STEM READY AMERICA

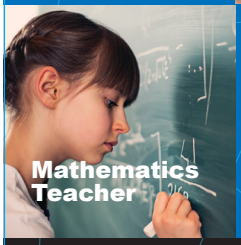
Inspiring and Preparing Students for Success With Afterschool and Summer Learning

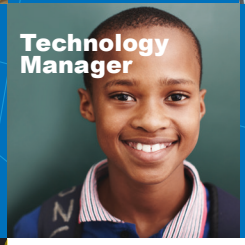
This collection of articles is excerpted from a new resource, *STEM Ready America: Inspiring and Preparing Students for Success with Afterschool and Summer Learning.* In this volume, Executive Editor Ron Ottinger and Contributing Editors Cary Sneider and Ian Hickox have collected expert perspectives on the state of the field of STEM learning—especially in afterschool and summer learning opportunities.

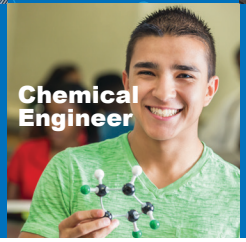
Collectively, these writings from more than 40 thought leaders highlight how young people are developing STEM knowledge and skills that will prepare them to be successful in school today and the workforce tomorrow.

The articles provide persuasive evidence and real-world examples to inform effective partnerships, policies, and actions to bring quality STEM learning to children and youth across the nation. This volume is focused in three key sections:

- **The Evidence for STEM**
- **Partnerships for STEM Learning**
- **Ensuring Access to Quality STEM Learning**







Developed by STEM Next with support from the Charles Stewart Mott Foundation, *STEM Ready America* builds on the award-winning 2013 publication *Expanding Minds and Opportunities: Leveraging the Power of Afterschool and Summer Learning for Student Success* edited by Terry K. Peterson, Ph.D., which made the definitive case for the power and effectiveness of afterschool programs and summer learning.

For more information about STEM Ready America and to download articles visit: www.stemreadyamerica.org.

STEM READY AMERICA

Inspiring and Preparing Students for Success with Afterschool and Summer Learning

Evidence and examples on how young people are developing STEM knowledge and skills that will prepare them to be successful in school today and the workforce tomorrow.
www.STEMReadyAmerica.org

Building Statewide, Cross-Sector STEM Ecosystems in Oregon:

Lessons Learned from Oregon's Work Engaging a Network of Partners to Create Cross-Sector Changes in STEM Education

Dr. Krissi Hewitt, Regional Education Partnership Policy Advisor, Oregon's Chief Education Office
Mark Lewis, CTE & STEM Education Policy Director, Oregon's Chief Education Office
Beth Unverzagt, Executive Director, OregonASK

Ronald Ottinger, Executive Editor
STEM Next | Charles Stewart Mott Foundation

Developing Regional STEM Hubs

Learners interact in different contexts throughout their "cradle-to-career" experiences. These contexts include not only formal school environments but also more informal learning settings. The larger sociocultural environment in which learning takes place includes institutions and organizations that reside within larger sectors and that vary with regard to their interconnectedness (Falk, Dierking, Osborne,Wenger, Dawson & Wong, 2015). Students and educators interact in classrooms, higher education institutions, homes, afterschool and summer nonprofits, museums, parks, and places of worship. When these larger systems are aligned and coordinated in their actions to support learning, there is the potential for positive impact on students (Henderson & Mapp, 2002). Moreover, when diverse perspectives from different sectors come together to support students, there is the possibility for innovative ideas to emerge and shed light on how communities can take action together and help their region increase prosperity for all.

From urban to rural to coastal, Oregon's regions are as diverse as the biological ecosystems in which they exist. We know that learners reside in different places and contexts, and that these contexts are important for development and learning (Hay, 1998; Smith, 2013). Moreover, learners bring with them a variety of assets and face different challenges based on their sociocultural environment (Lemke, 2001). In the different geographic regions of Oregon that include farmland, cattle ranches,beautiful deserts and lakes, thriving urban communities, and coastal areas where forests meet the beaches, there are varying economic drivers and workforce needs. This has implications for resources, programs, and learning opportunities for students across our state.

