The FieldSTEM Journal





Real-World Science Outdoors

From The Desk of the Executive Director

It has been 48 years since the first Earth Day, often recognized as the beginning of the modern environmental education movement. Why, after 48 years, hasn't the field of environmental education achieved its goal of a scientifically literate citizenry that can make sustainable decisions? I believe it has something to do with what I refer to as the need to reach "the 85%."

Many environmental education models achieve success for some teachers and their students. Based on my experience, I estimate about 15%. That is, through the typical "one-and-done" workshop model, about 15% of the teachers take what they learn and run with it. Similarly, community-based programs offered by non-formal educators—as great as they are—simply can't reach all students. In this model, again, it's usually the teachers most passionate about science education who sign up—about 15%. But what about the students who don't have teachers looking for these opportunities? What about the students whose



Kathryn Kurtz EXECUTIVE DIRECTOR

teachers don't hit the ground running after a single workshop? Are we surprised when a community needs to make a decision that will affect the salmon in a nearby creek and only 15% go to the voting booth with an understanding of the interplay between our social, economic and ecological systems?

So, then, how do we address this inequity in our delivery? To embed a sustainability thread through our K-12 system, ensuring that all students graduate with environmental literacy, all teachers must develop the confidence

We need to include and engage "the 85%."

to deliver integrated, career connected, field-based, locally relevant education. A systems approach for K-12 schools can address questions of programmatic inclusiveness and sustainability of implementation at all levels.

As PEI strives to include the 85%, our work is guided by the question, *How do we meet educators, educational leaders, and community members where they are, set reasonable goals, and develop support structures that engage the 85%?* PEI is addressing this by taking a systemic approach to FieldSTEM delivery. With this work, we aim to help realize the goal that the teach-ins at 2,000 U.S. colleges and universities and nearly 10,000 K-12 schools set on April 22, 1970—to ensure that all students develop the skills to be scientifically literate citizens making balanced decisions for thriving and sustainable communities. Thank you for all you do to contribute to this work.

Region Spotlight: Lower Columbia

Developing High Impact Field Experiences for Students K-12

Vancouver Water Resources Education Center - Vancouver, WA



Chad Mullen, Lower Columbia FieldSTEM Coordinator

Hello from southwest Washington! I am thrilled to share what's been going on here. On March 14th, 18 non-formal educators joined me and PEI FieldSTEM Coordinator Julie Tennis for a 7-hour workshop focused on deepening their understanding of high impact field experiences and strengthening their programs' support of the Next Generation Science Standards (NGSS). Participants came from a range of organizations and agencies, including Clark County Public Works, Oregon Coast Aquarium, Issaquah Fish Hatchery and the U.S. Army Corps of Engineers/Bonneville Dam. Together, these groups reach an estimated 28,300 students per year.

Participants were challenged to think beyond a "walk and talk" field trip, where a docent leads a group of students around an interesting site, to a "high impact field experience" where students are at the center of the learning-asking testable questions, gathering evidence and making claims about the landscape and/or other observable systems around them. This "CER" model (make a Claim, site Evidence, communicate Reasoning) is an important component of both the NGSS and the Common Core State Standards (CCSS), as students are now expected to explain phenomena, make sense of patterns around them, and observe systems rather than simply memorize knowledge-level facts. As teachers grapple with this more rigorous and student-centered way of learning, those in the non-formal setting (including park rangers and other environmental educators) can play an important role in providing an authentic context and opportunity for teachers and students to apply the CER model.

At the conclusion of the workshop, many participants shared that they felt inspired and equipped to refine, or in some cases totally redesign, their programs around this powerful format. While there is currently much discussion inside schools to shift to the new philosophies and methods of NGSS and CCSS instruction, non-formal educators are often left out of that conversation. PEI's work helps align the critical work these groups are doing with opportunities for higher level student learning.







Lower Columbia Sponsor Highlight



We owe a big thank you to Stevenson Land Company. Stevenson and its leadership recognize the need for locally relevant career connected STEM education and have been contributing to PEI since 2013 to make it happen! THANK YOU, Stevenson Land Company!

