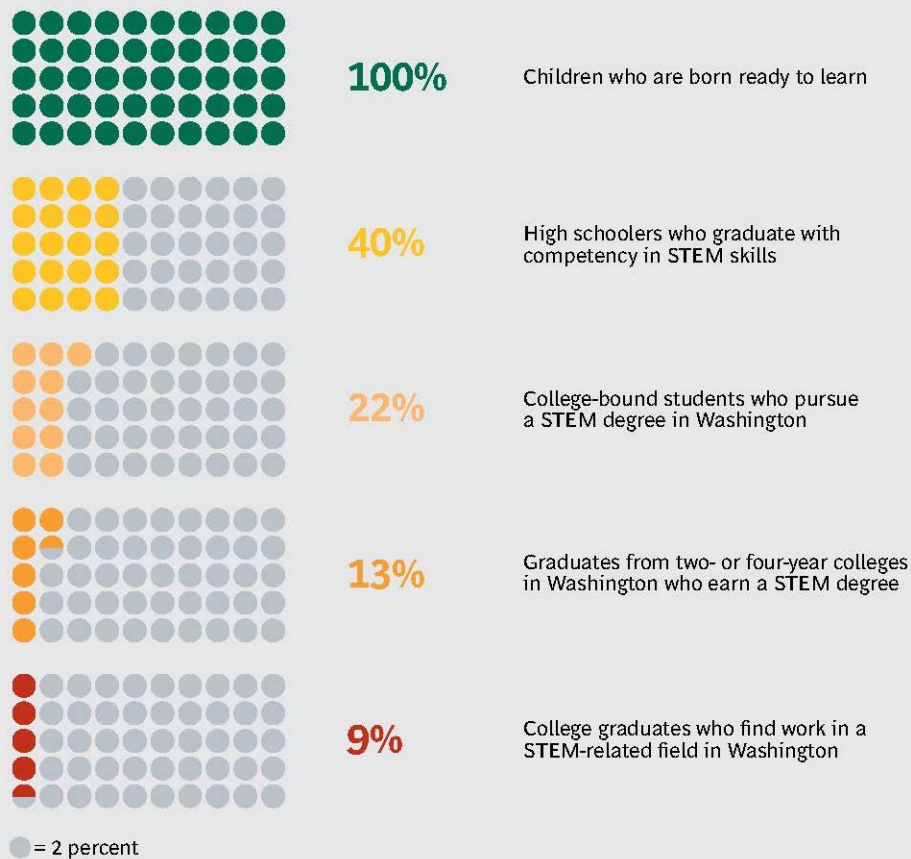
The Washington team presented a poster board that depicted the key challenges Washington faces, STEM Alliance objectives, and proposed goals for addressing our education and workforce training issues. The poster won first place as the "Most Informative" presentation.

**December 2, 2014:** ***The STEM Alliance met at the Washington STEM Summit.*** The Governor and the STEM Education Innovation Alliance attended a meeting during a special breakout session at the Washington STEM Summit held on the Microsoft Campus on December 2. The STEM Summit convened a wide range of education, business, and community leaders, policymakers, and philanthropists to share visions and advance goals. The summit was well attended and included an address by Governor Inslee and Jesse Jackson, who delivered a memorable speech on the issue of promoting diversity in STEM education and careers.

During this meeting the STEM Alliance formally adopted the Washington STEM Framework for Action and Accountability to guide policy development and the creation of a dashboard for tracking progress. The framework includes a set of key progress indicators that will be used in the development of annual STEM Benchmark Report Cards going forward. Alliance members began a discussion of the indicators and expressed an interest in further refinement.

The Boston Consulting Group (BCG) presented a new report, *Opportunity for All: Investing in Washington State's STEM Education Pipeline,* at the Washington STEM Summit. The report uses key trend data to produce an analysis of what happens as students move through the education system, identifying a number of barriers that arise at critical stages in the STEM education pipeline:

**Exhibit 1 | Potential STEM Employees in Washington State Fall Out of the Pipeline at Several Stages**

**100%** Children who are born ready to learn

**40%** High schoolers who graduate with competency in STEM skills

**22%** College-bound students who pursue a STEM degree in Washington

**13%** Graduates from two- or four-year colleges in Washington who earn a STEM degree

**9%** College graduates who find work in a STEM-related field in Washington

= 2 percent

Source: BCG analysis.
Note: STEM = science, technology, engineering, and math.

- *Early Learning.* One-third of school-age children are not ready for Kindergarten, and even fewer are ready for math in Kindergarten, because they lack access to high-quality, affordable preschool and informal learning opportunities outside the classroom.

- *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 fall out of the STEM employee pipeline because of poor overall academic performance, limited proficiency in science and math, or a lack of interest in STEM subjects.

- *The Transition to College.* Only 22 of every 100 kids will pursue STEM-related postsecondary education in Washington State. The major factors for this sharp decline include a lack of capacity in the state's higher education system, students' disinterest in STEM majors or in attending in-state universities, and students' inability to afford postsecondary education.

- *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 finish on time.

- *Career.* Finally, only 9 of every 100 kids 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 high local demand.[7]

The Boston Consulting Group's   report recommends that Washington invest strategically in STEM education, estimating that a $650 million state investment in STEM would create 8,000 jobs and generate $4.5 billion in returns per year. The full report is included in **Appendix D**.

## Strategic Action Plan

The work of the STEM Alliance going forward, both in the development of policy recommendations and in the tracking of progress, will be guided by the Washington STEM Framework for Action and Accountability.

*Washington STEM Framework for Action and Accountability.* The framework identifies a number of key fundamental objectives that will drive the development of progress indicators and guide the Governor's STEM Alliance recommendations for investments, programmatic initiatives, partnerships, and advocacy. These objectives are distributed over four broad areas of focus:

**In the area of early learning through high school**, the objectives focus on two areas:
(1) Preparing, supporting, and retaining excellent STEM teachers; and
(2) Inspiring students to excel in STEM in the preschool through high school system by increasing STEM awareness, interest, achievement, and readiness for college-level study.

**In postsecondary education**, the focus is on graduating more students with certificates and degrees in high-demand STEM fields (e.g., computer science, engineering, and health) and retraining adult workers with high-demand skills.

**In the area of employment and system alignment**, the focus is on aligning postsecondary programs with the workforce needs of the economy and the fostering of key partnerships.

A broad view of the goals and general approach of this framework is outlined below. A full summary of the vision, goals, and rationale underlying the development of the Framework for Action and Accountability is presented in **Appendix E**.

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[7] Wenstrup, John, Bona, Carmen, and Marc Casale. December, 2014. *Opportunity for All: Investing in Washington State's STEM Education Pipeline*.  Boston Consulting Group.

# THE FRAMEWORK

**VISION** → All Washingtonians have the STEM skills necessary to live a life of opportunity and success in the state's thriving innovation economy and democratic society.

