



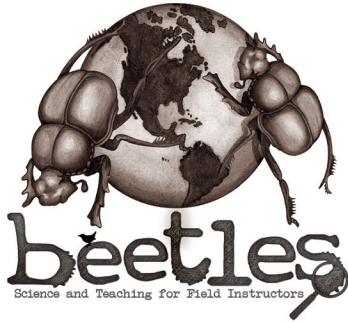
beetles

Science and Teaching for Field Instructors

Guide for Program Leaders in Outdoor Science



THE LAWRENCE
HALL OF SCIENCE
UNIVERSITY OF CALIFORNIA, BERKELEY



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UNIVERSITY OF CALIFORNIA, BERKELEY

ABOUT BEETLES™

BEETLES™ (Better Environmental Education Teaching, Learning, and Expertise Sharing) is a program of The Lawrence Hall of Science at the University of California, Berkeley, that provides professional learning sessions, student activities, and supporting resources for outdoor science program leaders and their staff. The goal is to infuse outdoor science programs everywhere with research-based approaches and tools to science teaching and learning that help them continually improve their programs.

www.beetlesproject.org

The Lawrence Hall of Science is the public science center of the University of California, Berkeley. www.lawrencehallofscience.org

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Guide for Program Leaders

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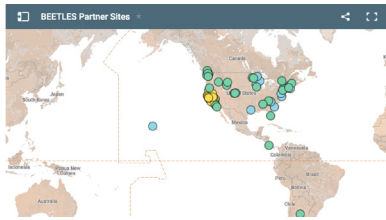
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NOTES

See a map of all our partners:
<http://beetlesproject.org/about/partners/>



Research Group Findings: Research by the Lawrence Hall of Science's Research Group showed that BEETLES Institutes shifted program leaders' attitudes about teaching to favor a more student-centered approach and resulted in revisions to several outdoor science programs' missions, goals, curriculum, and staff professional learning opportunities. Program leaders reported that even in short time spans, these organizational revisions led to changes in how field instructors facilitated learning experiences for students, leading them to provide more student and nature-centered instruction.

Letter to the Reader

Welcome to the BEETLES Guide for Program Leaders! We're glad you're here.

Much of what's in this document comes from professional relationships with leaders like you. We've had the immense pleasure of being deeply engaged in the culture of outdoor science programs and trying to figure out how to make outdoor science the best it can be. The information here was collected over a three year period from over 70 programs across the U.S. and even a few international programs. The leaders of these programs have been using BEETLES resources with their staff in a wide variety of ways and contexts. They've had exciting successes, unexpected outcomes, and some bumps in the road and have given us thoughtful, honest feedback about all of it. The advice, guidelines, and recommendations shared over the following pages come from hundreds of casual conversations, emails, formal interviews, focus groups, and many, many surveys thoughtfully submitted by our field test sites and partners. We combined those responses with our own delightful first-hand experiences observing programs, teaching in programs, working and musing with hundreds of you about how to improve our field, and with all the lessons we could learn from pouring over 25 years worth of research on science and environmental education, cognitive science, professional learning, language development, equity and inclusion, and organizational capacity building. As we've observed programs shifting their outdoor science programs toward more student and nature-centered instruction, we've found patterns in their challenges and successes. And we're pleased to share them here. Throughout this guide, we've based our recommendations largely on the experiences and anecdotes of leaders in the field and then generalized from them while citing research that validates the approach and moves the anecdotes toward becoming a principled theory of action. Our goal is to elevate the field of outdoor learning by basing our improvement efforts on the latest evidence from research, while at the same time retaining the informal and spirited exuberance that continually draws us back to this community.

While this document is primarily focused on the specific use and implementation of BEETLES materials, its purpose is much broader than that. This guide is also

about achieving *your particular goals* for your outdoor science program, whether you use BEETLES resources or not. We know from experience and research that an isolated workshop now and then or a few new student activities won't lead to deep and durable change. We have also learned from our partners that diving too quickly

Some goals your program might have (and that this guide could help you address):

- To provide high quality learning experiences that result in deep understandings about nature.
- To position your outdoor science program as central and essential to mainstream education and societal goals for every student.
- To promote connection to and appreciation of nature and the environment, and encourage the development of the critical thinking and decision-making skills needed to protect the environment.
- To help students become permanently curious about nature by engaging in science practices and developing scientific habits of mind.
- To create an ongoing staff culture of professional learning focused on improving teaching and learning.

into big changes doesn't tend to work very well either. Thoughtfully planned approaches that take the long view work best. This guide is a planning tool to help leaders successfully implement change in their programs.

We're covering a lot of territory in this guide. We want to stimulate conversations about how to be the best at what you do. Change is hard and takes time if it's going to last. Some leaders that have tried to change everything all at once have been frustrated. Slow and steady wins the race! Be patient, flexible and responsive to your staff. Listen, and take their feedback into consideration as you implement changes to your professional learning, curriculum and/or program structure. Be strategic; start where some noticeable change seems most possible. Keep revisiting your goals, discuss them extensively with your leadership team, and decide what will nudge your program a little closer to achieving them. While you may be excited about changes, it's important to plan ahead, even sometimes at the expense of implementing immediately. Remember that staying the same is easy for individuals, but change is a team sport. Include people from throughout your organization to be part of these important conversations, and have them often.

It's a common belief among outdoor science educators that they work for the best program. But there's no such thing as a perfect or "best" outdoor science program. Each has its strengths. Because programs are scattered in wild places around the country, it's easy for a program to become a little isolated and insular. Many programs have shared their specialties – their "best practices" – with us, and now we're sharing them with you, combined with our experience and perspectives, as well as research and expertise from other realms of education. We're sharing them through BEETLES resources and through this document, so we can grow together as a field and provide even better "best" outdoor science education experiences for our students.

We're excited to see what you do with our humbly offered resources and tools!

all our best,

the BEETLES Team

NOTES

On becoming excellent educators:

"I find the whole endeavor to critically evaluate what we do as environmental educators and raise the bar fascinating. It makes me think about excellence in all areas of our life both personal and professional. The term "Kung Fu" originally meant developing a skill through diligent hard work to become a master. Let's become Kung Fu Educators."

- John Muir Laws

(Naturalist, field guide author, educator, and thoughtful human)

Share your learnings with us! We

would truly love to see how you use BEETLES material. If you've got a story, share it!

<http://beetlesproject.org/contact-us/>

Figure 1. Unpacking the BEETLES Professional Learning System



The BEETLES Professional Learning System consists of:

1

Resources for Program Leaders providing science education- focused professional learning opportunities for field instructors

2

Resources for Field Instructors and other educators leading science-focused learning experiences with students in the outdoors

PROFESSIONAL
LEARNING SESSIONS

(PL Sessions) on key topics in outdoor science instruction.

MODEL STUDENT
ACTIVITIES

that illustrate the pedagogy & strategies of the PL Sessions.

Both PL Sessions and Model Student Activities include:

Background Information	Educative Sidebars	Written Guides	Learning Cycle Connections
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PL Sessions also include:

Embedded Model Student Activities	Suggestions for Extending Learning	References	Presentation Slides
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Student Activities also include:

NGSS Connections	Connected Activities	Common Misconceptions	Field Cards
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LEADER
IMPLEMENTATION
SUPPORT

to support leaders using BEETLES leader resources, including:

PL SESSION “How-To” VIDEOS	Guide for Leaders	Reflective Teaching Tools
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INSTRUCTOR
IMPLEMENTATION
SUPPORT

to support educators using BEETLES student activities, including:

Exploration Guides	DISCUSSION STRATEGY VIDEOS	ACTIVITY “How-To” VIDEOS
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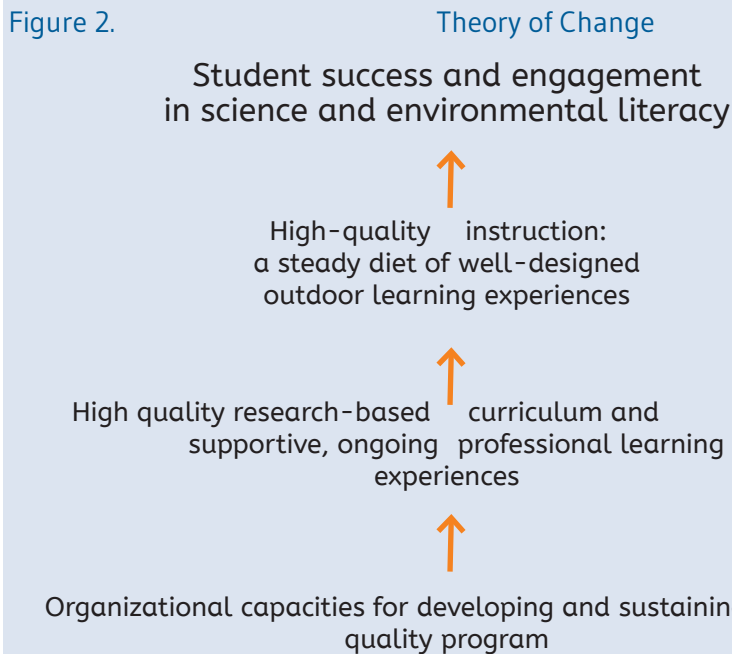
Leadership Institutes
& Custom Support

Free 5-Day Professional Learning Opportunities and Customized Fee-for-Service Support

Introduction

This guide is designed to help you, and other outdoor science education leaders use BEETLES resources to provide high quality professional learning for instructors and program leaders and to ensure the use of consistently effective practices in teaching and learning throughout your program. It's intended to be a conversation starter for your program's leadership team about your goals and vision and how to achieve them. We suggest that you review the information provided here and work with colleagues at your site to design an action plan that will meet your needs. You can use this guide as a kind of virtual thought-partner for providing ideas, exploring lessons learned from the field, and becoming more familiar with research-based strategies to expand and improve your outdoor science program.

This is not a step-by-step guide! It presents research-based capacities that are common to organizations that have intentionally and successfully improved their programs. As a backbone to this work, we've used the theory of change, represented in Figure 2, and described below.



A common, ultimate goal of outdoor science programs is for all students to be successful, engaged, and environmentally literate. For that to happen, students need a consistent, steady diet of high-quality outdoor science instruction. If you want every instructor to provide high quality outdoor science instruction, you need a systematic program of research-based, tested materials and ongoing, supportive professional learning experiences to support them. To create and maintain a systematic program like that, your organization needs a well-articulated and widely understood vision for high quality teaching and learning, multiple levels and forms of leadership, and policies that are in-line with this vision, as well as a supportive context for the work.

NOTES

See an example action plan template on page 51

The Theory of Change model illustrated here was developed by the BaySci program at the Lawrence Hall of Science and has been extensively evaluated by Inverness Research. It has been used widely to support school districts in improving their science programs. In writing this guide, BEETLES has adapted this approach specifically for use with outdoor science programs.

Organizational whaaa?? Chapter 3 of this guide, starting on page 37, specifically addresses what we mean by "organizational capacities".

Value of goals: "Nonformal environmental education programs should be designed with well-articulated goals and objectives that state how the program will contribute to the development of environmental literacy."
- Key Characteristic #3: Program Scope and Structure, from NAAEE Guidelines for Excellence. For more detailed information about conducting a needs assessment and developing goals for your program, refer to the NAAEE Guidelines for Excellence: Nonformal Environmental Education Programs.

NOTES

Scientific habits of mind, or a scientific mindset, is when a person has certain knowledge, skills and attitudes that empower them to look at the world scientifically. It involves being curious, asking questions, and coming up with testable explanations. A scientific mindset is important for everyone, not just for scientists. A scientific mindset helps make sense of observations, to figure out what's going on, and to come up with ways to test different ideas. A scientific mindset includes values like verifiable data, testable hypotheses, and predictability, as well as more general human values of integrity, diligence, fairness, curiosity, openness to new ideas, skepticism, and imagination. Definition adapted from Rutherford, F. J., & Ahlgren, A. (1991). *Science for all Americans*. Chicago: Oxford University Press.

The Learning Cycle is a model for designing instruction that is consistent with research about how people learn. The Learning Cycle includes the following phases of learning: 1) Invitation (students become engaged with and access prior knowledge), 2) Exploration (students explore, become curious and begin making sense), 3) Concept Invention (students invent concepts for themselves, with and without guidance), 4) Application (learners apply what they've learned to a different context), and 5) Reflection (learners think back on how their ideas have changed, and what helped them change). The Learning Cycle was originally described in the 1960s by University of California, Berkeley researcher who was an early leader of the Lawrence Hall of Science! It was revised and re-published in the 1990s by Roger Bybee as the "The 5 E Model." See the BEETLES "Teaching and Learning" PL Session for more information.

In order to improve student learning experiences, it's important to think about all the elements of this theory of change. You don't have to start at the bottom and work your way up the chart in a linear fashion, but it's important to recognize that you need to address all the levels to achieve your ultimate goal of your learners being consistently engaged and successful. It may take a little longer to thoughtfully build your program's capacity to improve, but it will give you more satisfying and lasting results.

Throughout this guide, we use the term "high quality teaching and learning." "High quality outdoor science teaching and learning" can be defined in many ways. Most instructors and programs think what they're doing is high quality (no one sets out to deliver medium quality!), especially when they get positive feedback from their audience. When BEETLES refers to high quality, however, we mean something very particular and specific that is based on research: **Nature-centered** and **Student-centered**. This is the essence of high quality for outdoor teaching and learning. We use the following four design principles (the first two are "nature-centered," the next two are "student-centered") to make sure BEETLES resources help programs maximize opportunities for students to:

- **Engage directly with nature:** It's not enough for students to just be in nature. They need to make their own first hand, extended observations of the details of nature; they need to establish intimacy with organisms, objects and processes in nature. They need to develop an on-going relationship with nature through direct engagement, while growing lifelong curiosity and inquiry skills that they take away with them.
- **Think like a scientist:** Students need to observe, ask questions, develop explanations and understand the importance of evidence. Students learn science most effectively when they engage in the same practices scientists engage in. Scientific habits of mind are important to help students grow into responsible decision-makers.
- **Learn through discussions:** Students need to make sense of their experiences by putting their ideas into words and comparing their ideas to those of others.
- **Experience instruction based on how people learn:** Students learn best when learning experiences are designed based on the Learning Cycle, a highly effective and flexible model for designing high quality student-centered instruction. Research shows that students actually learn more through peer-to-peer exchange, than by listening to scientific explanations made by an instructor.
- **Learn through instruction that affirms their lived experiences and cultural identities:** Students learn in the context of their cumulative life experiences, family histories, and cultural identities, including race, socioeconomic status, and gender identity. Quality instruction affirms individual's cultures and lived experiences. Educators should show cultural curiosity and humility, recognizing the many ways students' lives, experiences, and values may be different from their own and making space for students to share diverse perspectives.

Overview of the Chapters in this Guide

Each of the following chapters will help leaders use BEETLES resources and materials to bring about regular, consistent, systemic improvements in their program:

Chapter 1: Creating a Professional Learning System, page 7.

Instructors need to engage in professional learning that builds their understanding of pedagogy and provides opportunities to discuss teaching and learning with peers and with others who know more than they do. They need time to struggle with how they know if their teaching is helping students learn, to let go of old ideas, and to explore new strategies. BEETLES Professional Learning Sessions (PL Sessions) are designed to inspire this kind of reflection on and improvement of teaching practices. Because ongoing dialogue and follow-through with staff is so important, we also describe in this chapter how to use reflective practices to create a staff culture that develops a supportive learning community.

Chapter 2: Using Student-Centered & Nature-Centered Instructional Materials, page 21.

As instructors become inspired to teach in “new” ways, they need access to student activities that clearly reflect research-based pedagogy. Using these activities will give them successful experiences with curriculum aligned with best practices; Then, they can apply those experiences to revising activities they’ve used in the past. Without high quality, instructional materials and time for reflection, instructors can easily fall back into teaching in the same ways they did before. In this chapter of the guide, we offer suggestions for how to effectively use BEETLES student activities as models of instruction, how to support your instructors to revise and create new or existing curriculum, and how to think about the other changes you might need to support improved teaching and learning in your program.

Chapter 3: Building Capacity for Program Improvement, page 37.

In this chapter, we dig into how to create a programmatic infrastructure that supports consistently high quality instruction. This means taking a close look at critical capacities of your program that may need some strengthening or restructuring. We provide prompts for discussing your organizational capacity and offer suggestions on how to address program-wide improvements.

Chapter 4: Implementation Examples, page 52. This final chapter is a collection of real “Tales from the Field” examples or vignettes that provide a window into how several outdoor science programs have used BEETLES resources to improve their programs. They were written (or sometimes spoken in long interviews) by the thoughtful folks who have used our materials. They represent “warts and all” realistic approaches to implementing change using BEETLES resources. “Tales from the Field” are also sprinkled throughout the guide when specifically relevant.

NOTES

Pedagogy is the study of teaching. It’s the art and science of instruction.

Chapter 3 is accompanied by the “Appendix: Building Capacity Tool” starting on page 65

Figure 3. Implementation Cheat Sheet

A reviewer of a draft of this document asked for direct guidance for program leaders who want explicit instructions to start implementing BEETLES quickly. Here is some cautious guidance, but keep in mind that so much depends on your particular circumstances.

1. **Slow down.** Take a deep breath. You don't have to go slowly, but you can't skip any steps either. Don't try to do too much too fast. It can take a lot of work to undo the resistance you may get from a too hasty start. Seriously.
2. **Have lead instructors teach BEETLES student activities.** Have lead instructors (and program leaders) watch our online videos and read our student activity write-ups, then start leading BEETLES student activities with students. Start out with these: *Walk & Talk*; *I Notice, I Wonder, It Reminds Me Of*; and any of the focused explorations that are appropriate for your site (e.g., *Lichen Exploration*, *Bark Beetle Exploration*, *Case of the Disappearing Log*). Have them teach the activities as written and then talk with each other and with you about how it went.
3. **Set tone for a learning culture.** Set an expectation for everyone on staff (including yourself) to work hard to improve their effectiveness. Model openness to new ideas, humility, and a willingness to share your stumbles, struggles, excitement and successes. Model curiosity about instruction and about learning--but most of all, about learning! Read "Building A Culture of Reflection" on page 17.
4. **Be respectful of staff.** Be respectful of what your instructors know, of their thoughts and feelings. Don't announce drastic changes. Invite staff into the process of change, and of discussing what it is that helps learners to learn. Read "Additional Considerations For Using BEETLES Professional Learning Sessions" on page 13.
5. **Lead Professional Learning Sessions.** Lead the *Making Observations* PL Session with your staff. Follow it up with either *Questioning Strategies* or *Field Journaling with Students*. Teach each PL Session fully as written, and resist the temptation to cherry pick certain parts, while skipping others. Before leading each PL Session: watch the videos and study the write-up; team up with someone who can teach the student activity exemplars featured in the PL Session and read "Using Beetles Professional Learning Sessions" on page 9.
6. **Facilitate application of the PL Session to instruction.** Be sure to read the "Applying Session to Instruction" section at the end of the PL Sessions, and ensure time each week to facilitate instructors to apply the pedagogy they have experienced to their instruction. Maintain an on-going staff dialogue about pedagogy, challenges and successes.
7. **Check in with staff.** Check in with staff frequently, as a group and as individuals. Read the "Creating Structures for Coaching and Mentoring Staff" (page 18) and "The Difference between Evaluation and Coaching" (page 20) sections of this guide.
8. **Read this Guide for Leaders.** Read the rest of this *Guide for Leaders* to plan out a long-term approach!

Chapter 1. Creating a Professional Learning System

How can we make our professional learning most effective for inspiring instructors to become curious about how students learn and to engage in a process of ongoing instructional improvement and reflection?

A Vision of Ongoing Professional Learning: a Vignette

An outdoor science school's instructional staff is gathering at the end of a student program. As they wander in with their backpacks of teaching gear, they're already casually debriefing their teaching experiences. They grab food and sit down in small groups, continuing their conversations. Eventually, a leader prompts them to segue into discussing the question of the week that was introduced on the first day of the program: "What can you do to encourage more exploration and a culture of curiosity in your learning groups?" Instructors generally share what worked, what didn't, and come up with some ideas they'd like to try with the next group of students. Next, the leader moves on to a reflective routine. One instructor risks being vulnerable and volunteers to begin. She shares a challenging situation she encountered where a critical instructional decision needed to be made, then small groups discuss ideas about what an instructor might do in that situation, and finally the first instructor shares out what she actually did to address the challenge. The staff speaks thoughtfully during the small group discussions, following the agreed upon Discussion Norms posted on a wall at the beginning of the season. A lively whole group discussion follows, as they come up with some interesting ideas for dealing with the dilemma and add to the instructor's suggestions for moving forward. There is some disagreement, but the conversation is consistently respectful and productive.

Not long ago, this same staff was less collaborative. Instructors were left to "do their own thing" with students, and they were more guarded when talking about their teaching and more invested in portraying how successful they had been. Now program leaders are delighted that staff are more open and candid about improving their teaching and regularly engage in thoughtful discussions about pedagogy, even during their off-hours. Visiting classroom teachers have even noticed improvement in instruction and have reported that they feel they can learn teaching strategies from watching field instructors.

In the past, "staff training" had been a week at the beginning of the season, consisting mostly of program logistics, some natural history, and modeling of some student activities. But this season, it had a different feel. Thought provoking in-depth sessions on pedagogy inspired ongoing discussion among staff about their own teaching. Key student activities were modeled, but were integrated within professional learning sessions as practical examples of how to implement new approaches to instruction. Instructors participated in discussions about growth mindset and how to cultivate a learning culture among their students and each other. Instructors became more vulnerable with each other, and this made their discussions deeper. At the end of that first week, each instructor created a professional growth plan, which they refer to throughout the season, particularly during coaching sessions with senior staff. Throughout the season, they experienced additional professional learning sessions. Program leaders actively encourage trying out new teaching approaches, discussing progress, and planning what to do next. The reflective discussions about teaching and learning include veteran and new instructors as well as program leaders. It's commonly understood that everyone has room to grow as a teacher.

NOTES

Sections in this chapter:

"Setting Professional Learning Goals" on page 8
 "Using Beetles Professional Learning Sessions" on page 9
 "Using Student Activities as Professional Learning" on page 17
 "Building A Culture of Reflection" on page 17

Discussion norms are features that are expected of a group during discussions.

They help participants know how to effectively participate, and help them feel safe in sharing. The following is an example of discussion norms that we have used with both adults and students: Listen actively and share ideas; Share and ask for evidence; Build on ideas of others; Keep an open, curious mind; Disagree respectfully to increase understanding; and Pay attention to participation.

The Talk Science Primer (listed in the References on page 63) has more info on creating and setting Discussion Norms with a group.

Want more about student activities?

Don't worry, the whole next chapter starting on page 21 focuses on student learning experiences.

NOTES

The References, page 63, lists the primary resources we've used to shape how we think about professional learning.

Growth Mindset is the belief that our basic abilities can be improved through practice and dedication. Find more information on growth mindset and how it's related to professional learning on page 17.