Feature: I'm in Kindergarten. I'm a Scientist.

FieldSTEM Implementation at Emerald Hills Elementary School Sumner School District

Eleanor Steinhagen, Communications Coordinator

Andrea Landes, Principal at Emerald Hills Elementary, has a mantra: *We don't do everything at this school. We just try to do a few things really well.* In this spirit, after Emerald Hills earned the "Title Achievement" and "Title School of Distinction" awards for 2016 (the latter of which they earned again in 2017), she contacted PEI to schedule professional development for her staff, her goal being to equip every Emerald Hills teacher with the knowledge, tools and support they need to implement PEI's FieldSTEM Model. "That's how we've always done professional development in our building. We train the entire staff. I've found that it's not as effective to train just a few leaders. It really needs to be that everyone is being trained. Everyone sees the vision together. We're all going to move as a group."





With this in mind, PEI staff worked with Andrea to plan a professional development opportunity in August of 2017. Over the course of two days, huddled around the student-sized tables in the school library and surrounded by laptops, coffee cups and water bottles, the group delved into the FieldSTEM components—meaningful math applications, economic and civic engagement, scientific inquiry and engineering design, English language arts (ELA) and high impact field experiences with community collaborators. They also explored several PEI performance tasks, or mini-research projects that combine local science content and English-language arts and present an easy and meaningful entry point to science for elementary school teachers.

"They just come alive when they can get outside and combine classroom learning with outdoor learning."

Toward the end of the second day, the group began to envision how they might incorporate FieldSTEM into their science curriculum. As a part of PEI's commitment to providing ongoing support to educators and schools, attendees were given Project Learning Tree's[®] *PreK-8 Environmental Education Activity Guide* along with several handouts and PEI guides, including *Project Based Learning, Field Investigations, Designing High Impact Field Experiences* and *Fostering Outdoor Observation Skills*.

For the second training, which occurred in late October of 2017, Andrea received permission from the district to focus on STEM and field experiences during a scheduled school improvement planning day. The goals for the 6-hour training were to choose a field investigation and complete two performance tasks—one based on land and one based on water—for each grade level. Together, Emerald Hills teachers also began building the school's "FieldSTEM Continuum," a living document that plans and evaluates how all of the elements of the FieldSTEM Model will be implemented with increasing fidelity and excellence.

Anna Carlson, fifth-grade teacher at Emerald Hills, began implementing FieldSTEM with her class last fall. They started with a field investigation during which students identified plants on their school campus. One of Anna's

goals has been to give her students the opportunity to build outdoor observation skills and cultivate their curiosity. "They just come alive when they can get outside and combine classroom learning with outdoor learning. My students are thinkers... And honestly, a lot of them don't have a lot of experience outside, so it's great to open that up for them and hopefully encourage a love of the outdoors." The group has become fascinated by the difference between moss and lichen and has begun to develop theories as to why moss grows on some trees, but not others.

"They want to take care of the world. They just need to know how."

Anna's students had the opportunity to continue their moss and lichen investigation as they observed trees in the "Emerald Hills Forest"—a strip of about 20 mixed deciduous and coniferous trees between the parking lot and the road—while carrying out PEI's "Tree Benefits" performance task in early December. The students took notes in their FieldSTEM Journals, measured the diameter of several trees using kitchen string, markers and yardsticks, and then, using the National Tree Benefit Calculator at treebenefits.org, researched the monetary value per year that each tree provides in stormwater interception, energy savings, property value, air quality improvement and carbon sequestration. During the latter part of the task, students shared their enthusiasm: "My tree makes \$127 each year. My tree makes *money*." And, "Oh, wow, that's a lot! My tree absorbs 5,614 gallons of stormwater!"

In conjunction with this work, Anna had invited the Pierce Conservation District to her classroom to teach four lessons on groundwater and stormwater pollution the week following her class's completion of "Tree Benefits."

"These outdoor experiences will create, and hopefully sustain, a passion for science."