## EARLY LEARNING–HIGH SCHOOL STUDENTS

**Indicator 1:** STEM awareness in Washington state
**Indicator 2:** Student interest in STEM fields
**Indicator 3:** Student STEM achievement among early learning–high school
**Indicator 4:** Student readiness for college-level study in STEM fields
**Indicator 5:** 21st century skills

**Objectives:**
- Inspire early learning through high school Washington youth through real-world stem learning opportunities
- Raise public awareness and support

## EARLY LEARNING–HIGH SCHOOL EDUCATORS

**Indicator 6:** STEM classes led by effective educators from early learning–high school
**Indicator 7:** Teachers and school leaders with STEM-related degrees

**Objectives:**
- Prepare, support, and retain excellent early learning through high school STEM teachers
- Raise public awareness and support

*Improve equity and opportunity by improving outcomes for underrepresented groups*

## POST SECONDARY AND EMPLOYERS

**Indicator 8:** Graduates from post-secondary institutions with degrees in STEM fields
**Indicator 9:** Alignment of STEM education programs with workforce needs of key economic sectors

**Objectives:**
- Prepare WA future workforce by graduating additional students with certificates and degrees
- Raise public awareness and support

## ALIGNED SYSTEMS

**Indicator 10:** Partnerships and funding and resource allocation for STEM education and training in Washington state

**Objectives:**
- Raise public awareness and support

## STEM Dashboard Metrics to be Developed and Refined in 2015

The progress indicators outlined in the Framework for Action and Accountability (see summary on page 8) will form the foundations for the STEM dashboard. They will be further refined in ongoing discussions among members of the STEM Alliance.

A sub-group of Alliance members will be brought together to form a Metrics Work Group. Members of this group will meet regularly to explore the range of potential measures and develop a set of indicators for tracking progress. The NGA-STEM grant management and operations team (outlined in **Appendix C**) will facilitate the process and provide technical support, led by Jim Schmidt, Director of the Education Research and Data Center (ERDC).

The Metrics Work Group will begin its work in early March and present periodic progress reports to the full STEM Alliance membership, with the goal of submitting final recommendations in August 2015. The dashboard metrics will be rolled out in three phases. The phase one metrics will be those indicators with sources that are fairly well-established and for which data is readily obtainable. Phase two and three metrics will be refined and incorporated into the dashboard in subsequent additions. Some of these may undergo varying degrees of refinement before they are rolled out**.**

## Development of Policy Recommendations to be guided by Best Practices

National Governors Association resources will inform the development of policy recommendations. The NGA-STEM grant project provides many opportunities to learn about and take advantage of the experience of other states in improving STEM education. The STEM Alliance will develop policy recommendations guided in part by information gleaned through a series of planned meetings with NGA Center for Best Practices staff and conferences with representatives of other states with NGA grants.

An outline of planned activities over the course of the next year is presented in **Appendix F**.

**Appendix A**

# FINAL BILL REPORT
# E2SHB 1872

**C 25 L 13 E2**
Synopsis as Enacted

**Brief Description**:  Establishing a comprehensive initiative to increase learning opportunities and improve educational outcomes in science, technology, engineering, and mathematics through multiple strategies and statewide partnerships.

**Sponsors**:  House Committee on Appropriations (originally sponsored by Representatives Maxwell, Dahlquist, Lytton, Sullivan, McCoy, Upthegrove, Bergquist, Seaquist, Morrell, Wylie, Goodman, Ryu, Tarleton, Tharinger, Springer, Stonier, Jinkins, Orwall, Pollet, Fey, Hansen, Liias and Freeman; by request of Governor Inslee).

**House Committee on Education**
**House Committee on Appropriations**
**Senate Committee on Early Learning & K-12 Education**
**Senate Committee on Ways & Means**

**Background**:

In 2010 the Legislature directed the Office of the Superintendent of Public Instruction (OSPI) to convene a working group to develop a comprehensive plan to establish educational pathways  from elementary education through postsecondary education and careers in Science, Technology, Engineering, and Mathematics (STEM).  The plan defined STEM Literacy and made a number of recommendations regarding recruiting and retaining STEM educators; creating STEM pathways to boost student success; and using STEM education to close the opportunity gap and prepare students for career and college.

Examples of other STEM K-12 education initiatives currently supported by the state include:
- designation of a statewide STEM director within the OSPI;
- provision of funds to support career and technical education in the STEM and professional development for teachers to implement STEM curricula;
- designation of STEM lighthouse schools to serve as examples of innovation and best practices;
- support for a Mathematics, Engineering, and Science Achievement (MESA) program run through state colleges and universities to encourage students in under-represented groups to gain skills and explore careers in the STEM; and
- grants for high schools to implement advanced STEM curricula, such as Project Lead-the-Way.

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*This analysis was prepared by non-partisan legislative staff for the use of legislative members in their deliberations. This analysis is not a part of the legislation nor does it constitute a statement of legislative intent.*

Washington STEM is a nonprofit organization established in 2011 with the objective of identifying and supporting innovations in STEM education across the state.  Since its inception, Washington STEM has invested in a variety of initiatives including support for regional networks of education institutions and community organizations to advance STEM education that is aligned with local economic development; entrepreneur awards to help educators test new ideas and innovations; and portfolio awards that support multi-year STEM education projects.

One of the responsibilities of the Washington Student Achievement Council (WSAC) is to propose educational attainment goals and priorities through a ten-year Roadmap.  Strategies to be included in the Roadmap are outlined in statute.  The first Roadmap is due December 1, 2013.

The Quality Education Council (QEC) is charged with recommending and informing the ongoing implementation of the program of Basic Education to be delivered by the public schools.  The QEC also must identify measurable ten-year goals and priorities for the education system.

**Summary**:

*STEM Literacy.*
A definition of STEM Literacy is adopted:  the ability to identify, apply, and integrate concepts from science, technology, engineering, and mathematics to understand complex problems and to innovate to solve them.  Four components of STEM Literacy are also described:  scientific, technological, engineering, and mathematical literacy.

*STEM Education Innovation Alliance.*
A STEM Education Innovation Alliance (Alliance) is established to advise the Governor and provide vision and guidance in support of STEM education initiatives from early learning through postsecondary education.  The Governor's Office, in consultation with the Superintendent of Public Instruction, must invite representatives of businesses, education institutions, and organizations with expertise in STEM education to participate.  The Governor's Office, the OSPI, and other state education agencies are also represented.

The first task of the Alliance is to combine previous STEM education strategic plans into a comprehensive STEM Framework for Action and Accountability (Framework).  The Framework must use selected measures that are meaningful indicators of progress in increasing STEM learning opportunities and achieving longer-term outcomes in the STEM.

*STEM Benchmark Report Card.*
The Alliance must also develop a STEM Benchmark Report Card (Report Card) based on the Framework.  The purpose of the Report Card is to monitor progress in aligning strategic plans and activities in order to prepare students for STEM-related jobs and careers, with the longer-term goal of improving educational, workforce, and economic outcomes.  The Report Card must be posted online and contain the following:
   • the most recent data for the measures and indicators of the Framework;

- information from state education agencies on how activities and resources are aligned with the Framework; and
- data regarding STEM job openings.

The Education Data Center in the Office of Financial Management (OFM) coordinates data collection and analysis to support the Report Card. State education agencies must annually report on how their policies, activities, and expenditures align with and support the Framework. The Employment Security Department must create an annual report on current and projected job openings in STEM fields for the Report Card.

The first Report Card must be published by January 10, 2014, to be updated annually thereafter.

*Statewide STEM Organization.*
To the extent funds are appropriated for this purpose, the OFM must contract with a statewide nonprofit organization with expertise in promoting and supporting STEM education from early learning through postsecondary education. The purpose of the contract is to identify, test, and develop evidence-based approaches for increasing STEM learning opportunities and improving outcomes that are aligned with the Framework.

The activities conducted under the contract are negotiated between the Governor's Office, the OFM, and the selected organization, and include:
- a communications campaign about the importance of STEM Literacy and the opportunities presented by STEM education and careers;
- expansion of regional STEM networks;
- competitive grants to support innovative practices in STEM education, including models of interdisciplinary instruction and project-based learning;
- professional development opportunities, including technology-enabled learning systems to support state learning standards; and
- opportunities to extend the STEM into early learning.