Our vision for professional learning, supported by research and experience in the field, involves stimulating adult learning experiences that help participants construct deeper understandings of pedagogy, as well as important concepts and practices of science. It involves developing an attitude among field instructors that is open to being challenged and stretched to improve teaching skills and student experiences.

As seen in the vignette above, a quality professional learning system should also include enough time for reflection and discussion, a variety of mentoring and coaching structures to support instructor growth, and a safe environment for instructors to share and struggle with teaching ideas as well as to try out new strategies. Instructors' professional learning and growth should occur well beyond the confines of any particular formal experience. Engaged instructors will continue to talk about their teaching after work. A growth mindset will pervade all aspects of their work. In systems like this, professional learning is an ongoing process that is never complete because there's always something new to learn. The system described here is more expansive than many outdoor science program professional learning systems, which may consist mostly of a week-long "staff training" at the beginning of the season, in which veteran staff model student activities, share their wealth of content knowledge about the local ecosystem, and introduce logistics for working on the site. While this approach can be an efficient way to quickly orient new staff to certain aspects of a program, it doesn't provide long-term improvement of teaching for all instructors.

Setting Professional Learning Goals

The goals you choose will impact your decisions as a program leader, from sequencing adult learning experiences to creating programmatic structures. "Figure 4. Professional Learning Goals and Decisions" shows examples of how particular professional learning goals might influence the decisions you'll make.

Goals for professional learning are influenced by specific program needs and characteristics of instructors. A program that primarily uses interns as instructors might have different goals than a program with experienced instructors and/or credentialed teachers. You might find that you need to

Figure 4. Professional Learning Goals and Decisions

PL Goal	Example Professional Learning Decisions to Make
Change instructor practice	What adult-learning experiences do instructors need? What will "mastery" look like? What are the current instructional goals of staff?
Create culture of reflection	Does our program structure maximize time for instructor reflection and discussion? Am I adequately differentiating between evaluation and coaching?
Utilize staff for curriculum rewrite project	What adult-learning experiences do instructors need? How will I create a system where all instructors can be successful?

differentiate your program's long-term and short-term goals. For instance, creating a new curriculum that supports the implementation of the Next Generation Science Standards may be a long-term goal that influences your approach to the short-term focus of your professional learning. Many programs start with two improvement goals that are appropriate for most outdoor science programs: 1) supporting more student-centered instructional practices and 2) providing more nature-centered experiences for students. Although BEETLES resources can be used flexibly to support a variety of goals, all our resources deliberately address and support student-centered and nature-centered teaching and learning.

Using Beetles Professional Learning Sessions

All BEETLES professional learning resources focus on improving program leaders' capacity to support their staff in becoming the best instructors they can be. They are meant to be used by program leaders to develop a community of learners among their staff and provide a structure for reflection and growth to continually improve instruction and other program elements.

BEETLES PL Sessions are based on best practices in adult learning and have been tested by leaders of dozens of programs with their instructors. Each PL Session is based on the Learning Cycle and is designed to be an experience that inspires instructors to thoughtfully examine and make shifts in an aspect of their instructional practice.

Selecting and Sequencing PL Sessions

BEETLES PL sessions are designed to be used flexibly. They have been carefully and thoughtfully sequenced together in a variety of successful ways by program leaders with different goals. The sessions you choose and when you choose to do them will depend on your program's specific goals, needs, and context. "Figure 8. BEETLES PL Sessions At-a-Glance" on page 11 provides an overview of all the PL Sessions and comments about their use. However, there are also some common "tried and true" approaches that have proven successful for many programs. Below, three such approaches for sequencing BEETLES PL Sessions are described. The first approach is the one we most often recommend, but they've all been used successfully by different programs.

Practical Strategies >> Teaching Theory >> Science Pedagogy >> Science Content

This sequencing approach, the most commonly used by far, starts out with sessions that feel more practical and less theoretical. It's easier to understand practical strategies than more abstract theory, and it's easier to be open to and curious about theory after you've had success with practical strategies. This tends to stir up excitement about trying new approaches and openness to learning more. We've found that starting out with a session that's focused on theory can sometimes cause more resistance, especially with instructors that may be less accustomed to having academic discussions with peers as part of their job.

Figure 5. The "Practical Strategies >> Teaching Theory >> Science Pedagogy >> Science Content" Approach

First: (Practical Strategies- focused)	Then: (Teaching Theory- focused)	Next: (Science Pedagogy- focused)	Finally: (Science Content- focused)
<ul style="list-style-type: none"> <i>Making Observations</i> <i>Field Journaling with Students</i> <i>Questioning Strategies</i> 	<ul style="list-style-type: none"> <i>Teaching & Learning</i> <i>Promoting Discussion</i> <i>Constructing Understanding</i> 	<ul style="list-style-type: none"> <i>Evidence & Explanations</i> <i>Nature & Practices of Science</i> <i>Assessing for Learning</i> 	<ul style="list-style-type: none"> <i>Adaptation & Evolution</i> <i>Matter & Energy in Ecosystems</i>

NOTES

Partners and design process: Find out more about our extensive design process and numerous partners across the country and globe!

<http://beetlesproject.org/about>

PL Sessions and the Learning Cycle:

Each session is structured by phases of the Learning Cycle: Invitation: participants access their relevant prior knowledge about the topic. Exploration: they engage in the topic, usually by experiencing an outdoor student activity that exemplifies the highlighted pedagogy. Concept Invention: participants discuss teaching strategies used in the activity, linking theory with practical teaching approaches, as they makes sense of the ideas they've been exploring. Application: they consider how these ideas might be implemented into their own teaching. Reflection: participants reflect on what they learned, and how they learned it.

Common FAQ: Selecting and

sequencing PL sessions. Read this section carefully and think through the questions provided to figure out the best approach for your program.

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All BEETLES PL Sessions include both theory and practice, but *Making Observations*, *Field Journaling with Students*, and *Questioning Strategies* are lighter on the theory and heavier on the practice. These early sessions can help build a sound foundation for nature-centered, student-centered teaching. The strategies introduced are pretty straightforward to use with students and often quickly influence instructional practice. Once instructors have some successful strategies under their teaching belts, they're often ready to dive deeper into teaching theory (accompanied by more strategies), which they will get with the PL Sessions *Teaching & Learning*, *Promoting Discussion*, and *Constructing Understanding*. These sessions get instructors thinking more deeply about instruction and may require more intentional effort to apply the ideas to practice. Once instructors have had some practice thinking about teaching theory and incorporating new research-based teaching methods into their own teaching, they can then be introduced to PL Sessions that are designed to deepen instructors' knowledge of science pedagogy (*Evidence & Explanations*, *Nature & Practices of Science*, *Assessing for Learning*) and, finally, science content (*Adaptation & Evolution*, *Matter & Energy in Ecosystems*). These in-depth sessions encourage participants to immerse themselves in teaching methods specific to science. They can help bridge conversations between staff with varying amounts of science background and can inspire staff to learn more science.

1-2 Punch

Some program leaders have found it effective to create a sequence that alternates between sessions more focused on practical strategies and those more focused on teaching theory— i.e., a repeating 1-2 punch sequence. Most commonly, this approach looks something like:

Figure 6. The "1-2 Punch" Approach

	Practical Strategies-Focused	Teaching Theory-Focused
First:	<i>Making Observations</i>	<i>Teaching & Learning</i>
Then:	<i>Field Journaling with Students</i>	<i>Constructing Understanding</i>
Next:	<i>Questioning Strategies</i>	<i>Promoting Discussion</i>

A Deep Dive Example: We asked Sean Hill of Sierra Nevada Journeys, Portola, California how much time it took to present the Teaching & Learning session, and he said, "8 hours." We asked what took so long, and he said that because he saw applying the learning cycle as the linchpin of re-vamping their entire curriculum, he decided it was worth spending the whole day on it. After a thorough presentation of the session with lots of discussion, they spent the rest of the day applying the learning cycle to their curriculum, as the discussion continued. This process continued throughout their season.

Deep-Dive Into One Topic.

Figure 7. Example "Deep-Dive" Approach

First:	<i>Teaching and Learning</i>
Followed by: <i>(over the course of a season or year)</i>	<ul style="list-style-type: none"> Whole staff conversation reflecting on existing curriculum All instructors teach Lichen Exploration and reflect afterwards with the whole group. Paid time for revision of existing curriculum (see "Tale from the Field 6. Engaging Staff in Creating New Site-based Activities and Improving Existing Activities" on page 32) Whole staff discussion focused on how to structure a week based on the Learning Cycle. Observations and coaching focused on use of Learning Cycle

Figure 8. BEETLES PL Sessions At-a-Glance

PL Session	Design Element	Guiding Question(s)	Model Activities	Comments
<i>Making Observations</i>	Nature-Centered Science Instruction	How can we help students make careful observations while encouraging wonder and curiosity?	Various sensory activities; <i>I Notice, I Wonder, It Reminds Me Of</i>	Great for presenting first or early on. Lots of practical information, not as much theory.
<i>Field Journaling</i>		How can field journaling be used to support student-centered learning in nature?	<i>To Each Its Own; Plant Timeline</i> ¹	For programs that are interested in increasing the utility and relevance of student journals.
<i>Teaching & Learning</i>	How People Learn	How can we use what we know about how people learn to create effective learning experiences?	<i>Lichen Exploration</i>	Participants should have some prior experience teaching, and some experience using BEETLES activities. Not ideal for interns who've never taught as they won't have enough experiences to connect to the pedagogy. For program leaders anticipating a curriculum rewrite, this session is critical.
<i>Constructing Understanding</i>		How does learning happen and how can instructors facilitate learning?	<i>Moon Balls</i> ²	One of the more theory-rich sessions, that helps make sense of the rest of the sessions and the overall instructional approach. Perfect for staff who are still wondering about the research and ideas behind student-centered learning.
<i>Questioning Strategies</i>	Learner-Centered Instruction	How can we questions to encourage or discourage exploration and discussion?	<i>Walk & Talk</i>	Great for presenting first or early on. Lots of practical information, not as much theory.
<i>Promoting Discussion</i>		How can we nurture discussion of science ideas in the outdoors?	Variety of discussion routines	<i>More challenging strategies to implement, especially for programs with large groups. Should be preceded by Questioning Strategies.</i>
<i>Assessing for Learning</i>		Why is assessment for field instructors? What should be assessed? How and when should it be assessed?	<i>What Scientists Do; Decomposition Mission;</i>	Focuses mainly on formative assessment strategies instructors can use to improve their instruction (not summative assessment or programmatic assessment).
<i>Evidence & Explanations</i>	Thinking Like a Scientist	How can we use science to encourage students' wonder and curiosity outdoors?	<i>Nature Scene Investigators (NS)</i>	Helps cultivate an approach to exploring nature through discovering science mysteries and trying to explain them.
<i>Nature & Practices of Science</i>		What is science and how is it done?	<i>Discovery Swap</i>	Helps learners understand how science works and how to think like a scientist.
<i>Adaptation & Evolution</i>	Concepts in Environmental Science	How can we improve our understanding of adaptation and evolution to better teach students?	No model student activities included	These two content sessions explore science concepts in depth, and raise lots of questions. Be prepared to give instructors more time for research after the sessions, and to provide some ongoing adult learning experiences on these topics.
<i>Matter & Energy in Ecosystems</i>		How can we improve our understanding of matter and energy to more effectively teach students about interactions in ecosystems?	<i>Food, Build, Do, Waste and Matter & Energy Diagram</i>	

¹These model activities come from the *Opening the World Through Nature Journaling* curriculum written by Emilie Lygren and BEETLES-collaborator, John Muir Laws. More information and resources at <http://johnmuirlaws.com/>.

²*Moon balls* is our only indoor model student activity. We feel strongly that student experiences at outdoor science schools should be outdoors as much as possible. However, we've found that this activity is such a powerful adult learning experience, that it's well worth the trade-off. It can also be used with students for "rainy day" night programs.

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Extended Learning: Additional information about extending learning is described in the section of this chapter titled “Building A Culture of Reflection” on page 17.

Some program leaders have chosen to spend a substantial part of their professional learning time immersing staff in the teaching approaches from one or two BEETLES PL Sessions to fully explore a specific topic or instructional goal. For example, if curriculum revision is a priority, it’s useful to spend a significant amount of time exploring the *Teaching & Learning* session and using the Learning Cycle as a planning tool to think critically about how to make improvements to existing curriculum. Much of the professional learning throughout the year can be connected to understanding the Learning Cycle.

Feedback from our field-test sites indicates that the guiding questions included in each BEETLES PL Session are sufficiently rich, complex, and nuanced to provide recurring touchstones for a year of professional learning. Leaders have used the optional extension activities in the PL Sessions (in the “Applying Session to Instruction” section) to create an ongoing process of reflection on teaching practices. Programs with veteran staff can benefit from taking a deep-dive approach, as it can inspire instructors to move out of their comfort zone and to think intensively about a particular aspect of their teaching.

Other Lessons Learned About Sequencing

Go Slow and Be Strategic. Each PL session is designed to inspire instructors to apply strategies and make changes to teaching approaches in the field, a challenging and important part of the learning for instructors. Many leaders have recommended that the PL Sessions should be introduced and spread out gradually over time (instead of all at once during a week or two). This rhythm allows instructors experience applying each teaching approach before being introduced to the next one. Typically, when instructors have more time between PL Sessions to practice and discuss what they learned, they feel less overwhelmed and are more successful in shifting their teaching practices.

Planning for Follow-up. It’s useful to think about how to build upon and reinforce instructors’ learning after each session is presented. Planning out the

follow-up support and feedback you will provide to instructors is just as important as planning for the sequence of BEETLES PL Sessions themselves. It takes time and consistent feedback to thoughtfully integrate pedagogy into practice. Every BEETLES PL session has a section titled “Applying Session to Instruction” that provides a variety of specific strategies and suggestions for following up with participants after that session.

How Have Other Program Leaders Decided on a PL Sequence?

We asked program leaders using BEETLES PL Sessions what they considered in deciding on a sequence for their staff. Here are some responses:

- “Our perception of what staff needed. “*Making Observations*” was first as we thought it was really strong and wanted a sure ‘win’ on the first training.”
- “Logically, we wanted to give participants a context for the program and how to implement it with the *Constructing Understanding* session. Then, we wanted the most practical uses of BEETLES for our staff, so we jumped right into *Questioning Strategies*. After that, it seemed the most logical to further those ideas with *Promoting Discussion*.”
- “I thought about which one would be best for catching attention and creating buy-in from educators. I then thought of the best progression for understanding how we learn, how to make observations, how to look for/use evidence and encourage science speak, reflect on our learning and then how to put it all together with investigations.”
- “We felt that *Making Observations* was so central to what we do with our program that we wanted to do it right away.”
- “Some of the graduate students starting in the fall had very little teaching experience and we wanted to start with *Making Observations* and *Questioning Strategies* because we felt like they were foundational to the other learning sessions. We also felt that these were skills that were important for their own practice, and it was good to get them practicing and in the habit of making observations and questioning in their own learning.”

Additional Considerations For Using BEETLES Professional Learning Sessions

Introducing BEETLES to your staff. Before you start using BEETLES Professional Learning Sessions, it's worth taking time to think about how you'll introduce the BEETLES project to your entire staff (not just instructors). BEETLES field testers reported that the way they introduced BEETLES had surprisingly long-term influence on staff receptiveness. Some programs played up BEETLES as an exciting new set of resources and focused on getting instructors interested in how they could be helpful to them as they participate in a pivotal time of change in their program. Others downplayed staff worries about overwhelming changes by explaining BEETLES as resources to support and improve what they were already doing well. A common strategy used to create overall buy-in was tapping veteran opinion leaders on staff to lead the change by asking them to try out specific BEETLES activities to see how they work before introducing the PL Sessions to all instructors. Your approach to describing the BEETLES materials will depend on your staff, your existing rapport, your personality, and your leadership style.

Read and prepare for PL Sessions carefully. Read each PL Session carefully and thoroughly before leading it with instructors. There are extensive, detailed preparation instructions in each PL Session that are the result of widespread field testing with many programs. Leaders reported that they spent a significant amount of time preparing for a PL Session by reading over the presentation notes, reviewing the script, and referring to the background information provided for the presenter. All field-testers told us this was well worth the effort to become familiar with the session content and to avoid potential pitfalls.

Get an instructor to help present the PL Sessions. Since many program leaders don't have direct responsibility for teaching students, our field-testers often enlisted a lead instructor to present the student activity in each session. Almost all the PL Sessions incorporate one or more BEETLES student activities to model teaching strategies. Programs using BEETLES have found that it helps to have a respected instructor lead the activity with students in advance of presenting the Session so they have authentic first hand experiences to share when presenting the activity to instructors during the PL Session. This takes some preparation burden off the main presenter and demonstrates confidence in your best instructors. When you create an "expert" who has taught BEETLES activities with students, your staff can approach that person for advice when they try them out.

Staff need to struggle with new ideas. The PL Sessions provide field instructors with opportunities to actively struggle with new ideas and approaches, which is critical to meaningful learning. Each session takes about 3 hours to present. To some folks, that seems like a lot of time. (Of course, you could take the content from a session and simply tell it to your staff in a fraction of that time.) But if you want your staff to have meaningful shifts in the way they look at and practice instruction, that takes time. Expect and welcome their efforts to make sense of the experiences, which may include some disagreement, even heated discussion, challenging you and other leaders with tough questions about the process. Deep learning requires active processing by the learner, which manifests differently in different types of learners.

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The "Meet the BEETLES" video provides one quick and easy way to introduce BEETLES to your staff.
<https://youtu.be/VRzpjDNuMsA>

Our sessions practice what we preach. Instructors, especially novice instructors, and especially when in stressful situations, tend to fall back on teaching how they were taught. If you want them to teach with learner-centered strategies, then you should, too. Plus, it's just more effective. Yes, even with adults.

Part of a strong implementation should include building capabilities in staff to keep up BEETLES if one or two leaders leave. Plan for your eventual departure - cause it happens.

- Corky McReynolds,
retired program leader

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Sometimes those who are the most verbal and open in their skepticism end up being the most thoughtful implementers of new approaches.

Don't shortcut the struggle in PL Sessions! Program leaders who tried shortcutting the learning by skipping parts of sessions reported that they would not repeat that mistake again. The same was true for those who chose to

Tale from the Field 1. Creating a Culture of Openness

By Drew Dumsch, Executive Director at The Ecology School, Saco, Maine:

I've heard from other program leaders about some of the resistance they encountered when introducing BEETLES to their staff, but when we introduced it to our staff, we didn't encounter any resistance at all. I think that's because we already had a deliberate culture of change and innovation in place. We hire with that expectation, and we train for it too. We inculcate the perspective that there are always new ideas around the corner that can improve what we do. I used to work at a program where it was more like, "this is what we do," and I couldn't stand it. We have a culture of openness, so when BEETLES came along our staff were eager and excited to learn about it.

convert parts of a PL Session into lecture, in place of experience and facilitation. Each session is meant to be an experience staff move through, that's designed to inspire instructors to think about some aspect of science education in a different way. Taking enough time for extended discussions and experiential learning is more effective than reading about a topic or listening to someone talk about it. Successful programs reported that discussion and struggle often continues on well after the PL Session is over, as instructors begin trying out new strategies. Some programs reported getting feedback from some staff that they wanted

the sessions to move faster because they thought they understood the point quickly and didn't need a full session on the topic. These programs often found that those same instructors were those who struggled the most with implementing ideas from the Session into their instruction.

Differentiating professional learning for staff with mixed experience levels.

Outdoor program leaders implementing BEETLES agree that each PL Session provides opportunities for instructors' at all levels of teaching experience to grow. But reaching veteran instructors can sometimes present a challenge because they already feel pretty effective in teaching students and don't necessarily recognize that additional skills and approaches might allow them to be even more successful. Some strategies for working with experienced teaching staff include:

- Mix up the small groups during PL Sessions, so each includes a combination of less experienced and more experienced instructors. They'll benefit from each others' perspectives as they engage in discussions together. This helps distribute expertise among your instructors. Before you begin a session, remind veterans to be positive role models and mentors for less experienced staff. There are also advantages to sometimes creating space for expert instructors to talk among themselves.
- Don't be too worried about having experienced staff participate in a PL Session more than once. These sessions are rich enough and the discussions are wide-ranging enough that staff continue to learn, especially if you frame it in a way that encourages them to approach each learning opportunity with an open mind and a growth mindset.
- Introduce a PL Session topic as a "problem of practice" that all instructors can work on together. Veteran staff can be put-off by introducing a PL Session as a "new and better" way to teach, which implies that everything they've done before

was somehow “wrong.” It may be less jarring to introduce the materials as useful tools for thinking about and making overall improvements to instruction in your program. Encourage your staff to keep an open mind, be reflective about their teaching, and adopt a growth mindset. This will facilitate the acceptance and adoption of innovations you introduce.

- Choose experienced staff to present the model student activities in each PL Session, so they’re helping lead the charge in advocating for specific teaching approaches. Some veteran staff might be ready for additional leadership roles during a PL Session, such as leading a whole-group discussion or a section of a Session. Some program leaders gradually passed off PL Session-leading responsibilities to specific instructors.

Using slides. Leaders have had different responses to using the slides in BEETLES PL Sessions. Many instructors say the slides help them learn and track information as it’s introduced during a PL Session. But some instructors struggle with learning in this format. Some staff may be habituated to professional learning through simple, fun games and activities they can experience and use without having to think too hard. Most slides are designed to support participants by reiterating key points or providing ideas and quotes that inspire thinking. Displaying a slide usually eliminates the need to read information out loud to the group. Other slides are designed to show and keep track of the outline for the PL Session or to provide group instructions. If your program has developed a fairly academic professional learning culture, then you’ll probably find them receptive to this format. If your staff is unaccustomed to using slides during professional learning, then you can fairly easily alter the format to suit their needs. Some leaders have opted to present entire sessions outdoors, using printed copies of slides or whiteboards to write out instructions and other important information during the Session.

Professional Learning Session Planning Summary

Keep in mind the long-term learning trajectory for your staff can ensure that instructors have the best chance to develop, practice, and improve their teaching skills. While you may be very excited to use the BEETLES approach, jumping in too fast or without adequate framing can create some resistance. Field instructors tend to get a lot of positive feedback for doing what they do, which can make it very difficult for them to risk changes to their practice and to accurately evaluate success. You’ll need to discuss with your staff how these PL Sessions can help them meet their goals for students and provide support for improving the program overall. These conversations, the first steps in creating a culture of reflection, will help provide instructors with motivation for improvement.

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Tale from the Field 2. Focusing on the Long Term: How We Overcame Resistance

By Heather MacDougall, Director of Santa Cruz Outdoor Science School,
Watsonville, California.