Of her commitment to implementing FieldSTEM, Anna said, "Every child needs it. These kids are going to have to solve major problems in the environment, so they need to be attached to the environment. They need to have a working vocabulary of the environment...They want to take care of the world. They just need to know how."





For Andrea, the drive to make PEI professional development and resources available to teachers is fueled by her love of the outdoors and outdoor education, as well as by her desire to prepare students to be leaders in natural resource and environmental stewardship. "We have some pressing times coming in terms of environmental impact... The world is going to be a better, healthier place with students who are informed and able to make critical decisions." Given that Emerald Hills was a designated Title I school for several years until 2017, and so faced with the challenges that come with economic hardship, their effort in making this building-wide shift toward FieldSTEM implementation is notable.

Now being in education, I realize how few children really have the opportunity to be outdoors and to love science and to love learning... Regardless of economic status, all students should be provided with science experiences both in and out of the classroom. So I want this for my school. I really want this. I want it for our

kids because kids love science. They love science. I mean, you get them outside and they are so excited. These outdoor experiences will create, and hopefully sustain, a passion for science.

Andrea stressed the need to start integrated outdoor science learning from an early age. "We don't want to wait until they're in middle school or high school. We want them to see themselves now as scientists: 'I'm in kindergarten, I'm a scientist.' Just to get that exposure and that feeling of success at such an early age." She sees integrated outdoor science education as a way to provide students with academic benefits that will help them to thrive in future career pathways, and also as a channel through which to cultivate a love of the outdoors and the environment. But she also has another motivation for providing students and teachers with these opportunities: "Some activities in school should just be fun. And being outside and exploring the world is fun. These are the experiences that students will always remember. They will never forget walking down to the lake and taking water samples. Or doing a stormwater activity. They will never forget those things. These are the meaningful activities that are so important for children."









As proud partners of Battelle and Pacific Northwest National Laboratory, we appreciate their commitment to STEM learning! Battelle staff at PNNL are working to advance scientific discovery and are creating solutions to the nation's toughest challenges in energy resiliency and national security. And while doing so, Battelle is helping to enhance, enrich and extend STEM education in Washington State and beyond.

Battelle's grant to PEI is dedicated to two FieldSTEM initiatives: tools for providing online and blended learning to our state's rural teachers, and field-based engineering design frameworks for primary and secondary grades. These will expose more teachers and students to engineering design and enable teachers to incorporate it in their classrooms.

Thank you, Battelle, for investing in the next generation of scientists and engineers!

Building Systemic and Sustainable FieldSTEM Implementation

Kathryn Kurtz, Executive Director

All of us, as citizens on a planet with finite resources and increasing human population, face the realities of increasing demands on our natural systems. PEI seeks to educate teachers—and through them, students—in a way that supports sustainable communities. Before learners can make effective decisions for the social, ecological and economic welfare of their communities, they need to understand the complexities of environmental issues, the pros and cons of the decisions related to those issues, and the diverse perspectives involved.

Today, public school educators are being asked to take on increased class sizes and additional responsibilities, including: addressing student health and well-being, connecting instruction to careers, and teaching to everincreasing state and national education standards. Given these pressures, how can our education systems find time to facilitate in-depth, meaningful learning? One way to effectively help schools and districts meet this challenge is through integration. PEI works with partners across the state to support schools and districts in developing long-term, viable, systemic programs that address environmental and sustainability education through FieldSTEM.





What do we know about this work already? To be sustainable, it takes commitment at the district level and it takes a distributed leadership model to create a shared vision to help schools and districts identify and set clear achievable goals. It also takes time. Reaching the passionate teachers with experience integrating and engaging students in out-of-classroom learning can be done in a year or two; for teachers that don't share that passion or have the experience, these projects can take three to five years as we transition teachers from past practice, through guided instruction and into independent instruction. This work is people-intensive. FieldSTEM coordinators work in one-one or small group settings with teachers to support the transition to integrated instructional practices based in outdoor work. Just like good classroom instruction, PEI works in collaboration with teachers in a continuous learning model, meeting the needs of the individual learners. This work also involves partnerships with—and time commitments from—community businesses and organizations so they can effectively support teachers.