*Other Initiatives.*
Subject to funding, the OSPI, in consultation with the Alliance, must identify and disseminate resources and materials to elementary, middle, and high schools to encourage interdisciplinary instruction and project-based learning in the STEM.

The WSAC must consult with the Alliance in order to align the Roadmap with the Framework and must include strategies in the Roadmap to strengthen the education pipeline and degree production in STEM fields. The QEC must include strategies to increase STEM learning opportunities in the goals and priorities for the K-12 education system.

The provisions of the bill, as well as laws pertaining to STEM lighthouse schools, the STEM director in the OSPI, the MESA program, and grants for STEM curricula, are all placed in a new RCW Chapter.

**Votes on Final Passage:**

House    58    40

<u>Second Special Session</u>
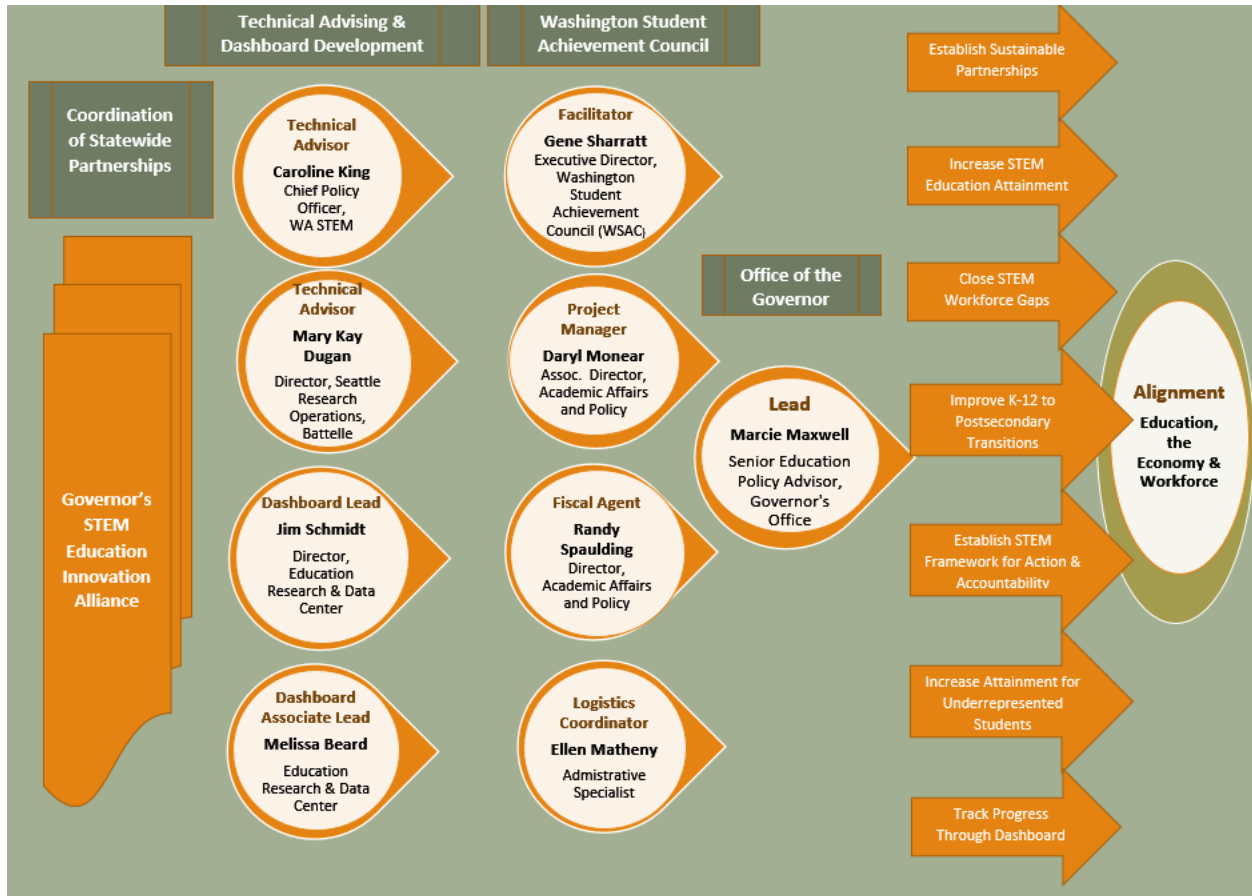House 58 32
Senate 47 0

**Effective:** September 28, 2013

**Appendix B**

**The Governor's STEM Education Innovation Alliance Membership**

- Brian Bonlender - Director, Washington State Department of Commerce
- Violet "Vi" Boyer - President and CEO, Independent Colleges of Washington
- Jeff Charbonneau - 2013 National Teacher of the Year, Zillah High School and Educational Service District 105
- Maud Daudon - Director & CEO, Seattle Metropolitan Chamber of Commerce
- Susan Enfield - Superintendent, Highline School District
- Christine Johnson - Chancellor, Community Colleges of Spokane
- Scott  Keeney - President & CEO, nLIGHT Corporation
- Caroline King - Chief Policy Officer, Washington STEM
- Mike  Kluse - Director, Pacific Northwest National Laboratory
- Ed Lazowska - Bill & Melinda Gates Chair, University of Washington Computer Science & Engineering
- Marcie  Maxwell - Senior Policy Advisor on Education, Governor Inslee's Legislative Affairs & Policy Office
- Gil Mendoza - Deputy Superintendent, Office of Superintendent of Public Instruction
- Isabel Munoz-Colon - State Board of Education Member, City of Seattle, Office for Education
- Gene Sharratt - Executive Director, Washington Student Achievement Council
- Brad Smith - Executive Vice President, Microsoft Corporation
- Stan Sorscher - Labor Representative, Society of Professional Engineering Employees in Aerospace
- Brian Teppner - Principal, Newport Heights Elementary School, Bellevue School District
- Nancy  Truitt Pierce - Director, School Board, Monroe Public Schools
- Margaret  Tudor - Executive Director, Pacific Education Institute
- Joyce Walters - CEO and Founder, Corporate Education Strategies
- Yolanda Watson Spiva - President & CEO, College Success Foundation
- Sam Whiting - President & CEO, Thrive By Five Washington
- Yale Wong - Chairman and Founder, General Biodiesel

# Appendix C



**Technical Advising & Dashboard Development**

**Washington Student Achievement Council**

**Coordination of Statewide Partnerships**

**Governor's STEM Education Innovation Alliance**

**Technical Advisor**
Caroline King
Chief Policy Officer, WA STEM

**Technical Advisor**
Mary Kay Dugan
Director, Seattle Research Operations, Battelle

**Dashboard Lead**
Jim Schmidt
Director, Education Research & Data Center

**Dashboard Associate Lead**
Melissa Beard
Education Research & Data Center

**Facilitator**
Gene Sharratt
Executive Director, Washington Student Achievement Council (WSAC)

**Project Manager**
Daryl Monear
Assoc. Director, Academic Affairs and Policy

**Fiscal Agent**
Randy Spaulding
Director, Academic Affairs and Policy

**Logistics Coordinator**
Ellen Matheny
Administrative Specialist

**Office of the Governor**

**Lead**
Marcie Maxwell
Senior Education Policy Advisor, Governor's Office

Establish Sustainable Partnerships

Increase STEM Education Attainment

Close STEM Workforce Gaps

Improve K-12 to Postsecondary Transitions

Establish STEM Framework for Action & Accountability

Increase Attainment for Underrepresented Students

Track Progress Through Dashboard

**Alignment**
Education, the Economy & Workforce

# Opportunity for All

*Investing in Washington State's STEM Education Pipeline*

The Boston Consulting Group (BCG) is a global management consulting firm and the world's leading advisor on business strategy. We partner with clients from the private, public, and not-for-profit sectors in all regions to identify their highest-value opportunities, address their most critical challenges, and transform their enterprises. Our customized approach combines deep insight into the dynamics of companies and markets with close collaboration at all levels of the client organization. This ensures that our clients achieve sustainable competitive advantage, build more capable organizations, and secure lasting results. Founded in 1963, BCG is a private company with 81 offices in 45 countries. For more information, please visit bcg.com.