When we first started implementing BEETLES we met some resistance, but we've since made a big leap away from that. Here's how:

We've changed the way we do job interviews. We talk about how we've adopted new curriculum: BEETLES. We let potential employees know right away that we're going to expect them to be able to change their teaching style, and they need to be OK with that. We look for familiarity with BEETLES/student-centered teaching. We've also changed our interview questions: we ask, "tell us how you would teach about decomposition or adaptation." One of the things we're looking for is whether or not they include a discussion on the topic. We also have them teach a lesson. We ask, "are you open to learning new teaching styles and philosophies?" They always say 'yes,' but it's interesting what they add to that. We have about a two year turnover on teaching staff, which allows us to grow and change our culture relatively quickly.

We've empowered our Lead Field Instructor to have a pivotal role. Our Lead Field Instructor has been a huge asset. They have some authority, but are also teaching all the time. We've found that the Lead Field Instructor needs to have 100% buy-in because they need to be able to "cheerlead." Since they also teach in the program, other instructors can more easily connect with them, as a more experienced person doing the same work. They also see what's going on out there more than a director does, so I trust them to make the call - what does the staff need now to keep growing? They can also share their own successes/struggles/reflections about teaching with staff, to set that as a norm and to help define the culture as self-reflective.

It takes a lot of work. It's not easy. People will revert back, until you reach the tipping point when this way of teaching has become your program's culture. We would focus on a student activity at the beginning of each week and let folks know that they all needed to teach it at some point during the week. At the end of the week, we'd talk about successes and challenges. This creates an "everybody's doing it, so I better do it so I have something to share" feeling.

Through these, and other discussions, I can get an idea of who's doing it and who's not. It's where individuals' relationship to BEETLES/teaching becomes apparent and where their fears or challenges come out. Obstacles that get in the way of doing it, such as fears, or if their value as a teacher feels threatened, come forward. Sometimes because they say it and sometimes you just notice it. Those issues we address individually. One instructor came to us from a very science=facts program. We had to have a lot of conversations, about things like, "you don't need to tell them all this information they can easily get online."

The book *Switch* has been helpful to me. In it, the authors [Chip Heath and Dan Heath] describe how human decision-making is like a tiny rider on a huge elephant. The rider is logical thought that thinks it's in charge. The elephant is emotion, and it always wins. They suggest that for change to take place you need to direct the rider, motivate the elephant, and shape the path. An effective way to direct the rider is by focusing on what is working well and expanding on it. An experience or a story often is effective to motivate the elephant. Then, you shape the path by making change "easy," removing as many obstacles as you can. One of the ways we've done that has been by providing plenty of staff reflection and planning time, and it's within the work day, not on instructors' own time. They are given planning time everyday. I think resistance comes from people's emotions, not their rational thoughts, and I try to appeal to their emotional experiences by supporting them as they develop new teaching styles.

Without some "top down" directives to change, I don't think changes would've happened, but the peer to peer influence is more powerful, and that's part of why our lead instructor is so influential. That's why I've given them a lot of power to do whatever they think is right to implement. One programmatic feature that helped inspire more peer-to-peer influence has been increased opportunities for peer observations. One week we didn't have many students so we had "peer observation week." All instructors were paired up, and each pair took turns teaching or observing each other, using reflective teaching tools. That way, everyone got experience following/giving coaching/being coached. The staff learned from this, appreciated it, and wanted to do it again. A takeaway has been that they really appreciate peer review. Now, whenever we have a staff member who is not teaching during a program, they use Reflective Teaching Tools and observe different staff each day.

Heather is referring to:
Heath, C., & Heath, D. (2010). *Switch: How to change things when change is hard.*
New York, NY: Random House.
<http://heathbrothers.com/books/switch/>

See BEETLES Reflective Teaching Tools
<http://beetlesproject.org/resources/reflective-teaching-tools/>

Using Student Activities as Professional Learning

BEETLES student activities can be used to create professional learning experiences for staff. The two primary methods of using student activities as professional learning are described below.

Modeling Student Activities. Some programs have introduced BEETLES student activities to instructors, before presenting the PL Sessions. This allows instructors who are new to this type of instruction to get a feel for it. Leaders using this “try it out first approach” emphasized that it was important to encourage instructors to lead the activities as written, since instructors not familiar with the pedagogy may be tempted skip steps of the learning cycle or convert broad questions to narrow, without a thorough understanding of the underlying principles behind the teaching approach. After instructors have some experience leading model activities with students in the field, they are curious, anticipating the PL Sessions, and have instructional experiences to draw upon when participating in the session.

Curriculum Revision. After introducing BEETLES through PL Sessions and/or student activities, some programs have had instructors apply their new teaching approaches to revising the curriculum used in the program. Several programs have used BEETLES materials to help launch a large-scale curriculum revision effort. Some programs have used the *Teaching & Learning* session to introduce the learning cycle first, while others have had senior staff incorporate the learning cycle into their program’s written activities before formally introducing this instructional model in the BEETLES PL Session. Regardless of the order of events, it’s important for the curriculum you’re using to be aligned with and supportive of the pedagogy you’re encouraging. Instructors, like any professionals, need the right tool for the right job. The less adapting of curriculum your instructors have to do, the more likely they are to make the instructional shifts you’re aiming for.

Building A Culture of Reflection

An outdoor science program can be an amazing laboratory for developing the “art of instruction” where instructors push themselves and each other, focus on developing teaching skills, consistently try out new student activities, and continually reflect on teaching and learning. In this kind of setting, becoming a good instructor involves more than just learning a “shtick” and being able to consistently present it in an entertaining way. When a teaching staff has a healthy reflective learning culture in place, you can feel it. It’s exciting and stimulating to be part of a community trying out new approaches and discussing successes and challenges with peers. Program leaders who support this kind of reflective culture help young field instructors develop into thoughtful educators who go on to have rewarding careers in science, education, and beyond, and continue to impact the world in meaningful ways.

Establishing a reflective learning culture provides a foundation for growth and change within your program. Research on teacher learning argues strongly for including reflective practice for both new and veteran teachers. And, it just makes sense that instructors who actively think about the effectiveness of their teaching, discuss these issues with colleagues, and develop strategies

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Find more about curriculum revision in the sections, “Adapting Your Existing Activities” on page 30 and “Creating New Activities” on page 30

For research specifically on learning culture, reflective practice, and professional learning communities in the References list, page 63.

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Growth Mindset emerged out of the work of Carol Dweck, a Stanford researcher. Her TED talk (https://www.ted.com/talks/carol_dweck_the_power_of_believing_that_you_can_improve) provides a great introduction on the topic and her book, *Mindset*, dives into more details.

What is a professional learning community? A professional learning community (PLC) is created when educators engage in sustained discussions and activities together to learn about teaching and learning, in order to be more successful when instructing their students. Key components of PLC's are sharing teaching experiences with colleagues, discussing evidence of student learning, and creatively acting on suggestions for improvement.

BEETLES Reflective Teaching Tools include: a summary of reflective teaching, an outline for following up on professional learning sessions by asking staff to set instructional improvement goals and reflect on successes and challenges, a set of coaching tools (including Do's & Don't's and a variety of forms), and an observation checklist.
<http://beetlesproject.org/resources/reflective-teaching-tools/>

to improve, will make more progress than those who aren't given these opportunities and structures for collaboration and ongoing support.

Working towards a common goal. Establishing a somewhat formalized “professional learning community” can encourage instructors to adopt new approaches to teaching and learning. The central idea is that every member of the community is working toward a common goal of figuring out the best teaching approaches and strategies to reach the audience for the program—and there is a regular structure in place to help everyone work together. A professional learning community must establish a clear goal like, “creating the best possible learning experiences for our students.” Programs that actively cultivate openness and growth among staff explicitly state that they have a goal of staff exploring different strategies to improve instruction. They also provide meeting time for staff to share examples of student work or debrief how a new activity went in order to learn what works best. Professional learning communities use specific discussion protocols that structure conversations to ensure an attitude of learning from practice rather than evaluating performance. When all staff are focused on achieving common goals, and when program leaders are equally focused on providing necessary support to instructors through coaching and mentoring, a learning community can form that leads to improved performance and increased job satisfaction.

Encouraging a growth mindset among instructors. An essential characteristic of a professional learning community is that members adopt a growth mindset. This means they understand that the abilities of individual learners (their students and themselves) can change and are not fixed or primarily due to innate talent. For example, an instructor who leads an unsuccessful discussion might then decide to not try leading discussions again because they're not good at it or they are convinced their students can't do it. An instructor with a growth mindset is more likely to think about what didn't work, look into the sorts of abilities they can develop to overcome that issue next time, and try again (and again, and again...). When instructors and program leaders truly believe teaching abilities can grow (and that we all have room to grow!), they're more willing to make adjustments to their instructional practices and try out new strategies and approaches. Program leaders who nurture a growth mindset create an environment of receptivity that helps instructors build and improve their teaching skills.

Creating structures for coaching and mentoring staff. Many of the programs implementing BEETLES PL Sessions incorporate the topics and pedagogy from the PL Sessions into their coaching and mentoring programs. Studies of professional learning models report that a critical aspect of improving teaching practices is receiving timely feedback from more experienced educators and peers, and this has been a recurring theme among those successfully implementing BEETLES materials, as well. Observing an instructor and engaging with them in discussion about teaching strategies and approaches can be a very effective way to improve specific teaching practices. BEETLES Reflective Teaching Tools assist program leaders to observe students, then provide feedback that can help instructors meet their goals and make adjustments to teaching.

Tale from the Field 3. Setting a tone: How we Develop a Learning Culture Among Staff

By Ray Cramer, Senior Faculty for Teaching Practicum at Islandwood, Bainbridge Island, Washington.

As a graduate program, Islandwood has focused on developing a culture of learning within their instructional staff for many years. Here's a brief synopsis of how they do it:

Challenge people's ideas of what science looks like and how we talk about it. This is a key feature of what we do with both students and staff. For example, instead of telling students, "we're being scientists," we encourage them to say, "we're thinking like scientists." This is a subtle, but important distinction. The first statement may ring false as students may think, "I'm not a scientist, I'm a fifth grader." The second statement implies that no matter who you are, what you do, or your profession, everyone can develop their abilities to think like a scientist.

Develop growth mindset. This is a key feature of what we do with both students and staff. A "fixed mindset" implies that we are born with certain abilities. One way we encourage growth mindset with instructors is by telling them, "You can be a superstar instructor. It's not innate, and it's not a secret how to do it. We know what the skills are that you need to be a superstar teacher, and we know how to help you develop them. How? You need to embrace mistakes. You need to try to talk about reality –what really happened– as accurately and honestly as you can."

Helping instructors apply principles. Cohorts of instructors build principles they want to follow when teaching, when talking to each other, when interacting with other groups, sharing space, when planning their day, etc. These agreements are posted in a staff area. They also have a list of principles of instruction that they each write, alter, and try to follow. These are also posted.

Instructors create professional growth plans. These are created with the help of a mentor and are modeled after those used by pre-service teachers in credential programs in Washington state, called Dispositions of a Whole Life Educator. They look at dispositions, skills, and knowledge goals they want to focus on for that season. They're aiming to keep all principles in mind, but their professional growth plan is the one they focus on. Their goals are informed by the principles, but are different.

Observations of Instructors. Instructors are observed once a week. The instructors are expected to tell the observer what to look for. If they say, "I'd like you to look for evidence of student engagement," then we ask, "What does that look like? What exactly are the 'look fors' I should be watching for?" For example, "Am I responding equally to wrong answers without giving hints?" or "What's the gender balance in those I am calling on?" We try to keep the observations "in their court." It adds to the spirit of them being observed, not evaluated. It's us working together to learn, grow, and look for evidence. They get a write-up of each observation. They also get a 5 minute video of their instruction. They're encouraged to be directive about what they want recorded, and it should be something relevant. For example, "I want you to record the students reaction to this prompt..." or, "Can you film how I respond to student comments during discussion?"

Journaling. They journal every week, based on a prompt from Monday. They don't have to write on that prompt but it's a fall back option. They are encouraged to take risks that get others reading and thinking. They're asked to read each other's blog entries and comment, and they get to see how many hits and comments they got. Their mentor gets an email anytime there's a post or comment so they can see what the mentee is thinking about. This information feeds into our one on one meetings that happen every week.

Field instructors often have opportunities to lead the same activities with different groups of students, and given appropriate feedback, they can effectively fine-tune their teaching skills. Providing reflective time during staff meetings, creating paid opportunities for staff to get together and discuss their teaching, and organizing a structure for peer-coaching (among other things) supports continual improvement and allows instructors to learn from each other's experiences.

The Value of Natural History: Your staff culture should also encourage ongoing curiosity about natural history. Although some instructors come to the field with an existing interest and background in natural history, some don't, and they may need support to develop a practice for learning about local natural history. This might include a field journaling or nature study practice, learning opportunities led by knowledgeable staff or outside experts, requiring each to choose an aspect of natural history to focus on, or mentorship from other instructors who have more experience in the area.

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Some possible examples of feedback instructors could ask for could include:

- “I’d like you to look for evidence of student engagement,”
- “Am I responding equally to wrong answers without giving hints?”
- “What’s the gender balance in those I am calling on?”
- Then, coaches/mentors can ask: “What does that look like for your students? What are the ‘look fors’ I should be watching that would indicate students are engaged?”

- Ray Cramer, from Islandwood

Differentiating between evaluation and coaching. It’s important to distinguish performance evaluation efforts from coaching. Evaluation efforts primarily focus on informing the program or individual about how well they’re meeting specific goals and expectations. Coaching, on the other hand, usually has the distinct purpose of improving practice.

Evaluation: When observing instructors for evaluation purposes, the criteria for success should be clearly communicated well in advance and can take the form of a checklist of teaching or student behaviors. The evaluative feedback provided is to let the instructor know how well they’re meeting expectations.

Coaching: Coaching or mentoring focuses on observations rather than evaluations or interpretations. The coach asks the instructor to choose a particular teaching strategy or technique they’d like to work on by receiving observational feedback about what actually happened. Program leaders have emphasized that instructors are much more open to feedback about their teaching when it feels like a collaborative discussion and when they have permission to try new, challenging things that they might not succeed at the first time. Coaches can support instructors to make their own thoughtful adjustments and improvements. Negative or positive evaluative feedback during this kind of learning process can actually undermine instructors’ success.

Tale from the Field 4. A Structure for Reflection: How We Organize Our Post-Program Debrief Lunch Meeting Routine

By Ray Cramer, Senior Faculty for Teaching Practicum at Islandwood, Bainbridge Island, Washington.

This is an example of how the Islandwood Graduate Program structures their post-program debrief meeting to maximize reflection and learning.

Outline of the Post Program Debrief Lunch Meeting Routine:

1. Get good food, and sit in groups with mentors
2. Discuss: Food, stories, question of the week
3. Whole group/small group: What would you Do?
4. Whole group share: Stories From the Week
5. Leaders share teacher feedback
6. Logistics
7. Gratitudes
8. Announcements

Instructors get good food, sit in mentor/mentee groups, and discuss their week: Program leaders ask staff to not “give it all away” to the kids on the final day of their 4 day program, so they have some energy for the debrief lunch. The kitchen staff prepares a high quality adult meal for this meeting. Once the kids are put on the buses, everyone on staff grabs a lunch, sits with their mentor/mentee group of 3-5, and engages in discussion about stories from the week and general chatting. Then, these groups dig into discussing the “topic of the week” that was introduced on the first day of the program.

What would you do? Sometimes, the whole group engages in the routine, “What Would You Do?” in which an instructor describes a challenging instructional situation they found themselves in, but stops short of describing the decision they made in the moment. The rest of the group is asked to discuss in table groups, “what would you do if you were the instructor in this situation”, including how and how that response informs their theory of learning (or vice versa). Some of these ideas are shared out with the whole group. Then, the person who posed the question describes what they actually did. Before they share, the leader reminds everyone that there’s some risk involved for the person who is sharing. They’re putting themselves “out there.” The leader explains that the group just spent ~15 minutes with lots of brainpower and little risk thinking about what to do, while the instructor in the actual situation had only seconds. It’s acknowledged that what the instructor did was probably less nuanced and elegant than the ideas they just suggested. This routine improves instructional decision-making and also helps keep the instructors open and vulnerable.

Whole group share: Stories From the Week. Folks who functioned in a semi-leadership role during the week lead “Stories From the Week,” calling on a few instructors to share highlights from the program.

Leaders share teacher feedback, logistics, gratitudes, announcements. Leaders share feedback and general impressions that classroom teachers gave with the whole group. Any logistics that need to be discussed are brought up (e.g., “there’s a fallen tree on Ridge Trail,” “The spotting scope needs repair,” etc.). Anyone in the group is invited to share gratitudes (what are you thankful for from this week: people, opportunities, how kids approached the week, how teachers supported kids, etc.). Finally, any necessary announcements are made.

This whole process takes about ~2 hrs. 15 min., but it really functions as a feast for stomachs and a feast for the brain and some steps could be omitted to work within the context of your program.

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Questions to Help Determine Your Approach to Professional Learning

Choosing PL sessions:

- What are our professional learning goals? What do we want to accomplish?
- Which sessions are most likely to get our instructors interested in shifting their instruction and least likely to inspire resistance?
- What are the teaching strategies we want instructors to think about when teaching and designing programs?
- What are the current strengths and weaknesses of instruction at our site?
- What do our instructors think successful teaching and learning look like? Does their understanding match our program's goals? If not, what sessions might shift their understanding?
- What are the areas of expertise of leaders and lead instructors who will be presenting PL sessions?

General considerations:

- What is the overall learning culture of our staff? How can we make it a safer space for trying out and discussing new ideas and approaches?
- How can we make reflecting on instruction an integral part of our staff meetings?
- Does our staff value a reflective, evidence-based approach to learning how to be better instructors?
- What can we do to help make sure our staff implements the instructional practices? How will we know if our staff is incorporating what they learn into their practice?
- How can timely feedback be given to staff that will help support their growth as instructors?
- How can we support each other to create more student-centered and nature-centered learning experiences for students?
- Are there any topics or areas we think staff might be resistant to? Is there anything we might do ahead of time to ease that resistance?
- Does our staff see their job more as camp counselors or as professional outdoor science instructors?
- What are some challenges we anticipate related to the PL Sessions? How do we think our staff will respond? How receptive do we think our staff will be to discussing pedagogical theory and other academic aspects of instruction? How might we prepare them to be receptive?
- What's our plan for making sure there's time for continuing conversations after a PL session?

Chapter 2. Supporting High Quality Student Experiences

How can we ensure that all our students receive high quality learning experiences?

A Vision for High Quality Teaching and Learning: A Vignette

A hiking group is walking towards the creek. Everyone in the group –adults and students– is walking and talking about a question just posed by the field instructor: “What kinds of adaptations might we find in organisms that live in the stream?” The previous question they discussed was about how conditions in water are different than on land. The air is filled with enthusiastic conversations. “Some of them may go up to the surface to get air.” “Some might get oxygen out of the water.” The instructor stops the group. A few students share out ideas they discussed with their partners. It turns out that some students are confused about how gills take oxygen out of water, so the instructor asks three students to say what their ideas are, then fills in the gaps of what they haven’t figured out. When they get to the creek, the instructor sets boundaries, then gives the group 5 minutes to run around and explore. The area is filled with students moving about, stopping, pointing, kneeling or laying down, picking things up, and generally exploring. “There’s fish in there, look!”

The instructor signals them to stop, and they sit while the instructor explains what they’ll be doing next. Their job will be to work in pairs to find and catch organisms, then put them in clear cups of water. The instructor quickly models different ways of doing this, such as using a net or by examining the undersides of rocks. They also model how students will later do a scientific drawing of an organism, and write about it, emphasizing that it’s not about making a pretty picture, but about gathering data through drawing. For 15 minutes, the students eagerly catch organisms, while the instructor explores with them.

The instructor calls time, and each pair chooses one organism to focus on. Pairs sit together and carefully draw their organism, keeping up dialogue about what they’re observing, and questions and ideas they have. “Are those legs or antennae?” “Look, it moves both backwards and forwards!” Some students are more focused on observing, some on drawing, some on writing, but they’re all engaged. After ~10 minutes, the instructor passes out an identification key and a small book with information about stream organisms to each pair. They work together to key out their critter, then read about it from the other book. The instructor and a chaperone help out with how to use the keys. Some student questions and ideas are answered and confirmed, and new questions come up.

The instructor calls time, and one member of each pair stays with their organism, while the other roams around, checking out the organisms other students have chosen to focus on. After a few minutes, students switch roles. The area is filled with students checking out each other’s organisms, drawings and notes, and talking about the organisms.

At the end of the activity, students put back materials and grab their packs. As they walk away from the creek in pairs, the instructor gives them a series of questions to discuss, such as, “What questions do you still have about the organism you studied?” and “What were some different adaptations you saw in the different organisms?” Students continue to talk excitedly as they walk down the trail.

NOTES

This chapter will address each of these elements in the following sections:
 “Implementing BEETLES Student Activities” on page 25
 “Adapting Your Existing Activities” on page 30
 “Creating New Activities” on page 30
 “Making Program-level Changes to Support High Quality Student Experiences” on page 32

Behind the vision: this vision is based on a creek-focused version of *Discovery Swap*, a BEETLES exploration routine (*Discovery Swap* can also be used to investigate other ecosystems). The pair talk at the beginning and ending are from the BEETLES discussion routine, *Walk & Talk*.

NOTES

Student-centered, nature-centered: We often describe the BEETLES approach to teaching and learning as being “student-centered” and “nature-centered.” This is our shorthand way of referring to all four design principles. Engaging directly with nature and thinking like a scientist make experiences nature-centered, and learning through discussions, utilizing the Learning Cycle, and creating opportunities for students lived experiences and cultural identities make them student-centered.

Each of these design principles is addressed by specific PL Sessions. See “Figure 8. BEETLES PL Sessions At-a-Glance” on page 11 for more information.

No cookie cutter programs: BEETLES is not in the business of standardizing or homogenizing programs, or attempting to remove a program’s or instructor’s autonomy. We create flexible resources for programs to use how they see fit within their context.

Debriefing the Vignette

This vignette showcases the five design principles for high quality instruction incorporated into BEETLES student experiences:

- **Engage directly with nature.** The instructor set up the experience to be nature-centered, to help students develop a desire to explore nature and the skills to do it. The students explored, observed, drew, and asked questions about organisms they found. As they spent time with the organisms, particularly their focus organism, they learned about them, while also deepening their relationship with nature.
- **Think like a scientist.** They learned that nature is filled with mysteries, and that it’s fun and interesting to try to figure them out through observations, evidence, reasoning, and discussion. As students made observations and asked questions about their organisms, their curiosity exploded. As they used informational text to answer some of their questions, they further developed field science skills. As they came up with and shared evidence-based explanations for what they saw, they developed academic language.
- **Learn through discussions.** The discussion questions at the beginning helped students begin thinking about the topic and got them interested. Through talking with peers, they exchanged and tried out ideas. In the whole group, the instructor used follow-up questions and added occasional content to guide the conversation. The instructor listened for what students understood, what they were confused about, and what they were interested in, then used that information to guide instruction to be centered around the interests, needs, and abilities of the students. The discussion helped keep the experience student-centered, not instructor-centered.
- **Experience instruction based on how people learn.** The experience was based on the Learning Cycle. It began with students accessing their prior knowledge and becoming engaged (Invitation), then students explored the ecosystem, and the organisms that live in it (Exploration). They accessed content through their own observations, discussion, informational text, and from their instructor (Concept Invention). They applied what they learned as they talked about their organisms with others and as they expanded their observations to include other organisms (Application), and finally, through paired discussion, they reflected back on the experience, what they learned, and how they learned it (Reflection).
- **Learn through instruction that affirms their lived experiences and cultural identities.** The *Walk & Talk* at the beginning of this experience creates opportunities for students to discuss ideas with each other and with adult chaperones, creating a safer space for students to explore new ideas, make connections to previous experiences, or potentially use a more comfortable language. As they explore organisms, students have autonomy to move at their own pace and all students have equal access to learning about something they can directly interact with, instead of relying on prior experience or knowledge that only some students might have. As students share with each other, they have the opportunity to be in the role of teacher as well as learner. As learners, the lack of a timed rotation provides more autonomy to follow their own interests. Throughout the activity, students are asked to engage in content in multiple ways (discussing, drawing, writing, sharing).

