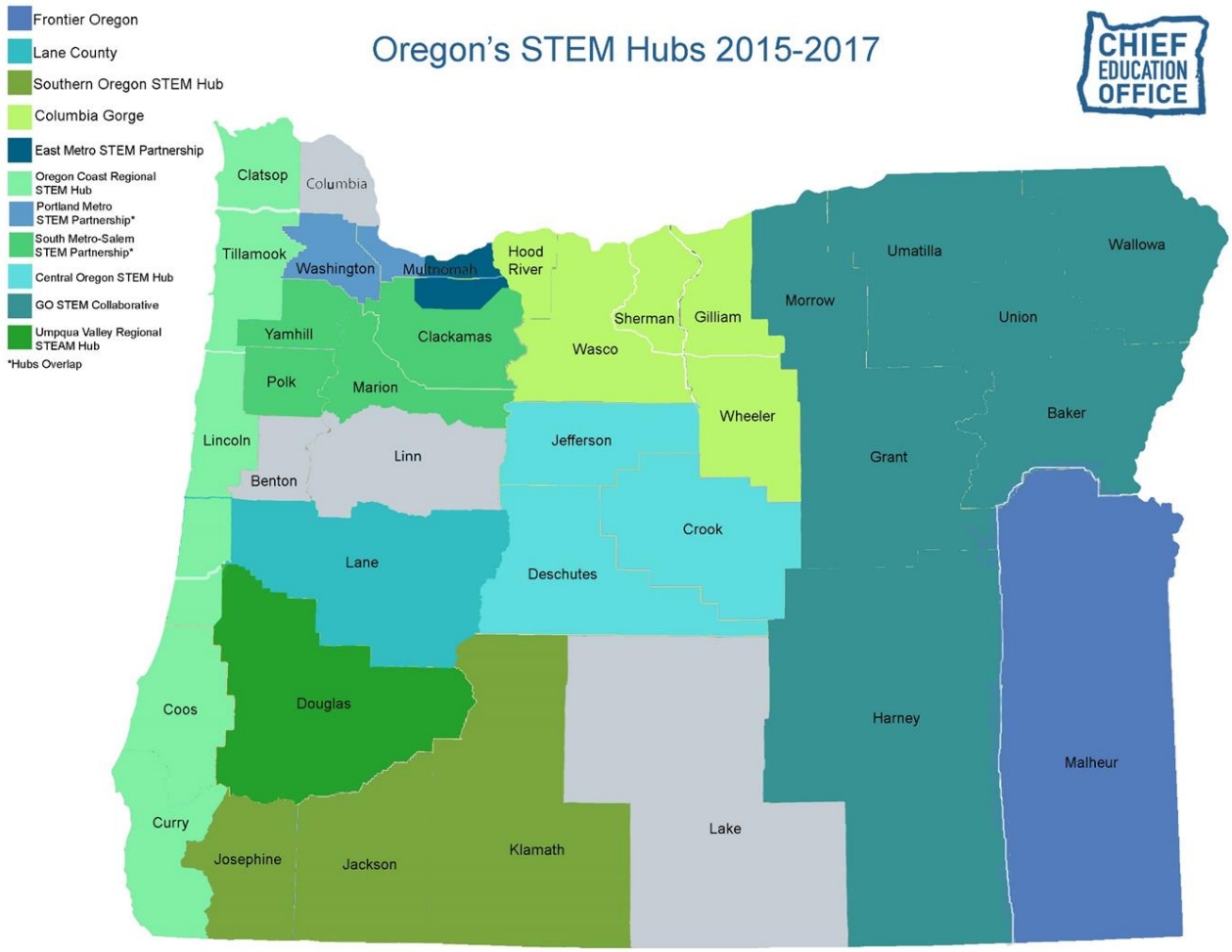
Oregon Coast Science, Technology, Engineering, and Mathematics (STEM) Hub Partnership Plan

Revised and Approved By the OCSH Leadership Council, November 14, 2017

Oregon Coast STEM Hub Executive Summary

About the Oregon Coast Regional STEM Hub

The Oregon Coast Science, Technology, Engineering, and Mathematics (STEM) Hub is one of a network of 11 statewide STEM Hubs that is supported largely by Oregon Legislative funding. The Oregon Coast STEM Hub (OCSH) started as a grassroots partnership that began in Lincoln County and has expanded to include coastal communities along the entire Oregon Coast. Geographically dispersed and covering 363 miles of coastline, the Oregon Coast region is an area rich in natural resources from marine resources to coastal forests and wetlands. Thus, our Hub seeks to advance STEM skills of all Oregon Coast students by leveraging local and regional resources and utilizing coastal issues as a means to engage students and contextualize learning.



The OCSH is a collaborative of 59 partners including 20 coastal school districts, coastal community colleges, two universities, numerous state and federal agencies, and multiple business partners who share a common vision of providing world-class STEM learning opportunities for teachers and

students in rural communities along the Oregon Coast. See Appendix 1 for a list of current partners. OCSH partners have agreed that they will not form a new legal entity, but will utilize existing partners to advance the STEM Hub's work. Oregon State University (OSU) is the current fiscal agent and the OCSH office is physically located at OSU's Hatfield Marine Science Center in Newport, Oregon. Multiple partners act as leads regional workgroups, planning and implementing specific programs and activities based on grant sources, relationships, and expertise.

Career Readiness and STEM Education in Oregon

In 2011, State leaders launched the 40-40-20 initiative with the following goals by 2025:

- 40 percent of adult Oregonians have earned a bachelor's degree or higher;
- 40 percent of adult Oregonians have earned an associate degree or postsecondary credential as their highest level of education attainment; and
- 20 percent of all adult Oregonians have earned at least a high school diploma, an extended or modified high school diploma, or the equivalent of a high school diploma as their highest level of educational attainment.

One strategy for meeting this goal was to create a statewide network of STEM Hubs as part of a larger STEM Ecosystem. A critical component of this STEM Initiative is strong collaboration and shared vision among P-20 education providers, STEM-related business and industry, student-focused nonprofits, government, informal education providers, parents and students. In 2013, the Oregon Legislature passed House Bill 3232, providing additional funding for STEM programs and activities, to foster 21st Century career skills and expand access for student populations that have historically been underserved and underrepresented. This Legislation included funding for a network of six regional STEM Hubs across the state, including the Oregon Coast STEM Hub, which has now been expanded to a network of 11 STEM Hubs. Regional Hubs are intended to help partners connect and leverage resources to support STEM education in their regions, as well as create a statewide network of STEM Hubs to share expertise, disseminate best practices, and move STEM education forward on a statewide level.

About this Document

This Partnership Plan focuses on utilizing existing resources and research on best practices to transform STEM education for students and youth along the entire Oregon Coast. It builds on collective impact partnerships, coordinating cross-sector resources and programs to actively engage coastal communities in improving STEM teaching and learning for all students, at all levels in the P-20 continuum.

The OCSH collaboration outlined in this Partnership Plan is a regional initiative involving local school districts, higher education, business/industry, and a diverse set of community partners. The current geographic scope for OCSH's work is in coastal school districts and communities from Astoria in the north to Brookings in the south and includes those approximately 35 miles inland.