# Opportunity for All

*Investing in Washington State's STEM Education Pipeline*

**John Wenstrup, Carmen Bona, and Marc Casale**

December 2014

# AT A GLANCE

There's a leak in the pipeline for employees to fill Washington State's most valuable jobs in science, technology, engineering, and math—collectively known as STEM. We estimate that only 9 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 of people needed for those jobs. The situation is worse for low-income students. Trying to fill great jobs with a leaky human-capital pipeline is like living in a boomtown without enough roads, electricity, or water.

### What's Holding Back Washington State

We have found five choke points in the state's educational system, "from cradle to career," that are impeding Washington's ability to produce enough STEM graduates to address its job skills shortage. To foster economic growth, improve social equity, and offer opportunity to all, Washington will need to invest in the STEM employee pipeline.

### The Impact of Developing More Washingtonian STEM Employees

Targeted investments today can double the number of STEM graduates, lift nearly 100,000 people out of poverty and into the middle class, yield a sevenfold return on investment for government, and boost the long-term competitiveness of the region.

20

WASHINGTON STATE'S ECONOMY IS booming, producing great jobs that offer competitive salaries in world-class technology, aerospace, clean-energy, and biomedical companies. But a serious problem is lurking behind the boom: a leak in the pipeline for employees to fill the state's most valuable jobs in science, technology, engineering, and math—collectively known as STEM.

In *Great Jobs Within Our Reach,* a 2013 joint report by The Boston Consulting Group and the Washington Roundtable, we calculated that, even after importing highly educated workers from out of state and abroad, Washington was missing out on an opportunity to fill as many as 25,000 high-skill jobs—a number that could double by 2017.

Now we estimate that only 9 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 of people needed to fill Washington jobs requiring STEM-related skills. (See the sidebar "The Facts About the STEM Employee Pipeline in Washington State.") The situation is worse for low-income students, who are two to three times 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. These skills are critical for the state's citizens, regardless of whether they end up in STEM-related fields.

Creating more STEM jobs would not only boost Washington's economy, it would also reduce poverty and unemployment, help all Washington families prosper, and create a better-prepared workforce. If Washington can match the practices of high-performing states, such as California and Massachusetts, it could double or triple the number of STEM jobs in the state as well as expand the participation of women and underrepresented minorities in the STEM workforce.

Right now, Washington State can fix the leaks in its STEM employee pipeline and be rewarded with an economic return equal to seven times its investment. The move could generate $4.5 billion in additional tax revenues and social-spending savings per year—a significant return on the $650 million investment needed. Even better, Washingtonians could take home $12.6 billion in additional salaries. What's more, the state could lift nearly 100,000 people out of poverty and into the middle class.

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

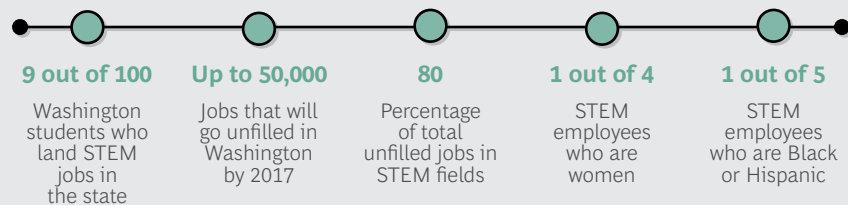Investments in the STEM pipeline could lift nearly 100,000 people out of poverty.

## THE FACTS ABOUT THE STEM EMPLOYEE PIPELINE IN WASHINGTON STATE

Washington State is home to numerous world-class technology, aerospace, clean-energy, and biomedical companies. Nevertheless, the pipeline for employees in science, technology, engineering, and math—collectively known as STEM—is broken. The state currently cannot meet the demand for STEM jobs with local talent and must instead impo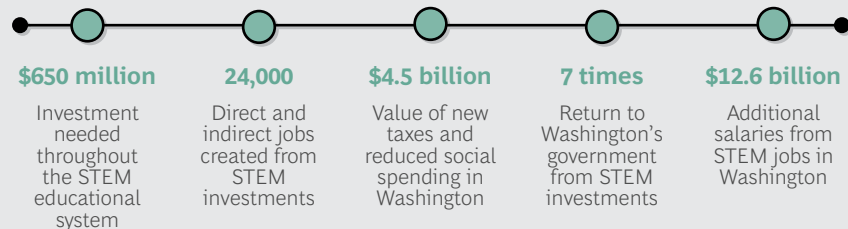rt those workers from out of state or abroad. As a result, Washington is missing out on creating critical middle-class jobs for all its citizens, especially women, underrepresented minorities, and those with low incomes.

Let's take a look at the current state of the STEM employee pipeline, the costs and returns of investing to fix it, and the social-equity benefits of creating more STEM jobs in Washington.

### The **Current STEM Employee** Pipeline

**9 out of 100**
Washington students who land STEM jobs in the state

**Up to 50,000**
Jobs that will go unfilled in Washington by 2017

**80**
Percentage of total unfilled jobs in STEM fields

**1 out of 4**
STEM employees who are women

**1 out of 5**
STEM employees who are Black or Hispanic

### The **Costs and Returns** of Investing to Fix the Pipeline

**$650 million**
Investment needed throughout the STEM educational system

**24,000**
Direct and indirect jobs created from STEM investments

**$4.5 billion**
Value of new taxes and reduced social spending in Washington

**7 times**
Return to Washington's government from STEM investments

**$12.6 billion**
Additional salaries from STEM jobs in Washington

### The **Social-Equity Benefits** of a Strong STEM Employee Pipeline

**18 percent**
Reduction in the number of unemployed people from new STEM-related jobs

**9 percent**
Reduction in the proportion of people in poverty from new STEM-related jobs

**Nearly 100,000**
People moved out of poverty and into the middle class

**30 percent**
Increase in women and underrepresented minorities in STEM jobs

## The Situation in Washington

Washington sits at the top of many rankings of innovation-related human capital and research and development.[1] The state also has one of the highest proportions of STEM jobs in the nation, half of which are in computer science.[2]

In Washington, STEM jobs pay nearly double the salaries of non-STEM positions and represent much of the economic future of the state. But Washington currently cannot meet the demand for STEM talent with qualified local employees.

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 ranks low in the production of computer science and engineering degrees relative to occupations 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 is not alone in facing serious challenges when it comes to filling jobs in high-demand STEM fields. Nationwide, there are 2.5 times as many entry-level, STEM-related job postings as there are STEM graduates.[3] If the STEM employee pipeline is not fixed, the state will simply not be able to preserve and expand the number of jobs in this innovative sector. A survey by BCG and the Washington Roundtable showed that approximately 30 percent of STEM companies have already moved new positions out of Washington because of the skills gap.