Teaching and learning as described above doesn’t just happen. *Discovery Swap* was designed to engage students in student-centered and nature-centered learning. It was tested by a wide range of instructors and revised based on feedback. It’s an example of what we mean when we say, “high quality instructional materials.” The most reliable way to ensure high quality instruction in your program is to provide high quality instructional materials.

Quality materials help ensure a baseline experience for every student who walks through your doors (or trees!). If a beginning instructor and a very experienced instructor both lead *Discovery Swap* as written, you’ll know that every student in each of their groups will get to spend time engaging directly with nature, discussing ideas with peers, and deepening their understanding of science ideas, even if there’s variation in the instructor’s skill levels. This chapter focuses on how to make sure your instructors have quality teaching

materials to use with students, through: 1) using published activities (like BEETLES) that are research-based and tested, 2) adapting and improving your existing activities, or 3) creating new activities using research-based pedagogy. You may also need to assess whether your overall program structure supports the thoughtful use of those materials.

Coaching, reflection, and professional learning (described in the previous chapter) are also critical pieces of a program. Without understanding the pedagogy behind it, an instructor may adapt a student activity in ways that make it less effective. More knowledgeable instructors will use instructional materials in more expert and sophisticated ways, and professional learning focused on best practices helps staff make more informed in-the-moment decisions with their students.

Implementing BEETLES Student Activities

BEETLES student activities are not meant to be a comprehensive curriculum, and there is no “right” way to implement them. Programs use the activities to support their goals and their students’ learning. They’re meant to be used in tandem with professional learning sessions, so instructors can develop their understanding of why they’re teaching a certain way at the same time that they’re learning how to teach that way.

BEETLES activities are student-centered, discussion based, nature-centered, help students develop scientific habits of mind, and follow the Learning Cycle.

Figure 9. BEETLES Student Activities At-a-Glance

	Description
Exploration Routines	These activities can be used again and again in different settings to promote exploration, curiosity, and a scientific mindset.
Discussion Routines	These activities can be used again and again to promote and structure discussion
Focused Explorations	These activities help students spend sustained time exploring a certain feature of nature, such as lichen, bark beetles or a decomposing log
Field Journaling	These activities support other learning experiences by helping students observe nature deeply through engaging in field journaling as scientists do. (these aren’t BEETLES activities, they were developed by our friend, John Muir Laws, in partnership with fellow BEETLE Emilie Lygren, and are available at www.johnmurlaws.com)
Assessment & Reflection	These activities help students reflect on their learning, and reveal what they understand to instructors.
Science Investigations	These activities help students plan, conduct, and make sense of field science investigations
Concept-Focused	These activities help students develop deep understanding of concepts like Adaptations or Matter and Energy in Ecosystems.
Night Sky	These activities are used on a night field experience or in an indoor night program
Classroom (Pre- & Post)	Activities for classroom teachers that help prepare students for outdoor science programs and extend some of the benefits of outdoor science learning experiences into the classroom.

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Curriculum vs Instructional Materials:

Curriculum usually refers to an instructor’s plan for teaching that is intended to meet particular learning goals or outcomes for students. Curriculum can also refer to a plan for a longer set of units or courses, often delivered over an extended period (several months or years) that together will achieve broader learning objectives. The term “instructional materials” refers to any materials that describe what or how to teach, and can include lessons, units, text books, simulations, manipulatives, videos, etc.

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3 examples of possible sequences:

Inquiry Sequence: *Walk & Talk >> NSI: Nature Scene Investigators >> Case of the Disappearing Log >> Discovery Swap >> Walk & Talk*

Adaptations Sequence: *Whacky Adapt >> Adaptations Intro Live! >> Walk & Talk >> I Notice, I Wonder, It Reminds Me of >> Structures & Behaviors >> Spider Exploration >> Interview an Organism >> Walk & Talk*

Ecosystems, Matter & Energy Sequence: *You Are What You Eat >> I Notice, I Wonder, It Reminds Me Of >> Food Build Do Waste >> Decomposition Mission >> Card Hike: Ecosystems Matter & Energy focus >> Walk & Talk*

For more ideas and guidance on sequencing, see the *Planning a Themed Hike: Ecosystems, Matter & Energy* or *Planning a Themed Hike: Adaptations*.

More about “educative curriculum” on page 29

If those are goals of your program, BEETLES activities will serve you well. There are enough BEETLES activities to fill several days of programming, and they can be sequenced together to create cohesive experiences in nature, sometimes delving deeply into complex concepts. BEETLES activities can also be combined with other activities, or they can simply serve as model activities to help instructors get a feel for high quality instruction.

We’ve organized our student activities into a series of categories to help instructors and program leaders understand the characteristics and value of each type of activity and also to help them make informed decisions about when and how to use each activity with students. “Figure 9. BEETLES Student Activities At-a-Glance” on page 25 describes each category.

Introducing Instructors to BEETLES Student Activities

Make a plan for how your instructors will learn about and use new student activities within your program. BEETLES Activity Guides are meant to be educative (instructors learn about teaching by using the activities). They include background science information, information about the pedagogy behind the activity, common misconceptions, and instructional options for different situations, among other things. It won’t work for an instructor to pick one up five minutes before they teach it. Make it an expectation that as professionals, instructors will take the time to carefully read Activity Guides before teaching. Having a plan for introducing BEETLES activities to instructors will lead to higher impact experiences for students. Here are some strategies used by different programs:

- Model a new student activity, embedded in a PL Session or during other professional learning, then ask instructors to lead the activity within the next few weeks. Follow up with group discussion and reflection.
- Get to know a few activities yourself, or ask senior instructors to, by teaching them several times to students. Then, less experienced teaching staff have someone to discuss with or ask questions of related to those activities.
- Designate an instructor who is enthusiastic about BEETLES to regularly share new student activities with other instructors, as well as help them access and use necessary materials.
- Keep a binder with hard copies of all the student activities in your staff room so instructors can peruse it during their down time.
- Maintain a location where materials are pre-assembled for each activity that has been introduced to instructors. Include printed handouts (if there are any), a field card, hand lenses, etc. Check frequently to make sure materials are maintained (or assign someone else to).

Where's the content?

Sometimes instructors (and leaders) new to BEETLES student activities ask, "Where's the content?" or "Where's the science?" Some instructors think of science content exclusively as facts and names of organisms, and think teaching science is the process of delivering facts, definitions, and names to students. Telling students names, facts, and concepts – even if you tell them in engaging and entertaining ways – tends to result in short term memorization (at best) that is often quickly forgotten and not deep, meaningful learning. Facts can be interesting, useful, and fun. Names are very useful to categorize, remember, and communicate information. Students need to learn some facts and names during an outdoor experience, but they're best learned in the context of understanding bigger science concepts. BEETLES activities focus less on teaching students names and facts, and more on students deepening their understanding of challenging, relevant science concepts. If your instructors ask "where's the content" as they teach BEETLES activities, point out how each activity provides opportunity for student engagement with nature and deeper understanding of a small number of important concepts.

"Content" is much more than just facts about science. For example, in the BEETLES activity *Discovery Swap* students learn content throughout the entire activity. When students construct explanations about how a structure or behavior might help an organism, they're not only learning about that organism and how it survives in its environment; they're learning how to construct an explanation, including using evidence and reasoning to support their explanation. When students discuss their thoughts with their peers, or in the large group, they learn how to communicate ideas, how to listen to others, and how to work towards a deeper understanding. When students look at nature through the cross-cutting concept of patterns to try to notice where water striders are found in a stream, they learn about water striders while simultaneously deepening their ability to notice and make sense of patterns in the world. All of that is content. Help instructors to recognize it as content and see the value of it in their teaching.

How Learning Happens: For more information on how learning happens, see the National Research Council (2000; 2007; 2010) for more information.

The Zeigarnik effect is the idea in psychology that people are better at remembering details of uncompleted tasks than they are at remembering details of completed tasks. When we learn the name of something, it often completes the task, if the goal was learning the name. This effect helps explain why learners will often stop observing and inquiring, and move on to something else once they've learned the name for something. See Zeigarnik (1967) for more information.

Suggested Order of Introducing BEETLES Activities to Staff

All BEETLES student activities have been tested by many instructors, and we don't publish them until we know they've been successful with many different groups of students in many different parts of the country. Still, some BEETLES activities are more challenging to lead than others, especially for instructors with little experience leading students in genuine exploration, science discussions (which can be particularly challenging), or with teaching in general. We've learned which activities are easier for most instructors who have little experience teaching outdoors using student/nature-centered approaches and which activities are better led by instructors with some experience under their belt.

"Figure 10. Introducing Staff to BEETLES Activities" shows recommendations for when instructors might begin learning and using each student activity. (Note: it's *not* a chart of when instructors should introduce activities to students.) Activities on the left side of the chart tend to be easier to lead, and those towards the right tend to require more experience. Using those towards the left can help an instructor build the skills needed to eventually lead the activities towards the right.

If you have instructors new to this type of teaching, and you're trying to figure out which activities to get them started, one way to use this chart would be to look at the second column and choose activities from there. Another way to use it would be to choose the goals you have for introducing student activities to your staff, choose which of the categories are most relevant to your goals, and then look at that row for guidance on a suggested sequence for introducing these activities to your staff. Your goals for introducing activities to instructors might include: giving instructors experience with carefully crafted activities to

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Understanding Figure 10: This chart shouldn't impact when you decide to do PL Sessions with your staff. Present PL Sessions when they best support your goals for your staff, and don't avoid doing a PL Session because it includes an activity to the right side of this chart. But try to avoid introducing staff to a BEETLES activity they'll experience soon in a PL Session. This will help the PL Session have its full impact on the staff.

Refer back to "Figure 8. BEETLES PL Sessions At-a-Glance" on page 11 to see which activities are included in each PL Session.

We suggest that all programs embrace Exploration Routines, Focused Explorations, and Discussion Routines, but other rows of the chart will not be relevant to all programs.

These Field Journaling activities come from the *Opening the World Through Nature Journaling* curriculum written by Emilie Lygren and BEETLES-collaborator, John Muir Laws.

help them learn pedagogy; increasing the amount of certain types of activities you want in your program, such as exploration, discussion, or field journaling; helping instructors lead conceptual sequences with students, such as adaptations or ecosystems hikes; or helping instructors get better at guiding students to conduct their own science investigations.

Figure 10. Introducing Staff to BEETLES Activities

Activity Category	Less challenging to teach <<----->> More challenging to teach		
Exploration Routine	<i>I notice, I wonder, It reminds me of</i>	<i>Discovery Swap; Interview an Organism; What Lives Here</i>	<i>NSI: Nature Scene Investigators</i>
Focused Explorations	<i>Lichen Exploration; Bark Beetles Exploration; Case of the Disappearing Log; Fungi Exploration; Stream Exploration;</i>		
Discussion Routines	<i>Walk & Talk; Thought Swap; Turn & Talk; Think-Pair-Share</i>	<i>Whip Around; Tape Recorders; Two Cents</i>	<i>Argumentation Routine</i>
Field Journaling	<i>To Each Its Own; Comparison; Zoom in, Zoom Out; Plant Scavenger Hunt</i>	<i>Plant Timeline; Make a Field Guide</i>	<i>Mapping; Cross Section' Timed Behavioral Observations</i>
Reflections & Assessments	<i>Mind Pie</i>	<i>What Scientists Do</i>	
Investigations			<i>Spider Investigation; Exploratory Investigation</i>
Ecosystem, Matter, & Energy-focused	<i>Adaptations Intro Live; Whacky Adapty</i>	<i>Structures & Behaviors;</i>	<i>Related & Different</i>
Adaptations-focused	<i>You Are What You Eat</i>	<i>Decomposition Mission; Blending in, Standing Out</i>	<i>Food, Build, Do, Waste</i>
Night Sky	<i>Night Scavenger Hunt ; How Big How Far</i>	<i>Double Take</i>	<i>Moonballs</i>

This chart represents general recommendations for deciding which activities to introduce to your staff. While some instructors have struggled with using *NSI: Nature Scene Investigators* at first, others who are skilled in leading discussions have found immediate success with it. Use what's on the chart combined with your knowledge of your instructors to inform your decisions about when to introduce them to different activities. Pay attention to instructors' skills, interests, and progress with other activities. You might choose to introduce an activity you know an instructor will be successful at leading in order to build their confidence or offer an activity that includes a new skill as a challenge to an instructor whose practice you want to see expanded.

Some Lessons Learned In Implementing BEETLES Student Activities

Program leaders have learned a lot about what works best when implementing BEETLES activities. Below are some important considerations.

Using Student Activity Guides and notes: BEETLES activities are written up thoughtfully and carefully, with much attention to the language and sequencing of the activity. Reading a student Activity Guide before leading the activity is essential. Some instructors can see a BEETLES activity modeled once and then lead it effectively with students. But if they don't take the time to read the Guide, the carefully crafted and tested specific prompts and sequencing are probably going to be lost, and the effectiveness will decrease (we've seen this A LOT). To make sure the activities are given their best chance of success, set a tone of professionalism in which instructors are expected to read guides and prepare before teaching. Point out the educative features of BEETLES Activity Guides and that reading through a BEETLES activity is a way to become a better instructor. Point out the teaching tips, lists of common misconceptions and descriptions of the rationale behind different strategies used in the Guide. Encourage instructors to read guides to deepen skills like questioning strategies, responding to students, and developing learning cycle-based lessons.

Don't alter the activities (at first): As with PL Sessions, there are some adjustments instructors can make with any activity to better serve the unique group of students in front of them. These adjustments should be made after an instructor has taught the activity a few times the way it was designed. Significantly altering the sequencing and language of the activities will most often compromise their effectiveness. The wording written in the activity was intentional and rigorously tested. The sidebars, teaching notes, and background section in every BEETLES activity can help inform instructors' decisions about how to make these kinds of adjustments for different audiences without compromising the activity.

Use field notes. All BEETLES activities have a field card (a small card showing the main steps of the activity). Encourage instructors to carry field cards and use them as presenter notes when they teach. Some instructors worry that if students see them looking at notes, they might lose respect. Explain that, if anything, using notes is a sign of professionalism and will result in better teaching (as long as an instructor isn't staring at their notes or reading directly from them). Field cards help an instructor remember key questions and the order of steps and phases of the activity. (Heck, even though we wrote these activities, we all still use the field cards when we teach).

Return to the actual Activity Guide (occasionally). While field cards are designed to be complete enough to teach from, they only include an outline of the activity. We recommend that instructors return to the actual Guide every few times they teach the activity. There's a LOT of information in BEETLES Activity Guides, and it's easy to forget parts. After teaching it a few times, a note that didn't seem important the first time they read it may suddenly make more sense and influence their instruction. So, re-reading the activity is important if instructors continue to lead it over time (and yes, we also re-read the activities now and then, too).

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Educative curriculum is designed and written with the idea that instructors can learn about pedagogy as they learn and teach the curriculum. BEETLES student activities aren't short skeletal lists of steps, but include: Learning Cycle Stages in the chart at the beginning of the write-up; Teaching Tips just below that; Teaching Notes in the margins, including science background, potential modifications for different audiences/situations, and rationale for why the activity is structured as it is. The Instructor Support section includes Teaching Knowledge; Content Knowledge; Common Relevant Misconceptions; and Connections to NGSS. We've found that some instructors need help in recognizing the value of these and in reading them carefully before teaching.

NOTES

The BEETLES Guide, *Creating Effective Outdoor Science Activities*, is designed to support the process of developing new activities or modifying existing activities. This guide focuses more on the types of individual learning experiences most common in outdoor science programs, not entire units of activities.

"Teamwork makes the dream work."
Curriculum design should not be a one person job. It takes a lot of collaboration and a skilled team.

Adapting Your Existing Activities

Designing quality instructional materials is a challenging and complex process, so much so that we made an entirely separate document describing how to approach it (so we wouldn't have to make this guide any longer). For more on how to approach this process, see the BEETLES resource, *Creating Effective Outdoor Science Activities*. We encourage programs to use BEETLES activities as models of high quality instructional materials, but most programs also use non-BEETLES activities.

Many programs adapt their existing activities to reflect the pedagogy and strategies, outlined in BEETLES materials to move towards a more student and nature-centered approach. This process can be challenging, but worthwhile. "Tale from the Field 5. How We Adapted Existing Activities" on page 31 details Camp Seymour's approach.

This Tale from the Field offers valuable insights. They were strategic, not impulsive. It was a long term approach that anticipated and accounted for the needs of instructors. Regardless of the conditions in your program, a measured and careful approach is more likely to succeed than a rushed one. They didn't put the revision fully in the hands of instructors, but included them meaningfully in the revision process with structure and guidance, which generated buy-in. Senior staff taught some BEETLES activities first to get the feel of nature-centered, student-centered instruction, then made overall suggestions for revisions to Camp Seymour activities that were then implemented by less experienced staff. They also made sure staff who were responsible for changes to their curriculum had some professional learning experiences on best practices of teaching. The process the leaders used included testing ideas and activities, modifying their professional learning, and communicating with their clients about their process.

Once you've made some initial changes, you can continue the process by making several passes at the activity, each with a different focus for the revisions. A first pass at a lesson might be focused on restructuring it to be learning-cycle based (e.g., adding in invitational questions and discussion, making plenty of time for exploration early on in the activity, shifting the order of parts of the activity to make sure facts are only offered after students explore and before they apply their learning). A second pass might focus on adding more interesting and relevant broad questions. Another pass might pay attention to deepening opportunities for students to engage in science practices. Another pass might focus on the accuracy of science content. Another could center on promoting equity and inclusion.

Creating New Activities

After getting excited through PL sessions and BEETLES student activities, many programs have created brand new instructional materials to reflect research-based practices and student and nature-centered pedagogy. As with revising existing activities, it's important to have a cohesive, long term plan for creating new instructional materials to ensure quality. It might take a while. Decide who will be primarily responsible for the design of new materials and give them enough time and support in developing their understanding of

Tale from the Field 5. How We Adapted Existing Activities

From Jill Begin, Assistant Director & Becca Gjertson, Director at Outdoor Environmental Education Camp Seymour, Gig Harbor, Washington.

Jill and Becca were excited about implementing BEETLES, but were in a quandary. They had a set program for their instructors to use with students. If they started off their new season with BEETLES Professional Learning Sessions, they were worried that their instructors would get excited about teaching in new ways, but then would be frustrated by having to teach the existing activities that didn't reflect these new approaches. They also figured that their instructors couldn't help improve the activities without first experiencing the Professional Learning Sessions. What to do? Chicken or egg? At the last minute, they decided to restrain their eagerness to get started and hold off on the professional learning at the start of the season. Meanwhile, Jill made time to teach BEETLES activities with students to get some first hand experience with them. She then chose a few of their student activities and wrote out her general recommendations for how each one should be improved. During their next big training, they did launch a few BEETLES Professional Learning Sessions with their staff and got them revved up. Then they divided into teams, each in charge of updating an activity working off of Jill's notes. The small groups did the revisions over 1-2 days, consulting with Jill. They made sure every activity began with making observations and exploration and marketed this to their teachers as a selling point. They took out the 20-minutes of talking about the topic that had been at the beginning. They shifted the lesson to be about building understanding of a few things and students using this understanding to evaluate a claim. Then, they piloted the new lessons and revised them. They chose who they thought would be the best person to pilot the activity and had them keep teaching it many times, before training another staff person on it. As other staff would get to test a new lesson they would come back very excited after the experience, and this got other staff excited about when they would get a chance to teach it. "I just taught the best class of my life," one instructor reported hearing frequently. They followed this process to slowly work their way activity-by-activity as they revamped their program.

There was very little resistance because the staff was involved in the revision process, was trusted to be a part of an exciting shift in teaching that was happening within the program, and had ownership over the way the lessons turned out. They got buy-in from teachers by letting them know what kind of changes they were making and communicating this as an asset. And, it didn't hurt that they all agreed that the activities ended up being more successful and engaging with students.

pedagogy, science concepts you decide to focus on, and the ways those concepts are present in the local ecology. Be sure to deliberately design your materials to promote diversity, equity, and inclusion. Take your context and program goals into account in deciding the scope and focus of your new materials.

Some programs don't have required established materials or activities, and instructors are responsible for designing the lessons and activities they lead. While many instructors enjoy this autonomy, there's no guarantee their lessons will include best practices, and this can lead to a large variation in the quality of students' experiences. If it's a priority of your program for instructors to design their own lessons and activities, consider an approach in which you give access to and require the use of some high quality instructional materials first. This not only gives some baseline quality to student experiences, but using high quality materials that reflect best practices can also inform and be a model for the kinds of activities an instructor designs themselves.

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Jill and Becca's story has been documented more thoroughly on our website. See <http://beetlesproject.org/ymca-camp-seymour/> for a more complete account, including a side-by-side comparison of one activity before and after revision.

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Tale from the Field 6. Engaging Staff in Creating New Site-based Activities and Improving Existing Activities

By David Gardner, Director of Environmental Education at Barrier Island Environmental Education in South Carolina.

Our program had a lesson we offered regularly on marine mammals. We offered the lesson on our site, because sometimes dolphins could be spotted offshore. But we realized that because the students couldn't really explore and investigate actual dolphins other than occasionally spotting their fins, the lesson was essentially a classroom lesson done outdoors with lots of props and games, and wasn't taking advantage of the opportunity for students to engage with nature on our site. We decided to shift our instruction to interesting things on our site that students could investigate, but we weren't sure what that should be. So the whole staff took a day to explore their site together. They got down on their hands and knees with hand lenses and poked around to see what was interesting and that might be easy for students to explore. During the experience, the group became interested in how their slough (ephemeral wetland) formed in the maritime forest. We discussed and puzzled over this together as a staff. It resulted in our team later turning an existing two hour forest ecology hike into a discovery-focused experience with the goal of students ending with the tools and natural history knowledge to have a valuable discussion on this question. The staff exploration exercise also led to staff coming up with a bunch of authentic broad questions, which turned into a brainstorm about productive broad questions to use in other existing lessons in their program.