> If we want a future where each Oregonian thrives, it is incumbent upon us as a community of political leaders, policymakers, educators, school administrators, the business community, and, most importantly, students, to shape the future of our state through educational opportunities that give our young learners the foundations they need to be ready for the jobs of tomorrow.
>
> —Governor Kate Brown

Oregon's Statewide Network of Regional STEM Hubs

Oregon Coast Regional STEM Hub
- Serves Clatsop, Tillamook, Lincoln, Coos, Curry and parts of Lane & Douglas Counties
- Partners with 20 school districts & 1 ESD

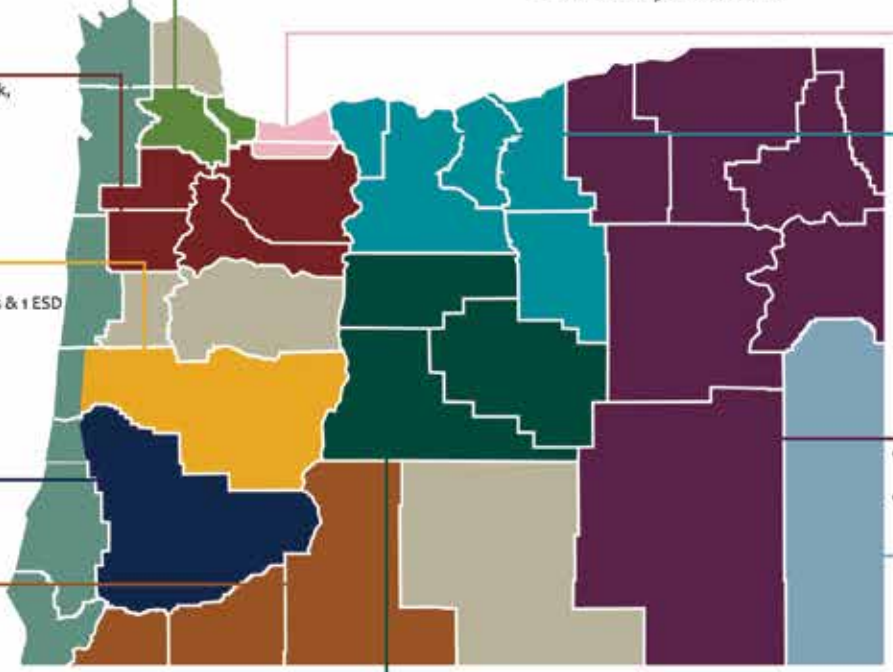
Portland Metro STEM Partnership
- Serves Multnomah and Washington counties
- Partners with 5 school districts

East Metro STEM Hub
- Serves parts of Multnomah & Clackamas Counties
- Partners with 7 school districts

South Metro-Salem STEM Partnership
- Serves Clackamas, Marion, Multnomah, Polk, and Washington counties
- Partners with 16 school districts

Columbia Gorge STEM Hub
- Serves Hood River, Wasco, Sherman, Gilliam and Wheeler counties
- Partners with 11 school districts & 2 ESDs

Lane County STEM Hub
- Serves Lane County
- Partners with 6 school districts & 1 ESD



GO STEM Collaborative
- Serves Baker, Grant, Harney, Morrow, Umatilla, Union, and Wallowa counties
- Partners with 5 ESD's

Umpqua Valley Regional STEAM Hub
- Serves Douglas County
- Partners with 13 school districts & 1 ESD

Frontier Oregon STEM Hub
- Serves Malhuer County
- Partners with 10 school districts, 2 ESD's

Southern Oregon STEM Hub
- Serves Josephine, Jackson and Klamath counties
- Partners with 13 school districts & 1 ESD

