
THEORY of ACTION

STEM is more than an acronym and it's more than a combination of the four disciplines. STEM is a transformative public-private initiative that uniquely engages formal and informal partners from education, government and business. STEM is both an approach to teaching and learning, i.e. "STEM education," as well as a strategy for economic development, i.e. "STEM economy." And both STEM education and the STEM economy are capable of broad spillover into all spheres of civic vitality. The Southwest Washington (SWWA) STEM Network is a consortium of stakeholder organizations that recognize the intrinsic interdependency between STEM education, the economy, and the resulting impact. The Network represents four sectors: K12 education, postsecondary education, business and economic development. The combined membership of these organizations represents stakeholder groups—students, parents, teachers, leaders, employees and employers—actively engaged in the national and local dialogue on STEM education and STEM industry. The SWWA STEM Network formed as a collective body to support the positive outcomes that both STEM education and STEM industry can bring to Southwest Washington.

The SWWA STEM Network has adopted a *three-pillar "Theory of Action"* that guides how we will address our identified needs and leverage the Network's participating members and organizations to move our community from its current state to its desired future. Our theory of action provides a foundational explanation of our guiding principles and assumptions about how the STEM Network will bring about the desired outcomes. The three guiding assumptions govern our goals, reforms, structures and processes and are meant to promote a deeper understanding of our vision and mission. Grounded in research, our theory of action aligns to the intended work within the Network, connects strategy to actions and operations, and identifies the mutual dependencies that are required to complete complex projects.

The first pillar is the notion that *education is the primary catalyst* for impacting our economic future. Both formal and informal education has the potential of increasing student interest in STEM fields, deepening student knowledge of STEM content, and developing higher-order thinking and learning skills needed for a college, career, and life. Research in STEM learning concludes there are several factors in STEM education that lead to long-term interest and engagement. Among the key factors: STEM education capitalizes on students' early interests and experiences, identifies and builds on what they know, and provides opportunities to engage in the application of science, technology, engineering, and mathematical concepts to sustain their interest. Studies have also identified the elementary years as the period when students form their interests in STEM identities and careers, making it important to focus on the whole education pipeline and retain students' interest and confidence throughout.ⁱ

Employers in many industries lament that job applicants lack the needed mathematics, computer, and problem-solving skills to succeed, and traditional approaches to instruction have failed to guarantee that graduates will have basic levels of content mastery. STEM-based instructional approaches, on the other hand, have shown to not only develop students' technology and problem-solving skills, but also to develop deeper content mastery through the constant application of key concepts.ⁱⁱ The role of education in driving our economic future has been further emphasized by new Common Core State Standards and Assessment

systems which call for “deep disciplinary understanding and higher-order thinking skills that are increasingly demanded by a knowledge-based economy.”ⁱⁱⁱ Developing these capacities among our population will help us close the skills gap in our existing workforce, strengthen the pipeline of STEM graduates prepared to enter our workforce, expand industries and attract new ones. Ultimately, investing in STEM education is an investment in our economic prosperity no matter what kinds of industries and jobs emerge in the future.

The second component that informs our theory of action is that when it comes to supporting the needs of our economy, **there isn't a single education pathway** that will guarantee collective employment needs are met. The perception of STEM is that you have to have an advanced degree to pursue a STEM career, yet that isn't the case today nor is it universally predicted for the future. In fact, professional jobs in STEM only account for about 4% of employment opportunities nationwide, but as industries and have evolved, the underlying knowledge for jobs that now exists classifies 20% of all jobs as STEM. In the Vancouver, WA-Portland, OR metro area, 54% of STEM jobs today require a bachelor's degree or more (compared to 62% in Seattle Metro and 51% nationwide)^{iv}, and in Clark County 46% of STEM jobs today don't require more than a high school diploma. Opportunities to begin STEM careers directly after high school are abundant, as are dual enrollment options and opportunities to continue one's education through Associate Degree or certification programs. Choosing these paths can happen simultaneously with starting one's career, after gaining some work experience, or directly after high school. There are many options in STEM fields at all levels of educational attainment that will help fuel our economy and we believe that when properly supported, high school graduates alone represent a critical demographic capable of making a sizable impact on our region.

