



STEM Investment Council

April 24, 2015

9:00am – 12:00pm

2 World Trade Center

Mezzanine Rooms 3&4

121 SW Salmon St., Portland

Call-In Information:

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JIM PIRO, Chair

AUBREY CLARK

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ERIC MESLOW

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MORRISON

Staff:

MARK LEWIS

AGENDA

1. **Welcome & Introductions**
2. **Director Updates**
3. **Subcommittee Updates**
4. **STEM Strategic Plan**
5. **Reviewing prior RFP and selection process**
6. **Public Comment**

Members of the public wanting to give public testimony must sign in.

There will only be one speaker from each group.

Each individual speaker or group spokesman will have three (3) minutes.

All meetings of the STEM Investment Council are open to the public and will conform to Oregon public meetings laws. The upcoming meeting schedule and materials from past meetings are posted online. A request for an interpreter for the hearing impaired or for accommodations for people with disabilities should be made to Seth Allen at 503-378-8213 or by email at Seth.Allen@state.or.us. Requests for accommodation should be made at least 48 hours in advance.

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STEM Council Advisory Group

Process:

- 1) Agree on size, purpose, and representation for the Advisory Group.
- 2) Identify selection committee from Council
- 3) Solicit candidates from institutional leadership and practitioners.
- 4) Final selections

Purpose:

To assist the STEM Investment Council with expert research, perspectives, and insights on the complex ecosystem that leads to success in STEM, and to contribute to the development of policies and strategies that have a high probability of implementation and effectiveness.

Sector Representation:

- a) **Early Learning (1)**
- b) **Department of Ed, CTE (1)**
- c) **Formal K-12 Education (3)**
 - Teachers (Elem, Middle School, CTE, HS Sci/Math)
 - Administrator/principle
- d) **Community Colleges/Workforce (1)**
- e) **4-year University (1)**
- f) **Private University (1)**
- g) **Out-of School STEM programs (1)**
- h) **Philanthropy (1)**
- i) **Legislative Rep (1)**

Criteria for selection:

- Is a recognized thought leader and influencer across diverse stakeholder networks
- Thinks strategically and understands complex social systems.
- Committed to the realization of the OEIB Equity Lens and addressing the achievement gap for our students of color and those in poverty.
- Values STEM literacy as essential to success in work and society, and will work to ensure ALL students achieve essential proficiency in STEM.
- Has the authority within his/her organization to make strategic decisions.
- Has a deep understanding of youth motivation, engagement, and learning—particularly in regard to STEM education.
- Able to identify clear goals, understand data and metrics, and determine specific measurable outcomes critical for success.
- Committed to working in partnership across institutional cultures and is willing to set aside individual agendas in order to make objective recommendations.
- Represents diverse geographic areas and constituencies.

The Oregon STEM Manifesto & Strategic Plan (DRAFT)

Our Vision

Build an inclusive, sustainable, innovation-based economy by reimagining and transforming how we educate and empower individuals and communities. Oregonians of all races, economic status, and locations will develop the fundamental STEM skills and mindsets necessary to:

- Fully contribute to an increasingly complex and technologically rich global society
- Address high-demand workforce and industry needs
- Improve the prosperity of all individuals and communities across the State
- Become creative, life-long learners who can adapt to changing social and economic conditions