All of the OCSH's work supports Oregon's statewide STEM Education Plan with a vision to:

Reimagine and transform how we educate learners in order to enhance their life prospects, empower their communities, and build an inclusive, sustainable, innovation-based economy. To support this vision, the OCSH has developed our own unique initiatives and strategies based on local needs and assets.

The following chart shows the current state of STEM education in most classrooms, as well as the end goal of transformed STEM teaching. By providing adequate training and support to Oregon Coast teachers, the OCSH seeks to increase educator effectiveness, student engagement and proficiency.

FROM	TO
Teacher Directed- Traditional lecture and limited labs in classrooms.	Student Centered- Contextualized, project-based learning the norm; application of concepts/knowledge enabled through teachers coaching students as they learn.
Low enrollment in STEM-CTE courses or lack of STEM courses and/or content especially at lower grade levels.	Abundant STEM-CTE content/courses including increased exposure to STEM careers. Contextualized learning programs developed and delivered throughout P-20 learning continuum.
Teachers have difficulty implementing STEM due to limited knowledge of STEM content and careers, feelings of being overwhelmed and isolated, limited or no technology in the classroom.	Engaged and excited teachers who understand basic STEM concepts and what scientists and engineers do, are supported with effective STEM Professional Development (PD) and resources, including mentors and industry partners in and outside the classroom, and have access to adequate technology.
STEM subjects, when taught, are treated separately in classrooms.	STEM subjects seamlessly integrated so that students understand interrelatedness and core concepts.

In addition, the OCSH will focus on equity and inclusion in STEM and CTE, with the intent of engaging underrepresented populations in our region; specifically, economically disadvantaged, Hispanic/Latinos, Native Americans, and female students. The OCSH will align work, as appropriate, with Common Core State Standards (CCSS) and the Next Generation Science Standards (NGSS).

OCSH Mission Statement

The Oregon Coast STEM Hub engages learners with STEM by leveraging local and regional resources and collaborating with diverse partners.

OCSH Vision Statement

The OCSH fosters a culture of STEM innovation by engaging people of all ages to create a vibrant and prosperous region.

OCSH Goals

The OCSH helps establish a coherent, rigorous, and equitable system of STEM education for all students and youth along the Oregon Coast. In addition, the Hub excites youth and parents about STEM education and STEM-related careers; link educators, parents and students to STEM-related educational opportunities; support the sharing of lessons learned and best practices among both formal and informal educators; and identify and create opportunities for industry and community partners to engage with teachers and students. The long-term goals of the STEM Hub are that:

- Students have the knowledge, skills, experience, and motivation needed to enter post-secondary education and high paying, in-demand careers in STEM-related fields.
- Oregon businesses and industries have access to an Oregon-educated STEM talent pool that is highly skilled and globally competitive.
- Oregon Coast schools and teachers have the tools and support needed to deliver world- class STEM instruction.
- Coastal Oregonians have the scientific literacy and technological knowledge needed to make informed decisions in their personal lives and as citizens to address increasingly complex and interconnected local, regional, and global issues.

Expected measurable outcomes include:

- Increased STEM interest, participation, retention, and achievement for P-20 coastal students including those from typically under-represented populations in STEM fields (ethnic minorities, females, English Language Learners, and economically disadvantaged)
- Improved 21st Century skills of participating students with a focus on critical thinking, communication and collaboration
- Increased ability of coastal educators to deliver integrated STEM instruction and student experiences that incorporate Inquiry and project-based learning (PBL)
- Increased graduation rates and college readiness of Oregon Coast students.

Values

The following values inform our decision-making and guide our behavior:

- Transparency: *We are an open book:* We conduct ourselves with openness and honesty in all aspects of our work. Our transparency makes mutual trust possible.
- Focus: *We keep our eyes on the ball.* We develop shared goals and prioritize our work. We

recognize that aspects of our work will move slowly, but we keep pushing forward. We look forward to the future, while recognizing and valuing what has proven successful in the past, and make decisions necessary to accomplish important goals.

- Equity: *We want everyone to succeed.* We respect people, value diversity, and are committed to equitable access for all.
- Accountability: *We do what we say we will do.* We are accountable to one another and to our partners.
- Integrity: *We do the right thing even when no one is watching.* We act responsibly, respectfully, and with honesty – in our work, with the people we interact with, and in the decisions we make.
- Collaboration: *We work together.* We leverage our collective strengths and build honest and open relationships through communication. We realize we represent a larger community and we strive to serve and support our partners.
- Action: *We work towards positive outcomes.* We anticipate opportunities and challenges, and are quick to confront complex or ambiguous situations, while always considering the impact of our decisions before we proceed. Our constant pursuit of solutions enables better decisions and better outcomes, making a tangible difference in communities around us - for the better.
- Innovation: *We evolve:* We take risks and confront failure openly. We recognize and repeat success aggressively. We sustain a spirit of adventure by investing in and rewarding curiosity, creativity, and innovation.

Governance

The Oregon Coast STEM Hub governance framework document which details the OCSH structure, roles and responsibilities of the backbone staff, leadership council, and regional workgroups can be found on our website at:
http://oregoncoaststem.oregonstate.edu/sites/oregoncoaststem.oregonstate.edu/files/Hub-docs/170315finalocshgf.pdf

The overall OCSH governance structure consists of the following elements:

STEM Hub Partners: The OCSH Partners are comprised of 59 cross-sector partners. The Partners support the mission of the STEM Hub and provide input to the Leadership Council.

The Leadership Council for the Oregon Coast STEM Hub provides strategic direction, networking, advice, support, and oversight for OCSH activities. The Leadership Council supports OCSH backbone staff. The Leadership Council consists of not less than nine or more than 18 formal or informal leaders representing organizations of K-12 education, industry and business, higher education, community organizations, workforce or economic development agencies, early learning, regional achievement collaboratives, elected government, and tribal leaders.