Central Oregon STEM Hub
- Serves Crook, Deschutes, and Jefferson counties

In response to the need for alignment, coordination, and innovation in STEM education, the state invested in Oregon's Regional STEM Hubs, in 2013. This investment represented a strategic initiative, recommended and overseen by Oregon's STEM Investment Council and the Chief Education Office, designed to improve math and science achievement, as well as increase post-secondary STEM degree and certificate attainment rates. These regionally focused, cross-sector partnerships unite schools, institutions of higher education, community-based nonprofits, businesses, civic leaders, and communities in order to drive local STEM innovation and improvements at the systems level, while also reducing inequities in opportunities for students of color and those in poverty. Lindsey Capps, Oregon Chief Education Officer and Education Policy Advisor to Governor Kate Brown, notes that, as a state, Oregon is "committed to ensuring that learning motivates, inspires, and connects students with real-world application. STEM Hubs are one vehicle where the state fosters locally driven strategies to improve access to hands-on learning opportunities that engage students and align with local workforce needs" (Oregon Department of Education, 2016).

Oregon's STEM Hubs leverage state and local resources and opportunities to bring STEM to students early and often, engaging them within and beyond the classroom. Where regional programming gaps exist, STEM Hubs also implement strategies that include educator professional development, increasing access to hands-on STEM learning experiences, and deepening student connections to the fast-growing STEM employment opportunities, among others (http://education.oregon.gov/stem-hubs/). The state originally invested in six regional hubs of innovation in the 2013/2015 biennium. Subsequently, the state has expanded its investment to $5 million and 11 regional hubs.

Regional Challenges and Opportunities: Oregon Coast STEM Hub

The Oregon Coast STEM Hub is one such regional partnership working to align STEM education efforts. The region has experienced economic downturns that have been exacerbated by geographic isolation, but it also has a wealth of natural resources and many partners focused on marine science and conservation. After examining its regional assets and barriers to student success, the Oregon Coast STEM Hub chose to focus on coastal natural resources and marine issues. It has also set its sights on raising academic achievement, graduation rates, and college enrollment while decreasing the dropout rate for all students, particularly those from underserved populations. The Oregon Coast STEM Hub is developing creative, innovative ways to work with partners and assets unique to their community to impact these goals. For example, they have created immersive, at-sea experiences for educators, students, and researchers to work together to solve our most pressing coastal resource issues. They have also held community events, including a renewable resource competition that enabled students to create and compete with wind, solar, and wave energy devices. Most importantly, each of these events has been the result of cross-sector partnerships that break down traditional silos to enable collaboration that positively impacts students and their communities.

State senator Arnie Roblan captivates a group of young competitors with his stories about when he was a principal on the Oregon coast.

Building a Statewide Network: Fostering Connections Among Regional Hubs

Oregon's regional approach depends upon communities using their particular assets to support students. Many have asked how we intend to scale something that is so unique to the region where it was conceived. From our perspective, there can be many distinct approaches to the implementation of programs and practices that are based on sound evidence and make sense for each regional context. In spite of differences among learner experiences in regional ecosystems, there are common needs and issues that unite our state and critical lessons that must be shared among regions. For this reason, we have invested in leadership development and capacity building in separate regions as well as in connecting regional leaders through a statewide network.

