STEM Investment Council

AGENDA

March 20, 2019
9:00am – 12:00pm
Public Service Building, Third Floor, Room H301
255 Capitol Street
Salem, Oregon 97310

Call/Video conference: *https://hecc.adobeconnect.com/stem_council/*
Conference #: 877-810-9415 Participant Code: 4851345

Persons wishing to testify during the public comment period should sign up at the meeting. Times approximate and order of agenda items may vary.

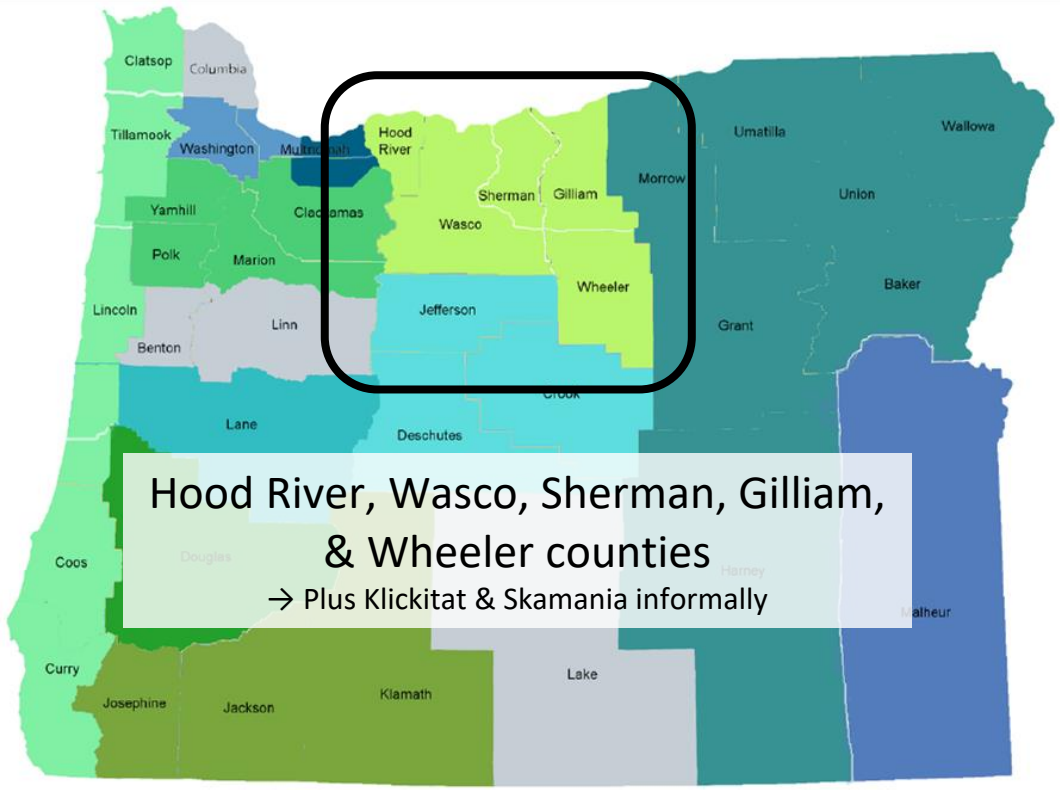
9:00	**1.0**	**Welcome & Meeting Overview**	Chair Piro
9:10	**2.0**	**Consent Agenda**	Chair Piro
	2.1	*CONSENT ITEM: Approve February STEM Council Meeting Minutes*	
9:15	**3.0**	**Public Comment**	Chair Piro
		Each individual/group will have a time limit of three minutes	
9:25	**4.0**	**Department of Education Update**	Tom Thompson
9:35	**5.0**	**STEM Hub Updates**	
	5.1	Columbia Gorge STEM Hub	Christy Christopher
	5.2	GO-STEM	Kim Young
9:55	**6.0**	**Director's Update**	Julia Steinberger
	6.1	Legislative Update	
	6.2	Project updates	
10:05	**7.0**	**STEM Innovation Grants**	
	7.1	Digital Literacy & Computer Science	Terrel Smith & Jill Hubbard
	7.2	Math in Real Life	Maddy Ahearn & Tom Thomson
	7.3	STEM Beyond School	Beth St. Amand, Kristen Harrison & Jerian Abel
	7.4	Proposed 2019-21 Funding Framework	Julia Steinberger
11:05	**8.0**	**Discussion of STEM Education Plan**	Chair Piro/Julia Steinberger
	8.1	Council Work Session – Goal 4	
11:50	**9.0**	**Other Business and Next Steps**	All
12:00	**10**	**Adjourn**	

All meetings of the STEM Council are open to the public and will conform to Oregon public meetings laws. A request for an interpreter for the hearing impaired or for accommodations for people with disabilities should be made to Stephanie Solomon at (503) 947-2416 or by email at HECC_WTDB@oregon.gov. Requests for accommodation should be made at least 72 hours in advance. Staff respectfully requests that you submit 12 collated copies of written materials at the time of your testimony. Persons making presentations including the use of video, DVD, PowerPoint or overhead projection equipment are asked to contact STEM Council staff 24 hours prior to the meeting.

Columbia Gorge STEM HUB

SCIENCE, TECHNOLOGY, ENGINEERING & MATHEMATICS

Columbia Gorge Region



Columbia Gorge
EDUCATION SERVICE DISTRICT

Partners:

- 10 school districts
- Gorge Technology Association
- Local businesses & non-profits
- Columbia Gorge Community College

Strengths:

- Tight-knit communities
- Diverse rural economy
- Industry support
- Strong robotics

Challenges:

- Slow start for Hub
- State boundaries
- Rural & very rural

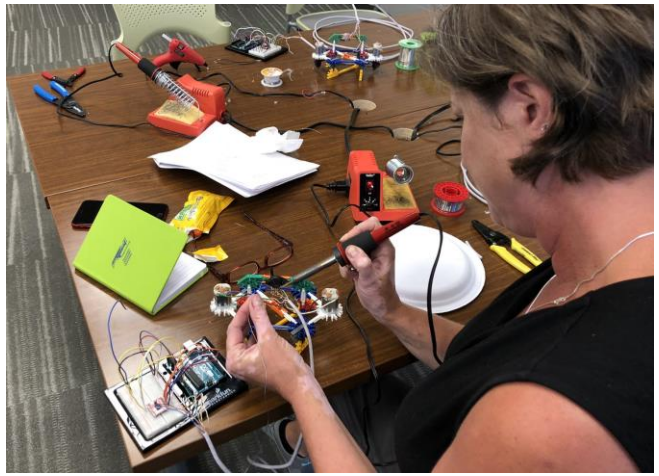
Educator Support

Student Opportunities

Regional Collaboration

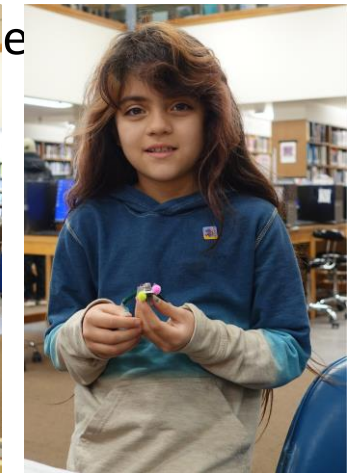
Educator Support

- Microgrants
- Field trip grants
- Educator Trainings
- Lending Library
- Free resources



Student Opportunities

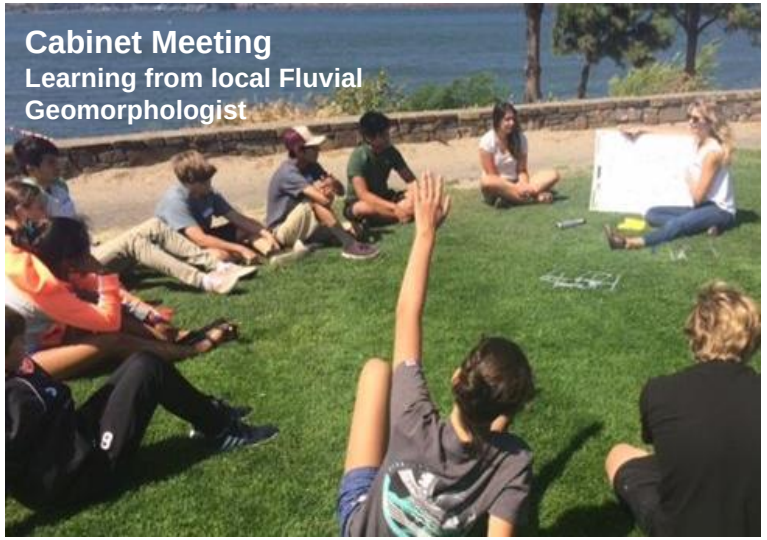
- STEM Nights & Maker Clubs (E)
- Intro to Engineering (E/MS)
- Chief Science Officers (MS/HS)
- Lunch w/a STEM Pro (HS)
- *2019-20:* Career Connections e



Regional Collaboration

- Communication
- Collaborative grants
- Gorge STEM Fair
- Asset Mapping
- STEM Insert

Program highlight: Chief Science Officers



What: National youth voice program

Where: 4 Hubs, all rural, including all of Eastern Oregon

How: ODE Innovation Funds & collaboration between Hubs

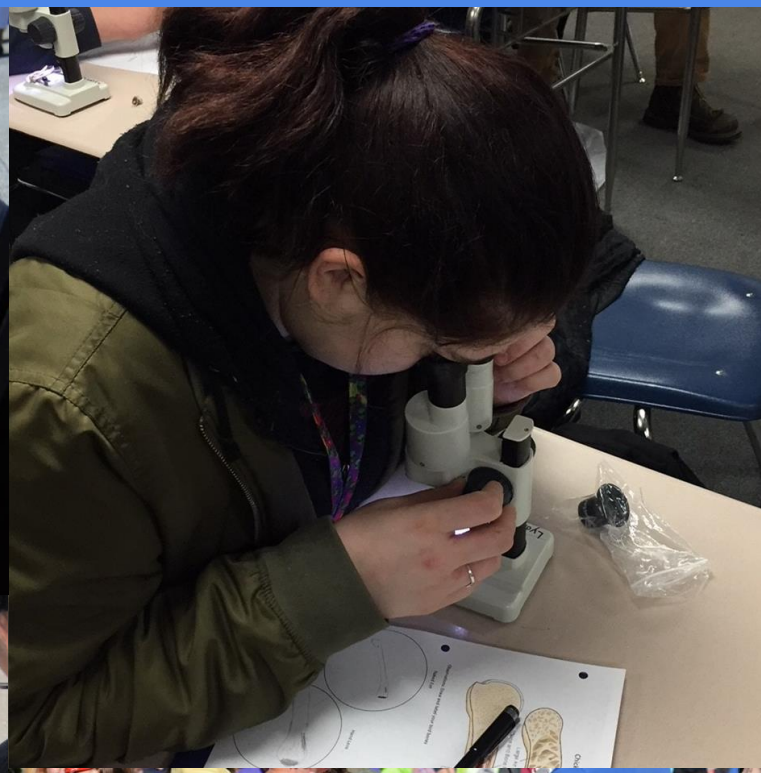
Strengths:

- Win-win: growth for CSOs, more STEM leadership, youth insights
- National Support
- Regional leaders

Challenges:

- Uncertain Funding
- Building legitimacy in OR

Questions?