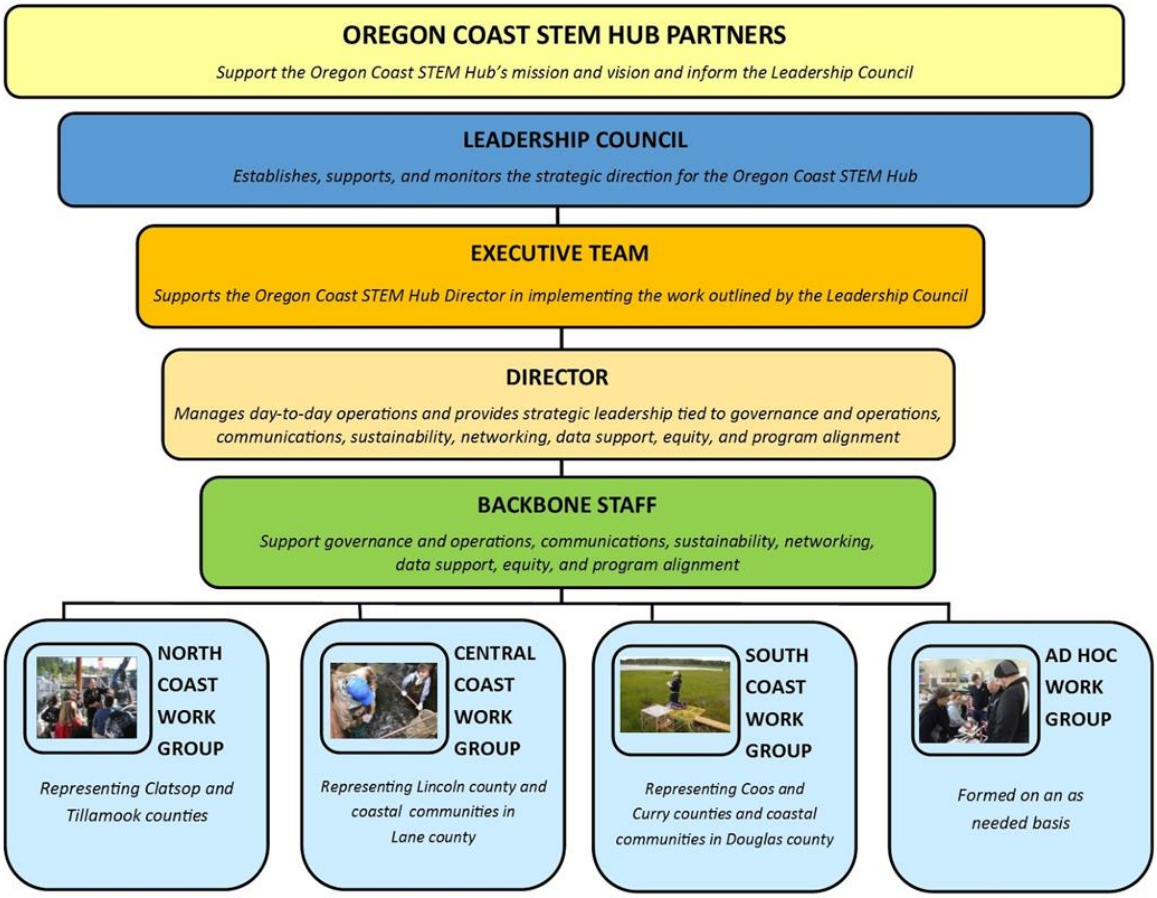
The Executive Team is a comprised of four to five members of the Leadership Council. The

Executive Team supports the OCSH Executive Director in implementing the work outlined by the Leadership Council, provides guidance and feedback in regards to any new business, maintains open communication with the full Leadership Council, provides input in planning agendas for the Leadership Council meetings, and facilitates the evaluation process for the Executive Director.

Backbone Staff include a full time Director and part-time Communications Coordinator, Professional Development Facilitator, Programming Coordinator, Satellite Coordinators, and Fiscal Agent. For the OCSH, backbone staff support the following: governance and operations, communications, sustainability, networking, data support, and program alignment. The fiscal agent for the OCSH is Oregon State University.

Work Groups turn strategic planning into specific strategies. Work Groups may be standing or ad hoc, depending on need. There will be a minimum of three standing regional work groups. These Regional Work Groups will gather around key elements of the Leadership Council's broader plan and engage in a continuous process of planning, implementing and evaluating STEM efforts for the communities which they serve.

Diagram of the Oregon Coast STEM Hub Structure:



Oregon Coast Regional Assets

Oregon coast regional assets were identified through a formal community engagement process that collected input from more than 200 representatives from various stakeholder groups. These participants provided input through online surveys and/or participated in one or more public meetings held in Oregon coastal communities in Spring of 2014 and in the Spring 2017.

Through this process, over 500 existing programs and STEM resources were identified, including; formal and informal education programs, potential businesses and industry partners, government agencies, and non-profit organizations. A table of generalized findings can be found below.

Assets
• Both in school and out-of-school programs provided in seven counties on the Oregon coast • Programs for students grades pre-K through post-secondary, especially targeting students in grades 3-12 • Programs targeting pre-K through post-secondary educators, especially targeting grades 3-12 educators and post-secondary educators • Family and community programs • Programs incorporating science, technology, and environmental education • Effective communication with STEM Hub partners via direct emails and the Oregon Coast STEM Hub website

A common take-away by participants at the community meetings was that coastal communities are rich in STEM resources, many of which are not widely known and/or are underutilized.

Unsurprisingly, an emerging theme from meeting participants along the coast was that assets currently supporting STEM education largely focus on marine and aquatic sciences content due to the proximity of local communities to the ocean; significant university, state, and federal ocean science research efforts; and the presence of numerous informal, aquatic science education organizations. A host of government and non-profit groups' environmental education programs combined with significant external funding has supported network building and STEM programming to date. Emerging STEM career opportunities in ocean observing, renewable energy, resource management, climate change, and marine technology poise us to develop our STEM Hub as a Collective Impact Partnership that will help prepare students for STEM majors and STEM careers.

Natural Resource Areas

The Oregon Coast provides numerous opportunities for students to engage with abundant natural resources from tidepools, to wetlands, to coastal forests. Easily accessible public sites exist along the entire coast, run by city, state and federal entities. Many of these sites provide guided field experiences with informal educators, curriculum and equipment that teachers can check out to

utilize with their students. Examples include Haystack Rock Awareness Program run by the City of Cannon Beach, Yaquina Head Outstanding Natural Area in Newport run by the Bureau of Land Management, South Slough National Estuarine Research Reserve in Charleston, and Bandon Marsh National Wildlife Refuge managed by the US Fish and Wildlife Service.

Existing Partnerships and Collaborative Efforts

There are several existing partnerships along the Oregon Coast that can be leveraged to support STEM education for students in our region. A network of Regional Achievement Collaboratives (RACs) have been established that include some coastal communities in addition to Early Learning Hubs. These partnerships involve additional partners and share some of the same goals as the OCSH, thus, providing opportunities for collaboration and leveraging of resources.

Many OCSH partners have also been involved in successful partnerships and projects that further strengthen the foundation for the STEM Hub. These include Lincoln County School District's Ocean Literacy Initiative, the Oregon Coast Education Program, OSU's Marine Studies Initiative, and the newly formed Maritime Workforce Solutions group. Synergies from these efforts help support OCSH goals and efforts.

Research and Resource Management Agencies

Numerous government agencies were also identified as assets in our region, many of which have primary responsibility for managing public areas and natural resources. Examples include: the National Oceanic and Atmospheric Administration (NOAA), which includes the Marine Operations Center for the Pacific (MOC-P) with numerous research vessels; the Bureau of Land Management (BLM); the US Environmental Protection Agency (EPA), the Oregon Department of Fish and Wildlife (ODFW), United States Fish and Wildlife Service (USFWS); Oregon Department of Forestry; United States Forestry Service (USFS); US Department of Agriculture (USDA), and the Oregon Parks and Recreation Department. These agencies have researchers and educators that provide assistance to teachers and students in the classroom and in the field. Many have curriculum resources, equipment, and locations for field experiences or monitoring/habitat restoration projects in which students can take part.

Because many of these agencies are located at the Hatfield Marine Science Center, Lincoln County teachers and students appear to have benefited the most from interactions with them. Although many of these agencies have offices in several locations along the Oregon Coast, it has become obvious through the community meetings that not all areas have active agency partners or education programs. Working with agency staff in those areas that currently have education programs and promoting the mentoring of staff in areas not currently offering these services will increase opportunities for students elsewhere on the Oregon Coast.