Additionally, our economy will benefit by stronger alignment between existing industries and credentialing programs (in both high school and postsecondary), as well as expanded access to a diversified set of programs and courses, not just the traditional requirements of those taught by host universities. Better alignment creates more flexibility and responsiveness in preparation programs so that institutions are consistently yielding graduates prepared for high-demand jobs. Currently, too many students are enrolled in low-demand programs, but if 25 percent of these students shifted to “high-demand” programs, we could close the existing skills gap and meet the expected STEM job growth in our state.^v Most institutes of higher education lack the flexibility and responsiveness to make these changes, at least in the required timeframes. But this type of flexibility—one with just-in-time program design—is another approach to allowing individuals to design their own unique pathway. In essence, our economy will be positively impacted by expanding access to STEM learning experiences for all students, not just those that express interest or are the highest achieving in traditional STEM fields. To do this we have to address the critical indicators of high-school and college drop-out, make stronger connections between education and employment, and eradicate the notion that there's only one pathway or continuum relevant for a STEM economy.

Third, our theory of action supposes that **a regional STEM Network is a necessary vehicle** to deliver positive outcomes community-wide. Known more commonly as a theory of “collective impact,” the regional STEM initiative uses a network of like-minded organizations committed to supporting STEM education and STEM industry in Southwest Washington. Similar networks have formed across the country and are producing successful results in their ability to better align educational preparation with economic demands, and even “STEMx” formed among 19 states to share strategies for multi-stakeholder alignment and engagement.

Stanford University's notable research on collective impact initiatives suggests five conditions that are necessary to yield operational alignment and systemic results: a common agenda, shared measurement systems, mutually reinforcing activities, continuous communication, and a backbone support organization.^{vi}

The Southwest Washington STEM Network is committed to achieving all five of these conditions. First, a core group of organizational leaders gathered with a common agenda largely driven by the need to redirect and revitalize our economic outlook. This agenda has been further developed in our adopted vision and mission statements along with supporting work. Second, the Network will support a system that measures and reports agreed upon indicators of success, and embed this requirement into our membership agreements. Shared measurements - including social, economic, and education indicators - allow us to focus, prioritize, and support decision-making and activities. Third, the STEM Network will pursue a plan of action that coordinates different stakeholder activities in a manner that is mutually reinforcing. We will do this by adopting three collective initiatives each year that capitalize on the strengths of participating organizations (and the collective Network) and leverage opportunities aligned to additional projects and endeavors within each organization. Continuous communication is the fourth condition to achieving collective impact, and the STEM Network regularly met for two years before committing to an organizational structure, vision, or plan of action. Moving forward, the Network will coordinate a community outreach strategy that embraces common language and goals, implement phases of a strategic plan, expand membership and establish ad hoc committees to execute on the work—all of which require continuous communication. And the final condition for successful collective impact is creating a separate backbone support organization (and staff) with a very specific set of skills to support the entire initiative. The SWWA STEM Network initially hired an Executive Director but will expand staff and operational investments as needed. Moreover, the Network has been careful to establish goals conditional to the unique functions of the collective Network so as to execute on a coordinated effort aligned to commonly desired outcomes.

ⁱ *Successful K-12 STEM Education: identifying effective approaches in Science, Technology, engineering, and Mathematics*. Committee on Highly Successful Schools or Programs for K-12 STEM Education Board on Science Education and Board on Testing and Assessment Division of Behavioral and Social Sciences and Education. National Research Council. 2011. www.stemreports.com.

ⁱⁱ Ibid.

ⁱⁱⁱ, *Smarter Balanced Theory of Action*. Smarter Balanced Assessment Consortium. Excerpt from the *Smarter Balanced Race to the Top Application*, June 2010.

^{iv} *The Hidden STEM Economy*. Jonathan Rothwell. Brookings Institute. June, 2013

^v *Great Jobs within our Reach: Solving the problem of Washington State's growing job skills gap*. A joint report from The Boston Consulting Group and the Washington Roundtable. March 2013.

^{vi} *Collective Impact*. John Kania & Mark Kramer.. Stanford Social Innovation Review. Winter 2011.