I tried it a second time with new staff (we're in the thick of it right now)! I have an almost complete turnover of instructors every year, and I wanted to try this with a staff that is not yet familiar with the programs' existing activities, to see if they might be better at coming up with completely new investigations for the site. This time, I gave them an afternoon, and assigned each instructor to spend it exploring our site, and finding something that really excited them that they wanted to investigate further. Then they are to come up with an activity about it, and make a 10 minute video of themselves teaching it with kids. They'll watch each other's videos, and give each other feedback. Their end goal is to make it into a learning cycle-based 45 min.-1.5 hours long experience. If any of them turn out really great, I'll take them, modify them, and add them to our program repertoire. It's an ongoing project for them to work on during the season. This second time around, my goals have expanded to the following: a) get instructors excited about something on site, b) get them to think about and apply pedagogy, c) take something they're excited about and turn it into a class, d) give them practice in how to teach and communicate effectively in a short and longer time slot, e) get others excited about their idea, and f) watch themselves teaching. When I gave them the assignment, about 50% of them rolled their eyes, but since then most of them are "on fire" about the assignment.

We recommend, especially for intern professional learning programs, that instructors become experienced with teaching several BEETLES (or other high quality) activities before designing their own. A good way for beginner instructors to "get their feet wet" with activity design is to assign them to find something on site they think will be intriguing to students, then take the BEETLES exploration routine, *Discovery Swap*, and use it as written, but with the content focused on their subject of choice. If they do this, they'll have a learning cycle based activity on their topic with nowhere near the effort and a much likelier chance for success than when creating an activity completely from scratch.

Making Program-level Changes to Support High Quality Student Experiences

High quality instructional materials will go a long way towards ensuring impactful learning for students, but the way your program is structured will also impact teaching and learning at your site. Program structure can be challenging to change and it may be taken for granted as "the way it's always been," but it shouldn't be overlooked as a key factor to consider in providing

high quality student experiences. Your program structure should complement your overall program goals. Below are four lenses through which to examine your program and consider potential shifts.

1. **Sequencing student experiences.** Whether your program sees students for an hour or a week, the learning cycle is a powerful tool for organizing, sequencing, and structuring student experiences. As you're planning any experience, consider: What could access prior knowledge and set a tone of excitement for exploration? What might be a good exploration experience? What might serve well as an introduction to a concept? How will students apply new knowledge to a different situation or context? When and how will students reflect on this experience?

Make sure your overall program structure gives students opportunities to make connections to prior knowledge, to explore, to invent concepts, to apply their knowledge, and to reflect on their learning. This might mean streamlining academic goals or reducing the expectations for instructors in terms of the amount of content they tell students in favor of deeper and higher quality learning experiences. Use the *Teaching & Learning* PL Session and the suggested follow-up activities to begin having these kinds of conversations with your staff.

2. **Using themes to organize learning experiences.** Choosing a theme as an organizing principle can be a useful way for programs to structure field experiences. Depending on program goals, themes might include: specific science concepts, a crosscutting theme in science (like one of the NGSS Crosscutting Concepts), building a mindset of curiosity and exploration, discovering nature mysteries, the nature of science, social justice, or interpersonal/team-building. Themes should be focused enough to provide students a useful mental scaffold to help organize new information, but broad enough that instructors have flexibility to respond to students prior knowledge and interests.
3. **Length of outdoor experiences.** There's a huge variety in how much outdoor time programs offer students. Whatever your program offers is great: you're providing students with outdoor science experiences! But research tells us that longer experiences and multiple experiences (if you can make it happen) increase the impact on students. And, from direct experience, we know there's a special "magical" feeling you can give students during a lengthy hike in which they get lost in the fantasy of being adventurers way out in the woods (even if you're only 10 minutes from campus). Of course, you can also do more significant building of concepts through a more lengthy experience.

The amount of time your program can allot to field experiences may be determined by factors you have little control over, such as available resources or bus schedules. But other changes in infrastructure, such as prioritizing picnic/field lunches over food served in the dining hall, tend to be more doable.

4. **Type of learning experiences.** Assess if your program structure and the types of experiences your program most commonly offers best meet your goals for teaching and learning and help staff use materials effectively

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Redesigning Tone-Sets: The Tale from the Field, "How We Changed Our "Tone-sets" to Inspire Students for Inquiry" on page 53 illustrates how a program redesigned their tone sets in order to provide a better invitation for student that meets programmatic goals.

See some examples of possible theme-based sequences of BEETLES activities in the sidebar "3 examples of possible sequences:" on page 26.

To review some of the research on longer outdoor experiences, check out ("References" on page 63): Shepard & Speeman, 1986; Begnar, 1998; Palmberg & Kuru, 2000; & Farmer, Knapp, & Benton, 2007.

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Scouting teaching locations: As much as possible, make sure your program provides time (either adequate free time, or paid program time) to scout their teaching locations, even if it's only briefly. Knowing where there's a pile of deer bones, an area with particularly intense poison ivy, and the safest place for a creek crossing can lead to more successful experiences for students. If instructors plan on leading an activity that's dependent on the presence of a specific organism, it's especially important that they're able to check ahead of time to make sure it's there.

to support high quality student learning experiences. "Figure 11. Types of Student Experiences" on page 35 outlines some common types of experiences, and what they afford and don't afford for learners. As you look at the types of experiences, think about which ones your program uses or might potentially use, if they match your program goals, and if you are taking advantage of the strengths or falling into some of the pitfalls for each type.

Most programs include a combination of all of these different types of experiences, leading to dynamic, rich, and balanced experiences for students. If students only explore nature slowly, they will probably crave movement. If a group only hikes from place to place, they miss the opportunity to slow down, look around and engage deeply with their surroundings. If a program is long enough, ideally

students should have the opportunity to explore slowly, adventure, and hike to destinations at various points during their experience. Regardless of the combination of field experience styles, be sure the duration, pace, and focus of your program supports your goals for high quality teaching and learning and the instructional materials your staff is using.

Tale from the Field 7. Adapting Pre-Program Classroom Visits.

By Olga Feingold, Program Director, Outward Bound at Thompson Island, Boston, Massachusetts

We realized we wanted to change our pre-program classroom visits to shift from a prior emphasis on memorizing facts towards our current goal of instilling students with a scientific mindset of making observations and asking questions. To accomplish this, we started using the BEETLES activity, *I Notice, I Wonder, It Reminds Me Of*, and the *Opening the World Through Nature Journaling* activity, *To Each Its Own*, during pre-program classroom visits. As soon as they made the shift, instructors noticed that students asked fewer questions about bears, swim time, and rooming with their BFF and started asking questions like: "How much time will we get to observe?" "Will we get to observe other objects like rocks and shells?" "Will we get to observe plate tectonics?" (for a geology themed trip) "What other type of objects or organisms will we get to observe?" and "Will there be time to observe every day?"

Questions to Ask Yourself to Improve Student Experiences:

- Do instructors have access to high quality instructional materials that support the goals of our program?
- Do instructors have enough pedagogical understanding and coaching support to implement those materials effectively?
- If you feel a need to adapt existing activities or create new ones, do you have the appropriate staff, bandwidth and process available?
- What do instructors do to sequence and tie together learning experiences for students?
- Does the overall structure, and timing of student experiences in your program support the kinds of experiences you want students to have?
- Is it logistically possible for instructors to scout locations in advance of leading students through them, either on their own time or within the scheduled time of your program?
- What is our most successful learning experience? How do we know?

Figure 11. Types of Student Experiences

Type of Experience	What It Is	Possible Advantages	Possible Disadvantages
Exploration Hike	Students learn how to slow down, and are introduced to curiosity tools to help them notice and explore what's around them.	If you give time and focus to teaching students how to explore, any part of nature can be fascinating. Students may become enthralled with the tiniest and most common objects, such as insects or leaves. This attitude of exploration can be easily applied by students at home.	Students may get antsy without enough movement. May result in student groups focusing on different topics or ideas, and inconsistent educational experiences for students in different groups.
Adventure Hike	Students go "off trail," or follow a rustic and rugged path, such as a deer trail.	It incorporates real world teamwork, as students work together to negotiate more difficult points. Adventure hiking works great for transforming apathetic students into excited adventurer hikers, or connecting a group that is struggling socially.	Not possible at all program sites and can exclude differently abled students.
Destination Hike	What most people think of when they hear "hike": walking on a trail to get to a destination, such as an overlook, a waterfall, a lake, or panoramic view.	The destinations can be awe-inspiring and the physical activity required to get there can be both challenging and empowering, particularly for students who have not experienced those before.	With the pressure to get to the destination, exploration and direct engagement with nature is often minimized. It supports the idea that being in nature primarily means moving through it. Students may struggle to transfer their awe to home environments with less dramatic destinations. There will likely be less time for learning on the way.
Stationary Outdoor Experience	An activity in one location, on or near campus.	Can allow for use of hard-to-carry equipment and can provide more time directly engaging with nature, instead of needing to allow for time to move along.	Some stationary field experiences take place in groomed areas and might be devoid of intriguing things to check out, like leaves, dead logs, or unmanaged vegetation. Students may become antsy to move. Less of a "nature adventure" feel.
Stationary Indoor Experience	A "typical" classroom experience.	Takes advantage of natural history collections or other interesting things students might not see elsewhere. An excellent inclement weather option.	In an era when students have little access to outdoor experiences, doing a classroom activity at an outdoor science program is a missed outdoor opportunity.
Tone Sets	Introductory activity at the beginning of a day or beginning of a new experience. Tone sets can be focused on: behavior expectations, site logistics, content preview, or inspiring a certain kind of mindset (e.g., curiosity). Tone-sets can be whole group events or something an instructor uses with a smaller hiking group.	At its best, tone sets build anticipation for the day and help students feel comfortable. They might: probe into student's prior knowledge (e.g. <i>Mind Pie</i>), encourage students to explore phenomena (<i>What Scientists Do</i>), ask broad questions, put participants in the "right" mindset, empower students with tools they can use throughout the day (like using <i>I Notice, I Wonder, It Reminds Me Of</i> , or <i>Nature Scene Investigators</i>), probe into social-emotional learning, or create goofy moments to build rapport.	Often misses the opportunity to inspire curiosity, and instead delivers content students aren't yet curious about. Often include a series of narrow questions which promotes recall rather than exploration and higher level thinking.

Wondering where games fit in? Read some of our thinking about games on our website: <http://beetlesproject.org/tales-field-using-games/>

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Tale from the Field 8. Making a “Destination Hike” Optional to Give Instructors More Flexibility

By Emilie Lygren, former lead naturalist at San Mateo Outdoor Education (SMOE), La Honda, California & current BEETLES team member

It was a tradition at SMOE for students to visit “The Emerald Forest,” a grove of buckeye trees that were covered in moss, on the picnic lunch day of their field experience. Instructors loved telling stories (both fictional tales or stories rooted in scientific concepts) about how the trees got there, and students would always react with enthusiastic ooohs and aaahs upon arriving there.

During a weekly reflection time in which groups of 4–5 instructors checked in about the successes and challenges of their weeks, one instructor brought up the feeling that visiting the buckeye grove limited what he could do with his students. The group of instructors discussed many different factors and weighed different perspectives. They all enjoyed taking their students to the location, but only one group could be there at a time, so it was necessary to schedule ahead of time when they would be there. Instructors found this limiting in several ways. Since the location was close to campus, they couldn’t take students as far as they would have liked to reach some of the more remote and interesting areas of their site. Because they had to be at the destination on a schedule, they weren’t able to be as responsive to students’ needs and energy in the moment, often needing to cut students off when they were excited about exploring nature in another area.

The program leaders at SMOE had successfully created a staff culture where instructors felt encouraged to bring up ideas for program improvement whenever they arose. This culture was established by the presence of formal, anonymous feedback mechanisms, as well as frequent informal conversations about the program structure. Any idea an instructor brought up to program leaders was listened to carefully. Because this culture was in place, instructors felt safe immediately going to program leaders to share their thoughts after their discussion about the “destination hike” to the buckeye grove.

The program leaders listened to these instructors’ thoughts, and were responsive immediately in addressing it. At their next all-staff meeting, the leadership team brought up the idea of making a visit to the buckeye grove optional. While program leaders shared some of their thoughts and perspectives during the discussion, they put the decision to their teaching staff, who would be most directly impacted by the potential change in program structure. After some discussion, the staff decided to make visiting the buckeye grove optional. After that, some instructors still took their students to visit the buckeye grove, but many chose instead to take their students farther afield, and spend more time focused on exploration in other locations. The flexibility displayed by SMOE has allowed their program to continually evolve to be responsive to the needs of instructors and students, and to be inclusive of the ideas of their teaching staff.

Chapter 3. Building Capacity to Improve Your Program

How can we assess the capacities of our whole program?

Improving programs and institutions is a surprisingly challenging undertaking. Why is it that even when we know what we want to be different, we have such difficulty bringing about the change we seek? For a whole host of reasons, we seem to be better at doing what we do than we are at improving what we do. So, programs need to engage in intentional ways to improve their ability to improve. Leaders and practitioners need to get better at getting better!

This chapter lays out a process for program leaders to follow who want to systematically look at their whole program to see how they might improve it. We've found that it's extremely powerful for leaders interested in building their capacity for ongoing improvement. It may look intimidating, but you don't have to tackle it all at once. You can explore these program capacities and questions to ask about your program over time.

The first section, "How to Assess Your Capacity and Make a Plan to Improve It", describes a process we've used with many education programs and school systems for 1) assessing their current capacity to support high quality outdoor science teaching and learning, 2) identifying priorities for building their capacity, and 3) developing an action plan to build capacity and to improve teaching and learning. This is not intended to be a formal strategic or long range planning process--it's a process for creating specific actionable steps to improve your program over 6 months to a year.

The 2nd section outlines program elements (what we're calling "capacities") that research indicates are essential to improve your program. Previous chapters of this guide focus on how to build the capacities specifically related to professional learning and instructional materials which are necessary but not sufficient for meaningful long term program improvement. This section describes and provides questions to assess the following organizational capacities:

- a clear vision
- distributed leadership and a strong leadership team
- policies that clearly support program priorities
- an awareness of and influence on contextual conditions
- cultural competence to understand and address the needs of participants
- ongoing professional learning
- high quality curriculum/instructional materials

These capacities come from research about complex formal education systems that have successfully changed and improved their science programs. Inverness Research, a long time partner of Lawrence Hall of Science, studied over many years the "improvement capacities" some school systems have that allow them to be more successful than others. School and program leaders working with

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This chapter includes two sections:
 "How to Assess the Capacities of Your Program and Make a Plan to Improve It" on page 38
 "Capacities" on page 39

See an example action plan template
 on page 51.

Research on organizational capacities:
 For more information about Inverness Research, and to see their reports and publications, see <http://inverness-research.org/>

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Lawrence Hall of Science now use this “Capacity Framework” to inventory their current strengths, identify areas where growth is needed, and create an action plan to develop their capacity to bring about systemic and durable improvement to their programs. BEETLES has adapted this framework specifically for outdoor science programs. We suggest you use it in a similar way as it’s been used by school systems.

How to Assess the Capacities of Your Program and Make a Plan to Improve It

1. The first step is to assemble a “vertical” leadership team that includes leaders from all levels of your organization (a board member, executive director, program or education coordinator, lead instructor, classroom teacher, etc.). Choose individuals who understand or can help to develop the vision you wish your program to achieve.
2. Print out “Appendix: Building Capacity Tool” on page 65 for each person on the team.
3. Find a meeting time when you can all be together in the same room. You’ll need at least three hours to get started.
4. Read through the capacity questions in each section all together. Use the examples and descriptions included below to help make sure you and your team are on the same page in understanding what each question is asking.
5. Ask each member to mark down a quick, informal, private rating of their view of the organization’s current capacity in each area. It’s particularly instructive to rate each capacity from multiple vantage points throughout the organization. Rate all the questions before you have any discussion.
6. Then, go back to the beginning of the list and systematically discuss the various perceptions of your program’s current status related to each capacity. Is there quick consensus or different viewpoints? Why? What would the immediate and long term benefits and costs be of improving each particular capacity? Try to arrive at a consensus score for each capacity. This could be a number or just an informal ranking (pretty high/pretty low). If you don’t have consensus, you might just want to note something like, “no consensus: we’re pretty high in some areas of this capacity and very low in others, and an average isn’t relevant).
7. After you’ve discussed each capacity question, decide what’s most important to start working on. You might prioritize something because it will only take a small investment to get from the current to the desired status, or because it has the largest gap between current and desired status, or maybe because you believe it’s particularly important and will lead to other improvements. You’ll need to balance “low hanging fruit” with strategic actions that are critical but may take longer to carry out. It’s important to show some quick progress related to this process, but also to move ahead in a somewhat systematic fashion.

8. Try to identify your top three priorities to address over the next 6-12 months (1 priority is too narrow for this process and 4 may be too unfocused or overwhelming).
9. Create a realistic and specific action plan, (you might want to use a template like the one shown in “Figure 12. Example Action Plan Template” on page 51) to create actionable steps toward improvement related to each of your priorities.

Capacities

In the sections below, you’ll find descriptions of each capacity, related questions to reflect on and discuss, and examples of how BEETLES’ partner programs approach and address these same issues. These capacities are all interrelated, and you’ll find many overlapping elements.

Vision and Reality

Many organizations have a vision and a mission statement, but making sure your vision is widely shared and understood, and *that it’s used to guide decision making*, is the key. A vision should be aspirational and describe your desired end-state. It should lay out what high quality teaching and learning looks like, as well as a vision for your overall program. Such a vision should provide common language that keeps staff focused on what’s important. Programs also need systems for gathering evidence about the current reality to understand how far you are from achieving the vision.

Questions for Reflection, Self-Assessment, and Dialogue:

1. **To what extent does our program have a widely shared programmatic vision?** Was that vision developed with consensus from leaders in our community? Does it outline key program components, such as the curriculum, a professional learning system, the types of experiences we provide, and what we hope will result from them?
2. **To what extent does our program have a widely shared commonly understood vision for good teaching and learning?** Does it outline best practices for good instruction, emphasize underlying philosophies, and address the subject matter to be included?
3. **To what extent does our program have a plan and concrete vision of how to develop and implement high-quality experiences for every student?** Are leaders in agreement about specific steps of the process?
4. **To what extent do all our program leaders and instructors have knowledge of instructional realities?** Are all program leaders able and willing to examine the realities? Are there multiple mechanisms in place for collecting and examining data to help leaders better understand what concepts and lessons are being taught, the quality of instruction, and the degree to which program supports such as student journals, lunch logistics, etc., are working?

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The following capacities are included below:

“Vision and Reality” on page 39

“Leadership” on page 40

“Program Policies and Priorities” on page 42

“Contextual Conditions” on page 44

“Professional Learning” on page 46

“Curriculum and Instructional Materials” on page 47

“Equity, Inclusion, and Cultural Relevance” on page 48

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5. To what extent does our program create differentiated opportunities to learn for all students, with particular attention paid to underserved/underrepresented student populations?
6. To what extent does our program have a system for gathering and using data? E.g., surveys, instructional plans, instructor journals, systematic observations of instructors, etc., including data about program implementation, the realities of instruction, and responses from students, that can be used both for program improvement and for “making the case” for the program to external audiences?

In order to improve and share their vision, some programs have:

- realized that they needed to change or expand their vision to better reflect their program’s current values [related to Question 1,2].
- included their vision statement in their staff manual, alongside BEETLES resources, such as handouts about the learning cycle to give instructors a clear picture of how to translate the vision into their teaching [related to Question 2].
- made time during staff orientation or other professional learning days to discuss their vision and related expectations [related to Question 2].
- decided to address instructional expectations upfront by adding information and questions during the interview process that make clear their vision of good instruction [Related to Question 2].
- developed a plan and assigned different program leaders to track and evaluate different elements of the plan (e.g., professional learning, student exit interviews) [Related to Question 3].
- included professional learning on topics like working with English Learners, including students who are differently abled and systems of oppression that disproportionately impact students of certain social identities [Related to Question 5].
- systematically used observation protocols to create opportunities for all levels of leadership to participate in and reflect together on observations [Related to Question 6].

Leadership

Visionary leadership influences every aspect of a program, including the specific activities that are taught, the instructional strategies that are used, the staff culture, and all the structures that are in place to support them. Leadership begins with executive leadership, but must be shared and expressed at all levels of an organization to be effective. Leaders are responsible for translating the organizational vision into infrastructure, systems, processes for decision-making and accountability measures.

Questions for Reflection, Self-Assessment, and Dialogue:

1. To what extent is there a committed and empowered core leadership team formally responsible for improving education at our site? Does this group represent a “vertical slice” of our program with varying responsibilities from executive functions to program administration to instructional duties? Does this group work well together and bring complementary skills, perspectives, and spheres of influence to the improvement effort?

2. To what extent do we have a diverse leadership team that reflects and represents our current participants and the participants we hope to serve?
3. To what extent does our overall organization leadership (staff leaders, board members, advisors, partners) reflect the diversity and the values of the community we hope to serve?
4. To what extent has our program identified and supported strong instructional leaders who can assist the improvement effort by leading or co-leading professional learning, demonstrating and model teaching with students, and participating in writing, revising, and piloting new curriculum? Are there instructional leaders at every site (for larger programs)?
5. To what extent is our board knowledgeable about and supportive of our efforts?
6. To what extent do we actively bring in diverse opinions from outside the organization to our Board of Directors and staff?
7. To what extent do we have a relationship with and working access to sources of outside expertise? E.g., university faculty, graduate students, local naturalists, high school teachers, or local museum staff? Do we have supports in place to enable them to play a useful role? E.g., review curriculum for scientific accuracy, sit on committees, assist with professional learning opportunities?
8. To what extent are there mutually beneficial connections, partnerships or collaborations between our program and other programs or institutes aimed at outdoor learning? E.g., similar programs, universities, school districts, science museums?
9. To what extent are our program leaders involved with and connected to leaders in other programs, professional associations, networks, and national projects involving outdoor education? E.g., North American Association of Environmental Education, Association of Nature Center Administrators (and its associated conference for Residential Environmental Learning Centers), statewide environmental education and science teachers associations, departments of education, regional environmental education collaboratives, or other professional associations?
10. To what extent is there strong external political leadership for outdoor learning opportunities and other supporting science and STEM education? Are our program leaders up to date and connected with the school system, after-school network, mayor's office, state initiatives, etc.?

Tale from the Field 9. Building Collaboratives

ELLMS and EarthSense Alliance are examples of programs that came together to form mutually beneficial regional collaboratives of like-minded organizations tackling challenges, raising funds, and finding solutions together.

By Drew Dumsch, Executive Director at The Ecology School, Saco, Maine.

