

PEI Learning Brief

Raising STEM Career Awareness Through CTE-Science Partnerships

BACKGROUND

The Pacific Education Institute's (PEI) mission is to advance science literacy and deepen student engagement by empowering K-12 educators to teach real-world science outdoors using PEI's FieldSTEM® model. PEI provides high school STEM teachers with high-quality, real-world experiences that enable them to bring concrete examples of how both technical and 21st Century Skills are used in local worksites, with a focus on careers related to agriculture, natural resources, and the environment.

In September 2016, the National Governor's Academy on Work-Based Learning awarded PEI a grant to pilot a "Learning Laboratory," called the "Teacher Industry Site-Based Learning Project." The goal was to expose teachers to how classroom science skills are used in local industries, so that they could then help students understand the connections between classroom lessons and career pathways. The project's premise—that a partnership between Career and Technical Education (CTE) and science teachers can play a unique role in raising students' STEM career awareness—was based on both research findings and feedback from members of PEI's Statewide Leadership Institute.¹ The Learning Laboratory engaged CTE and general science teachers from the Shelton and Snohomish School Districts. This learning brief focuses primarily on a project description and the lessons learned to date at the Shelton District, as the Snohomish project was still in progress at the time of this report.

PROJECT DESCRIPTION

The Shelton team consisted of the CTE director, who served as project coordinator; and two teachers, the science department chair and the CTE biology teacher (who teaches agriculture, marine biology, and ecology). The team members convened four after-school planning meetings where they reviewed the purpose of the work, selected which sites to visit, and discussed the types of information to collect. They then conducted three half-day trips, visiting Tacoma Power at Cushman Dam; the Taylor Shellfish hatchery and production site; and the Seattle Shellfish processing facility and geoduck beds. Each experience included both a tour of operations and informal discussions with a range of employees.

At the end of each site visit, we asked teachers to journal responses to five questions, capturing their insights and ideas for incorporating new learnings into career-connected lessons: (1) What was the goal in visiting this site? What did you hope to learn that you would bring back to your classroom? (2) Describe the experience. What activities did you observe? (3) What were the most important things you learned about FieldSTEM jobs? (4) What 21st Century Skills did you observe (e.g., critical thinking, teamwork, and communications)? (5) In what ways do you hope to take these learnings back to your classroom? Additional data collection strategies are described under Methodology Notes, below.

1. See: http://www.pdkwa.org/downloads/PDK-WAStateKappan_2013_Summer.pdf. The project design also drew on data collected from 36 participants, representing superintendents, ESD leadership, and the Association of Washington School Principals at the PEI Statewide Leadership Institute, in February 2016.

FINDINGS

Our investigation was intended to surface learnings that can spotlight the value of, and promising practices in, teacher industry site visits as a means to further student career awareness. We captured what teachers said they learned from the experience, and how they plan to apply these learnings in formal and informal interactions with students.

APPLICATIONS FROM SITE VISIT TO CLASSROOM

We observed two of the three site visits and carefully documented the questions teachers posed to workers. In one case, we were able to debrief with teachers immediately following the experience; they were also interviewed at the end of the project. Through interviews and journals, the teachers articulated their new understandings of how classroom lessons relate directly to workplace skills required by local industries. For example, following the visit to Tacoma Power, they journaled that the visits demonstrated academic and technical requirements (e.g., math and science skills for monitoring turbines and water flow, and design thinking for facility maintenance), as well as 21st Century Skills (e.g., teamwork, communications, and dependability). Among their other “aha” learnings were that there are entry-level positions that require only a high school diploma yet offer opportunities for in-house training and advancement.

This brief captures findings at the point in time when the teachers had just completed the site visits, identified opportunities to raise STEM career awareness in both science and advisory periods, and were beginning to infuse their learnings into practice. They commented that they felt they could now make the workplace more real for students through examples of the science behind each level of the company’s operations, stories of individual career paths, how workplace innovations come about, how failure is handled, and how 21st Century Skills play out in the workplace. They noted that prefacing career information with

“This is what I learned on my site visit” catches students’ attention and imparts credibility. In their journals and our interviews, these educators reported that they have taken the following steps or have plans to do so.