Our Beliefs

1. **All people create.** Our students should not just be consumers of knowledge, they need to be creators of it in a way that unleashes their creative genius, interests, and talents.
2. **Each student deserves an opportunity at prosperity.** There continues to be persistent inequities in race, ethnicity, gender, and educational background in high-wage, high demand professions. Many students in poverty and from rural areas are being left behind. No one's talents should be left behind.
3. **Diversity is our strength.** Differences of gender, ability, race, ethnicity, and culture provide critical and diverse perspectives and voices to address today's complex challenges. Innovation emerges where different ideas and cultures interconnect.
4. **Engaged learners succeed.** *How* we teach our students is as important as *what* we teach them. We must create meaningful learning experiences that empower all students to embrace their curiosity, take ownership of, and joy in their learning, and become lifelong learners.
5. **Education is a collective responsibility.** Effective STEM learning takes place both in and outside of classrooms. Everyone in our community is a potential educator and we need to build solutions that develop partnerships with all of the human capital in our communities.
6. **Innovation is the cornerstone of prosperity.** STEM is not just about filling jobs but creating jobs to address challenges and opportunities. Building an innovation-based economy is essential for long-term prosperity resulting in competitive advantage in a global marketplace.
7. **Learning takes courage, persistence, and humility.** Pushing the boundaries of one's understanding requires us to embrace ambiguity and to take intellectual risks. What we do with what we don't know is as important as what we do know. We should prioritize questions over answers.
8. **STEM skills are essential skills.** Advancements in science, technology, engineering, and mathematics are transforming every industrial and service sector, from agriculture to energy, medicine to manufacturing, forestry to nanotechnology.
9. **All learning is cross disciplinary.** It is the interconnectedness of ideas that enable people to integrate new learning with their prior experiences. STEM by its nature synthesizes analytical and creative thinking. It is a powerful tool that sits at the crossroads of the sciences, arts and humanities.

The Oregon STEM Manifesto & Strategic Plan (DRAFT)

10. **The best way to learn STEM, is to DO it.** Education is not about retaining facts or disconnected bits of information. Utilizing purpose-driven learning challenges students to pursue deeper questions and to solve problems that are relevant and meaningful.

Our Goals

1. Increase the number and diversity of students who successfully complete post-secondary credentials (degrees and certificates) in high-demand STEM-related careers.
2. Increase student aspiration, skills, and knowledge in STEM by increasing literacy, confidence, awareness, persistence and achievement for all students.
3. Provide access to effective STEM instruction and high-quality hands-on learning environments, both in, and out of school, for each and every Oregon student.
4. Increase the quantity and effectiveness of P-16 STEM educators, both in and out of school.
5. Build public awareness and support - Increase the understanding of Oregonians about the critical importance of STEM to their own economic competitiveness and to that of the State.

Our Strategies

1. **Increase the number and diversity of students who successfully complete post-secondary credentials (degrees and certificates) in high-demand STEM-related careers.**
 - Increase needs-based financial support and access to flexible, micro-loan/funds to ensure that talented students do not have to leave post-secondary education pathways due to (short-term) financial distress. Include provisions for students taking longer times to degrees/credentials due to work or life conditions.
 - Provide program “start-up” or retooling/modification funds to incentivize post-secondary programs aligned to high-wage, high-demand market needs.
 - Increase the number and quality of wrap-around services and pre-college transition/bridge programs to students from communities of color and those with more complex lives, and increase the number and diversity of programs that create supportive student cohorts of affinity groups.
 - Improve student advising by strengthening counseling services and tools, increasing access of students to alumni, professional, and near-peer networks, and increasing student access to up to date market data about high-wage, high-demand jobs.
 - Increase STEM internships, work-based and service learning opportunities, and undergraduate research opportunities in high-demand fields.
 - Dramatically transform the way that mathematics is sequenced and taught.
 - Investigate the efficacy of technology-based learning platforms, especially those that emphasize more complex reasoning and problem-solving.

The Oregon STEM Manifesto & Strategic Plan (DRAFT)