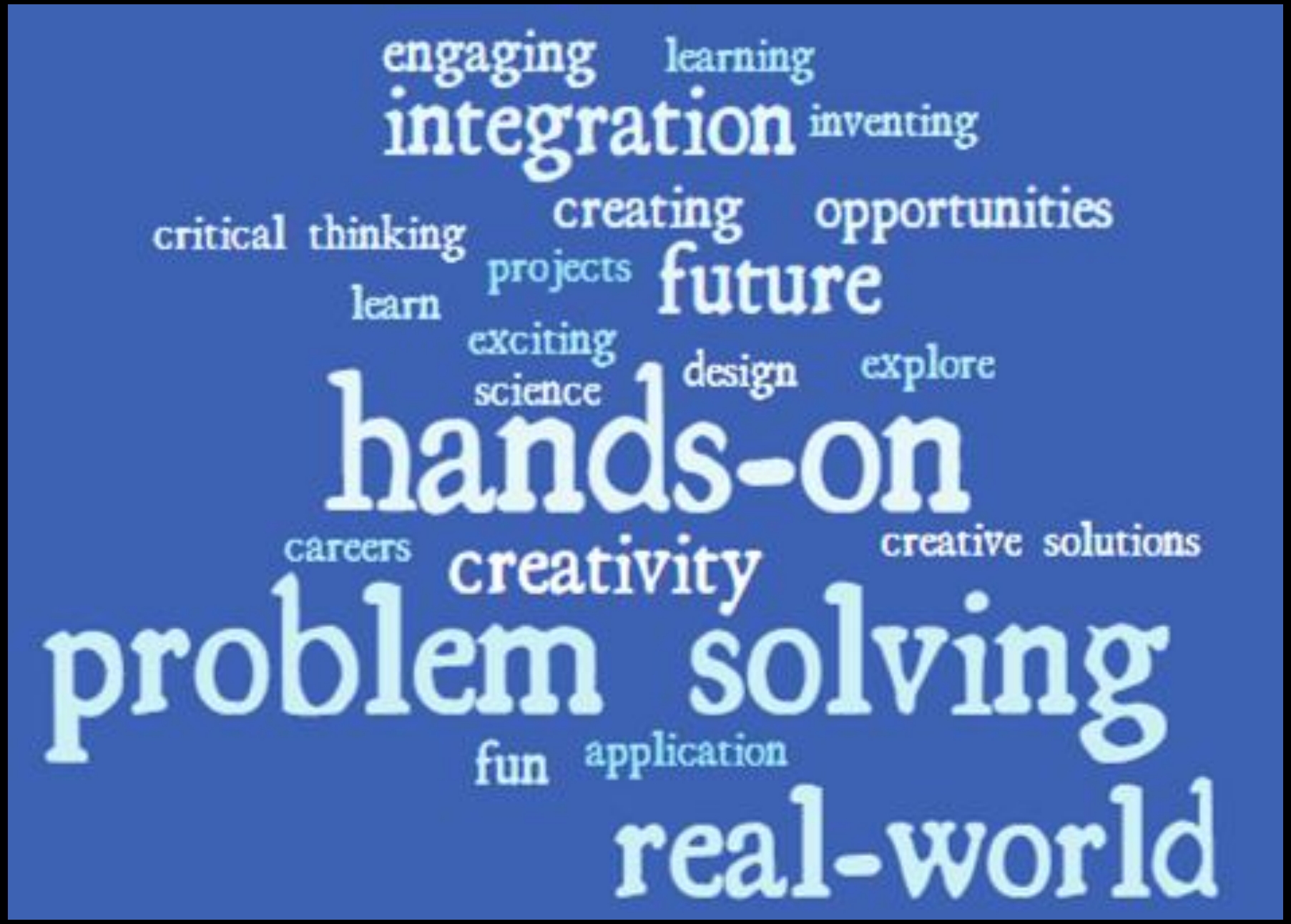
Christy Christopher
Columbia Gorge STEM Hub
GorgeSTEM.org
Columbia Gorge Education Service District
Phone: 541-296-2046 **Web:** www.GorgeSTEM.org
Email: cchristopher@cgesd.k12.or.us

Columbia Gorge STEM HUB
Science, Technology, Engineering, & Mathematics

Columbia Gorge
EDUCATION SERVICE DISTRICT

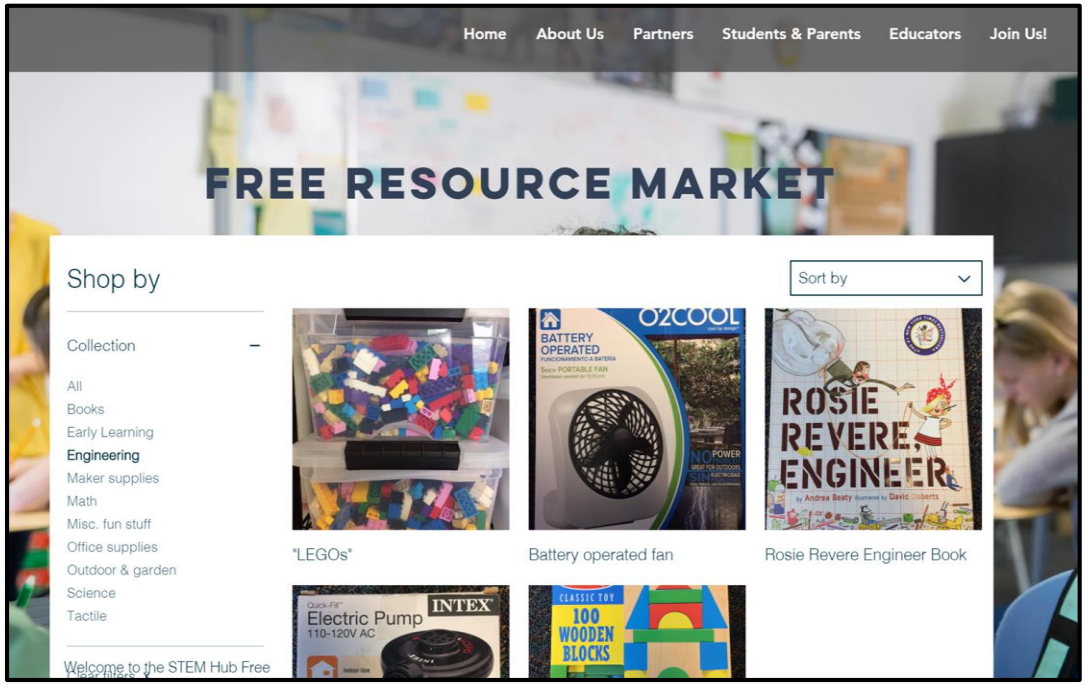
Appendix

How educators in the Gorge define STEM:



Educator Support

- Lending Library
- Free Resource Marketplace
- Microgrants for innovative projects & field trips
- Annual Educator Symposium
- Lesson plans



Student Opportunities

Exposure & Awareness

- Expanding school STEM Nights
- STEM Kits
- Gorge STEM Fair
- Lunch with a STEM Pro

Exploration & Leadership

- Chief Science Officer program
- Science Wizards pilot @ TDHS
- STEM Mentorship
- Maker Clubs

Regional Collaboration

- Region-wide communication
- Aligning efforts
- Collaborative grants

The Columbia Gorge STEM Hub was recently named one of just 8 cities named a **NATIONAL winner of the US 2020 STEM Coalition Challenge!**

The Columbia Gorge STEM Hub will support all students in The Dalles, and the Columbia Gorge more broadly, in attaining the exposure, hands-on learning, and support needed to envision themselves in—and successfully pursue—STEM careers. Through a collaborative process, The Columbia Gorge STEM Hub worked closely with partners, including Gorge Technology Alliance - a network representing over 3000 STEM professionals in the region, to guide the direction of the initial STEM collaborative and maker-centered learning programming in the community. In partnership with the STEM Hub Leadership Team, which includes representatives from local school districts, the community college, and industry, the coalition applied insights from partners on developing the its local STEM action plan, with goals to scale this pilot (if successful) to the entire Columbia Gorge region. By participating in the Challenge process, the team is moving forward with developing a maker-focused mentorship program that connects students and professionals in settings show students first hand how they can become STEM professionals.

The Columbia Gorge STEM Hub

The Dalles, Oregon

"This smaller community is committed to changing the lives of it students through its partnership between the high school, local library, and corporate partners like Google. Without this learning opportunity, students could miss out on taking up tech jobs in the region." *Esra Ozer, President, Arconic Foundation*