Environmental Education Organizations

The Oregon Coast is also rich in education organizations with an environmental focus. The Tillamook Estuaries Partnership (TEP), South Slough National Estuarine Research Reserve (SSNERR), Columbia River Estuary Study Taskforce (CREST), The Nature Conservancy (TNC), local

watershed Councils, and Surfrider Foundation are just a few examples. These organizations provide equipment, funding, staff, and specific authentic, contextual projects in which students and teachers can become involved. Many of these partners were involved in the creation of the Oregon Environmental Literacy Plan and can connect coastal educators and students to statewide environmental education and STEM resources.

Higher Education Partners

Oregon State University currently serves as fiscal agent and employer to many of the OCSH backbone staff. In addition, OSU's Hatfield Marine Science Center (HMSC) provides office and teaching space, and access to hundreds of researchers and graduate students. A recent award of $50 million dollars will help expand facilities at HMSC to create a Marine Studies Campus, which will serve 500 undergraduate and graduate students in interdisciplinary studies. This expansion will include a 100,000 square foot facility with teaching and lab space, some of which will also be available to support OCSH activities.

OSU staff who are currently involved in K-12 education have committed to continued participation in the STEM Hub, including those from OSU's Pre-college Programs, the Department of Fisheries and Wildlife; College of Engineering; College of Forestry; College of Earth, Ocean, and Atmospheric Sciences (CEOAS); Department of Science and Math Education (SMED); the Marine Mammal Institute (MMI); and the Northwest National Marine Renewable Energy Center (NNMREC). In addition, OSU's Extension program has a network of agents along the coast who have partnered with teachers and afterschool programs to provide training, curriculum, and hands- on activities focused on building underwater robots, wave energy devices, and fishing gear that reduces by-catch. These Extension agents have connections throughout coastal communities that help support the Hub's mission and activities.

The OCSH also partners with the University of Oregon's Oregon Institute of Marine Biology (OIMB) and Charleston Marine Life Center to provide educator PD and connect students and educators with researchers and other STEM resources.

Community Colleges

The coastal community colleges have several STEM programs that our students can look to during and after high school. Clatsop Community College (CCC) partners with Astoria, Seaside, and Warrenton-Hammond School Districts to provide introductory and intermediate classes to high school students at CCC's Marine and Environmental Research and Training Station (MERTS) and Integrated Manufacturing Technology Center (IMTC) campus. Tillamook Bay Community College (TBCC) has an Open Campus partnership with OSU and a focus on natural resources, while Oregon Coast Community College (OCCC) has a nationally unique Aquarium Science program offering both an Associate's Degree and Certificate. OCCC also has a Nursing Program that has graduated over 100 Associates level nurses and is currently expanding other Allied Health offerings. Southwest Oregon Community College (SWOCC) offers applied science and culinary arts programs, and is currently developing additional STEM focused offerings for dual high school-

college credit. They also offer several STEM Associates degrees.

In addition, SWOCC and CCC currently offer TRIO programs that aim to increase the number of low income and underrepresented students in higher education while OCCC and TBCC partner with OSU's Juntos program to provide guidance and support for high school students transitioning into the world of Post-secondary education, addressing an important transition zone in the STEM career pipeline.

All four coastal community colleges also have Small Business Development Centers (SBDCs) that provide consulting and education to small businesses, including those emerging STEM related businesses on the coast. These centers are currently located in Astoria, Tillamook, Lincoln City, and Coos Bay.

Informal Education Centers

There are also a number of informal education centers located along the Oregon Coast that focus on maritime heritage, forestry, and aquatic and marine sciences. These include the Columbia River Maritime Museum, the Tillamook Forest Center, the Oregon Coast Aquarium, the HMSC Visitor Center, the Oregon Hatchery Research Center, Cape Perpetua, Umpqua Discovery Center, Charleston Marine Life Center, and Coos Historical and Maritime Museum. These centers offer public and school programs and sometimes provide curriculum, teacher trainings, and equipment or kits that can be checked out by teachers. Many of these centers offer summer camps for students and interactive events such as "Marine Science Day" at HMSC that invites the public to engage in hands-on activities with local researchers. These sites also provide venues for challenge events and educator workshops.

Businesses and Industry

Traditionally, businesses along the Oregon Coast have focused on fisheries, forestry, agriculture, tourism, and service industries. Even within these more traditional industries, technology continues to progress and play an increasingly important role. The Tillamook County Creamery Association, Georgia Pacific, and the Oregon Forestry Resources Institute, including numerous timber companies, have been partnering with teachers and students along the coast in support of STEM education.

More recently, with the relocation of the NOAA Marine Operations Center to Newport, the Ocean Observing Initiative (OOI), the new Regional Class Research Vessels project, and offshore wind and wave energy development, the marine technology industry has shown growth that is expected to continue. Some current marine technology businesses include, Advanced Research Corporation and The Sexton Corporation. These businesses work with teachers and students as mentors and some are even able to provide paid internships and funding for student challenges. In addition, the Marine Technology Society (MTS) and the Association of Unmanned Vehicles Systems (AUVSI) have partnered to support student activities, as has the Central Lincoln PUD and Near Space Corporation.

Healthcare is also an increasingly important industry as coastal communities continue to grow and health care technology advances. Most coastal communities have hospitals and clinics specializing in everything from cancer treatment to pediatrics. Several coastal communities are in the process of building new hospitals with upgraded facilities and technology, and an Allied Health CTE program was recently established in Coos and Curry counties with ODE CTE Revitalization Grant funding.

Many coastal communities have ports or Economic Development Councils such as the South Coast Development Council and the Central Coast Economic Development Alliance which can further help identify key businesses and industries that can support STEM education and/or inform Hub participants about needs as they relate to workforce development and career readiness of coastal students.

Community Organizations & Programs

Numerous community programs exist along the Oregon Coast targeting specific demographics or issues which are pertinent to our Hub's success. The OCSH has been partnering with organizations like the Lower Columbia Hispanic Council, Lincoln County Youth Development Coalition, and the National Organization for Women, to bring STEM programming and resources to underrepresented populations. Furthermore, by partnering with established programs like Lincoln County School District's Homeless Education and Literacy Program (HELP), Lincoln County Foster Parent's Association, and OSU's Juntos Program, which already serve these target audiences, we are able to leverage resources to increase our impact.

Existing School Programs

Several Oregon Coast schools have unique, engaging programs that might serve as a resource to others looking to create similar programs. Examples of these are the Aquatic Sciences Program at Astoria High School and the Natural Resources Program in the Tillamook School District. Both of these programs excel at hands-on, project-based learning that involves community projects with numerous scientists and industry partners.

Several schools along the coast are also involved in Oregon Department of Fish and Wildlife's Salmon and Trout Enhancement Program with students conducting water quality monitoring, stream restoration, and even rearing juvenile salmon on their school grounds. These programs not only allow students to develop STEM skills but provide additional exposure to STEM-related careers.