The STEM skills gap in Washington is widening because of a lack of preparedness and program capacity. The University of Washington, the state's flagship, is at capacity and turns away more than half of the qualified students who wish to enroll: applications to the college of engineering and department of computer science and engineering, for example, have grown by more than 40 percent since the 2006-2007 academic year, while the number of students offered admission has remained relatively flat. Approximately 40 to 60 percent of students who were turned away had a grade point average of at least 3.25 (out of 4.0).

In short, the state creates a lot of high-impact jobs, but so far it has not created an efficient pathway for local students to get those jobs. Trying to fill great jobs with a leaky human-capital pipeline is like living in a boomtown without enough roads, electricity, or water.
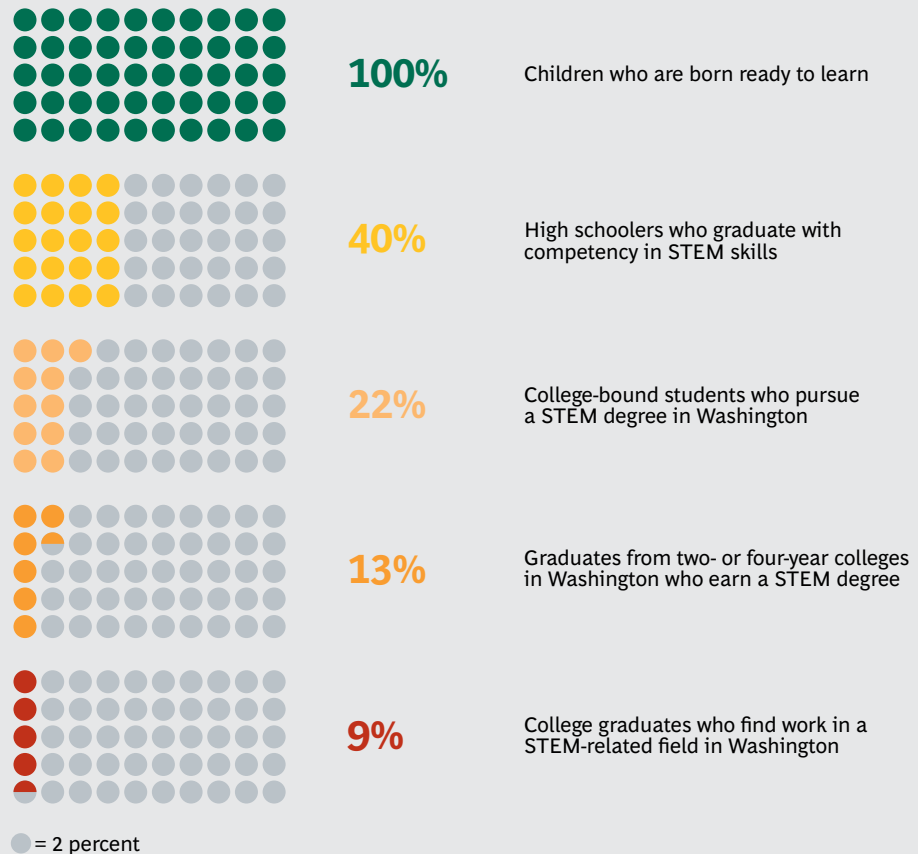
## What's Holding Back Washington State

At many stages from before kindergarten and up to full-time employment, Washingtonians fall off the track for achieving the state's greatest economic opportunities. A BCG analysis shows that Washington loses 91 out of 100 potential STEM employees in its workforce at some point "from cradle to career."

We have found that students who go off the STEM track do so largely because of a lack of academic preparedness. In fact, we have identified five choke points in Washington's educational system that are impeding the state's ability to produce the volume of STEM graduates needed to address the job skills shortage. (See Exhibit 1.)

Washington loses 91 of 100 potential STEM employees "from cradle to career."

**Exhibit 1 | Potential STEM Employees in Washington State Fall Out of the Pipeline at Several Stages**



**100%** — Children who are born ready to learn

**40%** — High schoolers who graduate with competency in STEM skills

**22%** — College-bound students who pursue a STEM degree in Washington

**13%** — Graduates from two- or four-year colleges in Washington who earn a STEM degree

**9%** — College graduates who find work in a STEM-related field in Washington

○ = 2 percent

**Source:** BCG analysis.
**Note:** STEM = science, technology, engineering, and math.

- *Early Learning.* We see signs of students at risk right from the start: one-third of children are not ready for kindergarten. (Even fewer will be ready for math in kindergarten.) Kids fall behind because of a lack of access to high-quality, affordable preschool and a lack of informal learning opportunities outside the classroom. While these students remain in the STEM employee pipeline, they enter the K-12 education system at a disadvantage.

- *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 fall out of the STEM employee pipeline because of poor overall academic performance, limited proficiency in science and math, or a lack of interest in STEM subjects.

- *The Transition to College.* Only 22 of every 100 kids will pursue STEM-related postsecondary education in Washington State. The major factors for this sharp decline include a lack of capacity in the state's higher education system, students' disinterest in STEM majors or in attending in-state universities, and students' inability to afford postsecondary education.

- *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 finish on time.

- *Career.* Finally, only 9 of every 100 kids 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 high 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 capable of completing STEM coursework in K-12, 12 percent are enrolled in STEM fields in postsecondary education, 6 percent graduate with STEM-related degrees, and 4 percent enter STEM jobs. We see the potential to at least triple STEM graduation rates among these students by raising academic performance to levels closer to those of wealthier students. Targeted interventions 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 the STEM employee pipeline today, however, it could change the lives of thousands of students, as well as fuel economic growth. If Washington could match the performance of the best-performing states in the U.S.—such as Massachusetts for early learning and K-12, and California for higher education—the number of Washingtonians who pursue STEM careers in the state could double or even triple.

## How to Prepare Washingtonians for Tomorrow's Jobs

Now is the time for investments to strengthen the STEM employee pipeline in Washington State. The Washington Supreme Court has mandated an increase in spending on basic education of about $4 billion, some of which could be targeted at STEM education. In addition, the business and nonprofit community has shown its strong commitment to addressing the innovation skills gap.

There is no silver-bullet solution, however. Washington will need to invest throughout the STEM employee pipeline, pursuing strategies such as the following to move the needle.

- *Early Learning.* The state must invest in early-learning opportunities for every student in Washington State and emphasize numeracy development in addition to a traditional literacy focus. Thrive by Five Washington, a public-private partnership focused on early learning, offers a promising approach with programs to increase parental engagement, informal teaching and curriculum support, and funding for STEM programs. Altogether, these efforts are reaching tens of thousands of students, many in low-income and rural communities.

- *K-12 Education.* Washington must invest in boosting student interest and success in STEM subjects, as well as in recruiting, training, and retaining world-class STEM teachers and arming them with top-quality curriculum and other instructional materials. For example, Washington STEM, a nonprofit

Now is the time for investments to strengthen the STEM employee pipeline.

dedicated to advancing STEM education in the state, has been working to develop cutting-edge models for teachers' professional development and to make Washington the first state to provide computer science education in every K-12 school.

- *The Transition to College.* Stakeholders must increase access to college by boosting the capacity to grant STEM degrees at state universities and colleges in Washington and by promoting equal opportunity through scholarships. Washington needs to double its STEM capacity in higher education while expanding scholarship programs such as the Washington State Opportunity Scholarship, which helps low- and middle-income state residents earn a bachelor's degree in high-demand STEM fields.