My background

Christy Christopher

Columbia Gorge STEM HUB
Science, Technology, Engineering, & Mathematics

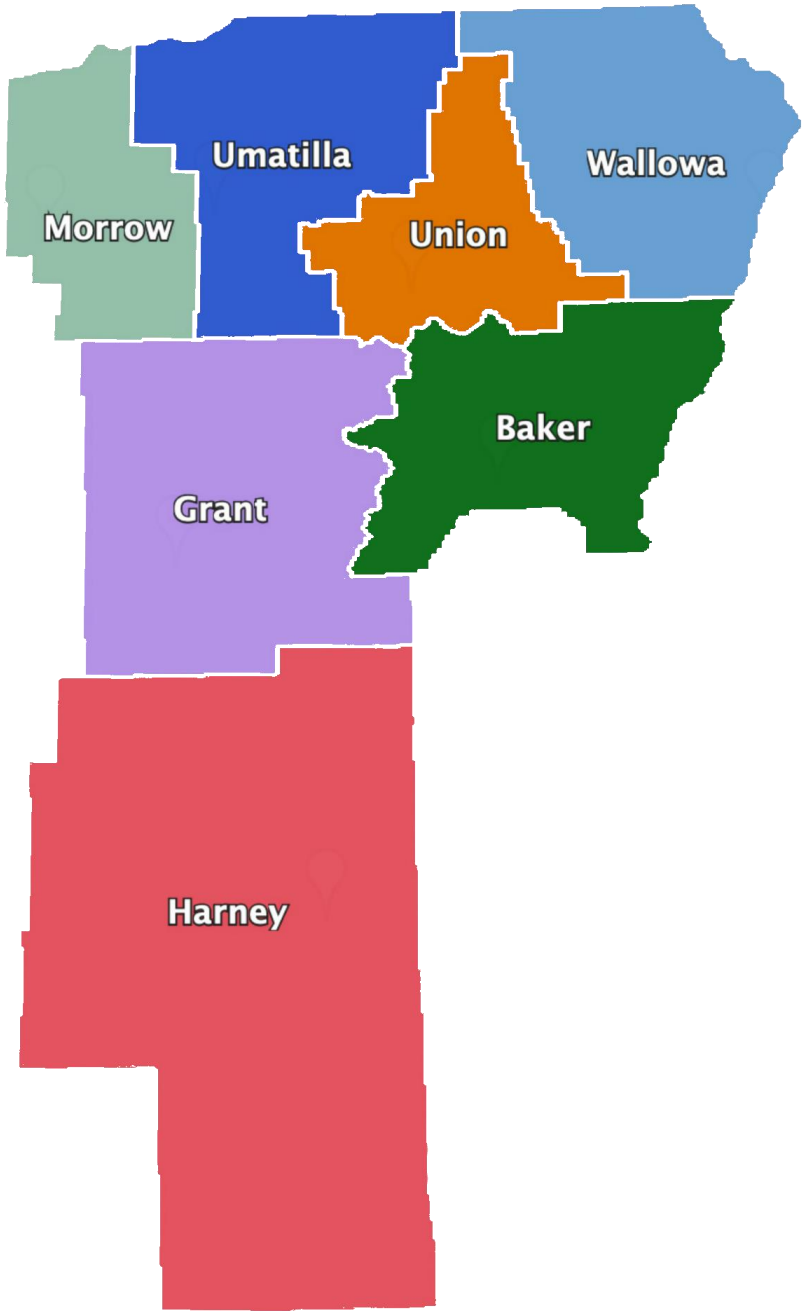
- Native of Hood River
- Former HS math teacher & business owner
- Education:
  - BS in Policy Analysis & Management, Cornell
  - MA in Education, Stanford
  - MBA Boston University

GO·STEM

GREATER
OREGON
SCIENCE
TECHNOLOGY
ENGINEERING
MATH

VISION

A regional partnership that values STEM learning, prepares youth for successful STEM careers, and builds pathways and pipelines to meet workforce needs.



OUR REGION

- 7 counties
- 30,975 acres
  - 31% of Oregon's area
- 150,947 residents
  - 4% of Oregon's population

HOW DO WE COMPARE?

	Region - GO STEM	State - Oregon
Adults with Bachelor's degree	18%	29%
Adults with a STEM-related degree	8%	14%

2013-2015 American Community Survey (ACS) 5 year estimates
State of Oregon Employment Department

PRIORITIES

1. STEM Awareness, Pipelines, & Pathways
2. STEM Systems for Education
3. Communicating Rural STEM Perspectives, Needs, Solutions, and Opportunities

PRIORITY:

The strategy addressed by a program or activity will be indicated here.

EMPLOYMENT & INDUSTRIES

ALL

Top Employers

- Hospitality
- Manufacturing
- Health

Household Income

$46,237

STEM RELATED

Top Employers

- Agriculture
- Health
- Natural Resources

Household Income

$67,013

PRIORITY:

1. STEM Awareness, Pipelines, & Pathways
3. Communicating Rural STEM Perspectives, Needs, Solutions, and Opportunities

OED projections based on SOC codes.
Included counties: Baker, Grant, Harney, Malheur, Morrow, Umatilla, Union, Wallowa

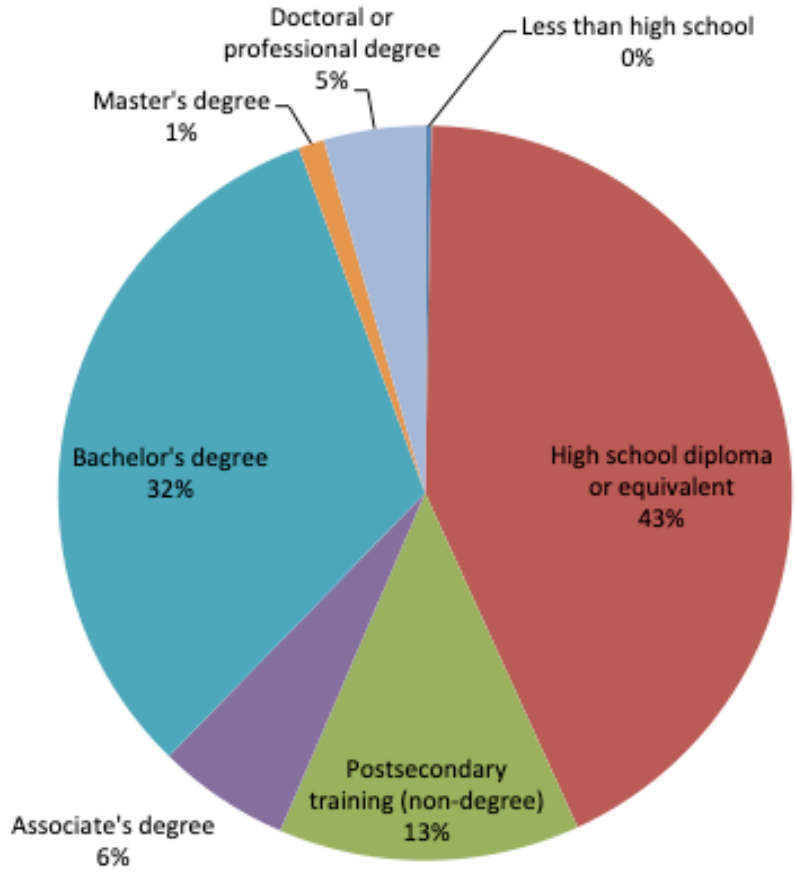
INDUSTRY TRENDS

GROWING

- Agriculture (managers, equipment operators)
- Medical (nurses, physical therapists)
- Natural Resources
- Mechanics & Technicians

SHRINKING

- Radio & Cellular
- Executives



2017 Job Educational Requirement

PRIORITY:

1. STEM Awareness, Pipelines, & Pathways
3. Communicating Rural STEM Perspectives, Needs, Solutions, and Opportunities

OED projections based on SOC codes.
Included counties: Baker, Grant, Harney, Malheur, Morrow, Umatilla, Union, Wallowa

PROFESSIONAL DEVELOPMENT

2017-2019 BIENNIUM

- 240 educators
- 1,623 hours of training

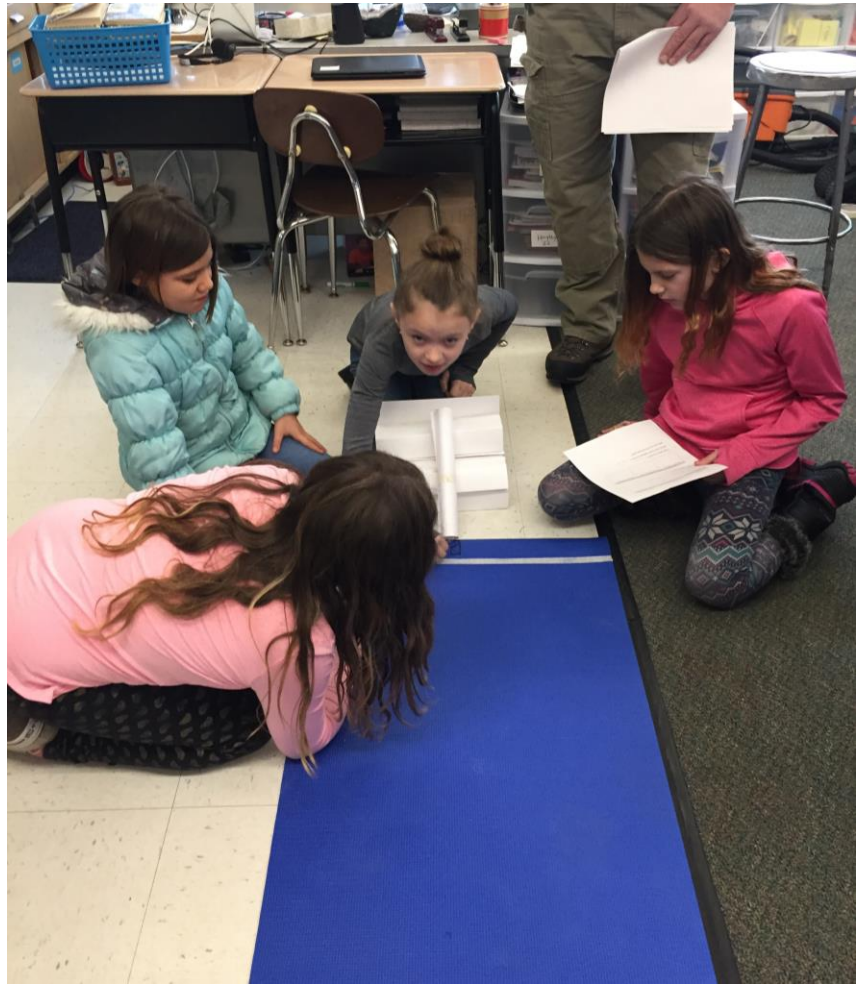
PRIORITY:

2. STEM Systems for Education

PROFESSIONAL DEVELOPMENT

OPPORTUNITIES

- Head Start
  - Baker, Harney, Union counties
- Increased Time on Science
- STEM coaching
  - In-school staff that adapts curriculum to STEM and NGSS curriculum
- Math in Real Life
- College of Education
  - STEM Methods, Integrated Methods



PRIORITY:

2. STEM Systems for Education

CHIEF SCIENCE OFFICERS

AY 2018-2019

- 6 counties
- 9 advisors
- 21 CSOs

PRIORITY:

1. STEM Awareness, Pipelines, & Pathways
2. STEM Systems for Education
3. Communicating Rural STEM Perspectives, Needs, Solutions, and Opportunities

CHIEF SCIENCE OFFICERS

ONGOING ACTIVITIES

- Individual action plans
  - Dinner with a STEM pro
  - Regional lessons
  - CTE/School outreach & awareness
- Community champions
- Community outreach

PRIORITY:

1. STEM Awareness, Pipelines, & Pathways
2. STEM Systems for Education
3. Communicating Rural STEM Perspectives, Needs, Solutions, and Opportunities

PROGRAMMING

Out-of-School

- 3,723 hours of student participation
- 347 students
- STEM Beyond Schools

Summer Opportunities

- iNVENT
- Nuts, Bolts, Thingamajigs
- Teacher Externships

Lending Library

- 80+ types of items
- Available across entire region

PRIORITY:

1. STEM Awareness, Pipelines, & Pathways
2. STEM Systems for Education
3. Communicating Rural STEM Perspectives, Needs, Solutions, and Opportunities

PARTNERSHIPS

OREGON CSTA

oregoncsta.org

Digital Literacy 2.0

Year in Review 2018

oregoncsta.org

Digital Literacy 2.0 Grant
2018 Deliverables, Outcomes, Budget
Infrastructure development
2019 plan
The Future

Presentation and supporting docs found here

Grant Goals

Goal 1. Grow the number of students with access to quality CS in K-12 classrooms and increase participation.