Several years ago Lincoln County School District (LCSD) launched an Ocean Literacy Initiative, aimed at utilizing existing natural resources and community partners to make LCSD students "the most Ocean Literate in the state if not the nation." To that end, every teacher was offered opportunities to participate in marine science related professional development as well as opportunities for their students to participate in field experiences. With the support of administration, many teachers have embraced the concept, developing their own unique, but often collaborative, projects and classes. LCSD continues to support these efforts by covering the

cost of Ocean Literacy related field trips as well as providing funding for two fulltime Community Resource Liaisons who help integrate STEM Hub activities in LCSD classrooms.

Afterschool Programs

Although not available in all areas, most coastal communities have afterschool programs that focus on or incorporate STEM into their programming. Examples include OSU's SMILE and 4-H programs, 21st Century Community Learning Centers (Neah-Kah-Nie , Lincoln County, and Siuslaw districts), Coos Bay Boys and Girls Club, and Scouts programs. Some communities also have recreation centers and/or libraries that run afterschool and summer programs that incorporate STEM activities. OCSH has been working with these programs and others to increase effective STEM programming and interaction with STEM mentors.

Limited STEM summer camp programs are available along the Oregon Coast and include those run at HMSC and by OMSI. The American Association of University Women (AAUW) partners with Tillamook Bay Community College to run a Tech Trek STEM focused summer camp for 8th grade girls that could be replicated in other areas on the coast. The OCSH has been partnering with OSU's Pre-College Programs to bring the Center for Outreach in Science and Engineering for Youth (COSEY) Day Camps to coastal communities, particularly in areas with high concentrations of underrepresented populations and where other STEM camp programs do not currently exist. The OCSH has also partnered with the Northwest ESDs Migrant Education Program to support the integration of STEM activities into their existing summer programs in Astoria and Tillamook.

Student Challenges

Oregon Coast students are currently involved with several different student challenge events, including LEGO Robotics, Science Fairs, MathCounts, and the annual Salmon Bowl Competition that feeds into the National Ocean Sciences Bowl.

In addition, recent partnerships have led to the creation of two new student challenges on the Oregon Coast focused on Marine Technology. Started in 2012, the Oregon Regional Marine Advanced Technology Education (MATE) Remotely Operated Vehicle (ROV) program provides teacher training, recruitment of industry mentors, and online curriculum for teachers to utilize with students grades 3 -16 who design and build underwater robots to accomplish certain tasks that are then brought by student teams to compete at the statewide competition. Mission tasks change each year, but all simulate tasks performed by remotely operated vehicles in the real world, such as launching and retrieving scientific equipment and collecting data. Student teams can compete at four different levels of increasing complexity and are scored on poster and engineering presentations as well as ROV performance. Dozens of researchers, engineers, marine technicians, and scientific divers volunteer their time to serve as judges and as support staff for the competition each year providing additional STEM career exposure for students and their families. Winners of the upper divisions of ROVs advance to the MATE International ROV competition where they compete with top teams from around the world.

Launched during the 2013-2014 school year by Oregon Sea Grant in conjunction with LCSD and

the Northwest National Marine Renewable Energy Center (NNMREC), the first annual Oregon Coast Renewable Energy Challenge focused on offshore wind and wave energy technology. Partners provided multiple workshops for educators, curriculum and materials for student devices, resulting in 32 teams from Tillamook and Lincoln County School Districts participating in the first day-long event held at HMSC in April 2014. Researchers gave presentations on current projects investigating potential impacts of these technologies on marine ecosystems and associated organisms, while industry representatives served as engineering judges for the competition. The STEM Hub has since continued to support this event adding solar energy and increasing access for other students up and down the coast. Winning wind teams advance to the National Kidwind Competition where they gain additional experience interacting with judges from industry and communicating their ideas.

Funding Sources

During the asset mapping process, numerous small grant funding sources were identified that currently support STEM activities for Oregon Coast students. These included Siletz Tribal Charitable Contribution Fund (STCCF), Georgia Pacific, Target Field Trips Grants, ODFW STAC Mini-grants, Tillamook Estuaries Partnership and Oregon coastal banks. Several national granting agencies and foundations that target rural Oregon communities were also identified as potential sources of funding. The OCSH currently has funding from many of these sources including STCCF, the Oregon Community Foundation, Gray Family Foundation, and Trust Management LLC.

Volunteers/Mentors

One key asset that some coastal communities have already tapped into is a pool of dedicated volunteers with diverse backgrounds and expertise. From parents, to retirees, to industry representatives, volunteers can serve as mentors in classrooms and at afterschool activities to support STEM activities where personnel and funds are limited.

Based in Newport, HMSC hosts over 400 employees and graduate students with a wide variety of STEM related expertise. The HMSC Visitor Center also has an active volunteer pool, many of whom are students or retired educators and engineers. Over 40 volunteers from HMSC and elsewhere in the community volunteer each year as mentors for the local science fair. These mentors commit to weekly classroom visits to assist students in completing projects for the HMSC hosted science fair. Volunteers and community mentors have also been key in running student challenge events. A total of 60 volunteers from OSU, NOAA, EPA, USDA, the Oregon Coast Aquarium, the Marine Technology Society, the National Organization for Women, and many small businesses volunteer as judges, divers, and support staff for the Oregon Regional MATE ROV competition each year.

Tillamook School District has a Community Mentor Program that actively recruits and trains volunteers to work with students on developing science fair projects as well as supporting teachers in other ways in the classroom and in the field. This program could serve as a model for other school districts seeking to recruit and involve community mentors in their schools.

Teachers

Teachers with diverse backgrounds and expertise, 75% of who have advanced degrees, populate Oregon Coast school districts. Many school districts have mentoring programs and several have dedicated STEM Resource Teachers (LCSD and Coos Bay SD). These teachers are dedicated to supporting other teachers and their students in effective STEM education and connecting them with resources. Several school districts have recently made the commitment to hire STEM Coordinators for their school districts, another valuable resource for their students and our Hub.

Regional Needs Assessment

The OCSH has worked with evaluators to create a number of tools in order to collect information from K-12 educators regarding current practices, needs and preferred professional development format. In 2014 and 2016, online surveys were distributed to K-12 teachers through coastal school district liaisons, resulting in a return rate of 26%. Results were added to information gathered by stakeholders who attended community meetings to provide a clearer picture regarding the needs of individual communities. A table summarizing overall needs can be found below.

Needs

• Programs targeting Pre-K-2 students and teachers as well as informal educators
• Assessment of the counties served by the STEM Hub that are not represented in the results of this survey
• Professional development
  ○ Aligned with NGSS
  ○ Including materials or kits
  ○ targeting math integration, engineering, and project based learning
  ○ targeting elementary and middle school educators
• Field experiences and projects for students
• Availability of logistical and financial assistance (substitutes, buses, etc.) for educators
• Increased information about STEM opportunities and events in each area

Educator Needs

The community meetings and teacher surveys identified many barriers and challenges that currently limit STEM education in coastal classrooms. These include the need for a common understanding of what STEM is and what STEM inclusion looks like. In addition, the need for Professional Development (PD) on STEM/NGSS/CCSS integration at various grade levels was a common theme. In addition to training, teachers also reported they need access to STEM curriculum that is connected to the new standards they are now required to teach. Support from school boards, administration, and the community also ranked high as a need. Although few coastal school districts have a designated partnership or community liaison, it was identified

as a need for many areas. Access to scientists, mentors, and citizen science projects were also identified as high needs. Not surprisingly, teachers also reported the need for smaller class sizes, a reduction in standardized testing, more time and increased funding.