- *Postsecondary Education.* Washington must invest in retaining at-risk students. The Mathematics Engineering Science Achievement Community College Program (MCCP) exemplifies success in this field. The MCCP's at-risk students advance through postsecondary education at a rate of approximately 75 percent per year, much higher than the average rate of about 45 percent for students who are not in the MCCP.

- *Career.* The state must invest in career coaching and employer outreach so that 100 percent of interested graduates can land a great STEM job in Washington. Businesses are starting to step up by partnering with schools to promote STEM career awareness and inspiration and by changing workplace cultures and practices to ensure that companies are friendly to women and other populations that are currently underrepresented in STEM fields. All of these efforts need to create the right incentives and systems for success.

## The Impact of Developing More Washingtonian STEM Employees

Developing more STEM employees in these ways would have an enormous impact on Washington State. First, landing a STEM job dramatically improves the lives of employees and their families. Paying nearly double the salaries of non-STEM positions, STEM jobs can be a pathway to the middle class for thousands of families.

Furthermore, creating STEM jobs in turn generates other jobs in the state. Every job created in a STEM industry—such as software development, manufacturing, health care, and engineering—generates an average of two additional indirect jobs. If the state makes the structural changes outlined above, Washingtonians could fill an additional 8,000 STEM jobs and an additional 16,000 indirect jobs could be created per year. These steps could reduce unemployment from the current rate of more than 6 percent to approximately 5 percent. That's equivalent to 18 percent fewer unemployed people.

These improvements in the state's economic development could also improve social equity in Washington. Today, only one in four STEM employees is female and only one in five is black or Hispanic. Efforts to target female, black, and Hispanic

STEM employees could potentially increase their presence in the workforce by about 30 percent.

All told, the result would be a total public return on investment of up to seven times—meaning that for every $1 spent on STEM education, $7 of taxes and social-spending savings would be gained. For example, the roughly $650 million investment that we recommend would return $4.5 billion per year, as well as an increase of $12.6 billion in salaries per year. (See Exhibit 2.)

Over the next 15 years, nearly 100,000 Washingtonians from low-income brackets and underrepresented minority groups would be given new economic opportunities, shaving more than a full percentage point off the poverty rate.

**EXHIBIT 2 | Fixing the STEM Employee Pipeline Could Produce Major Returns**

### Investing **$650 million...**
**Spending is needed on:**

**Early childhood education**
Such as numeracy development for elementary-school readiness

**K-12 education**
Such as STEM curriculum support and teacher training

**Postsecondary education**
Such as additional university capacity and better career preparedness

### ...would create **8,000** STEM jobs...
**The positions would have an impact on:**

**Joblessness**
18 percent fewer unemployed people

**Upward mobility**
$12.6 billion in salary gains; lifting nearly 100,000 people out of poverty

**Sevenfold return** ⟶ **Social equity**
30 percent more women and minorities in STEM jobs

### ...and generate **$4.5 billion**
**More tax revenues, less spending**

**Source:** BCG analysis.
**Note:** STEM = science, technology, engineering, and math. The reduction in joblessness is based on the creation of 8,000 direct STEM jobs and 16,000 indirect jobs. Additional tax revenues are based on a $12.6 billion increase in salaries and a 10.8 percent effective state-tax rate. Upward mobility is improved over 15 years through a reduction in the poverty rate as a result of higher salaries and more jobs.

**U**NLESS MUCH MORE is done to address the STEM employee pipeline, the costs of failing to address the skills gap will only increase in the years ahead. Students will continue to leave Washington State in droves to pursue higher education elsewhere. The war for out-of-state and international talent will intensify, and Washingtonians will not prevail. Companies will locate more and more jobs outside the state. Washington will miss a golden opportunity to shepherd its residents—particularly women, underrepresented minorities, and those with low incomes—into the high-paying STEM jobs of the future.

The payoff is hard to beat. Not many alternatives offer a sevenfold return on investment for government, a massive increase in opportunity for nearly 100,000 Washington natives, and a boost to the long-term competitiveness of the region.

Washington must take immediate steps to prepare local students to seize the great jobs in its backyard. The rewards are simply too great.

NOTES
1. *STEM Education in Washington: The Facts of the Matter,* Ed Lazowska, University of Washington, March 2013, http://lazowska.cs.washington.edu/STEM.pdf.
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. *Real-Time Insight into the Market for Entry-Level STEM Jobs,* Burning Glass Technologies, February 2014, www.burning-glass.com/research/stem/.

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# BCG

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# WASHINGTON STEM FRAMEWORK FOR ACTION AND ACCOUNTABILITY SUMMARY

WASHINGTON
**STEM**
REIMAGINING SCIENCE, TECHNOLOGY,
ENGINEERING + MATH EDUCATION

# AT A GLANCE

*The Washington STEM Framework for Action and Accountability is a research-based tool developed to spur greater coordination, smarter investments, and clear results.*

**VISION**

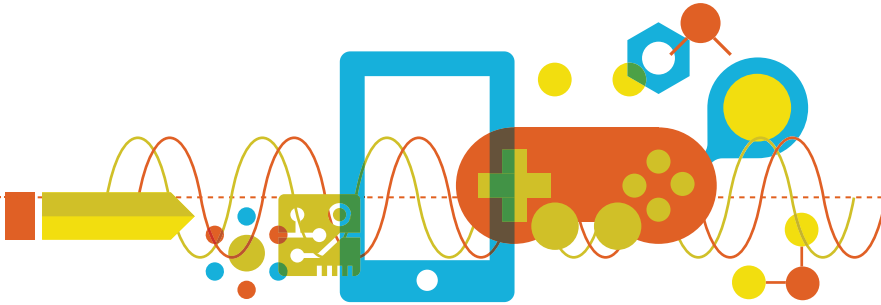All Washingtonians have the STEM skills necessary to live a life of opportunity and success in the state's thriving innovation economy and democratic society.

**GOALS**

*Washington state leads the nation with:*

- STEM literacy for all
- A diverse, world-class workforce

**IMPACT**

A strong and vibrant Washington state economy that offers ample opportunity for all.

# WASHINGTON'S STEM IMPERATIVE

Increasing science, technology, engineering, and math (STEM) talent in Washington communities is imperative to fill jobs, grow the economy, and close opportunity gaps for the next generation—and we don't have a moment to lose. The Washington STEM Framework for Action and Accountability is a research-based tool developed to spur greater coordination, smarter investments, and clear results.

Washington's communities are home to global STEM industry leaders and innovators. Washington-based companies in fields such as aerospace, clean energy, high-tech, health sciences, and advanced manufacturing are changing lives here at home and across the world. The state's ability to attract, develop, and retain STEM talent is vital for fostering opportunity for every Washingtonian and economic growth innovation and competitiveness. Yet, many young Washingtonians are not on a path to participate in and fuel our economy.

## WHY IS STEM IMPORTANT?

**#1**
*Highest concentration of STEM jobs*

*Nearly the fastest growing skills gap of all 50 states*

**#49**

If we are to fill jobs, grow the economy, and close opportunity gaps for the next generation, we must increase the STEM talent across our state.

# CONSIDER THE FACTS

*Washington's employers are predicted to face 50,000 vacancies by 2017 due to a lack of highly skilled STEM and health care workers.* The costs: $800 million in lost annual tax revenue, high-paying jobs moving out of state, and reduced job creation.