Recently, we invited 18 school districts in various stages of FieldSTEM implementation to join us for three days to envision how to build systemic and sustainable FieldSTEM communities* at our FieldSTEM Leadership Institute





*While FieldSTEM is PEI's model for our work with school districts, we recognize that the work of building environmental and sustainability education is not new and many districts already have projects in place that align with this work.

in Leavenworth, WA. Partners from the Association of Washington School Principals (AWSP), the Washington Association of School Administrators (WASA), the Washington State School Directors Association (WSSDA), and the Office of the Superintendent of Public Instruction (OSPI) lead systems coherence sessions to bring to the surface the roles and responsibilities that various leaders in a system have in successful implementation of sustainable programming. In support of this work, PEI introduced our new classroom, school and district level FieldSTEM Implementation Continuums, which identify components of implementation and provide indicators for three levels of implementation: "exploring", "emerging," and a level of "excellence."

The dialogue and collaboration that occurred at the Leadership Institute broadened and strengthened the professional learning network among PEI, OSPI and our district and association partners. Such a network will help us understand how better to support schools and districts in FieldSTEM implementation, ensuring that all teachers offer all students the opportunity to learn through integrated, career connected, locally relevant, field-based projects.







Why FieldSTEM?

We asked the Superintendents, Principals and Teaching & Learning Directors who attended the Leadership Institute to share why they believe FieldSTEM is important for all students.

Here is what Brock Maxfield, Principal of Hoquiam High School, had to say:

66 The truth is, we have little to no science education in our elementary schools. FieldSTEM education is a way to integrate science standards with math and ELA standards. All students deserve the opportunity to learn in an authentic real-world scenario. All students deserve the opportunity to really observe their natural surroundings. And all students deserve the opportunity to learn more about their community and from their community.



Brock attended the Leadership Institute with his colleague Mary White, Director of Teaching and Learning for Hoquiam School District.

Upcoming: Workshops and Events

2018 FieldSTEM Teacher Leader Institutes

Intended for formal K-12 teacher leaders from invited districts, PEI is thrilled to be offering four FieldSTEM Teacher Leader Institutes this summer. These two-day institutes will be held in Colville, Kalama, Puyallup and Tumwater and are designed to initiate FieldSTEM implementation while addressing NGSS, CCSS and Environmental Sustainability Standards. Participants will:

- Experience the FieldSTEM Model and develop high impact field experiences
- Receive mentored planning time with examples of how districts have implemented FieldSTEM across grade levels
- Assess their current FieldSTEM implementation levels and create an action plan

Participants will also receive 12 Washington-State-approved STEM clock hours and 3 PEI guides. For more information, call **Denise Buck, Program Director,** at **360 705 9286.**

Creating Connections Through Performance Tasks

June 18-20 / Spokane, WA 🐰 June 27-29 / Puyallup, WA

These 3-day workshops will support educators in creating compelling real-world connections to science for students. Participants will create performance tasks as instructional tools that integrate science and ELA. The focus will be to practice the research and writing standards that are part of the ELA Common Core expectations. Participants will:

- Focus on research methodologies
- Link performance task content to regional environmental, agricultural and natural resource sectors
- Develop and write their own performance task with guidance from PEI faculty and peers



Participants will receive **15 Washington-State-approved clock hours** free of cost and be eligible to receive a **\$150 implementation stipend!** For more information or to register, please visit **pacificeducationinstitute.org** or call us at **360 705 9294.**



You've probably heard of RealNetworks through their well-known media player app, RealPlayer, but you may not be familiar with the RealNetworks Foundation. The Foundation is the conduit through which the company connects with their local community, with emphasis on strengthening STEM education and supporting STEM educators.

RealNetworks Foundation has been a long-time supporter of PEI and FieldSTEM. And PEI has been fortunate to receive an invitation to apply for funding from the Foundation each year since 2013. The support we receive from the RealNetworks Foundation helps PEI to grow in the Puget Sound region by providing training and support to the region's educators. Thank you, RealNetworks Foundation!

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