Creating and Sustaining Networked Leadership

The focus of many state-level efforts has been on capacity development and creating conditions for leaders to engage with one another around common issues in building STEM ecosystems. The leaders of the Hubs themselves define their own engagement and build bottom-up approaches, in addition to participating in state-led activities. The following is a list of what we perceive to be critical success factors for building connected ecosystems at the state level:

- **Influential community champions who can mobilize regional efforts and break through traditional barriers**
- **Investments in a team of individuals who have had direct experience in establishing strong cross-sector partnerships that provide capacity-building assistance**
- **Investments in Hub leadership activities to create and maintain connections among regional leaders and among regions and state-level policymakers**
- **A critical mass of hubs and regional leaders across the state to impact the visibility of STEM learning and STEM Hubs**
- **Self-organization of STEM Hub directors in committees around topics important to all regions**

Leveraging Networked STEM Hubs

The statewide network of STEM Hubs is also a critical vector for efforts to increase the reach and effectiveness of other STEM investments. For example, the state awarded $1.5 million to Oregon State University Extension 4H and Portland Metro STEM Partnership to create a statewide, out-of-school time (OST) STEM collaborative network. A priority of this OST network is to engage fourth- through eighth-grade historically underserved youth in Oregon. Working with the STEM Hubs and 75+ community partners, the STEM Beyond School initiative will provide 1,000 students, 70 percent from historically underrepresented communities, with 70 hours of high-quality, community-based STEM programming.

In addition to the state agencies leveraging the regional leadership of STEM Hubs, other partners and networks are also working with Hubs to deepen their connections with communities. With funding from the National League of Cities, OregonASK collaborated with the STEM Hubs to host seven regional municipal summits focused on how the expanded learning opportunities that afterschool and summer programs provide can support equity, access, and fluency for increased STEM learning.

The summits brought together a diverse group of community leaders and STEM partners, including members of Congress, state legislators, mayors, city counselors, county commissioners, chambers of commerce, regional workforce boards, industry partners, higher education, K–12 administrators, formal and informal educators, community-based STEM programs, libraries, representatives from corporate and private philanthropies, and students.

Communicating the Impact of Regional STEM Hubs

It can be challenging to communicate the impact of investing in complex systems, partnerships, and leadership development. These investments are really about building relationships and connections among stakeholder groups that come to the work with differing expectations and perspectives. It takes time to build those cross-sector collaborations, and they are difficult to measure in terms of impact on traditional indicators (such as student test scores).

Working with the STEM Hubs and 75+ community partners, the STEM Beyond School initiative will provide 1,000 students, 70 percent from historically underrepresented communities, with 70 hours of high-quality, community-based STEM programming.

Based on research regarding effective cross-sector partnerships, we have successfully worked with state and regional leaders over the past two years to develop five statewide target partnership indicators:

1. The extent to which decision makers and influencers from a diversity of different sectors and cultures champion the effort and are engaged in governance of the collaborative
2. The degree of staff/partner satisfaction with the partnership
3. The use and dissemination of disaggregated data
4. The level of visibility in the community via press coverage, reports, media, etc.
5. The ratio of state dollars to collaboratively leveraged resources (in-kind and funds)

The state is currently piloting a research study to determine the utility of these indicators to drive continuous improvement. Preliminary data from our first cohort of Hubs indicate that those partnerships have leveraged more than $6 million in funds across a variety of funding sources, including $3.5 million in state funding grants; $1.8 million in other grants; $580,000 in direct partner support; $65,500 in other donated funds; $281,000 in in-kind donations (e.g., space, equipment, curriculum supplies); and $221,000 in volunteer time. When asked to identify one positive change as a result of their STEM Hub, a diverse set of cross-sector partners (n=119) named new or improved student programming, educator professional development, and a suite of important changes that indicate effective partnership activities such as improved communications (EPIC and OSU, in preparation).

A Multitiered Approach to Building a Networked System for STEM Education

Oregon's learners reside in complex communities nested in regions, and the STEM Hub network is one larger network amongst others in the state supporting STEM education innovation in and out of school, including professional organizations, philanthropy, educator learning communities, workforce development networks, and others. Efforts are made to connect within and across levels in the ecosystems to align cross-sector systems at the state level in support of regional leaders. Isolation at any level in the system may mean that we miss the chance to be mutually reinforcing in our activities to support students and help prepare them to be contributors to society as highly skilled employees, active citizens, and innovators who can solve the complex problems we face as individuals and as communities.