*Computer science—the ability to code, create algorithms, and analyze big data—is quickly becoming a high-value skill set and is a core driver of the state's skills gap.* Yet, only 47 high schools in Washington offer Advanced Placement (AP) Computer Science, and out of the 711 AP Computer Science exam takers in the state in 2013, only four African-Americans and 14 Latinos passed. While the state has projected that computer science degree production needs to increase by 146 percent each year to meet employer demand, the state's flagship computer science undergraduate program at the University of Washington can only accommodate 30 percent of all qualified applicants due to a lack of funding and capacity.

*While Washington adopted Common Core State Standards (CCSS) in math and English and Next Generation Science Standards (Next Gen) with the good intent to foster critical thinking and career- and college-readiness for students, the state has yet to make significant investments to help teachers retool their classroom practices.* Nationally, only 23 percent of teachers feel very prepared to teach CCSS. Here in Washington, only 54 percent of teachers have received learning opportunities specific to the changes that will occur with the implementation of CCSS. In science, 41 percent of elementary school teachers from across the country reported that they had not participated in any science-focused professional development in the past three years. The science professional learning needs are particularly acute now that engineering concepts and practices are included in Next Gen, the first time engineering has ever been in the state's science standards.

*Only 45 percent of incoming high-poverty kindergarteners in 2013 demonstrated "kindergarten readiness" in math;* yet research shows that early math skills are the greatest predictor of future academic achievement.

# WHY DO WE NEED A FRAMEWORK?

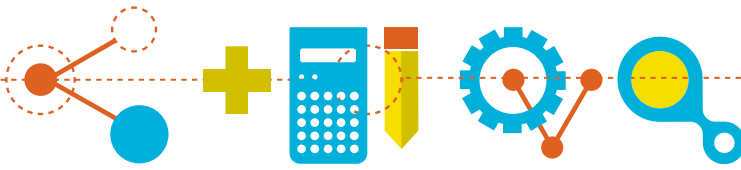*The good news is that Washington is home to many strong STEM education and workforce programs.*

So, what's the problem? Since launching three years ago, Washington STEM has asked experts and practitioners across the state and nation that very question. Here's what it heard:

- Absence of common goals and indicators to track results.
- Lack of agreement regarding "what works" and mechanisms to share learnings and best practices, leading to a tendency to reinvent the wheel versus scale-up proof points.
- Resources, activities, and policies—local, state, federal, and private—are not focused and aligned enough to tackle really big challenges. These challenges include persistent opportunity gaps in early learning through high school, turning computer science from an elite discipline to a natural part of the school day, and the underrepresentation of African-Americans, Latinos, Native Americans, and women in STEM majors and careers.

# DEVELOPMENT OF THE FRAMEWORK

Washington STEM created the Washington STEM Framework for Action and Accountability (The Framework) to respond to these challenges. The Framework is a research-based tool, co-constructed with and vetted by state and national advisors, designed to spur greater coordination, smarter investments, and clear results.

Washington STEM launched its efforts to develop the Framework in 2013. After creating an initial draft, the organization engaged with STEM leaders in Washington and across the nation to further develop and validate the Framework. Advisors included university partners, funders, businesses, policymakers, researchers, and educators in Washington, as well as members of STEMx, a multistate network of states dedicated to improving STEM education. Alongside Battelle, who acted as the evaluator, Washington STEM examined research and findings from the field to ensure the Framework components were evidence-based and actionable.

# FRAMEWORK COMPONENTS

*The Framework is comprised of the following components:*

## VISION AND GOAL: WHERE ARE WE GOING?

Our vision is that Washingtonians are prepared and inspired with 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 Washington to lead the nation in STEM literacy for all and to have a diverse, world-class workforce.

## PRIORITY ACTIONS: WHAT WILL WE DO TO GET THERE?

The Framework uses four logic models to show the activities Washington STEM and its partners will perform to reach the Framework goal. A logic model graphically depicts relationships among resources, activities, outputs, and outcomes for a program. The Framework logic models were developed through extensive research to articulate key focus areas to improve STEM education in Washington. The four logic models in the Framework are:

- Early learning through high school students;
- Early learning through high school educators;
- Post-secondary, workforce training, and employers; and
- Aligned systems.

## OBJECTIVES: WHAT WILL WE ACHIEVE?

Five objectives were identified to communicate priorities and desired actions and achievements within a specified time frame. These objectives will be used to guide activities (e.g., investments, programmatic initiatives, partnerships, and advocacy). The five objectives of the Framework are:

- Prepare, support, and retain excellent early learning through high school STEM teachers;
- Inspire early learning through high school Washington youth through real-world STEM learning opportunities;
- Raise public awareness and support for STEM;

- Prepare Washington's future workforce by graduating additional students with certificates and degrees in high-demand STEM fields (e.g., computer science, engineering, and health) and retraining adult workers with high-demand skills; and

- Improve equity and diversity by improving outcomes for underserved and underrepresented populations in the state (e.g., students of color, girls, and rural populations) across the previous four objectives.

## INDICATORS: HOW WILL WE MEASURE WHETHER WE ARE SUCCESSFUL IN MAKING PROGRESS AND BEING ACCOUNTABLE?

A critical component of the Framework is the ability to track and measure short- and long-term progress toward achieving the outcomes in each logic model. Working in tandem with stakeholders and drawing from research, 10 indicators have been drafted to correspond with the four logic models and five objectives. The following five criteria were used to select the indicators:

- **Be Focused.** Each indicator should speak directly to Washington's educational and workforce status in STEM-related areas. In addition, data should be disaggregated to the degree possible to provide information on underserved and underrepresented populations in STEM.

- **Be Meaningful.** Data should be useful to a wide variety of audiences and purposes.

- **Be Accessible.** Data should be available at no (or little) cost through currently existing secondary sources.

- **Be Perennial.** Data should be consistently available on an annual (or other regular) basis so they may be comparable over time.

- **Be Comparable.** Reporting of data should be comparable at various levels (United States, state, STEM Networks) to the extent desirable and feasible.

## IMPACT: WHAT IMPACT DO WE EXPECT TO MAKE IN WASHINGTON STATE?

Washington STEM expects impact in two key areas: 1) sustainability of STEM in Washington state (sustainability is defined as the interaction and integration of partners, resources, and funding that allows partners to accomplish common goals); and 2) improved opportunity for Washingtonians and increased economic vitality in the state and region. Short- and long-term progress toward these two impacts will be measured with the indicators.

# THE FRAMEWORK

## VISION

All Washingtonians have the STEM skills necessary to live a life of opportunity and success in the state's thriving innovation economy and democratic society.

## EARLY LEARNING–HIGH SCHOOL STUDENTS

**Indicator 1:** STEM awareness in Washington state
**Indicator 2:** Student interest in STEM fields
**Indicator 3:** Student STEM achievement among early learning-high school
**Indicator 4:** Student readiness for college-level study in STEM fields
**Indicator 5:** 21st century skills

**Objectives:**
- Inspire early learning through high school Washington youth through real-world stem learning opportunities
- Raise public awareness and support

## EARLY LEARNING–HIGH SCHOOL EDUCATORS

**Indicator 6:** STEM classes led by effective educators from early learning–high school
**Indicator 7:** Teachers and school leaders with STEM-related degrees

**Objectives:**
- Prepare, support, and retain excellent early learning through high school STEM teachers
- Raise public awareness and support

Improve equity and opportunity by improving outcomes for underrepresented groups

## POST SECONDARY AND EMPLOYERS

**Indicator 8:** Graduates from post-secondary institutions with degrees in STEM fields
**Indicator 9:** Alignment of STEM education programs with workforce needs of key economic sectors

**Objectives:**
- Prepare WA future workforce by graduating additional students with certificates and degrees
- Raise public awareness and support

## ALIGNED SYSTEMS

**Indicator 10:** Partnerships and funding and resource allocation for STEM education and training in Washington state

**Objectives:**
- Raise public awareness and support

## GOALS

**Washington state leads the nation with:**

- STEM literacy for all
- A diverse, world-class workforce

## THE IMPACT WE WILL HAVE

**A strong and vibrant Washington state economy that offers ample opportunity for all.**

# A TOOL TO ACCELERATE OUR IMPACT

***Upon implementation, the Framework is expected to accelerate impact in the state by:***

- Aligning STEM efforts across the state of Washington against a common vision, shared goals, and clear indicators;

- Focusing future investments and improving return on investment;

- Providing a strategic planning and measurement tool for STEM Networks and other STEM efforts in the state;

- Creating a common research and development agenda to test, identify, and spread promising practices; and

- Informing policy development and implementation.