Deliverable. Professional development.

#attendees: 648 in 2018 (increase in k-5 participation); 30:30:30:10, 3x increase from 2017

#total PD days: 30 days in 2018 (1day-spring, 24days-summer, 1day-fall, 4days popups)

#total courses offered: 62

#faculty: 87

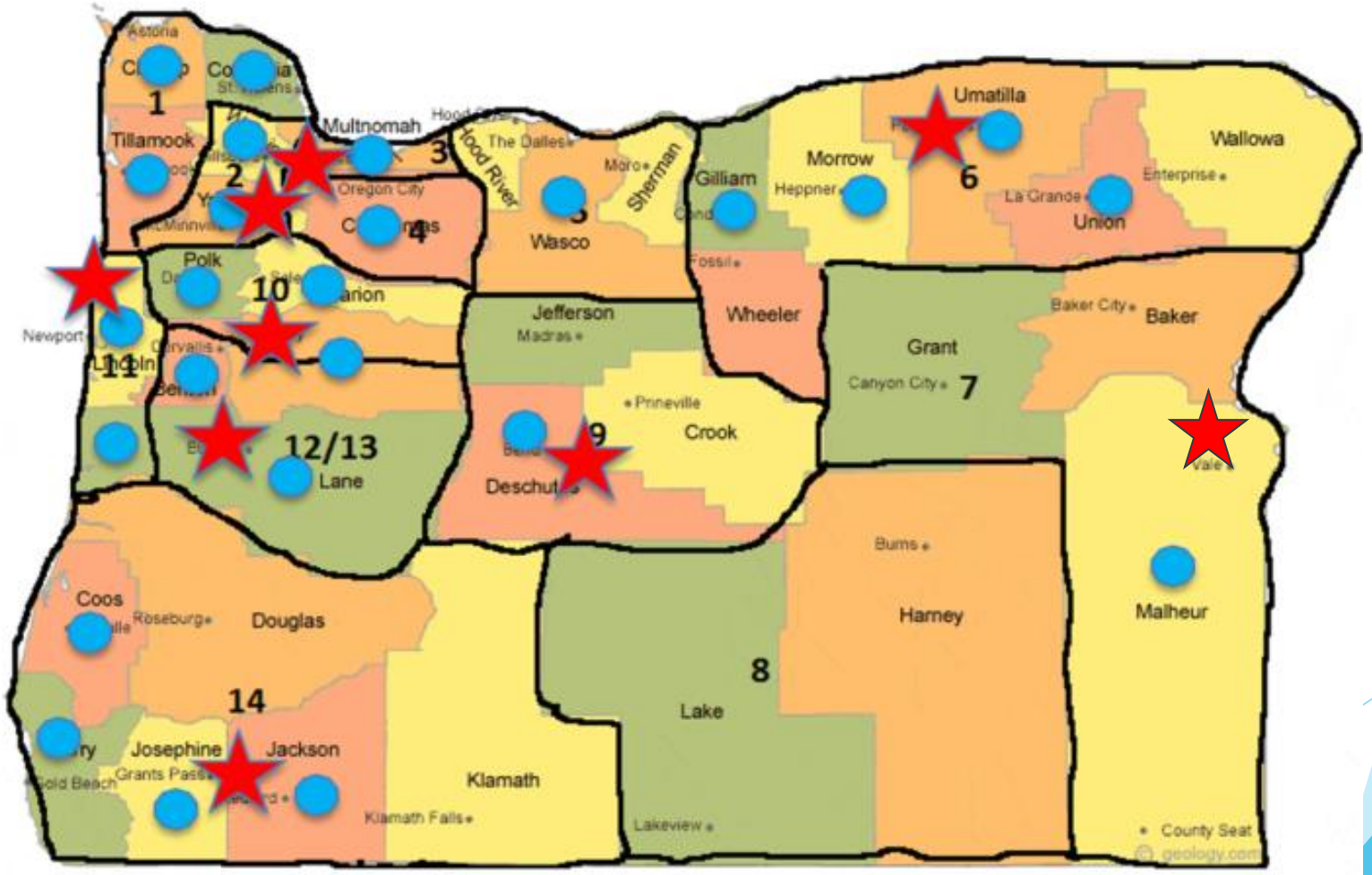
Summer Locations: Wilsonville, Salem, Eugene, Eastern, Central, Southern, Newport, The Dalles.

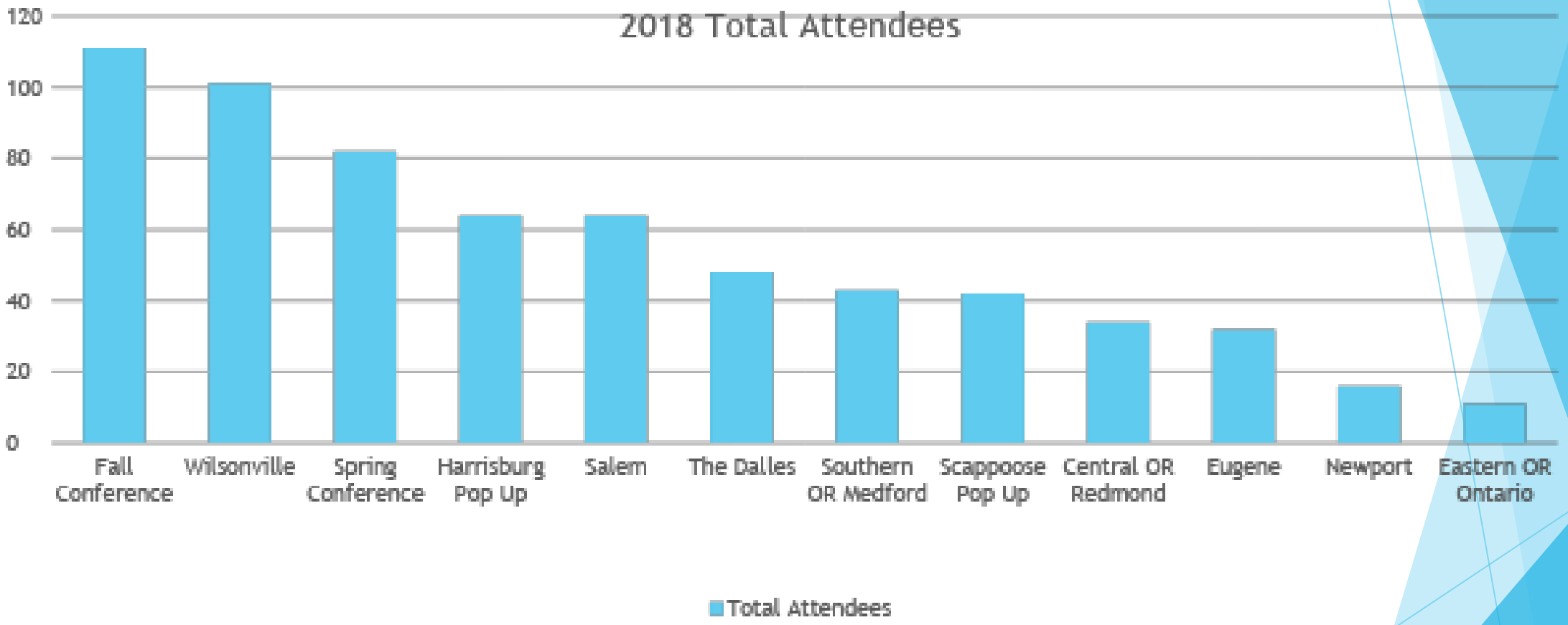
Rural-suburban gap closing as PD offerings in more areas statewide.

Ongoing Curriculum Development.

SuperQuest 2018 Professional Development Sites

Educator attendance by County




2018 Total Attendees
120
100
80
60
40
20
0
Fall Conference
Wilsonville
Spring Conference
Harrisburg Pop Up
Salem
The Dalles
Southern OR Medford
Scappoose Pop Up
Central OR Redmond
Eugene
Newport
Eastern OR Ontario
Total Attendees

oregoncsta.org

Grant Goals

Goal 2. Support the development of district plans to deliver high quality CS experiences to all students across the K-12 pipeline. The development of local plans will be guided by existing national work and help to create a shared vision for Oregon CS education.

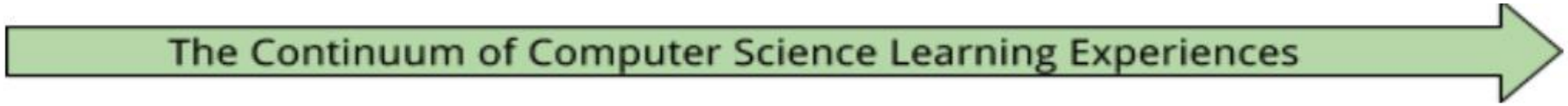
Deliverable. CS for Oregon plan.

Framework development with statewide partnership workgroup.

Currently used in Bend, Silver Falls, Beaverton and TTSD.

K-12 CS Pathways

To prepare **all students** for current and future careers, equip them with computational thinking skills needed to become future innovators, and empower them to be active citizens in our technology-driven world.