In Maine, five programs that do outdoor science school year programs (The Ecology School, Chewonki Outdoor Classroom, University of Maine 4-H Camp & Learning Center at Bryant Pond and the University of Maine 4-H Camp & Learning Center at Tanglewood, and the Schoodic Institute at Acadia National Park) decided that we wanted to pool our resources and collaborate formally with each other. We formed The ELLMS (Environmental Living & Learning for Maine Students) Project. Since 2010, ELLMS has raised over 3 million dollars for scholarships, which we have divided evenly between our organizations. We have a program we call "Whole Schools Whole Communities", in which each site is working in a more targeted way with two of their most local schools. With these schools, we go beyond just our residential programs and are doing multi-year programming. We are also doing professional learning workshops for classroom teachers and plan to use BEETLES professional learning sessions in these. ELLMS also collaborates on some research on the impact of residential outdoor science programs on students. Recently we were getting a bit overwhelmed by running ELLMS on top of our busy jobs, so we got grant money to hire a network coordinator. The coordinator focuses on our summer teacher institute, writing grants, and making sure all 5 programs follow through on their ELLMS commitments.

By Shannon Walz, Education Director, Wolfe Ridge Environmental Learning Center, Finland, Minnesota

The Earth Sense Alliance is a collaborative of six residential environmental education organizations in Minnesota. It was formed to open the door to larger funding opportunities based on our collective impact across the state of Minnesota. Since forming the collaborative, we have received funding for capital improvements, curriculum development and scholarships in all six programs. In addition to seeking joint funding, the Earth Sense Alliance has resulted in annual meetings (sometimes more) of the Directors and Education Directors. These meetings have allowed us to work together to solve problems we face and brainstorm about the direction of residential environmental education in the state.

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Program Policies and Priorities

It's critical that program policies and budgets are regularly assessed to make sure they reflect and support program priorities stated in the organization's vision and action plan. Improvements you focus on in the other capacities may need to be supported by policy changes. The careful alignment of policies with priorities makes it clear how decisions are made and how financial resources are used to make your priorities into realities.

Questions for Reflection, Self-Assessment, and Dialogue:

1. To what extent has our program made high quality teaching and learning a priority that's reflected in policies, finances, and supports?
2. To what extent has our program reviewed and evaluated state education standards, and made principled decisions about revising instructional expectations and curriculum to better support high quality education?
3. To what extent does our program have policies in place that support high quality student experiences?
4. To what extent does our program have policies in place that support regular and reflective professional learning opportunities for staff?
5. To what extent does our program have in place formal program evaluation, student assessment or other practices and policies designed to provide evidence of program effectiveness?
6. To what extent does our program have communication policies and practices for systematic communication with all stakeholders?
7. To what extent does our program have sufficient financial resources and capacity to acquire and designate funding resources as necessary for current priorities? How nimble is our organization at finding resources to address priorities?
8. Overall, to what extent does our program proactively and deliberately identify and resolve systemic barriers and challenges?
9. To what extent do our job descriptions have requirements that do not accurately reflect the demands of the job? For example, do we require a Bachelor's or graduate degree or teaching certificate when applicants could have certain other experiences that would also make them qualified?
10. To what extent do we have job descriptions, job announcements and interview questions related to cultural competence that demonstrate our commitment to equity, inclusion and cultural relevance?

Tale from the Field 10. How We Are Cultivating a Professional Learning Community at Our Statewide Meeting of Administrators.

By Celeste Royer, Director, Director of Environmental Education, Rancho El Chorro Outdoor School, San Luis Obispo, California, and State Chair of California Outdoor School Administrators (COSA)

COSA is a statewide association of outdoor school leaders from County Offices of Education and School Districts. We meet twice per year to discuss topics and issues specific to operating residential outdoor science schools. Each meeting takes place over two days with participants spending the night at one of the member sites. Most COSA members use BEETLES Project strategies in their outdoor school programs. The members share implementation successes and challenges and have invited guest speakers to deepen their own learning about constructivist, student-centered outdoor science education, and wanted to spend more time building a Professional Learning Community within their group. Time away from site administration presents a challenge and members did not want to add additional meetings. To make more time, we agreed to change the structure and length of each meeting to commence two hours earlier and end two hours later. Some of the added time will be dedicated to building a Professional Learning Community centered around focus topics such as implementing BEETLES strategies.

11. To what extent do we actively recruit and hire qualified staff that represent the communities we serve? To what extent do we explicitly treat cultural competence as an expertise comparable to other areas of expertise we value?
12. To what extent do we actively recruit and raise funds for scholarships to support underrepresented groups to participate in our programs?
13. To what extent do our bylaws, board policies, mission statement and program policies reflect an explicit commitment to equity, inclusion and cultural relevance?
14. To what extent do our program materials and publications, including website, brochures, annual reports, and student materials, reflect the communities we serve and want to serve? To what extent are our materials accessible to all stakeholders, including student families? E.g., translating materials or hosting information nights in accessible locations.

In order to improve program policies & priorities, some programs have:

- realized that they needed to change or expand their vision to better reflect their Updated job announcements, job descriptions and interviewing process to find and hire instructors oriented towards open-mindedness and improving practice [related to Questions 1 & 6].
- realized they need to increase and improve their communication with school and district administrators, teachers and parents to help decrease confusion some might feel due to a switch in instructional approach. Some strategies include:
 - crafted explicit statements for their websites, brochures and letters to schools. One program used “We teach what students can’t Google” for this, and was also explicit with teachers that “we don’t teach stuff you can Google, and we only do stuff you can’t do in the classroom.” These statements and messages make explicit what the program is emphasizing (observations, explanations, asking questions, discourse, etc.) and make it clear what the goals are, and how they related to the goals of the school. The statements are explicit that the program is NOT moving away from “teaching content” and that students will understand more content more deeply if they learn it this way. The statements use Next Generation Science Standards as a selling point, and explain that the program offers students an authentic, NGSS-aligned science learning experience in a rich and engaging environment.
 - prepared field instructors to be explicit in the field with classroom teachers, pointing out the use of Crosscutting Concepts and Science Practices (such as noticing and explaining patterns in nature.) Instead of focusing on there being fewer facts than there used to be, teachers recognized these aspects of the hike, and were more likely to value the approach of the instructor.
 - included written information on NGSS in the packet teachers received before arrival, then created a poster board explaining how BEETLES and NGSS connect. They use the poster to talk with teachers when they arrive.
 - One program developed written observation protocols for teachers and chaperones that help them notice and appreciate more student-centered teaching practices, such as: Are students engaged in discussion of content with one another? Are students applying crosscutting concepts? Are students engaging mostly with nature or with the instructor? How do students respond to broad questions vs. narrow questions?
- used BEETLES as a selling point. One program leader said “There are so many hurdles [teachers face] from fundraising to convincing the school board or the principal or your superintendent that the educational quality of the experience is more than just a camp. Our hope is that we’re able to say, ‘Listen. We are supplementing and supporting what is done in the classroom for these teachers in a vital way. And we can demonstrate this to you by showing you that you can

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Not sure if federal policies might influence your program? The Every Student Succeeds Act (replaced No Child Left Behind) funding specifically mentions environmental education and has money for schools to partner with community organizations, including environmental education providers, that could open up a whole new way for outdoor science programs to partner with schools and districts.

walk into any of our classes and see our instructors using these practices that your teachers are using. Or, if you look at a lesson plan you'll see a reflection of best practices in education.” The following is a list of specific policies and practices that programs have changed to better support higher quality student experiences:

- changed the schedule of the program so instructors stay with one group the whole week and dive deeper into important concepts, instead of switching instructors for every class.
- created more time for students to be outdoors, including longer field experiences.
- added more blank pages to student journals and removed some pages, such as word searches and crossword puzzles.
- created observations-based evening programs that have students look at artifacts and journals, or spend time outdoors on a night hike.
- created committees of instructors and leadership staff to review and track state standards. Other programs have created paid time for staff to go to professional learning events on science standards put on by organizations with expertise in that area.
- changed policies and structures to better support a culture of professional learning and growth among instructors:
 - changed the schedule of professional learning days, to allow time for making and practicing instructional changes between Professional Learning Sessions
 - allocated time in the program schedule to allow for a few hours of professional learning every week.
 - required that veteran staff members participate in professional learning, and gave them leadership roles, such as mentorship of newer staff.
 - added paid time for staff to plan lessons and reflect.

Contextual Conditions

Conditions from the site level to the federal level can exert influences on a program. On the site level, a healthy climate and culture is critical to staff retention and professional growth. On the state and federal level, being aware of various influencers might spark new partnerships, or help to identify new funding or potential barriers with enough time to plan ahead.

Questions for Reflection, Self-Assessment, and Dialogue:

1. **To what extent does our program have a healthy climate and culture?** Have we, as a program, developed indicators of a healthy culture and climate? Do program leaders understand how the working conditions, professional culture and overall morale influence the willingness of all those working in our program to initiate and sustain improvement efforts?
2. **To what extent does our program's stability, instability, turnover or growth affect the willingness of those working in our program to initiate and sustain improvement efforts?**
3. **To what extent do we explicitly refrain from asking one staff member or participant to speak on behalf of an entire community, and explicitly acknowledge a myriad of experiences within any given community?** To what extent do we ask staff and participants to speak to their own personal experiences?
4. **To what extent do we have a culture of safe, open communication, and a system of accountability for grievances so staff can share concerns without feeling stigmatized?** Do we have a system for

staff to share and address micro or macro-aggressions in the workplace?

5. To what extent do we have a no-tolerance policy to discourage inappropriate language or jokes that target a specific demographic?
6. To what extent are we aware of and proactively address cultural and societal tensions in our community, region, state, nation?
7. To what extent is our program aware of local school district and/or community political and financial conditions and how they influence our program's efforts to develop and plan a process to deliver high quality student experiences?
8. To what extent is our program aware of state political and financial conditions and how they influence our program's efforts to develop and plan a process to deliver high quality student experiences?
9. To what extent is our program aware of federal political and financial conditions and how they influence our program's efforts to develop and plan a process to deliver high quality student experiences?
10. To what extent is our program aware of state and federal guiding documents, such as the Next Generation Science Standards, Common Core State Standards, State Environmental Literacy Plans, and the C3 Framework for Social Studies, and how they support our program's vision for high quality student experiences? How are we adapting our program to address these documents?

In order to address contextual context, some programs have:

- created four formal opportunities for instructors to have input and speak to the effects of working conditions, including one-on-one conversations, group discussions, and anonymous surveys. Program leaders review this information and make adjustments.
- offered returning staff the opportunity to take on long term projects like revising curricula, building trails, or making other site improvements to help keep instructors engaged with the program.
- discussed the economic conditions and demographics of school groups before they arrive, then make plans for how to best engage the students given their context.
 - Oregon passed a law in 2016 that is the first of its kind in the United States, requiring that every student in the state attend residential outdoor science school. Measure 99 created an ongoing funding stream from the state lottery for outdoor schools.
 - Maryland has an environmental education high school graduation requirement.
 - California created a statewide environmental literacy plan in 2015, The California Blueprint for Environmental Literacy. This plan provides key support for outdoor science programs and is used to make a case for the importance of integrating environmental literacy into K-12 education. Read more about the California Blueprint (<http://www.cde.ca.gov/pd/ca/sc/envronliteracyblueprint.asp>) and other state environmental literacy plans: <https://naaee.org/our-work/programs/state-environmental-literacy-plans>
- heard about new Educator Effectiveness Funds distributed by the California Department of Education and worked with her county office to use those funds for "staff training days, with a clear agenda and [shifting it] to a Professional Learning Community. These days have allowed us to share curriculum ideas, discuss best practices, present demo lessons, and plan for new lessons."

Oregon's outdoor science law: Read more about the coalition behind the Oregon Bill:
<http://www.oregonoutdoored.org/>

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Looking for examples? Read through the “Chapter 1. Creating a Professional Learning System” on page 7 for examples of programs working to improve their professional opportunities.

Professional Learning

To ensure consistent high quality instruction, programs need ongoing support for instructors, including opportunities for coaching, mentoring and structured self-reflection.

Questions for Reflection, Self-Assessment, and Dialogue:

1. To what extent does our program have people with the expertise, position, time and interest to develop, shape and refine our professional learning program?
2. To what extent does our program include a diverse menu of high quality professional learning experiences?
3. To what extent does our program utilize partners and outside experts to provide specialized professional learning opportunities?
4. To what extent does our program have people with expertise to design and offer workshops, coaching, learning communities and other supports that help our educators use instructional materials and continuously improve their practice?
5. Specifically, to what extent does our program have expertise and capacity to offer professional learning opportunities on:
 - Pedagogy and best teaching practices
 - Relevant state standards
 - Specific science content knowledge
 - Assessment of student learning
 - Other important programmatic elements
6. To what extent does our program have the intention and capacity to provide ongoing leadership development leading to a pathway for career advancement, within or beyond our program? Does our program offer mid-level positions or other opportunities for instructors to take on leadership roles?
7. To what extent does our program provide ongoing professional learning opportunities for program leaders and administrators to help them support high quality instruction throughout the program?
8. To what extent do we directly address cultural relevance in our professional learning experiences in order to grow the cultural competence of our staff? Are instructors aware of systemic, institutional bias and prejudice, and how it might affect participants of different social identities who come to our program?
9. To what extent are staff encouraged to learn about students’ lived experiences and regularly reflect on how their instructional practices impact student experiences at our site?
10. To what extent is our staff knowledgeable about environmental justice issues that may affect underrepresented communities?

Curriculum and Instructional Materials

To have high quality instructional materials, it's important to have clear and commonly understood expectations for what high quality learning experiences are like. This may take some time and work, especially since recent research has changed what we know about how people learn best.

Questions for Reflection, Self-Assessment, and Dialogue

1. To what extent does our program have well-defined and shared expectations of what is to be taught, how it is to be taught, and how to differentiate between grade levels?
2. To what extent does our program provide opportunities for students to use science practices to engage directly with and investigate nature?
3. To what extent are our curriculum and instructional materials designed to address our state education standards?
4. To what extent are our state education standards philosophically aligned with our program?
5. To what extent do our curriculum and instructional materials represent best practices and up-to-date research on how people learn? Including, three-dimensional learning (for science-focused experiences), Learning Cycle/5E model, and other student-centered practices?
6. To what extent do our instructional materials support the vision and goals of our program?
7. To what extent does our program have people with the expertise, position, time and interest in continuing to plan for, shape, and improve our curriculum?
8. To what extent do we have staff who can communicate with program participants in their home language?
9. To what extent are our staff able to incorporate English Language Development strategies into their instruction to support English learners?
10. To what extent do we create space for participants to share issues that are important or concerning to them? Do the instructional materials create opportunities for students to raise issues and express concerns?
11. To what extent do we integrate the particular needs of the communities we serve into the curriculum, activities and the actual content we teach?
12. To what extent do our instructors effectively use student-centered practices that create space to learn with and from participants?
Are instructors aware of, knowledgeable about, and accepting of different belief systems and cultural approaches to knowledge, e.g., Traditional Knowledge?

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Looking for examples? Read through the "Chapter 2. Supporting High Quality Student Experiences" on page 23 for examples of programs working to improve their student experiences.

NOTES

For more information on equity, inclusion, and cultural relevance, see:

Youth Outside. (2016). Guide to cultural relevancy. Youth Outside: Oakland, CA. retrieved from: <http://www.youthoutside.org/resources>. *(This guide informed some of the questions below).*

NAAEE. (in press). Environmental education guidelines for community engagement.

Equity, Inclusion, and Cultural Relevance

Programs are at their best when we ensure the cultural relevance of outdoor science education in all the communities with which we work. This requires intentional and sustained attention, and in return, we are all enriched when the experiences, perspectives, and voices of our partner communities are represented in our work. In outdoor science education, we need to work hard at this, since people of color, low income communities, and English learners have not historically had access to outdoor science education or environmental and green economy careers. While these groups are disproportionately impacted by environmental and health problems, their needs and perspectives are not often represented in mainstream outdoor science education curriculum and programs. Achieving environmental literacy in our society and protecting the environment for future generations requires all of us to find the relevance of nature and healthy local environments in all the diverse communities of our country. The ability to accurately self-assess your organization's cultural competence and the cultural relevance of your programs is an essential component of program improvement.

Note: The questions below are embedded in the various capacities above, but are also clustered together here. The reason for this is two-fold: 1) so discussions of each capacity can include a discussion of equity, inclusion and cultural relevance in context and 2) so program leaders can accurately self-assess equity, inclusion and cultural relevance on its own as a distinct capacity.

Questions for Reflection, Self-Assessment, and Dialogue:***Leadership***

1. To what extent do we have a diverse leadership team that reflects and represents our current participants and the participants we hope to serve?
2. To what extent does our overall organization leadership (staff leaders, board members, advisors, partners) reflect the diversity and the values of the community we hope to serve?
3. To what extent do we actively bring in diverse opinions from outside the organization to our Board of Directors and staff?

Policy:

4. To what extent do our bylaws, board policies, mission statement, and program policies reflect an explicit commitment to equity, inclusion, and cultural relevance?
5. To what extent do our job descriptions have requirements that do not accurately reflect the demands of the job? For example, do we require a Bachelor's or graduate degree or teaching certificate when applicants could have certain other experiences that would also make them qualified?
6. To what extent do we have job descriptions, job announcements, and interview questions related to cultural competence that demonstrate our commitment to equity, inclusion, and cultural relevance?

7. To what extent do we actively recruit and hire qualified staff that represent the communities we serve? To what extent do we explicitly treat cultural competence as an expertise comparable to other areas of expertise we value?
8. To what extent do we actively recruit and raise funds for scholarships to support underrepresented groups to participate in our programs?
9. To what extent do our program materials and publications, including website, brochures, annual reports, and student materials, reflect the communities we serve and want to serve? To what extent are our materials accessible to all stakeholders, including student families? E.g., translating materials or hosting information nights in accessible locations.

Contextual Conditions:

10. To what extent do we explicitly refrain from asking one staff member or participant to speak on behalf of an entire community, and explicitly acknowledge a myriad of experiences within any given community? To what extent do we ask staff and participants to speak to their own personal experiences?
11. To what extent do we have a culture of safe, open communication, and a system of accountability for grievances so staff can share concerns without feeling stigmatized? Do we have a system for staff to share and address micro- or macro-aggressions in the workplace?
12. To what extent do we have a no-tolerance policy to discourage inappropriate language or jokes that target a specific demographic?
13. To what extent are we aware of and proactively address cultural and societal tensions in our community, region, state, nation?

Professional Learning

14. To what extent do we directly address cultural relevance in our professional learning experiences in order to grow the cultural competence of our staff? Are instructors aware of systemic, institutional bias and prejudice, and how it might affect participants of different social identities who come to our program?
15. To what extent are staff encouraged to learn about students' lived experiences and regularly reflect on how their instructional practices impact student experiences at our site?
16. To what extent is our staff knowledgeable about environmental justice issues that may affect underrepresented communities?

Curriculum & Instructional Materials:

17. To what extent do we have staff who can communicate with program participants in their home language?
18. To what extent are our staff able to incorporate English Language Development strategies into their instruction to support English learners?

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19. To what extent do we create space for participants to share issues that are important or concerning to them? Do the instructional materials create opportunities for students to raise issues and express concerns?
20. To what extent do we integrate the particular needs of the communities we serve into the curriculum, activities and the actual content we teach?
21. To what extent do our instructors effectively use student-centered practices that create space to learn with and from participants? Are instructors aware of, knowledgeable about, and accepting of different belief systems and cultural approaches to knowledge, e.g., Traditional Knowledge?

Tale from the Field 11. How We Changed our Hiring Practices

By Christy Rocca, Director, Crissy Field Center, San Francisco, California

In 2001 the Golden Gate National Parks Conservancy in California launched Crissy Field Center, an ambitious project to engage diverse youth, especially those who have had little access to their National Parks, in environmental leadership. We have learned quite a bit about what it takes to not only reach a diverse population, but to develop deep, authentic, long-term relationships with young people and their families. Our success depends on our ability to recruit and retain a staff that reflects the makeup of the youth community we want to engage in our programming. Our programs serve the San Francisco Bay Area so we need a highly diverse and multilingual team, which requires that we are continually intentional in our recruiting and hiring efforts. Today our staff is made up of 70% people of color who speak 5 languages spoken across the team. Here is how we got there:

Position Descriptions: We make our job postings an attractive invitation by putting our mission, values, and our intention to serve communities up front. We keep our “why” at the heart of our position descriptions. Our “why” is a long-term vision for making our park lands more welcoming, relevant and accessible to communities of color. We connect our desire to engage diverse youth to a longer term ambition to create a pathway through our youth leadership programs to job opportunities in the National Park Service to assist the entire agency in diversifying our staff.

Experience: We think carefully about the level of experience we require for a position. Do we really need a college degree for an entry-level position? Do we value community experience, service and volunteerism as much as we value a college degree? While college degrees are necessary for some positions, we are mindful about our requirements and what experience we really value. More requirements for a position will yield a narrower and less diverse pool of applicants.

Choosing Our Candidate Pool: We engage a diverse set of staff to both review and score resumes. Early on, this meant going outside our department or organization to create a diverse interview team. We develop and use the same criteria to evaluate each resume on a “score” sheet. Everyone on the interview team scores resumes separately and then we share results and select our pool of applicants. Having multiple perspectives engaged ensures we don’t fall into the common trap of choosing candidates who are “just like me.”

Interviewing: We develop a common set of questions to interview candidates. We don’t deviate from the questions, so the process is as unbiased as possible. Each member of the interview team scores each candidate’s answer to each question on score sheets. At the end of all of the interviews we share and discuss our findings.

First Day on the Job: We assign different staff members to orient new staff to the various components of the work they will be doing, to learn about the organization, and to eat lunch with them for the first couple of weeks so they feel welcome, valued and included in all aspects of the workplace.

Retaining Staff for the Long-Term: We invite our staff to build our work culture. We ensure they have opportunities to create an environment where diversity can thrive. We invite them to teach us about what makes them flourish in the workplace. We support activities that build mutual understanding, we act on their ideas, foster appreciation of differences and celebrate the amazing people that make up our team!

Deviating from interview questions:
For more information on why it’s important to not deviate from interview questions, check out:

Burrell, L. (2016). We just can’t handle diversity. Harvard Business Review. <https://hbr.org/2016/07/we-just-cant-handle-diversity>

Figure 12. Example Action Plan Template

[illegible]

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If you want to stay in touch with BEETLES and other programs that are engaged in this journey, go to beetlesproject.org: click on “Sign up to stay in the loop” in the upper right hand corner; click on “What’s New” to see blogs and announcements; and click on “Contact Us” to find various ways to reach us and other program leaders and educators using BEETLES materials.

More Tales from the Field: See an index of all Tales from the Field sprinkled throughout this Guide on “Index of Tales from the Field” on page v

Chapter 4. Implementation Examples

What are some challenges and successes others have had with implementing BEETLES that we can learn from?

You’ve made it this far? Great! That was a lot, wasn’t it? You might be wondering “Well, that was all helpful, but what might it actually look like to do all this in my program?” Luckily, many others have gone down this path before you, tried different approaches, and learned a lot. Through our interviews of many thoughtful and insightful program leaders, we’ve collected an array of interesting stories about strategies they’ve used successfully (and some that didn’t work out as well). You probably noticed some of them sprinkled here and there throughout this guide. These “tales from the field” serve as real-life examples of how some different programs have implemented approaches described in this guide (and sometimes beyond!) The following final section to this guide is a collection of a few more vignettes.