Linking Policy to Practice

In the larger ecosystem of partners, it is important to maintain leadership at multiple levels in order to influence funding and policy priorities in STEM Education. The Chief Education Office is a state agency that reports to the Governor and is charged with leading the building of a seamless system of education that catalyzes better student outcomes from cradle to career. Led by the Chief Education Officer and Education Policy Advisor to Governor Kate Brown, Lindsey Capps, we are conveners of stakeholders from many different sectors, constituencies, and agencies and have the ability to break down policy barriers that oftentimes impede systemic change. Our focus as conveners and developers of cross-sector systems uniquely situates our small and nimble agency to work across systems

and with regions around shared policy priorities such as STEM education. Our intent is to usher in a fundamental shift in state-to-regional relationships. Rather than taking a top-down approach, we recognize that policy needs to be informed by the wisdom of practice from the field and in service to those who interact with students on a daily basis, both within and beyond school.

STEM Hub leaders engage in their own advocacy and partnership-building within and across regions in order to impact policy, priorities, and state-level goals.

Additionally, Oregon's STEM Investment Council, an industry-led body, assists the Chief Education Office by recommending and monitoring investment strategies to accomplish Oregon's STEM goals. Thanks to the efforts of policymakers, agencies, and partners working alongside regional leaders, there has been widespread, bipartisan commitment from the Oregon legislature and the governor to support a STEM ecosystems approach. STEM Hub leaders engage in their own advocacy and partnership-building within and across regions in order to impact policy, priorities, and state-level goals. For example, the STEM Investment Council and Chief Education Office recently released a STEM Education Plan to transform STEM education as a means of driving individual, community, and state-level prosperity (http://education.oregon.gov/wp-content/uploads/2016/11/STEM-Education-Plan-Final_CEdO_Nov_2016.pdf). This effort was the result of over 18 months of engagements with stakeholders across Oregon and was supported by the Oregon Community Foundation and the Oregon Business Council.

National and Local Support

National organizations have made significant investments in STEM system-building in Oregon. STEM Next (the successor to the Noyce Foundation) has funded efforts such as the Oregon Girls Collaborative Project, which supports girl-focused STEM opportunities across the state, as well as the development of a STEM Mentor's Toolkit. The Mozilla Foundation and the National Afterschool Association supported efforts to design, implement, and evaluate digital badge systems. The Overdeck Foundation has provided funding to support state-level conversations on STEM learning language and implementation in ESSA. The national STEM Funders Network selected Oregon's Statewide Regional STEM Hub Network as one of 27 ecosystems across the nation in the first cohort of the STEM Learning Ecosystem Initiative (http://stemecosystems.org/). Through this larger national community of practice, we have leveraged professional networks and resources to support communications and youth voice capacity-building activities.

Oregon has also leveraged local support, particularly for professional development trainings focused on STEM. Between August 2015 and July 2016, OregonASK visited STEM Hubs and communities around the state to provide 35 trainings on STEM curricula to 153 afterschool professionals.

Conclusion and Recommendations

Oregon has prioritized STEM education as an integrated, applied, hands-on experiential learning approach, and as a mechanism for spurring necessary transformations in the education ecosystem. We know that achieving lasting change requires engaging a network of partners to create cross-sector innovations that are aligned and coordinated in their actions. In the future, we hope to ensure the sustainability of our efforts and to help deepen the work of our systems in order to increase opportunity, interest, and attainment in STEM literacy and jobs. For leaders hoping to create networked ecosystems at the state level, we provide the following recommendations:

1. Begin with creating and communicating shared values and beliefs.
2. Empower local leadership and influencers. Local leaders and their effectiveness to create innovation in their own communities will drive the success of regional initiatives.
3. Find simple ways to communicate the power of partnerships and showcase success.
4. Engage youth in every aspect of the work. Youth inspire action and offer invaluable perspective on their realities.
5. Have tolerance for complex, dynamic systems work rather than trying to oversimplify the work and impose singular solutions.
6. Develop champions and leaders at multiple levels in the regional hubs and statewide ecosystem network.