Of the teachers who responded to the survey, 55% do not hold a degree in the STEM subjects that they teach, 41% reported they do not have adequate access to PD in Science, and 52% reported they do not have adequate access to PD in Technology or Engineering. Teachers indicated that their preferred formats for PD were (in order of ranking): 1) during the school day with release time, 2) through collaborative study groups, 3) multiple days during the summer, or 4) after school/evenings in person. In addition, the majority of teachers ranked the following as *very important* considerations when choosing PD: obtaining new ideas and/or resources to use with students, funds or materials to support classroom activities, and the opportunity to interact with colleagues. More than half of the respondents said they needed the PD focused on: deepening their content knowledge, designing and implementing Project Based Learning (PBL), integrating technology, effective STEM teaching strategies, addressing CCSS through STEM, and STEM curriculum resources.

In teacher surveys, the number one need outside of PD was programs for students in the classroom, followed by STEM curriculum tied to the CCSS and NGSS. Teachers also ranked technology, field programs near their school, and field equipment as high needs.

The number one resource teachers said they needed from the OCSH website was STEM lesson plans, followed by STEM PD information. Funding opportunities, community partners' information and information on STEM student opportunities were also rated as high needs.

Student Needs

In 2016, the Oregon Coast STEM Hub hired an outside contractor to create individual profiles for the communities and school districts that we serve. These profiles included student demographics and achievement data obtained using online state and federal resources, as well as economic and workforce data. Complete profiles for each of the coastal communities, with associated student data, can be found in the report on the OCSH website at:
http://oregoncoaststem.oregonstate.edu/sites/oregoncoaststem.oregonstate.edu/files/Hub-docs/160622-community_report.pdf

Of the 20 participating school districts that the OCSH serves, almost all are at or below state averages for graduation rates, science and math test scores. Most of the school districts in our region also experience higher homelessness and child poverty rates than the state average. On the following page are tables showing math and science scores for students in coastal school districts. One of the overarching goals for all STEM Hubs in the statewide network is to increase the number of students who meet or exceed expectations in Math and Science as measured by these state standardized tests.

On average, 31.6% of coastal students meet or exceed expectations in math.

District	Grades 3 - 5 Overall	Grades 6 - 8 Overall	Grade 11 Overall
Astoria	43.0 %	39.8 %	29.4 %
Knappa	32.5 %	32.1 %	34.6 %
Warrenton / Hammond	36.3 %	35.9 %	35.3 %
Seaside	33.4 %	32.8 %	33.3 %
Jewell	32.0 %	14.7 %	22.2 %
Tillamook	37.2 %	35.4 %	25.2 %
Nestucca	36.0 %	25.0 %	30.6 %
Neah Kah Nie	42.6 %	55.0 %	42.4 %
Lincoln County	33.4 %	34.3 %	27.6 %
Siuslaw	37.8 %	29.7 %	34.8 %
Mapleton	20.6 %	34.1 %	8.3 %
Reedsport	33.3 %	15.7 %	22.6 %
North Bend	47.1 %	38.7 %	31.2 %
Coos Bay	41.1 %	31.9 %	17.9 %
Bandon	34.2 %	36.6 %	36.2 %
Coquille	40.1 %	40.9 %	23.4 %
Myrtle Point	20.7 %	15.7 %	13.9 %
Powers	26.9 %	15.8 %	-
Brookings	28.8 %	32.9 %	20.0 %
Central Curry	44.3 %	27.7 %	28.6 %
Port Orford / Langlois	65.8 %	52.2 %	50.0 %

On average, 60% of coastal students meet or exceed expectation in science.

District	Grade 5 Overall	Grade 8 Overall	Grade 11 Overall
Astoria	72.1 %	61.9 %	50.7 %
Knappa	54.5 %	58.1 %	66.7 %
Warrenton / Hammond	67.2 %	66.7 %	71.2 %
Seaside	69.0 %	50.9 %	39.4 %
Jewell	-	63.6 %	50.0 %
Tillamook	55.7 %	47.1 %	47.2 %
Nestucca	61.1 %	54.3 %	36.1 %
Neah Kah Nie	48.4 %	80.4 %	69.5 %
Lincoln County	65.3 %	57.6 %	55.3 %
Siuslaw	72.2 %	50.6 %	79.8 %
Mapleton	33.3 %	54.5 %	41.7 %
Reedsport	64.1 %	38.3 %	70.8 %
North Bend	64.5 %	51.2 %	71.6 %
Coos Bay	59.3 %	55.1 %	51.3 %
Bandon	76.0 %	75.0 %	95.0 %
Coquille	36.1 %	65.6 %	43.6 %
Myrtle Point	63.9 %	40.0 %	33.3 %
Powers	58.3 %	33.3 %	-
Brookings	65.7 %	63.7 %	57.1 %
Central Curry	43.3 %	74.4 %	59.3 %
Port Orford / Langlois	83.3 %	84.6 %	81.3 %

Other student needs for our region that were identified through the community meetings include: the need for STEM internships, apprenticeships, and STEM careers exposure; contextualized learning experiences; computer coding education; access to technology; opportunities for mentoring; out-of-school STEM opportunities; more dual credit courses for high school students; and parental support.

Also identified as a critical need, was improved communication and alignment between high school, community college, and university educators to increase student preparation and reduce the need for post-secondary enrollment in remedial coursework.

As demonstrated in the table on the following page, students in most coastal school districts have lower college going rates than the state average, which is approximately 61%. Several programs operating in our region are designed to increase college going rates, including Gaining Early Awareness and Readiness for Undergraduate Programs (GEAR UP), TRIO programs at coastal community colleges, and OSU's Juntos Program.

On average, only 47.3% of high school graduates along the coast enroll in college.

District	College Enrollment	County
Astoria	59.5 %	Clatsop County
Knappa	35.7 %	
Warrenton / Hammond	61.2 %	
Seaside	50.5 %	
Jewell	27.3 %	
Tillamook	52.2 %	Tillamook County
Nestucca	54.8 %	
Neah Kah Nie	40.5 %	
Lincoln County	45.8 %	Lincoln County
Siuslaw	44.2 %	Lane County
Mapleton	38.9 %	
Reedsport	54.3 %	Douglas County
North Bend	53.4 %	Coos County
Coos Bay	48.8 %	
Bandon	56.7 %	
Coquille	56.6 %	
Myrtle Point	52.8 %	
Powers	28.6 %	
Brookings	42.1 %	Curry County
Central Curry	51.3 %	
Port Orford / Langlois	38.9 %	

Finally, the need for social and economic issues to be addressed so that students come to school ready and able to learn was expressed by many participants in both community meetings and in educator surveys.