What Do We Mean By Computer Science?			
Computing Concept	**Computer Literacy**	**Digital Citizenship**	**Computer Science Applications**
Computing Systems	Students Learn How To Use Devices	Students Learn How To Troubleshoot/Maintain Devices	Students build and design computing systems to solve problems
Algorithms and Programming	Students Have Regular Access To Computing Devices	Students Regularly Use Computing Devices As A Tool	Students create and innovate using computing as a tool to critically solve problems

K-12 CS Pathways

Grade Level	Pre-K	K	1	2	3	4	5	6	7	8	9
K12CS Concept	https://www.csteachers.org/page/standards										
Computing Systems	Selecting Software				Internal And External Device Interaction			Human-Computer Device Interaction			Recognizing De
	Computing Systems and Components Terminology				Hardware and Software Interaction of Computing Systems			Collect and Exchange Data With Computing Systems			Device Abstract
	Basic Hardware and Software Problems Terminology				Basic Hardware and Software Problem Solving			Problem Solving Strategies			Systematic Trou
Networks and the Internet					Transmitting Data			Data Transmission Protocols			Network Scalab
	Password Protection/ Privacy and Security				Cybersecurity Fundamentals			Physical and Digital Security Measures			Potential Securi
								Data Encryption/ Privacy and Security			Security and Us Recommendati
Data and Analysis	Data Storage Basics				Collect, Validate, And Use Data			Collect And Transform Data For Usability And Reliability			Tradeoffs In Da
	Visually Organize And Present Data				Visualize Data To Show Relationships And Suport Claims			Represent Data Using Multiple Encoding Schemes.			Interactive Data
	`							Refine Computational Models Based On Their Generated Data			Creating Compu
Algorithms and Programming	Algorithm Basics				Comparing Algorithms			Using Algorithms To Solve Problems			Creating artifact
	Storing Data				Variables			Variables Using Different Data Types			Data Structures
	Sequences Of Instructions and Repetition				Control Structures			Combining Control Structures			Control Structur Programming
	Debug and Algorithm or Program				Test and Debug a Program or Algorithm			Test And Refine Programs			Test, Evaluate a

Barriers/Opportunities

1. Create a state plan for K-12 computer science
2. Define computer science and establish rigorous K-12 computer science standards
3. Allocate funding for rigorous computer science teacher professional learning and course support
4. Implement clear certification pathways for computer science teachers
5. Create programs at institutions of higher education to offer computer science to preservice teachers
6. Establish dedicated computer science positions in state and local education agencies
7. Require that all secondary schools offer computer science with appropriate implementation timelines
8. Allow computer science to satisfy a core graduation requirement
9. Allow computer science to satisfy an admission requirement at institutions of higher education

Arkansas

Enable All High Schools to Offer CS
Require all secondary schools to offer computer science by 2015-2016 school year (via Act 187 of 2015).

Fund CS Professional Development
Provided $5 million in the fiscal year (FY) 2016-2017 budget, and $5 million in the FY 2018-2019 budget for all high schools to offer computer science.

Create High Quality CS Standards
K-8 standards have been embedded into other content areas; high school standards are standalone and implemented 2017-2018.

Anthony Owen, Chief State STEM Officer and State Director of Computer Science Education
Arkansas Department of Education
Four Capitol Mall
Little Rock, AR 72201
Phone: 501-682-3386
Email: Anthony.Owen@arkansas.gov

Next Steps

Create a cross-sector task force to establish inclusive and rigorous **K-12** computer science standards based on the K-12 scope and sequence & national CS frameworks and standards.

Map K-12 computer science curricular resources to K12 CS scope and sequence leveraging national evidence based curriculum and train the trainer models/support

Create of cohort of regional administrators/leaders who are developing/have developed K-12 CS pathways in their districts.

oregoncsta.org

Grant Goals

Goal 3. Connect teachers and administrators to funds/support.

Deliverable. Administrator Guide developed for district leaders shared via an advisory group consisting of industry and education leaders.

Work continues thru CTE Coordinators, Regional Liaisons, COSA and meetings with administrators.

On-demand PopUp requests continue as Administrators being to understand the value of custom PD.

#attendees served by Popup PD: 165 (Harrisonburg, Scappoose, Silverton, Tigard).

Videos

What is SuperQuest?
https://youtu.be/BhmCLscYg38

Teaching Computer Science builds more than technical skills
https://youtu.be/QyddE1yDmxI

Terrel Smith on SuperQuest
https://youtu.be/HMsAwIloFNw

Jill Hubbard on the Oregon CS Playbook
https://youtu.be/K_MZ3eLkfac

2018 Evaluation report

Progress in deliverables from Grant DL1.0 to DL2.0

- Schools with course codes that include programming have grown 84 → to 100 in the last school year
- Within those 100 schools, we are offering 36 AP CS courses, which **is 3X** what we offered in the previous year
- 60% of those attending our PD are FIRST TIME attendees
- 94% will successfully implement knowledge learned in their classroom
- 86% will share with colleagues

Goal 1.
Professional Dev 2019 dates

March 16: Spring Conference & Programming Contest, George Fox U

Jun 25-27: Wilsonville, Clackamas CC

July 9-11: Salem, West Salem HS

July17-20: Eastern Oregon, Treasure Valley CC

July 23-25: Newport, Newport MS

Jul 31-Aug 2: Eugene, Lane ESD

Aug 7-9: Central Oregon, Elton Gregory MS

Aug 14-16: Southern Oregon, Rogue Valley CC

Aug 18-20: The Dalles, Columbia Gorge CC

Goal 2. CS For Oregon 2019 plan

Workgroup kickoff

Need to implement evaluations of pilot sites

Goal 3. Expansion of custom PD

- Professional development expansion into additional small and directed workshops statewide. Focus on additional communities such as CTE where professional development is scarce.

- Create more opportunities for districts and educators to participate in customized professional development workshops lead by master teachers who are experts in his/her subject matter.

- Serving this population of educators is directly tied to the economic development of human resources.

Math in Real Life
Lane County

Maddy Ahearn, STEM Specialist

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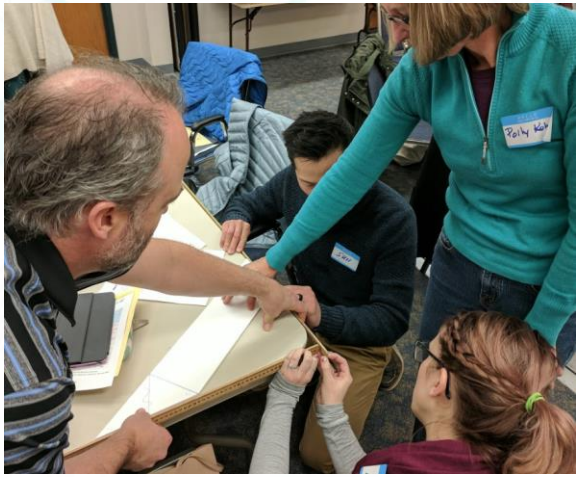
Project Outcome #1
Teacher Participation

Math in Real Life 1.0	Math in Real Life 2.0
• 9 teachers • All Math • 5 School Districts • 12 projects developed • Grades 7-10	• 24 teachers • 12 CTE and 12 Math • 7 School Districts • 36 projects developed • High School Only



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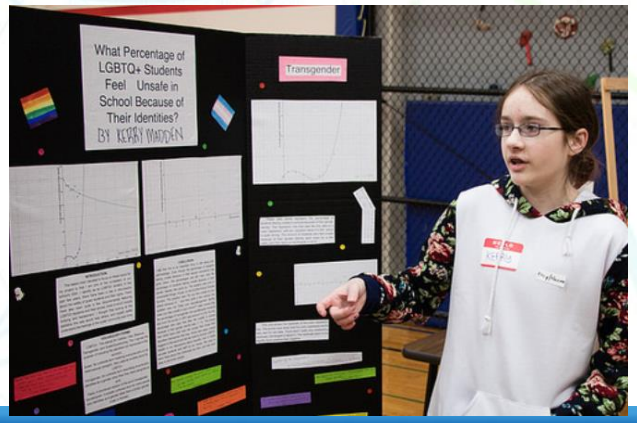
Project Outcome #2
Pedagogical Growth

- Streamlined Culturally Sustaining Instruction Framework for Mathematics
- Increased the authenticity of industry experiences



Springfield Math teacher "[I gained] a deeper understanding of student ***agency, identity, social justice, culture and language*** *within math classrooms. Reflecting on math instruction in terms of access, equity and empowerment."*

Creswell Math Teacher: "The experience going to the Dorena Power plant was eye opening to the students and myself in the ***amount of math necessary*** *to the operation on a daily basis. The plant operator said that it took electrical engineering to really understand why algebra was so necessary in high school. This is a field that they are* ***struggling to get qualified engineers*** *to commit to the time required to become an electrical engineer, even though most training is paid training.*

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Project Outcome #3 Unit Development

- Next phase of our work is developing units from projects
- Positioning teams of math & CTE teachers as leaders in this development

Project Outcome #4 Connect to Administrators

- Involvement in PD opportunities
- Presenting at monthly at Curriculum Leaders meetings at the ESD
- Connecting thisinititative to the other initiatives.

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Sustainability

Connecting this work with other initiatives:

- High School Success (both 9th grade on-track & focus on CTE)
- Social Emotional Learning
- Graduation Rate
- Chronic Absenteeism

Next Steps

1. Connect our math teachers to Elevate Lane County Externships
2. Seeing funding for math & CTE PLC's to develop units/courses from projects
3. Support statewide efforts to focus and provide coherence to High School math standards

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Math in Real Life (MiRL) Statewide

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Outcomes

- Teacher participation
  - 183 teachers from 43 school districts
- Pedagogical Growth
  - 7800 person hours of professional development
- Teacher Leadership and Unit Development
  - 176 lessons
  - Leadership summits and institutes
- Connecting to administration
  - COSA
  - Individual school contacts

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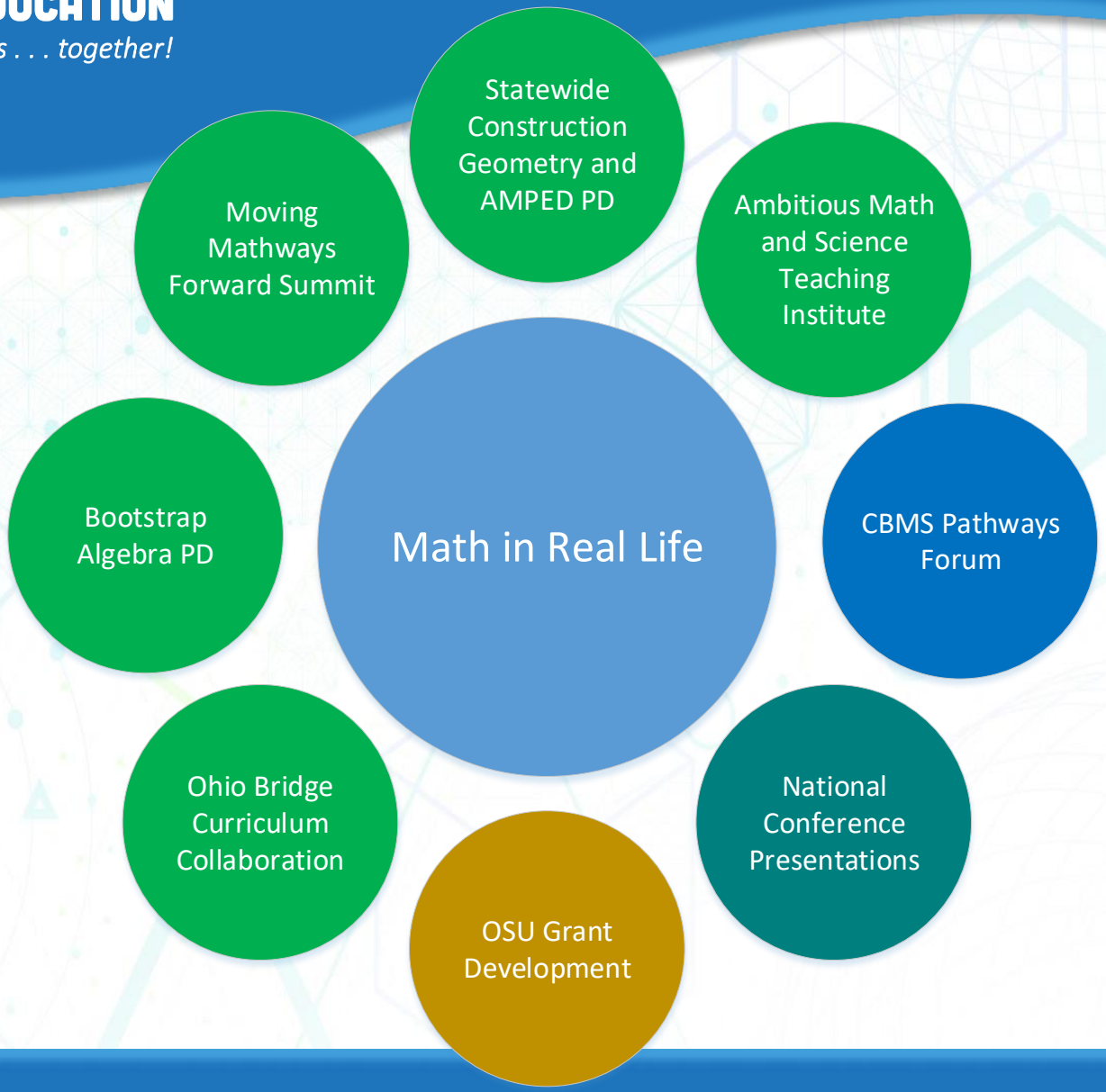
Scaling and Sustaining