Tales from the Field in this section:

- “Oops! How I Wish We Hadn’t Introduced BEETLES to Staff, And What We’re Doing Now” on page 52
- “How We Changed Our “Tone-sets” to Inspire Students for Inquiry” on page 53
- “Getting Better at Letting Go As an Instructor” on page 54
- “How Implementing BEETLES Transformed Our Program” on page 55
- “How Our Two Programs Conducted BEETLES Professional Learning Collaboratively” on page 56
- “How Our BEETLES Implementation Was a Learning Experience for Everyone Involved” on page 57
- “The Whole Enchilada: How we transformed our program through BEETLES” on page 59

Oops! How I Wish We Hadn’t Introduced BEETLES to Staff, And What We’re Doing Now

By Paul Raia, the Director of Caritas Creek Environmental Education Program, Occidental California.

After attending a BEETLES institute, I was extremely excited about implementing BEETLES, and my work partner and I decided that we wanted to completely transform our program to being BEETLES-based as quickly as possible. During our next staff training, we attempted to share our enthusiasm. We presented four BEETLES professional learning sessions in a one week training session, and told staff they needed to use one BEETLES student lesson per hike, Mon-Thurs (it’s a Mon-Fri program).

Our enthusiasm wasn’t shared by staff. [Our approach] was too much, too fast, and a number of staff became resistant to the changes. Staff also complained about the professional learning sessions, which kept them indoors more than they were used to. So we decided to pull back on professional learning sessions, and on the speed of change. Currently we do one BEETLES professional learning session per season. We still require that instructors use one BEETLES lesson per day.

Our Site Directors do “What Scientists Do” on pre- and post-class visits. They bring crazy cool nature objects with them. This is going very well. All staff are required to do “I Notice, I Wonder, It Reminds Me Of” and “Hand Lens Introduction” on Monday’s “New Discoveries Hike”. We integrate lots of discussion routines throughout each hike. We use an unpublished draft of the BEETLES “Planning a Themed Hike: Ecosystems, Matter and Energy” as a framework for our Tuesday “Connection Hikes” and the BEETLES “Planning a Themed Hike: Adaptations” for our Thursday “Change Hikes.” Wednesday’s Ocean Hike lends itself to many BEETLES activities. Instructors have now become excited about using BEETLES materials, and BEETLES educational philosophy and lessons are becoming more enculturated into the Caritas Program.

How We Changed Our “Tone-sets” to Inspire Students for Inquiry

By Seth “Lion” Weinberg, School Programs Manager, Westminster Woods, Occidental, California.

At Westminster Woods in the past, we used introductions to our program blocks that were designed to provide a baseline of information, and also to be fun. On our Forest Ecology day, we helped students act out a food chain skit. For watershed ecology, we dressed up a kid as a watershed, complete with aquatic themed shower curtain and spritzed water on them after explaining what makes a watershed. While there is nothing wrong with this approach, we have always felt there was room to grow. Students were involved, but they weren’t the leaders. Students were asked questions, but they didn’t participate in meaningful discussions. They provided information about the day’s adventures, but they did little to prepare the students to truly engage in the learning process. Since being influenced by BEETLES and NGSS, we now design our introductions with the following science practices in mind: ‘Asking Questions,’ ‘Constructing Explanations and Designing Solutions,’ and ‘Engaging in Argument from Evidence.’

Our current style of introduction helps the students recall prior knowledge, stokes curiosity, and prepares the students to truly participate in their adventure. One of our best Forest Ecology introductions is centered around the question ‘Do Trees Eat Salmon?’ This mysterious question, which was introduced by our talented David ‘Redwing’ Salomon, is already written up on the white board when students enter their meeting room in the morning. After a little bit of ‘Guide on the Side’ style prodding, we regularly witness students enter into debates with their peers regarding the answer to the question. After an appropriate amount of unguided conversation, Redwing steps in and provides some basic information about the forest and the life cycle of the salmon – just enough to further the conversation, but not enough to give an answer. He then facilitates an opened ended discussion with the students using a variety of questioning strategies, including broad questions and pair shares. During the discussion, he continuously turns the conversation back to the students, encouraging them to speak to each other and directly engage with the information they have been given. By the end of the introduction, the students are genuinely curious about the relationship between salmon and trees. Instead of providing them with an answer at the end of the introduction, we tell the students that their Forest Ecology day will be an adventure focused on researching these types of questions through inquiry and

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Changing Tone-Sets: Tara Fuad, Education Director of San Elijo Lagoon Conservancy, San Diego, California, also found she needed to change her tone-set to be less focused on content-delivery. They now have their whole group of students look at a dead tree, make observations, and come up with questions about it. They found that this approach inspired students to be engaged inquirers during the hike.

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investigation. The students go on their adventure ready to explore, observe and share ideas – excited about the mysteries still unsolved in the forest.

Not all of our new introductions have been created wholly new. Some were existing introductions we have adapted to incorporate Next Generation Science Standards and best practices of pedagogy. In our ‘Wings’ introduction, we ask students to close their eyes and listen to the sounds created by a turkey vulture feather and an owl wing. Then, we have them open their eyes and guess which item made which sound. After a short discussion, we make the sounds again, this time with their eyes open. In the past, we asked a narrow question and got narrow answers. Now, we ask broad questions framed in the language of the Next Generation Science Standards. ‘Who can construct an explanation about which item made which sound?’ We then ask whether anyone would like to respectfully disagree with that statement, but only if they can base their argument on evidence.’ After they have been hooked in by the ‘Wings’ demonstration, we share a little information about the structure and function of adaptations and bring out a full, taxidermy owl. The students get to observe the owl, ask questions about its structures and construct explanations about their function with their peers. This simple change in language and questioning strategies has changed an oldy-but-goody into something that supports cutting edge pedagogy and adoption of next generation science standards.

Since we changed our ‘tone-sets,’ we have noticed that the students are much more excited and prepared to proactively engage in their education, research the world around them and create meaning for themselves.”

Getting Better at Letting Go As an Instructor

By Amelia Rosenman, formerly lead naturalist at San Mateo Outdoor Education (SMOE) in La Honda, California. Currently a Teacher Educator and Instructional Coach at the California Academy of Sciences, San Francisco, California.

The first time I led NSI: Nature Scene Investigators, it was a total flop. We were studying a piece of scat on the trail – which usually is pretty exciting! The students kept looking at me with “Am I doing this right?” expressions on their faces. Some just got bored and literally walked away. When silence descended on the group, I started feeding questions to the outer circle, but none of them cared enough to listen to the answers. Did I mention they were hot and tired, too?

The next few times I led the activity I made some adjustments. I prepped my kids for discussion with a practice debate. I got out a piece of cardboard and wrote some debate sentence-starters on it (see “Habits of Discussion”). Most importantly, I tried to really listen to my students, and not be too attached to my plan. I realized that if I let go a little bit, their curiosity could determine the course of our lesson.

On one of these days, we were checking out a big redwood burl in NSI formation. I labeled the burl, “the Object of Mystery.” As they were examining it, the students zeroed in on some markings in the wood. I actually hadn’t noticed the markings before, but suddenly they became the heart of our mystery! Everywhere we went, students started noticing the markings on other trees and they would call out, “It’s the Object of Mystery!” At first, the students hypothesized that the markings came from lightning or people. As we continued on our hike, though, some students

guessed they could be evidence of insects. Meanwhile, another student wanted to check out some moss on an oak tree and soon we were all sticking our noses up to moss and inspecting it. I asked, “Is this moss growing in soil?” At first, they all shouted “No!” because it was growing on a tree, but when we looked closer, the moss seemed to have trapped some soil on the surface of the tree. Our question became, “Does moss need soil?” And as we went through our day, any time we ran into some moss, someone would go check – soil or no soil? At the end of the lesson, I wasn’t sure whether to return to the redwood burl. Did they need to know what it was? Did they need to answer the question I’d planned as the crux of our day? Looking back on it, I’d say no. By the end of the day, they’d already tackled the important mysteries – the ones they’d chosen themselves.

How Implementing BEETLES Transformed Our Program

By Jenny McGuigan, School Program Coordinator, Great Smoky Mountains Institute at Tremont, Townsend, Tennessee.

The implementation of BEETLES transformed our program in a variety of ways. The discussions within sessions helped reveal where we wanted to be, and the session activities showed us ways to get there. It inspired us to question a lot of things we were doing. We realized that we didn’t fully understand our own programs’ goals. It inspired us to change some of our curriculum. We ended up implementing BEETLES and doing strategic planning at the same time. It was frustrating at times, but led us to figure out a lot about what we wanted to do, and how we wanted to tell our story about what we do.

It helped to professionally develop our staff. Many instructors were “opened up” by the experience, including some hard nuts to crack. For a few staff, it rocked their world. Some of our team needed to get the tools and break-down of the process offered by BEETLES, as well as, the confidence from successful implementation. Some thought they were already being student-centered, but realized they weren’t. It made some of our instructors nervous to give power over to students, and it was enlightening for them to see it work so well when they did. It pulled out things we weren’t able to express together, increased dialogue between staff, and gave us new shared language to use to communicate. At the end of each professional learning session not everyone was happy. But it made us take the time to have the conversations that were needed. In some ways we were an old program stuck in its ways. BEETLES rejuvenated us, and helped instructors understand that it’s OK to struggle in your growth as a professional. It made us more relevant and current in education.

We work with a lot of classroom teachers who present some of our programming, and we conduct a lot of professional learning. The way professional learning was conducted at the BEETLES Institute has served as a model for us. We don’t want to offer “island” experiences anymore, but now offer more on-going professional learning. We’re better educators and professional developers, and students and teachers get a better product from us. We’re better at assessing ourselves and assessing students.

We invited National Park Service employees to most of our trainings. They do day programs and we do residential programs, with many overlapping children. A handful of NPS staff showed up, but it was enough to inspire change. In particular, I Notice, I Wonder, It Reminds Me Of and Questioning Strategies

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inspired them to radically change their curriculum and approach. They got rid of certain lecture introductions, and now get participants exploring quickly. This has really helped us to be more in sync with each other, which has allowed us to build on what children are learning in our respective programs.

In first 20 min of the first BEETLES session, we got into a long discussion on whether it was more important to do adventure, science, or to have fun. Eventually, through BEETLES sessions and the discussions they inspired, we learned how we could teach science, have adventures, hit standards, have fun, and stay safe.

We even brought BEETLES to a board meeting. The board had expressed that they wanted our program to be excellent and cutting edge. So we took 15-20 minutes of a board meeting to do a snippet of Decomposition Mission (We brought decomposing leaves in for them to work with), and then used this brief experience to explain a little about BEETLES, and the changes we were implementing. It was very well-received and we hope will inspire them to support and fund us in the future.

How Our Two Programs Conducted BEETLES Professional Learning Collaboratively

By Beth Taylor, Education Program Manager of Expedition Yellowstone, and Jessica Haas, Program Manager of Yellowstone Forever Institute, Wyoming.

Our two programs serve the same population in different ways. Before BEETLES, we didn't collaborate at all, and in fact were somewhat competitive and territorial with each other. When we learned about BEETLES, we thought we could be more effective if we were more collaborative, and thought we could be more efficient with professional learning if we conducted sessions together. We thought we'd be more powerful in unison, and that our workshops would be richer with more perspectives in the room. So we applied to the BEETLES institute as a team, they were intrigued by our plan, and accepted us. Over time, we presented four BEETLES professional learning sessions with our two combined staffs. We presented each one collaboratively, in a tag-team way, taking turns presenting different parts.

It went better than we expected. During the workshops, we integrated our staffs intentionally in terms of where they sat, and who they teamed up with for discussions. At the end of each session, we divided them back into separate staffs so they could plan how to integrate what they'd learned into their respective programs.

We think that one of the reasons the collaboration worked so well was that staff were kind of on their best behavior with the other staff present. We think this may have helped us avert possible resistance from staff who might've been more vocally opposed if they were just with their own staff. They couldn't as easily say that their program was fine as it was when mixed in with folks from a different program. BEETLES worked well as a sort of neutral tool that brought us together. It wasn't political. No one owned it. It wasn't one program presenting something to the other, but instead it was both staffs on the same page, learning together something that was new to us all. It was a good way to get our folks in the room and for them to get to know each other and respect each other as educators. It

was a great catalyst for our collaboration, and we got “brownie points” from our superintendent for collaborating with each other. It gave us a platform with a common language. We learned that we held similar values. Since then we have done a couple of team-building retreats together. The competitiveness is gone.

We’ve also had staff who’d been through BEETLES professional learning sessions take on the presenting of sessions to our seasonal staff. We’ve integrated BEETLES approaches into other aspects of our professional learning too. For example, we have a snow science session, into which we integrated questioning strategies and I Notice, I Wonder, It Reminds Me Of. Some of our staff have taken it further and done presentations for the Montana Environmental Education Association, and the Wyoming Math and Science Teachers Conference. Next year we plan to do more, including at the Idaho Environmental Education Association (IdEEA). This has empowered our staff, and increased our capacity as environmental educators.

How Our BEETLES Implementation Was a Learning Experience for Everyone Involved

By Keith Williams, Executive Director, Richard Garber, Director of Education, and Salena Garber, Education Manager, NorthBay, Elk Neck State Park, Maryland

When Daksha and I came back from the BEETLES institute we were extremely excited and wanted to implement BEETLES in a big way and right away. We experimented with rolling it out a few days after the institute. It was too much too fast. We had been quite proud of our program and knew combining character-development with hands-on science investigations to be an effective method of teaching kids how they can make better choices in their lives. Our curriculum consists largely of 3 hour lesson blocks 7 times per week for our five-day residential program. Students focus on issue investigation with our several seasonal lessons such as wetlands, clams, fish, baygrass, trees, vultures, deer, vernal pools, monarchs, eastern bluebirds, erosion, food 101, fungi, and pollinators. Our lessons were originally written using the 5 E format. When we introduced the BEETLES learning cycle, our staff did not understand how to adapt lessons to be more student-led and allow greater time for observation and exploration within our time constraints.

Educators teaching the NorthBay lessons often began with an engagement game followed by a lecture giving background information using a whiteboard. Issue investigation consists of identifying an issue, research question, study design, data collection and evaluation, with a conclusion, and recommended actions. When we got back, I told folks to stop using whiteboards and lecture. The team was excited to try something new but apprehensive about changing methods they felt were effective.

Our most experienced educators were very resistant because they felt a great deal of ownership in the existing program. They were afraid that we were throwing out all the lessons they had worked hard to develop over the years. Their perception, and that of many of our visiting classroom teachers, was that we were throwing out rigorous science curriculum and replacing it with wandering around in nature. For the first couple of months there was a lot of confusion and internal conflict. We certainly did not have universal buy in and the changes were argued continually. It wasn’t all bad, because if you’ve got a roomful of people arguing about the best way to teach, you’re in a pretty good spot! They were definitely

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engaged, and wanted to be effective educators. As they modified lessons, their timing was thrown off, and they weren't finishing on time. So we said, "what if you don't have a timetable," and encouraged them to break out of the 3 hour time block they had become accustomed to. For some it worked, but gave students different week long experiences and was often met with resistance by visiting faculty. Most went back to the 3 hour block. At this point, we were not successfully implementing BEETLES while maintaining our issue investigation curriculum. Changes were made that were drastic and not consistent with a healthy transition. There was a general impression among educators that we already expected a lot of them, and that we were now adding more outcomes for them to reach. They needed to realize we weren't giving them more outcomes, but a new pathway to reach their outcomes.

The turnabout came when we sat down as a team in small groups to re-vamp our lessons using the BEETLES Learning Cycle. We launched the meeting with a tone of understanding and clear expectations. Everyone agreed student centered education was the goal. The staff had been through the BEETLES Teaching & Learning professional learning session, so they had a good understanding of the Learning Cycle. We realized that although our lessons in the past had been written out using the 5E "learning cycle" model, they weren't always designed well. We also realized that in the past our staff didn't understand the Learning Cycle model well, and we didn't emphasize it enough. Instructors often used a game to engage students with the topic, but students were more focused on the game than on the topic. Instructors would also deliver a lot of content right after the game, skipping the Exploration phase. During the small group work, we assigned one existing lesson per group to incorporate BEETLES, and to redesign to be Learning Cycle-based. Our staff was really up for the task, and got to combine their deep experience and creative ideas with ideas they had learned through BEETLES. Our new lesson write-ups offered multiple options for educators to choose from to do during the Invitation and Exploration components. It worked really well. This strengthened and clarified the baseline expectation of how we should engage in learning with our students.

Another component that helped turn things around was that we had an educator who was a natural at teaching the way BEETLES suggests. He totally embraced it, because he felt like it was true to what was already making him successful. His confidence created demand for others to observe him teaching. In turn, many of our educators that were resistant to change in concept, embraced it as they saw it in action. Our most vocally resistant staff member was also our most senior. He echoed many of the concerns we had heard regarding a loss of academic rigor. I took the opportunity to observe him teaching and found that, despite his detractors, he had begun implementing BEETLES. He let students guide the lesson, and it flowed beautifully. The perceived lack of control created by sharing control of learning with his students was what he had feared. It took time to for him to prove to himself that it would be alright. The natural curiosity of his students coupled with his skills of questioning and facilitation would always be enough to reach amazing outcomes.

There was one other aspect to integration that proved valuable. Daksha was right in the middle of program creation/growth with our outreach program when she returned from the BEETLES institute. Daksha had total freedom to create

the program from the ground up and get it out to schools. The curriculum was created as a new integration of our IEEIA core curriculum, BEETLES and NGSS. Daksha got right to work in our partner schools and created a huge demand very quickly. Lessons were delivered in the classroom, schoolyard or local environment and it proved incredibly successful. Teachers praised the rigor and alignment with NGSS and took the learning cycle without batting an eye. The demand created a need for our field educators to get out with Daksha and work in classrooms and schoolyards. This additional experience of delivering programming side by side with teachers gave a huge boost of confidence to our staff. The fears of losing the rigor associated with our program gave way and we moved rapidly toward true across-the-board implementation.

BEETLES implementation has been a learning experience for us all. While our educators learned to give up some control I had to learn the same lesson. I learned to give our team the space to grow and allow them to build trust in themselves and BEETLES in whatever way worked for them. I found that just one approach isn't effective and I had to be open to allowing each person their own journey. Today, BEETLES is integrated in every aspect of our program from field experiences with 6th graders to Professional Development with seasoned classroom teachers and outreach programming in schools. We are still learning and growing and look forward to sharing the struggles and successes to come!

The Whole Enchilada: How we transformed our program through BEETLES

By Gregory Bahr, Principal of San Joaquin County Outdoor Education program, La Honda, California.

Why BEETLES? After many rewarding years in outdoor science schools as an instructor and director/principal, I remember feeling like what we were doing was great, but could be better. I didn't know how, but I just felt like it could be. Most of the strategies I'd seen in different programs were not inquiry based or student-centered. Many activities could be done in a parking lot, and didn't take advantage of the wonderful outdoor settings where they were being done. Students were not fully engaging with the environment. Using BEETLES has given us what we were missing. It teaches observation skills and brings out children's natural sense of curiosity. It gives students permission to explore and get dirty. It enhances scientific inquiry and discussion habits. And we've found that our students now do this even on their own, without an instructor telling them to do it!

Defusing Resistance. When I attended a BEETLES institute, I asked a lot of questions, and I struggled quite a bit with the ideas that were new to me. By the end of the week I was "all-in," but I try to remember the struggle I had as I work with instructors when they are struggling with new ideas. I've found that it takes time, and that I need to be patient with them, and meet them where they're at. Now when I hire staff, I explain the teaching philosophy and practices, and that the expectation is to teach using an inquiry-based, student-centered approach. I give them an example of what this looks like. If there is resistance to this, I address it head on and openly. Making small steps towards more inquiry-based student-centered can ease resistance. When re-hiring or promoting staff, I address BEETLES straight on. I let them know that BEETLES is here to stay and everyone needs to be on board and support it. I ask a lot of questions to see where they're

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at, such as, “Where are you with BEETLES, and where do you need to get to? How are exploration activities going? How are Walk & Talks? Group discussions? What new things will you be incorporating weekly into your teachings? What help or questions do you have about activities or the inquiry based, student-centered approach? What PL session do you want to lead or co-lead for the staff?”

I also support staff who are jumping on board with BEETLES-type instruction. I positively highlight and encourage those who are trying new activities. If an activity doesn't go well, I help them analyze what didn't work, and what can be modified.

I seek out and listen to feedback. I listen to see if complaints are legitimate, or if they're just complaining because it is something new, or if they are not sure how to make the change. I provide support to staff. This can be materials, time to create new lessons, opportunities to observe other staff, and or more discussion time with fellow instructors. I also offer to tag along on a hike with kids, and do a role model teaching of a lesson. This can be powerful and helpful for staff to see. Interview an Organism has become my jam. Afterwards, I debrief it with the staff and highlight the good, the not as good, and the things could be done better next time. Doing this makes me vulnerable, like I'm asking them to be. I've found it's important to model humility, openness, growth mindset, and all the things I'm asking them to do. I also tell them to have faith in this way of teaching, and I'd say the same to program leaders new to this approach. It can be challenging to have faith in something you are not familiar with or confident in. But have faith anyway and be observant as you and your staff implement this. Look to see what changes occur with your students. Rome was not built in a day, and neither was an overhaul of a program. Making long lasting changes to people's thinking and teaching is a journey, not a quick change-over. Be positive, understanding, and patient (but persistent).

BEETLES Permeates our program. We use the Instructor Support for Leading Meaning-making Discussions and Instructor Support for Guiding Exploration sheets as part of observations of instructors, including peer observations. I try to role model teaching and thinking in an inquiry-based and student-centered way in everything I do as a director. We have tweaked and modified our student journals and supplemental materials. Our counselor-coordinator has taken the “philosophy” of inquiry-based, student-centered learning and the importance of peer discussions to our high school cabin leader 2 hour training on Monday. He incorporated Walk & Talks and discussions, covering the material so it was not lecture format any more! We have even incorporated BEETLES philosophy into our evening programs. We have a staff person host our campfires at night as a character, so during staff training I modeled doing it as Curious George. I had a knapsack of things I'd found in the forest I shared during the banter part of campfire. Campfire stories and songs that highlight curiosity and discovery can also encourage inquiry based learning. A song by the Banana Slug String Band that supports the curiosity philosophy is Singing to the Moon.

Professional Learning Sessions. During our 2 week staff training we do 2 PL Sessions every year (since we have new interns every year). The first PL session is *Teaching & Learning*. The reason is the interns will need to know the basics about lesson planning, and this session is the best way to teach it to them right away. Most have never had to create a full blown lesson plan before.