Community/Industry Needs

Through the community meetings, industry representatives expressed a need for employees with critical thinking and communication skills who were motivated, innovative, problem solvers. Also acknowledged was the need in many communities for economic development to attract STEM businesses, creating and retaining jobs and talent. Lastly, the need for a common vocabulary, a place to announce events, connect individuals, collect and share success stories was also recognized.

The HMSC educational needs assessment identified the expansion of educational opportunities as a means to boost the coastal economy with a better-educated workforce. Many respondents also expressed an interest in improving sustainable business opportunities related to science and the marine environment.

Summary

Although numerous assets exist in Oregon coastal communities that support STEM education, there appears to be a "disconnect" between many teachers and potential resources and partners. Potential partners don't always understand teacher needs and constraints, and key information does not make it to the teachers in an efficient manner, thus resources that do exist are often underutilized. Current PD opportunities are not adequate to meet teachers' needs, in most schools inadequate support exists to integrate STEM effectively, and in most areas, students lack out-of-school STEM opportunities and STEM career connections.

High-leverage Strategies and Programs

The OCSH supports STEM improvement, by collecting and disseminating information about evidence-based best practices. The STEM Hub will also develop partnerships with industry and informal education providers, seek funding for existing STEM programs and work with partners to develop new programs to address current and future identified needs of Oregon Coast teachers and students.

The OCSH supports schools in providing STEM learning opportunities and providing teacher PD that focuses on strategies that will produce measurable outcomes for P-20 students, including traditionally underrepresented populations. The Hub will achieve its mission in three strategic ways:

- Professional Development: Providing Professional Development (PD) for educators in effective instructional practices focusing on STEM integration and Project Based Learning (PBL);
- STEM Experiences for Learners: Supporting STEM experiences for P-20 learners by providing connections to STEM professionals in the classroom and in the field, equipment and resources for carrying out STEM-related activities, and opportunities to showcase learner-created designs and STEM projects;
- Networking: Creating a STEM network of resources, programs, and professionals to support STEM for preK-20 learners, including a website that will serve as a clearinghouse or conduit for connecting business and community resources with educators, parents and students.

Strategy: Contextualized, Student-centered Learning Experiences

Based on national research around best practices for STEM education, the OCSH supports STEM learning activities that are student-centered, provide hands-on experiences, and contextualize learning by involving community mentors while focusing on current and emerging issues. The STEM Hub will strengthen connections between the rich resources in our coastal communities,

and the schools, teachers and students who are seeking relevant, hands-on, career-focused, experiences that help students envision how academic learning relates to their future and potential career paths.

Characteristics of Effective STEM Education:

- Integrate the disciplines of science, technology, engineering, and math (STEM)
- Integrate and deliver both formal and informal STEM learning opportunities for students
- Provide authentic experiences, contextual learning, and career awareness through partnerships with businesses, industries, agencies, and non-profits in the community
- Focus instruction on problem solving and critical thinking skills through inquiry and design
- Include effective instructional strategies that develop collaboration and teamwork
- Develop communication and literacy skills
- Include the use of standards-based performance assessments
- Provide post-secondary and career relevance and connections

In addition to utilizing currently identified best practices and national and state standards for guidance, STEM Hub staff will also rely on the regional workgroups to identify new opportunities, as well as local programs and resources that can be leveraged to meet OCSH goals and objectives.

Connecting students with mentors in and out of the classroom will be a priority for the STEM Hub. Over 150 community mentors currently work with teachers and their students in coastal communities. Efforts to identify an increasingly diverse group of mentors will continue, with special emphasis on recruiting mentors that are female and/or minorities. To further connect students to researchers and industry, the STEM Hub will work to identify and develop student internship and job shadowing opportunities.

Another critical component in maintaining student engagement in STEM pathways is the need to develop parental support for student participation in STEM programs and activities. In an effort to increase parental understanding and support, the STEM Hub will work with partners to develop, support and host community STEM events along the coast that engage participants in hands-on STEM-related activities, provide partners a venue for highlighting in school and afterschool STEM programs and opportunities, and allow us to showcase student projects and success stories.

Some specific examples of student-centered learning experiences promoted by the OCSH include:

- The Oregon Regional Marine Advanced Technology Education (MATE) Remotely Operated Vehicle (ROV) Program
- The Oregon Coast Renewable Energy Challenge
- LEGO and VEX Robotics
- Science/STEM Fairs
- STEM Careers Exploration Programs
- Internships

- Summer Bridge Programs
- Student Field Experiences
- Project Based Learning
- STEM Competitions
- Industry Tours
- Teacher/Student at Sea Research Cruises

Strategy: Develop Effective STEM Hub Network

The OCSH has both a physical and virtual presence. The STEM Hub website connects educators, students, parents, industry, and other community members to a vast network of community and online resources for supporting STEM education both in the classroom and in out-of-school settings. Through the OCSH website and our social media tools, educators can share requests for classroom mentors or scientists to work with their students in the field, industry representatives can promote internship opportunities, and parents can find STEM summer camps and afterschool activities. This website is a "one-stop" site for all coastal STEM stakeholders with an event calendar showing upcoming opportunities, access to the STEM Hub Facebook page and Twitter feed, and a wealth of resources to support students at all levels.

The Backbone is a group of representatives from different organizations, rather than one organization or entity, with offices located at OSU's Hatfield Marine Science Center. The OCSH:

- Builds and maintains on-going relationships with STEM Hub partners and stakeholders (K-12, higher education, informal education, industry, government and community partners).
- Brings partners together on a regular basis to develop short and long range plans for the OCSH
- Oversees the development and implementation of OCSH sponsored programs.
- Maintains STEM Hub online resources and create an asset map of STEM activities and resources within the region that can be shared and promoted.
- Collaborates with organizations and other STEM Hubs to match community resources to educators needs.
- Align STEM Hub activities with Common Core State Standards (CCSS) and Next Generation Science Standards (NGSS).
- Build capacity of volunteers and mentors to provide meaningful experiences for students, tied to learning outcomes.
- Collect and analyze assessment data from OCSH partners and create evaluation reports on the effectiveness of STEM Hub programs in meeting goals.

Strategy: Educator Professional Development and Mentoring

The OCSH brings together partners with diverse backgrounds, interests, and expertise around STEM education. Working together, each partner school district and community partner will contribute to creating a STEM Learning Community, rich with opportunities. Mentoring will be emphasized throughout the STEM Hub as all partners have a perspective and expertise to offer. Working together to understand each other's needs and viewpoints we will forge a common vision that will enable us to see the myriad of collaboration opportunities available for the benefit of all students.

Through the STEM Hub, a variety of professional development opportunities will be made available to all partners. Professional development opportunities will be based on needs assessments and program availability. Due to the large geographic area being targeted, every effort will be made to accommodate remote participation in PD. PD opportunities will also be made available in various formats when possible to accommodate schedules and learning styles.

Ongoing PD opportunities include daylong workshops supporting involvement in student challenges, online Early Learning and Picture Perfect training, NGSS study groups, PBL workshops, and weeklong workshops focused on student use of real-world data in classroom.

Oregon Coast educators also have the opportunity to attend the Coastal Learning Symposium (CLS), a two-day conference each fall with breakout sessions and workshops led by researchers, formal and informal educators, covering a wide range of STEM-related topics. Attendees increase their content knowledge, obtain new curriculum and resources, and make valuable connections with partners to support the implementation of STEM activities in their classroom.