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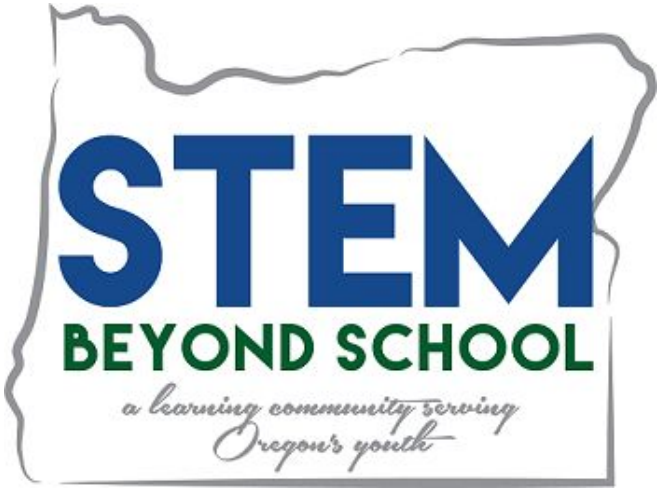
Needs Moving Forward

- Further outreach to district leadership.
- Growth of networked teacher leaders.
- Expanded access to Open Education Resources.
- Building strong systems of secondary and post-secondary mathematics education.



Out of School STEM Innovation Grant: STEM Beyond School

STEM Investment Council March 2019

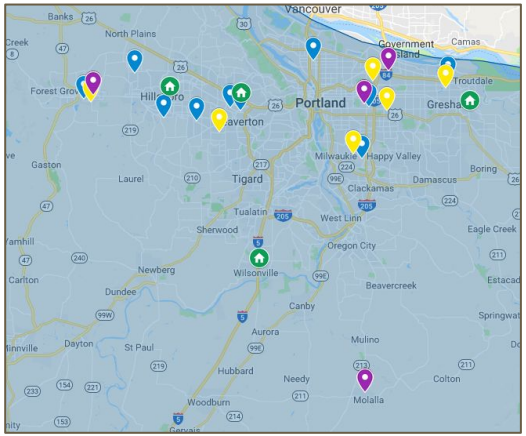
STEM Beyond School

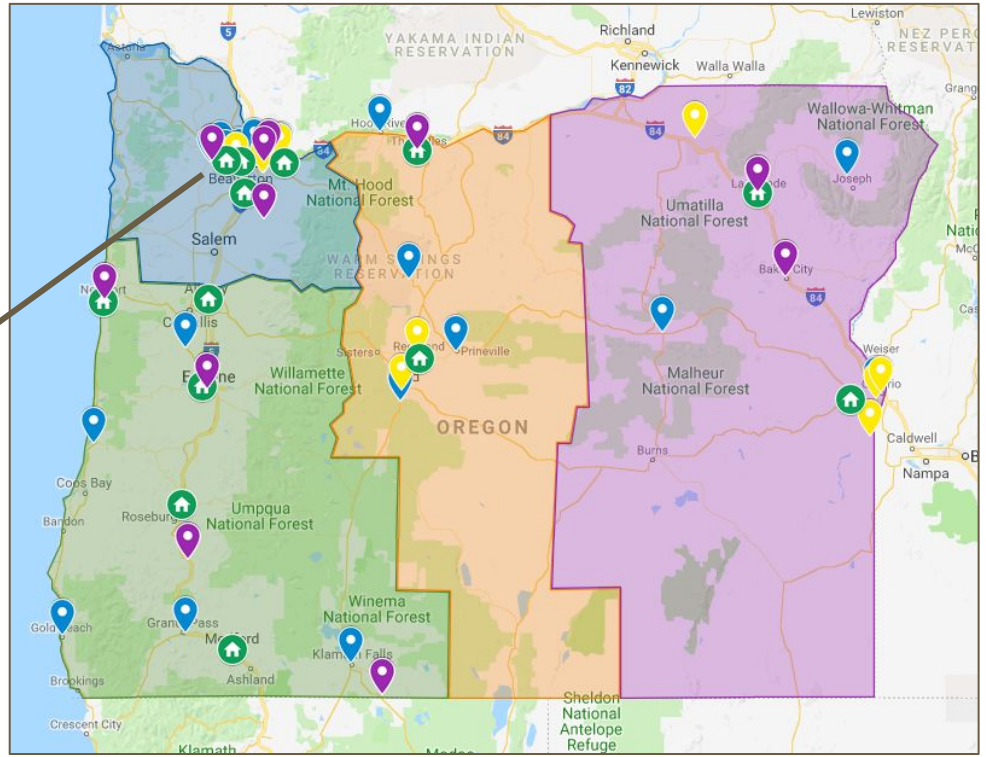
- Increase hours in high-quality out-of-school time (OST) STEM programming **for 3rd-8th grade underserved youth throughout Oregon**
- Build & maintain a robust OST Network of educators statewide
- Provide educator professional development to support programming that increases youth's STEM identity, a strong predictor of future academic success (70 hrs/new site)

STEM Education Plan Goals 1, 2, and 3

STEM Beyond School is in Year 3

Local community partners provide 50+ hours OST STEM programming to 70%+ historically underserved students: students of color, students in poverty, students with disabilities, English language learners.





Today's Focus

Project Outcomes

Outcome	Method	Progress
1. Increase or maintain **student STEM identity and motivational resilience** in STEM-related activities	50+ hours of student programming per program aligned to best practices; student surveys	**Met**
2. Ensure students have opportunities to **develop mindset,confidence** to envision their future in STEM careers	50+ hours of student programming aligned to best practices; student surveys	**Met**
3. Increase opportunities for students to engage in **interactive, student-centered, applied learning**	Align to NGSS practices and SBS 4 Core; PD for support; reporting workbooks	**Met**
4. Increase out-of-school STEM programming to **historically underserved students** (grades 3-8) in science, engineering and math (70%)	Partner with community and culturally based youth-serving organizations; student surveys match with ODE demographic data	**Met**

Project Outcomes

Outcome	Method	Progress
5. Develop a **statewide network of out-of-school providers** to disseminate and implement effective practices, ideas and resources for STEM-related education.	Support & provide PD hours (webinars, Learning Communities, in-person events, consults, ongoing reflection, Self-Assessment tool)	**Met**
6. Develop **baseline data elements** to inform size, scope, quality and student outcomes of out-of-school STEM-aligned activities.	Data collection; analysis of data; lays foundation for secondary and post-secondary success outcomes. Developing data measures w/ODE to track long-term impact.	**In Progress**
7. Increase opportunities for **career-connected learning** to ensure students see and believe they have a pathway for achieving a high school diploma and STEM post-high school careers.	Provide through youth programming; exit interviews.	**Met**

Key Project Outcomes

1. Youth maintained **STEM identity and motivational resilience**; youth starting with lower scores reported significant increases in all 7 measures.
2. SBS 4 Core programming requirements are creating **opportunities for students to develop skills and foster mindsets** to envision a future within STEM careers.
3. SBS Youth engaged in **interactive, applied learning aligned to science and engineering standards** in almost every session.

Key Project Outcomes, continued

4. The grant **increased OST STEM programming hours to historically underserved students**: 83% of surveyed students in 2016-17, and 87% in 2017-18 (2018-19 in progress).
5. The **backbone organization developed an effective statewide learning network** of OST STEM providers through professional development. Evaluators noted "strong and consistent evidence".

"We are able to create learning opportunities that extend school day learning with hands-on activities and interactive learning field trips. *This additional training supports the students in our SBS cohort and the other students we serve."*

SBS Educator - Metropolitan Family Services, David Douglas SD

Key Project Outcomes, continued

6. **Refinement of assessment and evaluation tools** continues, including the Student STEM Identity Survey and the Educator Self-Assessment Tool.
7. SBS programs connected **youth to STEM careers and professionals.**

These connections are powerful:

"I work with low-income Latina students who don't usually have opportunities to explore hands-on STEM activities. Having a program that solely focuses on STEM opens up a whole new world of exploration for my students. ***Making STEM relevant to these students and their lives, breaks the stereotypes they have to fight*** *through as Latinas."*

SBS Educator - Adelante Mujeres, Forest Grove SD

Barriers/Challenges at the Program Level

- Programs struggle with **transportation** for offsite activities
  - Backbone team and Network colleagues help find alternatives and facilitate strategic partnerships.
- Programs struggle with **student mobility**
  - Expand SBS to serve every school district.
- In rural areas, SBS educators are often **in-school educators who struggle to participate** in professional development
  - Explore regional solutions and/or creating a cohort of in-school educators

Barriers/Challenges at the Network & Backbone Levels

- **Staff mobility** is a challenge in the NW Region.
  - Leverage SBS as an incentive for program educators to stay.
- A minimum number of sites are needed to optimize the network.
  - **30-40 sites are optimal** for a robust educator network
- **Impact measurement tools are limited** in the OST space.
  - Additional data needed to track long term outcomes.
- **Funding uncertainty** impacts other possible funders and duration of funding from Foundation partners. Spirit Mountain Community Fund and Collins Foundation funding received, each for one year.