- Promote and invest in approaches that contextualize and integrate mathematics learning into other STEM courses. CTE is a powerful place to demonstrate applied mathematics.
 - Work with post-secondary institutions to vastly improve math placement approaches.
 - Consider policies and approaches that ensure continuity of mathematics learning in 12th grade to prevent long gaps between high school and college mathematics experiences.
 - Convene a workgroup to consider ways to shift away from “general math” courses to those that incorporate mathematics specific to the academic pathways (e.g Statway and Quantway).
 - Increase early college credits in STEM courses by strengthening local partnerships and articulation agreements between high schools, community colleges and 4-year institutions.
 - Address “weedout culture” in engineering, computer science, physics, mathematics and chemistry in post-secondary education by improved instruction, counseling, increasing capacity to serve students post introductory courses, and incentives that favor investments into student persistence and success, rather than failure, drop-out, or transfer into other disciplines.
 - Increase positive social messaging through *community and family outreach* about STEM disciplines to recruit students of color and students from ethnically diverse backgrounds.
 - Encourage undergraduate STEM teaching to be more contextualized in real-world problems by providing incentives for faculty to connect to and be trained in relevant national initiatives.
 - Expand ASOT (associate of science, Oregon transfer) program to include additional 2-year STEM degrees that transfer to 4-year for areas including Computer Science, Engineering, Physics, Chemistry, and Biology.
 - Increase the development and recognition/acceptance of learning proficiencies tied to industry-recognized credentials through micro-credentials (badging), digital portfolios, and other means that provide meaningful ways for students to exhibit their abilities and potential.
- 2. Increase student aspiration, skills, and knowledge in STEM by increasing literacy, confidence, awareness, persistence and achievement for all students.**
- Change the model of teaching where the educator becomes the facilitator and students are active in the pursuit of knowledge. Instruction that challenges students to be creative, resourceful and team-oriented in developing knowledge and skills to solve real-world problems. Instruction in this way is process-oriented: it keeps students engaged by challenging them, and it prevents frustration by remaining doable. It avoids drill and kill and regurgitation of facts. Funding for teacher pre- and inservice support in Oregon should be tied to evidence that this kind of instruction is intentionally nurtured.
 - Increase contextualization of content, particularly mathematics.
 - Focus on student engagement and purpose-based learning by increasing links between school-based and out-of-school learning settings.

The Oregon STEM Manifesto & Strategic Plan (DRAFT)

- Increase early career and course advising, and encourage “multiple pathways” thinking into flexible career trajectories that span across different industry sectors.
 - Develop and implement an Oregon leadership “academy” for principals and superintendents and other STEM instructional leaders to ensure that they have the dispositions, awareness, and ability to support improved STEM instruction and effective STEM pathways in their jurisdictions.
 - Focus STEM instruction on the development of STEM Identities by linking effective instruction with real-world experiences and deliberate student experiences that challenges them to think of themselves as lifelong learners and participants in STEM. Feature STEM professions or the inclusion of STEM skills in any profession as part of instruction. Bring in representatives (ideally alumni) to discuss the practical use of STEM in professions, and provide funding for field trips to STEM-rich institutions, community sites, and other learning spaces beyond the classroom.
- 3. Provide access to effective STEM instruction and high-quality hands-on learning environments, both in, and out of school, for each and every Oregon student.**
- Increase access to high-quality instructional resources and materials that integrates and applies the content.
 - Investment of public \$ to build capacity, increase cultural responsiveness, and ensure access for underserved students.
 - Engage communities of color to recruit children and youth into programs.
 - Incentivize co-created programs linking community-based education with classrooms.
 - Increase effective utilization of technology to individualize learning and deepen student engagement, while reducing cost of access to content and educator time.
 - Provide interactive early learning environments for students in poverty.
 - Develop, implement, and disseminate models for teaching mathematics using contextual and problem-based approaches.
 - Introduce validated and effective adaptive learning platforms to support mathematics instruction.
- 4. Increase the quantity and effectiveness of P-16 STEM educators, both in and out of school.**
- Increase educator “STEM identity” and contextual understanding by creating widespread opportunities for STEM educators to experience STEM in industry and research as part of their professional development. Integrate these experiences with mindful implementation of the Next Generation Science Standards and the Common Core State Standards for Mathematics, particularly shifts in beliefs and practices. Educators PD units to include industry-based, applied experiences wherein they practice STEM thinking and dispositions.
 - Provide resources, guidelines and infrastructure to increase purposeful interactions between STEM practitioners, educators, and students.
 - Increase classes co-developed between CTE and math/science teachers.
 - Increase credit equivalency of CTE courses for math and science.