The OCSH Regional Workgroups will work with the Educator Professional Learning Coordinator to identify specific activities, dates and locations. The North and South Coast STEM Hub Coordinators assist in this process as well as, helping to make logistical arrangements for PD in their geographical area. Marketing of and recruitment for PD will occur through the STEM Hub website, social media, and the coast wide network of mentor teachers and STEM Hub partners.

The OCSH will plan professional development opportunities that are rich in STEM content and model best practices. The Hub will work with educators, program providers, and industry partners to demonstrate how various types of STEM activities connect with and support the CCSS and NGSS. Participants will also learn how to integrate informal education and community-based experiences as part of the STEM learning continuum.

For a list of current and upcoming PD opportunities, visit the OCSH website at:
http://oregoncoaststem.oregonstate.edu/educators/professional-development

Data and Evaluation Strategies

STEM Hub programs are evaluated on an individual basis by program facilitators or OCSH staff through pre- and post-surveys of participants, interviews and the collection of other evidence such as student work.

In addition, all STEM Hubs are required to participate in a Continuous Improvement Process (CIP) which is dictated by the Oregon Department of Education. Evaluations of individual STEM Hubs are based on a combination of surveys and interviews of partners, stakeholders, and staff; as well as written documentation and a self-assessment by Hub leaders.

The 2017 ODE assessment for the Oregon Coast STEM Hub can be found on our website at: http://oregoncoaststem.oregonstate.edu/sites/oregoncoaststem.oregonstate.edu/files/Hub-docs/continuous_improvement_2017.pdf

OCSH also contracts with an external evaluator to help create evaluation tools, analyze data, and create evaluation reports which are reviewed by the Leadership Council and posted on the STEM Hub website for public review. STEM Hub liaisons, coordinators, and superintendents of partnering school districts are responsible for the dissemination of teacher- and student-surveys and collection of school-related data/statistics. Student and teacher surveys help measure STEM interest and self-efficacy and are one indication of overall STEM Hub effectiveness.

The following are some current measures for teachers and students involved in our STEM Hub:

Proposed Measure	How Evaluated	Who Will Collect Data
Number of Teachers Participating in STEM	Attendance rosters, sign-in sheets	PD Facilitators
Number of Teachers Changing Practice (Implementing STEM and PBL in Classrooms)	Survey of teachers	Online Surveys
Number of Students Taking Advanced Science and Math Coursework or STEM	District enrollment records	Participating School Districts
Number of Students Involved in STEM Activities (Afterschool STEM Programs, Camps, and Competitions)	Registrations	Programming Coordinator
Number of Teachers Involved in STEM Hub Activities and Using STEM Hub	Website downloads, surveys, attendance	Communications Coordinator
Number of Hours Spent Teaching Science & Engineering in K-6 Classrooms	Survey of K-6 teachers in participating districts	Online survey
Percentage of Students Meeting State Benchmarks in Science and Math	District and State Assessment records	District data personnel

Sustainability

Financial Strategy

Oregon State University currently serves as the fiscal agent for grants and philanthropic gifts that support the Oregon Coast STEM Hub's offices, personnel, and programming. All OCSH partners retain administrative and financial authority for the grants and contracts for which their employees serve as principal investigators.

The backbone organization (core staff) and programming for the OCSH are currently funded through a cost-sharing arrangement that includes contributions from the Hub's partners, as well as grants and contracts that are secured by partners from public and private sources. In addition, partners work together to raise funds for collective STEM-related activities. The STEM Hub plans to continue seeking funding from a wide variety of federal, state, and local sources, including private business and charitable foundations. Included below is a list of current and past funding sources for the OCSH.

Sources of Funding for the Oregon Coast STEM Hub

Federal Sources
National Oceanic and Atmospheric Administration (NOAA)
National Science Foundation (NSF)
State Sources
Oregon Department of Education (ODE)
Oregon State University (OSU)
Private Sources
Georgia Pacific Foundation (GPF)
Gray Family Foundation (GFF)
Mid-Coast Watershed Council (MCWC)
Oregon Community Foundation (OCF)
Siletz Tribal Charitable Contribution Fund (STCCF)
Lincoln City Outlet Mall
Trust Management LLC
In Kind Support
Coos Bay School District (CBSD)

Hatfield Marine Science Center (HMSC)
Lincoln County School District (LCSD)
Oregon Coast Aquarium (OCA)
Oregon Sea Grant (OSG)
South Coast ESD
Warrenton-Hammond School District (WHSD)

In addition to seeking our own funding, OCSH staff work with researchers to incorporate student and teacher STEM opportunities into their Broader Impacts as required by federal granting agencies. We also support teachers and other partners in grant writing/seeking by providing grant-writing workshops, promoting grant opportunities on our website and through social media, and by writing letters of support as requested. Finally, when developing and implementing STEM PD, we incorporate "Train the Trainer" opportunities to increase our partners' capacity for STEM programming in our region.

Appendix 1: PARTNERING ORGANIZATIONS, 2017-18

School Districts & ESDs

- Astoria School District
- Knappa School District
- Warrenton-Hammond School District
- Seaside School District
- Jewell School District
- Neah-Kah-Nie School District
- Tillamook School District
- Lincoln County School District
- Siuslaw School District
- Mapleton School District
- Reedsport School District
- North Bend School District
- Coos Bay School District
- Coquille School District
- Myrtle Point School District
- Powers School District
- Bandon School District
- Central Curry School District
- Port Orford / Langlois School District
- Brookings-Harbor School District
- South Coast Educational Service District

Regional Achievement Collaborative

- South Coast Connect for Success

Post-secondary Education Institutions

- Clatsop Community College
- Oregon Coast Community College
- Oregon Institute of Marine Biology / U of O
- Oregon Sea Grant
- PreCollege Programs at OSU
- Southwestern Oregon Community College

Community Organizations / NGOs

- American Association of University Women, Tillamook Chapter
- Boys and Girls Club of SW Oregon
- Central Oregon Coast Chapter, National Organization for Women
- Columbia River Maritime Museum
- Drift Creek Camp
- Lincoln County Interpretive Association

- Northwest Aquatic and Marine Educators
- Oregon Coast Aquarium
- Oregon Museum of Science and Industry
- Salmon Drift Creek Watershed Council
- Seashore Family Literacy Center
- Tillamook Estuaries Partnership
- Youth Development Coalition of Lincoln County

Industry/Business

- Advanced Research Corporation
- Central Lincoln PUD
- Georgia Pacific
- KidWind
- Marine Technology Society
- Near Space Corporation
- Port of Newport

Government Agencies

- Bureau of Land Management
- NOAA/NMFS/Northwest Fisheries Science Center
- NOAA Marine Operations Center - Pacific
- Oregon Parks and Recreation Department
- South Slough National Estuarine Research Reserve
- United States Fish and Wildlife Service

Centers and Institutes

- Hatfield Marine Science Center
- Marine Advanced Technology Education Center
- Northwest National Marine Renewable Energy Center
- Oregon Forestry Resources Institute
- Oregon Hatchery Research Center