- Share information on the range of, and educational requirements for, a variety of local FieldSTEM jobs, including through job description fact sheets.
- Provide real-world examples of how 21st Century Skills are critical to succeed in the workplace.
- Support students in applying for internships with local companies and competing in science fairs.
- Combine CTE and science classes for classroom presentations by FieldSTEM companies.
- Use PEI’s FieldSTEM Resource Guide, which includes PowerPoint templates; student and teacher interview guides; and student journal guides to develop career connected learning materials².
- Develop a slide deck featuring information about real workers in local FieldSTEM jobs.
- Deepen the relationships newly forged through the site visits, for example, by requesting shellfish and algae samples for classroom research projects, and then infusing career lessons about professions in shellfish companies into their science lessons.

TEACHER AND CTE DIRECTOR INSIGHTS

- “I can give real-world examples now.”
- “I see that local companies want to hire locals.”
- “Even kids who go away to college often want to come back. A lot of kids like our area, but they don’t think there are jobs per se here.”
- “I learned a lot about what types of careers are found working for Tacoma Light that I did not know existed in our back yard.”
- “These requirements [soft skills] surprised me the most because they were telling us that it was hard to find a qualified candidate.”
- “I want to emphasize the diversity of jobs at Seattle Shellfish from a beach worker, to an oyster processor and breeder, to a scuba diver, welder, and biologist.”
- “It surprised me that a person without a bachelor’s degree could become a manager of a division in the larvae hatchery as long as they worked hard, were successful in the organism that they were raising, and supervised employees in a positive and motivational manner.”
- “I want to instill a work ethic and also give them hope that there are living-wage jobs here in the area.”
- “Teamwork was important in the operations, which goes along with good communication skills. Also having the ability to problem solve and think outside the box. I also saw some good old fashioned science skills being used in testing new lighting systems.”

SYSTEM LEVEL INITIATIVES

The pilot experience sparked an excitement among the team members, who are now exploring new strategies to institutionalize site visits as part of their school culture, for example, by engaging other faculty in site visits during Professional Learning Community (PLC) time; teaming CTE and science classes for site visits; and team-teaching CTE and science lessons. In addition, the project has caught the attention of both the superintendent and the district STEM director, who, along with the CTE director, are exploring how this pilot might inform their vision for school restructuring and launching K-12 academies.

LESSONS LEARNED

Address Career Awareness as an Equity Issue. Knowledgeable teachers are uniquely situated to leverage students' abilities to make meaningful connections between their classroom lessons and potential STEM careers.³ This approach is particularly impactful for those students who may not have opportunities to learn about a broad range of career opportunities through family and social contacts but who benefit from daily contact with science teachers who can provide real-world examples of STEM careers in their own communities.⁴ One interviewee reflected that learning about FieldSTEM careers allows districts to connect with rural communities and supports the teachers in "engaging the traditionally unengaged."

Inform Systems Changes: New Opportunities for CTE–General Science Collaboration. CTE directors are positioned to forge worksite connections and experienced in doing so, and they keep current on workforce projections via their industry advisory groups. Crafting innovative CTE–science department partnerships opens new opportunities to leverage these connections for non-CTE educators and students.

Develop "Win-Win" School-Business Partnerships. Teachers perceived site visits as opportunities to foster new "win-win" relationships that advance student learning while benefiting their business partners. Following the visit to Tacoma Power, one journaled, "It would be interesting if we could help in testing some of the lighting tests they were going to be doing so students could get some hands-on, real-world problem-solving skills. I would bring back to the students the concept of teamwork, which they could practice by working in different lab groups (not always working with their friends)." Another proposed having students conduct research for the local hatchery.

Clearly Articulate Goals and Expectations. At the project outset, the CTE director clearly articulated five objectives that guided the team in their planning: developing a better understanding of the connections between classroom lessons and local employer needs; gaining an understanding of career requirements; discovering "where the science is" within these organizations; fostering working relationships for the purpose of student learning through FieldSTEM and career connected learning experiences; and sharing best practices with business representatives on how to deliver lessons to our students.⁵

Prepare Employers in Advance. Businesses benefit from an advance list of questions so that they can prepare for queries about job titles and descriptions, personal career pathway stories, company culture, typical workdays, and internship opportunities. Teachers were especially appreciative that one site distributed handouts that provided detailed job descriptions, the knowledge and skills required for each position, and salary ranges, as well as a worksheet demonstrating how math is used on the job.