The Oregon STEM Manifesto & Strategic Plan (DRAFT)

- Increase certification requirements of teachers in math and science to include research and applied content.
- Increase career-transitioners of STEM professionals into teaching for CTE, math, and science.
- Create a network of “STEM Stars”-- identify, recruit, and harness the experience and passion of the very best STEM educators in the ecosystem (k-12, postsecondary, and out-of-school). Utilize their experience and approach as peer mentors within and across regions. And, have them be our “go to” folks for curriculum development, strategic insights, wisdom of practice, and feedback from the field.
- Increase peer-based educator support systems (e.g. part-time TOSAs)
- Increase quality and access of PD for out-of-school/community-based educators.
- Increase quality and access of PD for early learning educators.
- Increase quality and access of STEM PD for elementary educators.
- Provide startup funding for creation of instructional practice networks that are incubators of promising STEM instructional practice. This would focus on testing and refining practice around a specific type of practice. Linked Learning is an example of what happens in such a network.
- Provide incentives to teacher preparation programs to develop, evaluate, and disseminate effective STEM preservice teaching strategies including continued support during the first three years of teaching.
- Create widespread opportunities for STEM educators to experience STEM in industry and research as part of their professional development.

5. Build public awareness and support - Increase the understanding of Oregonians about the critical importance of STEM to their own economic competitiveness and to that of the State.

- Change public perception of STEM as difficult, esoteric, and limited to the chosen few who can learn mathematics easily under current conditions. Target this outreach towards communities traditionally underrepresented in STEM.
- Increase the number of STEM role models of color by specifically recruiting and supporting a network of STEM professionals of color.
- Create “space” for the educational ecosystem to innovate by reducing the incessant, negative public messaging. Shine a positive public light on individuals, classrooms, and organizations that are effective in all parts of the state.
- Produce promotional materials that connect STEM learning opportunities to high demand industry sectors. Convey the exciting career and research opportunities that exist amongst Oregon businesses, organizations, and institutions.

The Oregon STEM Manifesto & Strategic Plan (DRAFT)

Our Plan

1. **Build, strengthen and support statewide partnerships for STEM education.** Utilizing Regional STEM Hubs and other professional networks, we will connect, align and leverage assets from around the state to develop and disseminate promising practices and resources for STEM education. At a local level, STEM practitioners, educators and local businesses will work closely to increase access and quality of STEM educational experiences both in and out of school. Support for this connected ecosystem of practitioners is essential to increase communication, spreading strategies that work, learning with and from each other, and providing critical feedback to inform policy and investment decisions.
2. **Change the perception of STEM careers.** Working with industry and institution partners, we will develop a statewide marketing campaign that conveys the creative nature of these careers and encourages participation of all members of our community, particularly reaching communities of color. The campaign will also convey to all Oregonians the relevance and importance of technology-enabled innovations to drive economic growth in all sectors of economy. Locally, there also needs to be more opportunities for students to interact with STEM employees and to engage in apprenticeships, internships, and research.
3. **Create ongoing, transformative professional development experiences for our educators and educational leaders.** Quality learning requires knowledgeable, confident, and supported educators. In order to realize our vision for richly-contextualized, purpose-driven educational experiences for students, educators must have the opportunity to deepen their own learning, transform the professional culture in their schools, and have the opportunity to interact with peers and STEM professionals. STEM education not only opens the door to new toolsets and mindsets, but also shapes new learning models that will impact all areas of education and better inspire life-long educational journeys.
4. **Develop a sustainable funding and policy environment.** In order to realize these these transformational aspirations, we must create the enabling conditions for change to occur. This will take a combination of leadership, resources, collective will, and outcomes-oriented funding. Our plan aligns corporate, state and philanthropic resources to provide stable funding streams that lead to sustained change.
5. **Support the transformation of STEM teaching and learning through empirical research and evaluation.** Are we making a difference? Are the various policy mechanisms working as intended? Do we have to reconsider some, add others, change? What does current research suggest we need to focus on and in what ways? Research and evaluation in education is ongoing, but much is known and supported through empirical and validated evidence; yet, more than often, policies in education are driven by beliefs and personal experiences, rather than by what we know works for who. Researchers, evaluators and reflective practitioners should be invited to form an Oregon educational research trust that advises the State on STEM education investments and can support ongoing investments through the generation of evidence of their effectiveness and efficacy.