Programming to Underserved Students

Best Practices

- Change takes time: A **two-year cycle is ideal** to realize changes, build capacity, attract students and commit to providers AND youth relationships.
- Go where students already are to **leverage existing resources** within community organizations.
- **Culturally relevant and community based programming is critical**.
- **50 hours of STEM programming** is achievable and impactful.
- Include **family participation** to increase engagement.

Programming to Underserved Students

Recommended Changes

- Make a two-year funding commitment to sites
- Develop a mechanism that STEM Hubs can use to identify potential sites early
- Extend PD opportunities to non-SBS partners to encourage future project growth

Supporting the OST Learning Network/PD

Best Practices

- Approx. 30-40 sites provides a robust network
- All-Program Events key to network building and promoting reflection
- PD must be ongoing and interactive
- Just-in-time PD addresses immediate cohort needs, leading to higher engagement and more impact
- Work closely with regional STEM hubs to mutually support each other

Research shows that a backbone entity is needed to support networks that create impact such as SBS.

Support an OST Learning Network/PD

Recommendations

- Develop a 3rd year model for SBS educators as coaches to newer SBS educators
- Ensure adequate funding for backbone operations at a level appropriate for the reach and impact desired

Additional Recommendations

- Continue encouraging the use and improvement of the State Longitudinal Data System to better track and connect OST outcomes to other K-12 and Post-secondary outcomes
- Address the longer-term role of OST in the STEM ecosystem and encourage the development of better funding systems and greater coordination across multiple funding streams

Your Questions?

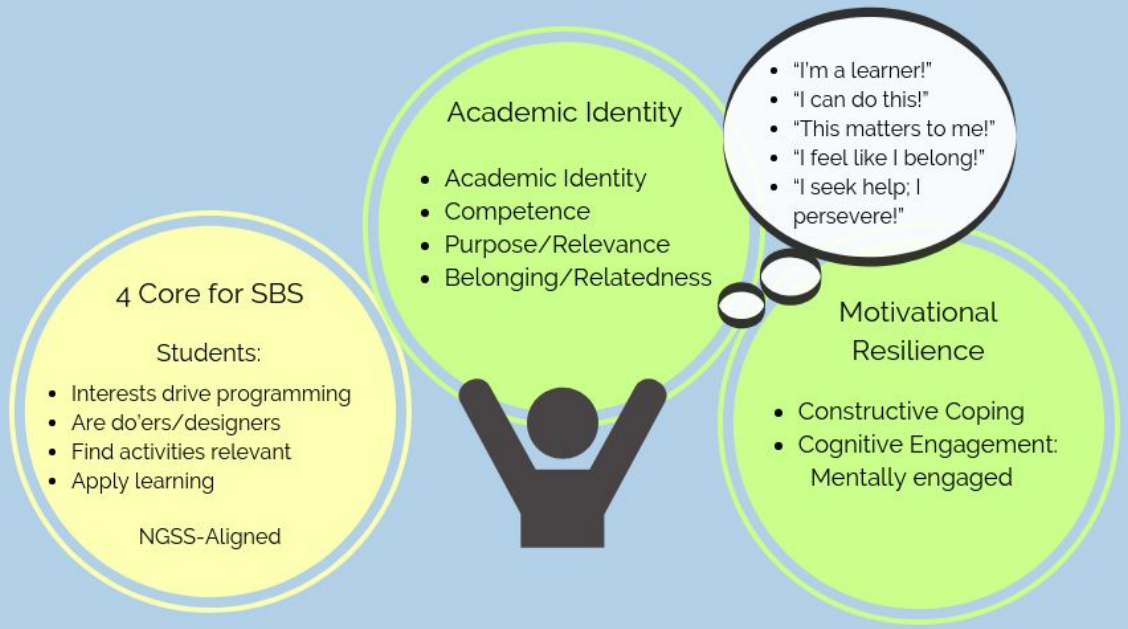
Additional Materials

Building My STEM Identity

Students' beliefs are a strong predictor of future success!

Today, I am...

Tomorrow, I can be...



INNOV. Grant $	Program Year	# of students statewide	Goal: Hours/Student	Hours Offered (total for all sites)	Student Contact Hours Achieved	Educator PD Hours Achieved
$1.5 M	**Year 1**: 2016-17	1,307	70	4,775	60,220	2,458
$1.2 M [with addl funds from Collins and Spirit Mtn.]	**Year 2:** 2017-18	907	50	3,788	45,786	1,174
	Year 3: 2018-19 *(current)*	Est. 585	50	Est. 1,540	Est. 29,250	Est. 1,160
Est. Totals: All Years		2,799	50-70	10,103	135,256	4,792

Why or how is your STEM Beyond School program beneficial to the youth you work with? How is it beneficial to your educators?

“**The STEM Beyond School program is a huge benefit to the students in rural Oregon**. In a regular school day there isn't enough time to offer students hands-on experiences with the ability to reflect on a trial and fix or improve a project and students of our community do not have other local options for educational enrichment outside of school. This program provides the opportunity and opens up the time for students to think and create what they see in their minds. Each week the students come to STEM club and excitedly ask, ‘What are we making today?’ **The excitement is similar to a pending holiday vacation, but they are excited about learning**. This reaches into the classroom, where a student knew when I talked about the Scientific Method he stated, "Oh that's what we do on Monday night, we make something and then test it to see if it works, or if we can make it better."

SBS Educator, Adrian Elementary School, Adrian SD

“STEM Beyond School provides opportunities for our students to go places and have learning experiences **that they never would be able to have if not for this program.** This grant provides a generous amount of funding specifically for professional development, which helps deepen our understanding of how to provide effective STEM education to our kids.”

SBS Educator, Immigrant and Refugee Community Organization, Portland PS

SBS Community Partner Providers 2016-19

Adelante Mujeres
Adrian Elementary School
Baker Middle School
Beaverton PAL
Bend Science Station
Camp Fire of Central Oregon
Centro Cultural
College Dreams of Grants Pass
Confederated Tribes of the Umatilla
Curry Soil & Water Conservation District
Eastern Oregon University
High Desert Museum
Immigrant and Refugee Community Organization (IRCO)
Impact NW (SHINE)
Klamath County School District
Klamath Falls City School District
LaGrande Middle School
Metropolitan Family Services
N/NE STEAM Coalition
Neighbors for Kids
Nyssa Elementary School
ORCCA Great Afternoons
OSU Extension 4-H (statewide)
Redmond Parks and Recreation District
South County YMCA in Canyonville
Wallowa Resources

School Districts served 2017-19

Adrian School District
Athena-Weston School Districts
Baker School District
Bandon School District
Beaverton School District
Bend LaPine School District
Brookings-Harbor School District
Central Curry School District
David Douglas School District
Dayville School District
Dufur School District
Enterprise School District
Forest Grove School District
Four Rivers Community School
Grant School District
Grants Pass School District
Gresham Barlow School District
Hillsboro School District
Jefferson County School District
Joseph School District
Klamath City Schools
Klamath County School District
La Grande School District
Lincoln County School District
Mapleton School District
Medford School District
Molalla School District
Monroe School District
North Clackamas School District
North Wasco County
Nyssa School District
Ontario School District
Parkrose School District
Pendleton School District
Pilot Rock School District
Port Orford-Langlois School District
Portland Public Schools
Prairie City School District
Redmond School District
Reynolds School District
Rogue River School District
South Umpqua School District
South Wasco County
Three Rivers School District
Wallowa School District

Affiliate PD participant sites
Scappoose School District
Roseburg School District

SBS Alignment with the 2016 STEM Education Plan

STEM Beyond School is designed to meet the STEM Education Plan Goal #1/Priority Outcome 4: By 2020, Oregon will have expanded participant hours in high-quality afterschool STEM programs by at least 25% with a special emphasis on historically underserved and underrepresented students to achieve Goal 1: inspire and empower our students to develop the knowledge, skills and mindsets necessary to thrive in a rapidly changing, technologically rich global society.

SBS incorporates 5 of the 10 key initiatives listed to achieve Goal 1:

- **Increase time on science** in elementary and middle school consistent with the NGSS;
- **Increase access to high quality out of school STEM-CTE learning** opportunities that inspire student interest and mitigate summer learning losses;
- Increase the use of teaching strategies that challenge students to be **creative, resourceful, persistent** and collaborative through **solving real-world problems;**
- Increase the use of **culturally relevant, place-based contexts** as a basis for **student inquiry** and **applied learning** projects;
- **Increase interactions of students with STEM professionals and community experts** to develop students aspirations and personal STEM identities as lifelong learners.

STEM Education Plan Goal #2: Ensure **equitable opportunities and access for every student** to become part of an inclusive innovation economy. Priority outcomes listed have an increase in historically underserved and underrepresented STEM students in STEM-related post-secondary programs and achieving degrees, and having STEM employees of color as role models in and out of school.

SBS also incorporates 3 of the 9 key initiatives listed to achieve Goal 2:

- Increase the number of female and role models of color for students who are underrepresented in STEM, including more STEM and CTE teachers of color;
- Increase access to quality, STEM-rich early learning environments for historically underserved and underrepresented families;
- Increase student and family access to culturally relevant community based STEM and CTE programs that build upon local assets.

STEM Education Plan Goal #3: Continuously improve the effectiveness, support and the number of formal and informal P-20 STEM educators.

SBS incorporates 2 of the 8 key initiatives listed:

- **Increase time** and funding **for educators to engage in professional learning** opportunities regarding effective STEM and CTE teaching strategies, including applied, project-based approaches, and which develop their own positive STEM identities.
- Increase the **effective implementation of Oregon's math and science standards**.

STEM Education Plan Goal #4: Create sustainable and supportive conditions to achieve STEM outcomes.

SBS incorporates 2 of the 12 key initiatives listed:

- **Build the capacity**, effectiveness, and connectivity **of STEM-related professional networks** for educators, administrators, community-based non-profits and other partners.
- **Partner with private** and corporate **philanthropy** to align investments to shared outcomes, address gaps in services, and increase quality of programs.

STEM Beyond School Year 2:

Accomplishments and Challenges

An Evaluation Report Prepared for the OSU Extension 4-H and Portland Metro STEM Partnership Team

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September 28, 2018

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Oregon State University

Update note: This report is for the 2017-18 SBS program year. SBS is currently in the 2018-19 program year; students and programs served during that program year are not described in this report. 3/13/2019

Executive Summary

The Center for Research on Lifelong STEM Learning was invited by the Oregon State University Extension Service 4-H Youth Development and the Portland Metro STEM Partnership to evaluate Year 2 of the STEM Beyond School (SBS) project. The STEM Beyond School project seeks to improve underserved youth's access to and interest in STEM learning through 1) the development of a statewide network of out-of-school providers focused on STEM learning opportunities, 2) building capacity of out-of-school providers to deliver effective STEM programming, and 3) delivering high dose programming to underserved youth. The Center evaluated the impact of the second year of programming on several youth outcomes (attitude towards learning, persistence in solving problems, active engagement with science, connection with and enjoyment in the program itself, and attitude toward science including whether they can succeed in science), assessed the type and quality of programming offered to youth, and analyzed the development of a state-wide network that supports out-of-school learning. In its second year, the SBS project continued to focus on collecting data that would address outcomes of the project and inform the development and maintenance of a sustainable infrastructure that would support a Networked Learning Community of community-based STEM education providers.