2. The FieldSTEM Career Connected Learning Resource Guide is available through PEI.

3. Cohen, C., Patterson, D. G., Kovarik, D.N., & Chowning, J.T. (2013). Fostering STEM Career Awareness: Emerging Opportunities for Teachers. *Washington State Kappan*, 7(1), 12-17. Retrieved April 13, 2017 from http://www.pdkwa.org/downloads/PDK-WASStateKappan_2013_Summer.pdf

4. The issue of how lack of social capital disadvantages opportunity youth's career awareness was recently noted as an international issue by the Organisation for Economic Co-operation and Development, Director of Education and Skills; Schleicher, A. (12/7/16). Presentation of Key Findings. Lecture presented at "Beyond the Classroom: Strategies for Integrating the Worlds of Work and School," Washington, D.C. Retrieved April 14, 2017, from <https://www.newamerica.org/education-policy/events/beyond-classroom/>

Coordinate Site Visits at the School or District Level. Our informants emphasized that coordination of site visits by an in-house facilitator, whether school, ESD, or district-based, can insure interdistrict alignment and reduce contact fatigue for businesses that lack resources to respond to multiple requests from schools. At the business partner end, an internal education coordinator is helpful as well. In this project, two of the three business partner sites had a staff person dedicated to education outreach.

NEXT STEPS/CONSIDERATIONS

Our initial literature review uncovered research on teacher externships that provide a long-term and in-depth professional development experience,⁶ but few scholarly sources that directly relate to strategies for, and the effects of, short-term industry site visits.⁷ Districts benefit from being able to draw on a menu of workplace experience options, including both teacher externships and the industry site visits described in this brief, as well as student work-based learning. We feel that piloting further carefully crafted industry visits, coupled with development of a community of practice and close tracking of outcomes, may shed light on the value of this “lean” option for raising STEM career awareness. This pilot also contributes to current policy conversations about the need to implement systems changes that “leverage CTE expertise and relationships beyond the CTE walls.”⁸ Our informants identified success elements ranging from a district- and schoolwide culture of collaboration, vision and leadership at the superintendent level, and a long-term comprehensive plan to raise STEM career awareness among educators.

METHODOLOGY NOTES

Our research included a literature review conducted by the Reference Desk Service at Education Northwest, which queried both peer-reviewed sources and databases associated with research institutions. Our data collection included a review of program documents, observations of two of the three industry site visits, and a content analysis of the teachers’ journals. We were in close contact with the pilot lead, who supplied information throughout the course of the project. Finally, we conducted a series of structured interviews and focus groups. Key informants at the district level included the two teacher participants, Mary Brown, CTE – Science teacher, and Brian Ducker, science department chair; Dr. Alex Apostle, Superintendent; Pat Cusack, CTE Director; and Wendy Boles, Science Curriculum Lead. Business partner interviewees included Jennifer Whipple, Education and Outreach Coordinator, and Bill Taylor, President, of Taylor Shellfish Farms.

The Pacific Education Institute’s FieldSTEM model works to deliver authentic career-connected learning with a balanced perspective. For more information please see <https://pacifieducationinstitute.org>, or contact Executive Director Kathryn Kurtz at kkurtz@PacificEducationInstitute.org. This report was supported by Margaret Tudor, Executive Director Emeritus, and Amanda Romero, PEI intern.

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5. Cusack, P. (2016, November 22). Shelton CTE [email].

6. Career Academy Support Network. (2010). Teacher Externship Guide. Retrieved March 10, 2017, from <http://casn.berkeley.edu/resources.php?r=251>; Luft, V. D., & Vidoni, K. L. (2000). “Educator Externships: How Classroom Teachers Can Acquire Business and Industry Experience.” *The Clearing House: A Journal of Educational Strategies, Issues and Ideas*, 74(2), 81-83. .

7. Education Northwest’s literature review findings noted, “We found very few scholarly articles that discussed how educators can bring worksite experiences back to the classroom. However, we did find several examples of such programs.”

8. Wheeler, G. (2017). Work-Based Learning Policy Academy TA Webinar Series: Enhancement, NGA Center for Best Practices [PowerPoint].