It hits the needed details and some of the why's of the Learning Cycle. During observations of instructors we discuss their lesson plan and apply the learning cycle to it. This session also lays the foundation and frame of reference for further discussions during the year about lesson planning. The second session we do during staff training is *Making Observations*. This session teaches how to teach observations skills. When one knows how to observe properly, they are able to learn directly from nature. The students can become life-long learners from nature. The observational skills also cut across learning disabilities and English learners. Observation is the doorway to understanding larger ecological concepts first hand. Observational skills can be, and should be, used to teach most environmental concepts.

Usually in a month or two in the program we do *Constructing Understanding*. This gives field instructors a deeper understanding of how and why inquiry based, student-centered learning is an effective way of teaching. It's like the "part 2" of *Teaching & Learning*. It's a re-visit to how we learn, but takes it to a deeper level. In January or February we will usually do *Evidence & Explanations*. This session provides more tools for observation based discussions and inquiries, and helps deal with students saying crazy explanations about nature that are not based on observation or evidence. Introducing "what is your source" is also valuable for staff. It makes people think about where they "learned" their information. It also puts staff on more level ground with the students - that we are also learners just like they are. It can also empower students to know where they can find out more information about "nature". *Field Journaling with Students* has been done at different times. It's now part of what we do, so some aspects of journaling gets passed on even if the full blown session is not done. We have also mixed in other BEETLES PD sessions.

Trail Routines and activities. We emphasize and teach the following activities, and they get used throughout the year. *Walk & Talk* is introduced during staff training, and most field instructors make it their own pretty early on. *I Notice, I Wonder, It Reminds Me Of* takes more encouraging and coaching in order for the staff to make it a mainstay every week. Encouragement and suggestions as to when to use it is needed. Re-explaining the importance of the activity and its versatility is needed many times. Either *Decomposition Mission* or *Lichen Exploration* is done as part of the PL sessions during staff training. *Mind Pie* and *Case of the Disappearing Log* are introduced sometime the first semester, sometimes a little more informally, during a Monday morning staff meeting for example. *Mind Pie* is used, but not consistently, which I am OK with. It is a good tool to know and use from time to time.

List of some weekly staff discussion questions we've used. At our Monday morning staff meetings, we spend time discussing a Big Question/challenge to bring up a topic that staff apply to their instruction with students that week. It's part of our attempt to create year-long dialogue of what good teaching and learning is all about. The question stays on the board throughout the week, as a reminder and invitation to further discussion. At the end of the program, they reflect/discuss- what was your plan, did it work, why/why not?

Example Discussion Questions: see the box on the next page for example questions that Gregory used with his staff.

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Gregory's Weekly Questions

- What are you most confident about this week? What are you most nervous and uncertain about?
- What inquiry based activity will you try to incorporate into your week?
- If you were a student here for the week, what would you want to take away from the experience?
- How will you address less telling of facts and more asking of student questions?
- What non-fiction story can you use this week and what fiction story can you leave out?
- How could you incorporate a discussion on sustainability?
- How can you connect with students on an individual level?
- What other type of exploration will you do beside spider exploration?
- How can you play "20 questions" less, and have more exploration on trail?
- How are you going to get your student's minds off of the cold?
- How are you going to avoid the "students getting antsy to get back to campus" syndrome?
- What theme will you use to tie in sit spots?
- How will you use the rain as an inquiry based activity/ topic?
- What "canned spiel" will you replace with student centered inquiry lesson?
- How can you incorporate "evidence" or "assumptions" into your inquiry based student centered teaching?
- What NSI (Nature Scene Investigators) will you do this week to go with your theme?
- How will you incorporate something you learned on our staff professional learning day at the Monterey Bay Aquarium into your teaching?
- What open-ended questions will you use for the theme of conservation?
- How can we increase participation and engagement within the trail group?
- How can you foster a sustainable inquiry based topic on trail?
- How will you incorporate the garden into your themes?
- What activity has changed since you started to teach it on trail?
- How will you unearth value in little things?
- What have you learned from your co-workers this year?
- How are you going to help your students create a community of positive energy?
- How are you going to encourage 100% participation from your students during discussion?
- How will you discover students' alternate conceptions this week?
- What are you going to use from the Association of Environmental & Outdoor Educators conference this year? This week?
- How will you apply positive discipline techniques?
- What open-ended questions will you ask about the tide pools and it's critters this week?
- Where can you apply I Notice, I Wonder, It Reminds Me Of?
- How will you use the rainy day activities/ tricks that were presented on Friday?
- What did you do or see over the break that inspired you and that you want to bring here?
- How will you increase inquiry fever on trail? Also, what do you consider a reliable source for information?
- How will you use inquiry fever with regards to salamanders, newts, and fungi?
- How are you going to expand on your group's wildlife observations this week?
- How will you use nature journaling on trail?
- What will you do to develop a culture of positivity within your trail group?

Thanks for reading (and using) this Guide, and thanks for all the hard and thoughtful work it takes to keep a program vibrant, and moving in the direction of increasing quality and effectiveness. It's important work!

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Appendix: Building Capacity Tool

Use this tool, along with the directions provided in “How to Assess the Capacities of Your Program and Make a Plan to Improve It” on page 38

Vision and Reality

1. To what extent does our program have a widely shared programmatic vision? Was that vision developed with consensus from leaders in our community? Does it outline key program components, such as the curriculum, a professional learning system, the types of experiences we provide, and what we hope will result from them?

Current Status	1	2	3	4	5	N/A	?
Notes:							

2. To what extent does our program have a widely shared commonly understood vision for good teaching and learning? Does it outline best practices for good instruction, emphasize underlying philosophies, and address the subject matter to be included?

Current Status	1	2	3	4	5	N/A	?
Notes:							

3. To what extent does our program have a plan and concrete vision of how to develop and implement high-quality experiences for every student? Are leaders in agreement about specific steps of the process?

Current Status	1	2	3	4	5	N/A	?
Notes:							

4. To what extent do all our program leaders and instructors have knowledge of instructional realities? Are all program leaders able and willing to examine the realities? Are there multiple mechanisms in place for collecting and examining data to help leaders better understand what concepts and lessons are being taught, the quality of instruction, and the degree to which program supports such as student journals, lunch logistics, etc., are working?

Current Status	1	2	3	4	5	N/A	?
Notes:							

5. To what extent does our program create differentiated opportunities to learn for all students, with particular attention paid to underserved/underrepresented student populations?

Current Status	1	2	3	4	5	N/A	?
Notes:							

6. To what extent does our program have a system for gathering and using data? E.g., surveys, instructional plans, instructor journals, systematic observations of instructors, etc., including data about program implementation, the realities of instruction, and responses from students, that can be used both for program improvement and for “making the case” for the program to external audiences?

Current Status	1	2	3	4	5	N/A	?
Notes:							

Leadership

1. To what extent is there a committed and empowered core leadership team formally responsible for improving education at our site? Does this group represent a “vertical slice” of our program with varying responsibilities from executive functions to program administration to instructional duties? Does this group work well together and bring complementary skills, perspectives, and spheres of influence to the improvement effort?

Current Status	1	2	3	4	5	N/A	?
Notes:							

2. To what extent do we have a diverse leadership team that reflects and represents our current participants and the participants we hope to serve?

Current Status	1	2	3	4	5	N/A	?
Notes:							

3. To what extent does our overall organization leadership (staff leaders, board members, advisors, partners) reflect the diversity and the values of the community we hope to serve?

Current Status	1	2	3	4	5	N/A	?
Notes:							

4. To what extent has our program identified and supported strong instructional leaders who can assist the improvement effort by leading or co-leading professional learning, demonstrating and model teaching with students, and participating in writing, revising, and piloting new curriculum? Are there instructional leaders at every site (for larger programs)?

Current Status	1	2	3	4	5	N/A	?
Notes:							

5. To what extent is our board knowledgeable about and supportive of our efforts?

Current Status	1	2	3	4	5	N/A	?
Notes:							

6. To what extent do we actively bring in diverse opinions from outside the organization to our Board of Directors and staff?

Current Status	1	2	3	4	5	N/A	?
Notes:							

7. To what extent do we have a relationship with and working access to sources of outside expertise? E.g., university faculty, graduate students, local naturalists, high school teachers, or local museum staff? Do we have supports in place to enable them to play a useful role? E.g., review curriculum for scientific accuracy, sit on committees, assist with professional learning opportunities?

Current Status	1	2	3	4	5	N/A	?
Notes:							

8. To what extent are there mutually beneficial connections, partnerships or collaborations between our program and other programs or institutes aimed at outdoor learning ? E.g., similar programs, universities, school districts, science museums?

Current Status	1	2	3	4	5	N/A	?
Notes:							

9. To what extent are our program leaders involved with and connected to leaders in other programs, professional associations, networks, and national projects involving outdoor education? E.g., North American Association of Environmental Education, Association of Nature Center Administrators (and its associated conference for Residential Environmental Learning Centers), statewide environmental education and science teachers associations, departments of education, regional environmental education collaboratives, or other professional associations?

Current Status	1	2	3	4	5	N/A	?
Notes:							

10. To what extent is there strong external political leadership for outdoor learning opportunities and other supporting science and STEM education? Are our program leaders up to date and connected with the school system, after-school network, mayor's office, state initiatives, etc.?

Current Status	1	2	3	4	5	N/A	?
Notes:							

Program Policies and Priorities

1. To what extent has our program made high quality teaching and learning a priority that's reflected in policies, finances, and supports?

Current Status	1	2	3	4	5	N/A	?
Notes:							

2. To what extent has our program reviewed and evaluated state education standards, and made principled decisions about revising instructional expectations and curriculum to better support high quality education?

Current Status	1	2	3	4	5	N/A	?
Notes:							

3. To what extent does our program have policies in place that support high quality student experiences?

Current Status	1	2	3	4	5	N/A	?
Notes:							

4. To what extent does our program have policies in place that support regular and reflective professional learning opportunities for staff?

Current Status	1	2	3	4	5	N/A	?
Notes:							

5. To what extent does our program have in place formal program evaluation, student assessment or other practices and policies designed to provide evidence of program effectiveness?

Current Status	1	2	3	4	5	N/A	?
Notes:							

6. To what extent does our program have communication policies and practices for systematic communication with all stakeholders?

Current Status	1	2	3	4	5	N/A	?
Notes:							

7. To what extent does our program have sufficient financial resources and capacity to acquire and designate funding resources as necessary for current priorities? How nimble is our organization at finding resources to address priorities?

Current Status	1	2	3	4	5	N/A	?
Notes:							

8. Overall, to what extent does our program proactively and deliberately identify and resolve systemic barriers and challenges?

Current Status	1	2	3	4	5	N/A	?
Notes:							

9. To what extent do our job descriptions have requirements that do not accurately reflect the demands of the job? For example, do we require a Bachelor's or graduate degree or teaching certificate when applicants could have certain other experiences that would also make them qualified?

Current Status	1	2	3	4	5	N/A	?
Notes:							

10. To what extent do we have job descriptions, job announcements and interview questions related to cultural competence that demonstrate our commitment to equity, inclusion and cultural relevance?

Current Status	1	2	3	4	5	N/A	?
Notes:							

11. To what extent do we actively recruit and hire qualified staff that represent the communities we serve? To what extent do we explicitly treat cultural competence as an expertise comparable to other areas of expertise we value?

Current Status	1	2	3	4	5	N/A	?
Notes:							

12. To what extent do we actively recruit and raise funds for scholarships to support underrepresented groups to participate in our programs?

Current Status	1	2	3	4	5	N/A	?
Notes:							

13. To what extent do our bylaws, board policies, mission statement and program policies reflect an explicit commitment to equity, inclusion and cultural relevance?

Current Status	1	2	3	4	5	N/A	?
Notes:							

14. To what extent do our program materials and publications, including website, brochures, annual reports, and student materials, reflect the communities we serve and want to serve? To what extent are our materials accessible to all stakeholders, including student families? E.g., translating materials or hosting information nights in accessible locations.

Current Status	1	2	3	4	5	N/A	?
Notes:							

Contextual Conditions

1. To what extent does our program have a healthy climate and culture? Have we, as a program, developed indicators of a healthy culture and climate? Do program leaders understand how the working conditions, professional culture and overall morale influence the willingness of all those working in our program to initiate and sustain improvement efforts?

Current Status	1	2	3	4	5	N/A	?
Notes:							

2. To what extent does our program's stability, instability, turnover or growth affect the willingness of those working in our program to initiate and sustain improvement efforts?

Current Status	1	2	3	4	5	N/A	?
Notes:							

3. To what extent do we explicitly refrain from asking one staff member or participant to speak on behalf of an entire community, and explicitly acknowledge a myriad of experiences within any given community? To what extent do we ask staff and participants to speak to their own personal experiences?

Current Status	1	2	3	4	5	N/A	?
Notes:							

4. To what extent do we have a culture of safe, open communication, and a system of accountability for grievances so staff can share concerns without feeling stigmatized? Do we have a system for staff to share and address micro or macro-aggressions in the workplace?

Current Status	1	2	3	4	5	N/A	?
Notes:							

5. To what extent do we have a no-tolerance policy to discourage inappropriate language or jokes that target a specific demographic?

Current Status	1	2	3	4	5	N/A	?
Notes:							

6. To what extent are we aware of and proactively address cultural and societal tensions in our community, region, state, nation?

Current Status	1	2	3	4	5	N/A	?
Notes:							

7. To what extent is our program aware of local school district and/or community political and financial conditions and how they influence our program's efforts to develop and plan a process to deliver high quality student experiences?

Current Status	1	2	3	4	5	N/A	?
Notes:							

8. To what extent is our program aware of state political and financial conditions and how they influence our program's efforts to develop and plan a process to deliver high quality student experiences?

Current Status	1	2	3	4	5	N/A	?
Notes:							

9. To what extent is our program aware of federal political and financial conditions and how they influence our program's efforts to develop and plan a process to deliver high quality student experiences?

Current Status	1	2	3	4	5	N/A	?
Notes:							

10. To what extent is our program aware of state and federal guiding documents, such as the Next Generation Science Standards, Common Core State Standards, State Environmental Literacy Plans, and the C3 Framework for Social Studies, and how they support our program's vision for high quality student experiences? How are we adapting our program to address these documents?

Current Status	1	2	3	4	5	N/A	?
Notes:							

Professional Learning

1. To what extent does our program have people with the expertise, position, time and interest to develop, shape and refine our professional learning program?

Current Status	1	2	3	4	5	N/A	?
Notes:							

2. To what extent does our program include a diverse menu of high quality professional learning experiences?

Current Status	1	2	3	4	5	N/A	?
Notes:							

3. To what extent does our program utilize partners and outside experts to provide specialized professional learning opportunities?

Current Status	1	2	3	4	5	N/A	?
Notes:							

4. To what extent does our program have people with expertise to design and offer workshops, coaching, learning communities and other supports that help our educators use instructional materials and continuously improve their practice?

Current Status	1	2	3	4	5	N/A	?
Notes:							

5. Specifically, to what extent does our program have expertise and capacity to offer professional learning opportunities on: Pedagogy and best teaching practices; Relevant state standards; Specific science content knowledge; Assessment of student learning; Other important programmatic elements

Current Status	1	2	3	4	5	N/A	?
Notes:							

6. To what extent does our program have the intention and capacity to provide ongoing leadership development leading to a pathway for career advancement, within or beyond our program? Does our program offer mid-level positions or other opportunities for instructors to take on leadership roles?

Current Status	1	2	3	4	5	N/A	?
Notes:							

7. To what extent does our program provide ongoing professional learning opportunities for program leaders and administrators to help them support high quality instruction throughout the program?

Current Status	1	2	3	4	5	N/A	?
Notes:							

8. To what extent do we directly address cultural relevance in our professional learning experiences in order to grow the cultural competence of our staff? Are instructors aware of systemic, institutional bias and prejudice, and how it might affect participants of different social identities who come to our program?

Current Status	1	2	3	4	5	N/A	?
Notes:							

9. To what extent are staff encouraged to learn about students' lived experiences and regularly reflect on how their instructional practices impact student experiences at our site?

Current Status	1	2	3	4	5	N/A	?
Notes:							

10. To what extent is our staff knowledgeable about environmental justice issues that may affect underrepresented communities?

Current Status	1	2	3	4	5	N/A	?
Notes:							

Curriculum and Instructional Materials

1. To what extent does our program have well-defined and shared expectations of what is to be taught, how it is to be taught, and how to differentiate between grade levels?

Current Status	1	2	3	4	5	N/A	?
Notes:							

2. To what extent does our program provide opportunities for students to use science practices to engage directly with and investigate nature?

Current Status	1	2	3	4	5	N/A	?
Notes:							

3. To what extent are our curriculum and instructional materials designed to address our state education standards?

Current Status	1	2	3	4	5	N/A	?
Notes:							

4. To what extent are our state education standards philosophically aligned with our program?

Current Status	1	2	3	4	5	N/A	?
Notes:							

5. To what extent do our curriculum and instructional materials represent best practices and up-to-date research on how people learn? Including, three-dimensional learning (for science-focused experiences), Learning Cycle/5E model, and other student-centered practices?

Current Status	1	2	3	4	5	N/A	?
Notes:							

6. To what extent do our instructional materials support the vision and goals of our program?

Current Status	1	2	3	4	5	N/A	?
Notes:							

7. To what extent does our program have people with the expertise, position, time and interest in continuing to plan for, shape, and improve our curriculum?

Current Status	1	2	3	4	5	N/A	?
Notes:							

8. To what extent do we have staff who can communicate with program participants in their home language?

Current Status	1	2	3	4	5	N/A	?
Notes:							

9. To what extent are our staff able to incorporate English Language Development strategies into their instruction to support English learners?

Current Status	1	2	3	4	5	N/A	?
Notes:							

10. To what extent do we create space for participants to share issues that are important or concerning to them? Do the instructional materials create opportunities for students to raise issues and express concerns?

Current Status	1	2	3	4	5	N/A	?
Notes:							

11. To what extent do we integrate the particular needs of the communities we serve into the curriculum, activities and the actual content we teach?

Current Status	1	2	3	4	5	N/A	?
Notes:							

12. To what extent do our instructors effectively use student-centered practices that create space to learn with and from participants? Are instructors aware of, knowledgeable about, and accepting of different belief systems and cultural approaches to knowledge, e.g., Traditional Knowledge?

Current Status	1	2	3	4	5	N/A	?
Notes:							

Equity, Inclusion, and Cultural Relevance

Reminder: The questions below are embedded in the various capacities above, but are also clustered together here. The reason for this is two-fold: 1) so discussions of each capacity can include a discussion of equity, inclusion and cultural relevance in context and 2) so program leaders can accurately self-assess equity, inclusion and cultural relevance on its own as a distinct capacity.

Leadership

1. To what extent do we have a diverse leadership team that reflects and represents our current participants and the participants we hope to serve?

Current Status	1	2	3	4	5	N/A	?
Notes:							

2. To what extent does our overall organization leadership (staff leaders, board members, advisors, partners) reflect the diversity and the values of the community we hope to serve?

Current Status	1	2	3	4	5	N/A	?
Notes:							

3. To what extent do we actively bring in diverse opinions from outside the organization to our Board of Directors and staff?

Current Status	1	2	3	4	5	N/A	?
Notes:							

Policy:

4. To what extent do our bylaws, board policies, mission statement, and program policies reflect an explicit commitment to equity, inclusion, and cultural relevance?

Current Status	1	2	3	4	5	N/A	?
Notes:							

5. To what extent do our job descriptions have requirements that do not accurately reflect the demands of the job? For example, do we require a Bachelor's or graduate degree or teaching certificate when applicants could have certain other experiences that would also make them qualified?

Current Status	1	2	3	4	5	N/A	?
Notes:							

6. To what extent do we have job descriptions, job announcements, and interview questions related to cultural competence that demonstrate our commitment to equity, inclusion, and cultural relevance?

Current Status	1	2	3	4	5	N/A	?
Notes:							

7. To what extent do we actively recruit and hire qualified staff that represent the communities we serve? To what extent do we explicitly treat cultural competence as an expertise comparable to other areas of expertise we value?

Current Status	1	2	3	4	5	N/A	?
Notes:							

8. To what extent do we actively recruit and raise funds for scholarships to support underrepresented groups to participate in our programs?

Current Status	1	2	3	4	5	N/A	?
Notes:							

9. To what extent do our program materials and publications, including website, brochures, annual reports, and student materials, reflect the communities we serve and want to serve? To what extent are our materials accessible to all stakeholders, including student families? E.g., translating materials or hosting information nights in accessible locations.

Current Status	1	2	3	4	5	N/A	?
Notes:							

Contextual Conditions:

10. To what extent do we explicitly refrain from asking one staff member or participant to speak on behalf of an entire community, and explicitly acknowledge a myriad of experiences within any given community? To what extent do we ask staff and participants to speak to their own personal experiences?

Current Status	1	2	3	4	5	N/A	?
Notes:							

11. To what extent do we have a culture of safe, open communication, and a system of accountability for grievances so staff can share concerns without feeling stigmatized? Do we have a system for staff to share and address micro- or macro-aggressions in the workplace?

Current Status	1	2	3	4	5	N/A	?
Notes:							

12. To what extent do we have a no-tolerance policy to discourage inappropriate language or jokes that target a specific demographic?

Current Status	1	2	3	4	5	N/A	?
Notes:							

13. To what extent are we aware of and proactively address cultural and societal tensions in our community, region, state, nation?

Current Status	1	2	3	4	5	N/A	?
Notes:							

Professional Learning

14. To what extent do we directly address cultural relevance in our professional learning experiences in order to grow the cultural competence of our staff? Are instructors aware of systemic, institutional bias and prejudice, and how it might affect participants of different social identities who come to our program?

Current Status	1	2	3	4	5	N/A	?
Notes:							

15. To what extent are staff encouraged to learn about students' lived experiences and regularly reflect on how their instructional practices impact student experiences at our site?

Current Status	1	2	3	4	5	N/A	?
Notes:							

16. To what extent is our staff knowledgeable about environmental justice issues that may affect underrepresented communities?

Current Status	1	2	3	4	5	N/A	?
Notes:							

Curriculum & Instructional Materials:

17. To what extent do we have staff who can communicate with program participants in their home language?

Current Status	1	2	3	4	5	N/A	?
Notes:							

18. To what extent are our staff able to incorporate English Language Development strategies into their instruction to support English learners?

Current Status	1	2	3	4	5	N/A	?
Notes:							

19. To what extent do we create space for participants to share issues that are important or concerning to them? Do the instructional materials create opportunities for students to raise issues and express concerns?

Current Status	1	2	3	4	5	N/A	?
Notes:							

20. To what extent do we integrate the particular needs of the communities we serve into the curriculum, activities and the actual content we teach?

Current Status	1	2	3	4	5	N/A	?
Notes:							

21. To what extent do our instructors effectively use student-centered practices that create space to learn with and from participants? Are instructors aware of, knowledgeable about, and accepting of different belief systems and cultural approaches to knowledge, e.g., Traditional Knowledge?

Current Status	1	2	3	4	5	N/A	?
Notes:							