This report draws from various data collection methods to provide insights into the development of the STEM Beyond School network and the potential impact of out-of-school programming on youth's learner identity and associated factors which contribute to the development of interest in STEM and STEM learning. Data were collected from SBS program providers, and youth participants through online and paper-based surveys; interviews with program providers; and reporting workbooks and post-program surveys completed by program providers.

Data indicate that investments into the SBS system and professional development and youth programming by the state continue to be instrumental in fostering and strengthening a growing network of effective and impactful out-of-school STEM programs. In general, program providers felt supported through a sufficient amount of collaborative learning opportunities. The SBS project served 907 youth in 2017/2018 through interactive and engaging activities, experiments and field trips focused on a wide range of topics. Youth on average entered the program with already strong science interest and identity which they maintained over the course of the program. In addition, those youth who entered with lower initial scores reported significant increases in identity-related outcomes across all six measures. These results indicate that the programs may be able to develop new STEM identities as well as support well-developed STEM learners along their already chosen path. Youth also shared a wide range of experiences they valued about the programs, including opportunities to engage with science and engineering activities, experiments, and field trips, as well as other aspects unique to out-of-school programming such as a space to safely express themselves, make choices about their learning and receive support from instructors who encouraged them to grow intellectually and personally, which are core components in development of identity. Based on empirical findings, the report provides recommendations for improvements and future

iterations of the SBS project, including: continued program support, experimenting with measures of student cognitive gains, and supporting additional face-to-face meetings to encourage network development and sustainability.

Key Findings in Detail

Program quality

- In the second year of the SBS project, participating institutions continued to develop and implement diverse, engaging and highly interactive out-of-school STEM opportunities for underserved youth. As a result, over 900 youth participated in STEM programming and field trips which they had otherwise not experienced during the funding period.
- Programs involved in the SBS project provided a wide range of opportunities for youth to engage in interactive, student-centered, applied learning, especially in the Math and Science/Engineering content that is aligned to NGSS practices. Most programs focused on engaging their students in two or more practices with the majority focusing on engaging students in designing, testing, & redesigning their own engineering solution, followed by designing and asking questions about the world around them. Not only did youth in the programs supported by SBS get to engage in the interactive, student-centered applied learning aligned to NGSS practices, they engaged with many of them often or every session/almost every session.
- The majority of programs focused on two of the 4 Core Programming Areas: "Students as Do'ers and Designers" and "Youth Interests Drive Programming." Only one program focused on helping youth apply their learning to new situations.

Youth Outcomes

- The SBS project served a total of 907 youth statewide, with 87% combined disadvantaged (based on 638 participants for whom we could obtain data). On average, these youth participated in 52 hours of STEM programming.
- Based on pre- and post-survey scores, on average, youth participating in the SBS Program maintained their STEM identity and motivational resilience over time.
- Similar to results in Year One of the project, the youth who began the program with low scores for youth affective outcomes in the pre-survey significantly increased in all measures, indicating that initially low-interest youth became more interested and engaged in STEM over the course of the year, although their post-survey scores were still at a weak to moderate level.
- However, youth who began the program with moderate to high scores for youth affective outcomes reported either no change or significant decreases for some measures. This outcome should be interpreted cautiously because unchanging or mildly declining pre-post attitudinal or dispositional measures can be due to the statistical

phenomenon called the ceiling effect (and associated "regression to the mean") rather than a functionally significant change in youth attitudes or motivation.

- Youth outcomes did not differ on the basis of race/ethnicity or gender. In addition, the number of hours youth participated in STEM programming did not significantly influence outcomes.
- Motivation to participate in the program appeared to influence youth outcomes. For example, youth in the initially low-scoring group were significantly more likely to have participated in order to have fun or because they were compelled by parents or others to attend, rather than due to an existing interest in STEM; that is, when students participated for reasons unrelated to the topic, they were also more likely to score low on initial measures. However, they were then also more likely to improve on these measures over the course of the program.
- Youth valued not only the opportunities to engage with science and engineering activities, experiments, and field trips, but also the opportunity to make friends, feel like they belong, safely express themselves, and receive support from instructors who encouraged them to grow intellectually and personally. In addition to these affective outcomes, some youth (16%) reported that they valued the learning that took place in these programs, indicating that there were likely important cognitive outcomes as well. Note that creating or measuring cognitive outcomes were not foci of the project in Years 1 or 2, hence we did not assess them.

Network

- The majority of program providers agreed that the SBS network fostered idea sharing and mutual learning and was a valuable aspect of the SBS project. In general, in-person meetings, which were viewed as prime opportunities for relationship building, were seen as most valuable and impactful, followed by Learning Communities and webinars.
- Nearly all participants were able to provide an example of a new relationship they developed as a result of SBS, or an existing relationship that was strengthened through the program.

Development and modification of the evaluation system and research tools

- Most of the development of research tools and assessment measures took place in Year 1 of SBS. Therefore, this year focused on refinement and/or modification as necessary.
- We retained the seven affective scales from last year's post-survey which continued to provide acceptable measures of the program outcomes (see appendix for reliabilities associated with each measure). The survey was only slightly modified to include a question about youth motivation for participating that could be used to segment the sample of responding youth during data analysis.
- We retained most of the questions in the self-assessment tool but reorganized it to make clearer ties to the 4 Core Programming Areas. We also developed a short online post survey for program providers to self-report characteristics of their programming.

2019-2021 Innovation Grant Framework

I. CATEGORIES

STEM Administrator Leader Grants

Many of the key initiatives that will advance Oregon toward the goals identified in the STEM Education Plan – particularly goals #1 and #3 – require the buy-in of school district administrators. To create an environment that encourages and promotes these initiatives – increasing time on science and math, integrating applied learning approaches, increasing STEM-based professional development, etc. – school administrators must have a deep understanding of the importance of STEM education, what STEM principles and pedagogy look like in practice, and STEM education's power to transform student outcomes.

STEM Administrator Leader Grants will:

- Provide professional development to school district administrators to deepen their knowledge of STEM teaching and learning. Topics may include:
  - Equity in STEM
  - Integration of applied learning strategies into curricula
  - Integration of Next Generation Science Standards into curricula
  - STEM-based professional development for educators
  - Partnerships with industry and community-based organizations
  - Increasing time on science and math in elementary and middle school
  - System change and school transformation
- Develop a network of STEM Administrator Leaders that will:
  - Provide STEM professional development to fellow administrators
  - Promote STEM education and shape STEM policy at the school, district, and state level
  - Identify and share STEM resources and best practices
  - Serve as a resource for pre-service teacher preparation programs

STEM Teacher Leader Grants

Goal #3 of the STEM Education Plan is to, "Continuously improve the effectiveness, support, and the number of formal and informal P-20 STEM educators." The STEM Teacher Leader grants will do just that by supporting high-quality, educator-led professional development.

STEM Teacher Leader Grants support development of networks of STEM Teacher Leaders that will:

- Craft, evaluate, and/or revise STEM professional development curricula and resources
- Provide STEM professional development to fellow educators
- Promote support for STEM education and shape STEM policy at the school, district, and state level
- Identify and share STEM resources and best practices
- Serve as a resource for pre-service teacher preparation programs

Equity in Postsecondary STEM Grants
Equity in Postsecondary STEM Grants directly address the STEM Education Plan's Goal #2 by supporting initiatives that increase enrollment in and attainment of postsecondary STEM degrees and credentials by historically underserved and underrepresented students.

Grant activities may include, but are not limited to:

- Working with underserved and underrepresented communities to establish volunteer and alumni networks of STEM professionals from historically underserved and underrepresented communities to act as role models in and out of school.
- Increasing paid STEM and CTE internships, work-based and service learning opportunities, and/or undergraduate research opportunities for students from historically underserved and underrepresented communities in high-demand fields.
- Increasing student and family access to understandable up-to-date market data regarding high-wage, high-demand career opportunities by improving student advising, career counseling services, and guidance tools.
- Increasing the number and quality of support services and pre-college transition programs for students historically underserved and underrepresented in STEM.

Scale-Up Grants
Scale-Up Grants advance progress on the STEM Education Plan's goals #1, #2, and #3 by supporting the continued operation, expansion, and/or evolution of existing successful projects, which may include:

- Digital Literacy & Computer Science
  - *Increase access to high quality computer science coursework*
  - *Provide professional development for digital literacy and computer science teachers of grades 7 through 12;*
  - *Develop a statewide collaborative network of computer science educators*
  - *Develop a statewide framework for digital literacy and computer science*
- Math in Real Life
  - *Creation and expansion of regional networks of math teachers grades 7 to 10 focused on developing and implementing applied math problems in classrooms*
- STEM Beyond School
  - *Provide out-of-school STEM experiences for students grades 4 through 8, with a focus on historically underserved students*
  - *Create a networked community of practice*
- Youth Voice
  - *Fosters a space for students to express their voices, realize their individual and collective power, and lead change in Oregon's K-12 education system.*

II. REQUIREMENTS

Lead Applicant Eligibility
The lead applicant must be a STEM Hub.

Partnership
Applications must identify the members of the partnership team and demonstrate why and how the partnership team is prepared to implement a successful project. Membership must include, but is not limited to representatives from:

- At least [x] additional STEM Hubs
- Postsecondary education: community college and university
- School district(s) with higher than state averages of historically underserved students
- Community-based organizations
- Business/industry

STEM Plan Goals
Applications must demonstrate how the project will advance Oregon's progress toward achieving the goals identified in the STEM Education Plan.

Tracking and Evaluation
Applications must demonstrate how the grantee will implement a tracking and evaluation methodology for their project.

Sustainability and Scalability
Applications must explain how the grantee will develop a sustainability plan and an implementation toolkit to guide the expansion of the project throughout the state

Equity
Applications must demonstrate how the project will support increased participation in, support for, and/or retention of historically underserved students in STEM.

Activities and Timeline
Applications must identify the activities associated with implementation of the project and include a timeline for each activity that will lead to the completion of the project.

Budget
Applications must include a detailed budget for completion of the project.

STEM Education Plan Logic Model Matrix

Key Initiative	Lead Agency	Supporting Agencies	Metrics	Priority Outcome	Metrics	STEM Education Plan Goal

STEM EDUCATION PLAN:
Goals, Outcomes, and Initiatives Logic Model Sample