To support implementation, Washington STEM will rely upon the Framework to prioritize its future investments and efforts. Washington STEM is working with its seven STEM Networks to ensure there is strong alignment between the Framework and each Network's business plan.

Washington STEM welcomes partners from around the state to use the Framework to maximize knowledge sharing, the spread and scale of best practices, and statewide impact. It is important to continue to engage stakeholders in all future Framework development. As progress is made, changes to the logic models will be considered and reviewed over time by statewide stakeholders and partners.

Washington STEM shared its Framework with the Governor's STEM Education Innovation Alliance, as called for in legislation passed in 2013. The STEM Alliance is currently reviewing the Framework; an important initial task for them will be to adopt a Framework for action and accountability. Once the Alliance adopts a framework, a STEM Benchmark Report Card (Report Card) will be developed based on the proposed Framework measures. The purpose of the Report Card will be to monitor progress in aligning strategic plans, resources, and activities in order to prepare students for STEM-related jobs and careers, with the long-term goal of improving educational, workforce, and economic outcomes.

Washington STEM will support establishing measurable goals for the Framework objectives by providing specific time frames and quantifying the magnitude of the changes expected. In addition, further development of the ten indicators is necessary to begin the preparation of statewide report cards.

# CONCLUSION

The Framework is intended to be a user-friendly tool to help focus state-level STEM education investments and efforts on proven practices and the most promising innovations. It is designed to enable the creation of a results-oriented STEM education learning community across Washington state and, ultimately, to accelerate equity and STEM education impact at scale. Washington STEM looks forward to working with many partners to implement the Framework and to sharing its collective insights with colleagues around the state and nation.

*To join us in accelerating STEM education, and learn more about the Framework and the research used to create it, please visit: washingtonstem.org/framework.*

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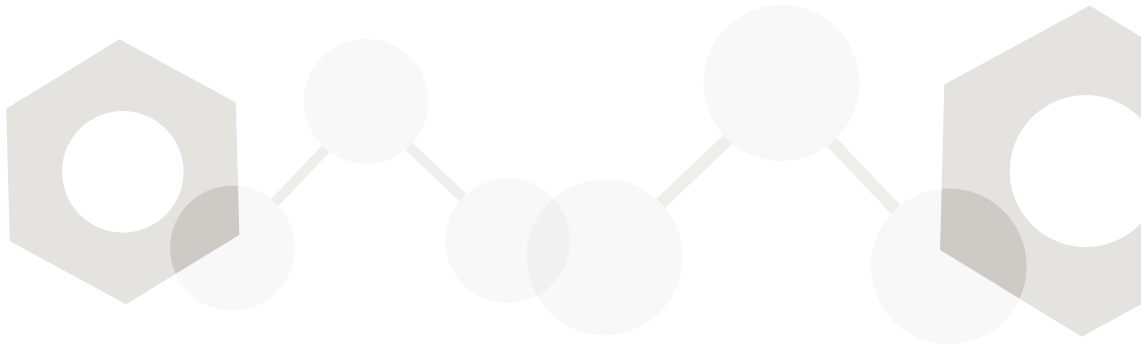Washington State University

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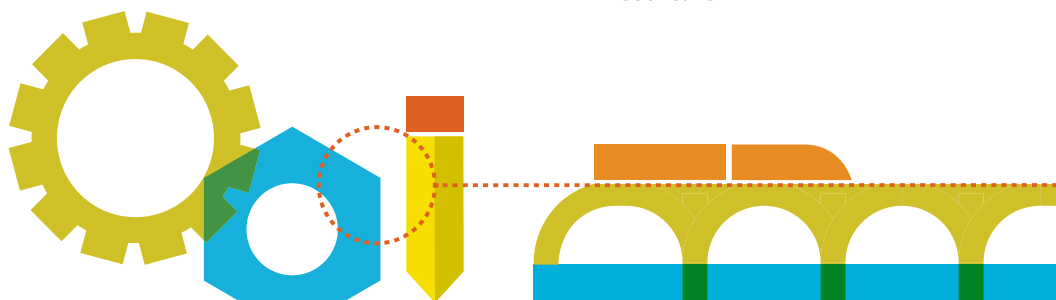Chancellor
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**Appendix F**

**Next Steps - Outline of Currently Planned Activity in 2015**

| DATE | ACTIVITY | OBJECTIVES |
|------|----------|------------|
| March 6, 2015 | STEM Education Innovation Alliance meeting<br><br>(Location: Governor's Conference Room, Capital Campus) | 1. Discuss priorities<br>2. Refine progress indicators for dashboard<br>3. Engage with legislators on STEM education and workforce issues |
| May, 2015 | Members of the STEM Alliance meet with National Governor's Association Center for Best Practices staff | 1. Review priorities and strategies<br>2. Assess progress<br>3. Discuss best practices and challenges with NGA Center staff<br>4. Discuss next steps |
| July, 2015 | Selected members of the STEM Alliance meet for the second time with National Governor's Association Center for Best Practices staff (2nd Policy Academy meeting, as part of the NGA-STEM grant project) | 1. Share progress report and knowledge gained from Washington state efforts to align its education system with a STEM-driven economy.<br>2. Share insights on best practices and experiences with representatives from other states.<br>3. Continue to review and refine strategic action plan |
| August, 2015 | STEM Education Innovation Alliance meeting (tentative location: Institute for Systems Biology, Seattle) | 1. Finalize set of dashboard indicators<br>2. Develop strategies for building connections between sectors and consolidating partnerships. |
| September, 2015 | Meeting with the Washington's Regional STEM networks:<br>• Mid-Columbia<br>• Snohomish<br>• South Central<br>• South King | 1. Share knowledge and experience among the regions for insights into best practices.<br>2. Consolidate partnerships. |

| | | |
|---|---|---|
| | • **Southwest Washington**<br>• **Spokane**<br>• **West Sound** | 3. **Build connections between regions.**<br>4. **Strengthen long-term collaborative relationships.** |
| **October, 2015** | **Selected members of the STEM Alliance meet for the second time with National Governor's Association Center for Best Practices staff (3rd Policy Academy meeting, as part of the NGA-STEM grant project)** | 4. **Share progress report and knowledge gained from Washington state efforts to align its education system with a STEM-driven economy.**<br>5. **Share insights on best practices and experiences with representatives from other states.**<br>6. **Continue to review and refine strategic action plan** |
| **December, 2015** | **The STEM Alliance participates in the 2015 Washington STEM Summit** | **Convene education, business, and community leaders, along with policymakers and philanthropists, to share vision and goals and consolidate partnerships.** |