We in Oregon, like others attempting to do the messy complex work of systems change, have had setbacks, points of tension, and unanticipated successes. We are continually encouraged in our collaborative work, though, because we believe that the partners in our ecosystem can do more collectively for students than they can alone.

In the future, we hope to ensure the sustainability of our efforts and to help deepen the work of our systems in order to increase opportunity, interest, and attainment in STEM literacy and jobs.

References

1. Hay, R. (1998). Sense of place in developmental context. *Journal of Environmental Psychology, 18*(1), 5–29. doi:10.1006/jevp.1997.0060

2. Falk, J. H., Dierking, L. D., Osborne, J., Wenger, M., Dawson, E., & Wong, B. (2015). Analyzing science education in the United Kingdom: Taking a system-wide approach. *Science Education, 99*(1), 145–173. doi:10.1002/sce.21140

3. Henderson, A. T., & Mapp, K. L. (2002). *A new wave of evidence: The impact of school, family, and community connections on student achievement—Annual synthesis 2002*. Austin: TX: Southwest Educational Development Laboratory.

4. Lemke, J. L. (2001). Articulating communities: Sociocultural perspectives on science education. *Journal of Research in Science Teaching, 38*(3), 296–316. doi:10.1002/1098-2736

5. Oregon Department of Education. (2016, February 17). State officials announce: Newly funded cohort of regional STEM partnerships [News release]. Retrieved from http://www.ode.state.or.us/teachlearn/subjects/science/curriculum/stem-media-release.pdf

6. Smith, G. A. (2013). Place-based education: Practice and impacts. In R. B. Stevenson, M. Brody, J. Dillon, & A. E. J. Wals (Eds.), *International handbook of research on environmental education* (pp.213–220). New York, NY: American Educational Research Association.

About the Authors

Dr. Krissi Hewitt serves as the Regional Education Partnership Policy Advisor for Oregon's Chief Education Office, directing the state agency's cross-sector education partnership initiatives and conducting policy analyses relevant to STEM and CTE. Krissi has over 10 years of experience in STEM education transformation and research. Her current focus is on strengthening regional partnerships to empower communities to impact education at the local-level and to influence policy at the state-level. In addition to her work as policy advisor, she also serves as graduate faculty for the College of Education at Oregon State University. Krissi earned her PhD in Science Education from Oregon State University, MS in Microbiology from San Diego State University, and her BS in Biology from the University of California, San Diego.

Mark Lewis serves as the STEM and CTE Policy Director in the Oregon Chief Education Office. With this role, Mark oversees state policy development and the work of the STEM Investment Council. He also monitors and guides the effective implementation of a $12.5M portfolio of STEM investments in the P-20 educational ecosystem to transform the lives and prosperity of individuals and communities across the state. With an undergraduate degree from Caltech and a Master's Degree in Education, he brings over 25 years of experience in STEM—from his first career as a satellite engineer, to teaching high school science and mathematics, to leading professional development and strategic planning initiatives with hundreds of teachers and administrators in Washington state. A lifelong educator, tinkerer, and advocate for youth, Mark is driven by a passion for the critical role that education has in shaping the lives and prosperity of individuals and communities.

Beth Unverzagt has served as the Director of OregonASK since 2005. OregonASK is a collaboration of public and private organizations and community members which seek to address common-issues and concerns across all out-of-school time services-child care, recreation, education and youth development. Beth coordinates state level efforts around afterschool and summer programming, including OregonASK's STEM system building efforts. Beth also educates policy makers, local and state representatives, educational stakeholders and afterschool professionals around the issues and resources for the field of afterschool and advocates for systemic change within statewide systems. In 2016, she received the White House Champions of Change award, for her work in summer learning.