



FROM SCIENCE TO STEWARDSHIP

Evaluating a Decade of Field Science Education Frameworks and Programs



WE ARE CREATING PASSION THROUGH SCIENCE

We are NatureBridge. Our mission is to teach science and environmental education in nature's classroom to inspire a personal connection to the natural world and responsible actions to sustain it.

In partnership with the National Park Service, we are educating the next generation of leaders to respect the natural world, understand the scientific principles that govern it, and preserve it for future generations.

We have led the way in environmental education for about four decades. Each year, more than 30,000 youth attend our environmental education campuses in Yosemite National Park, Golden Gate National Recreation Area, Olympic National Park, Santa Monica Mountains National Recreation Area, and Channel Islands National Park.



WE ARE LEADING THE WAY

Many Americans, especially our youth, are losing touch with nature and living at odds with the natural environment.

Our teachers and schools cannot bridge this gap by themselves. They need our help.

It is our mission to use core science education to inspire future generations of lifelong environmental stewards. Continual evaluation of our guiding framework and programs is critical to our long-term success.

Through a combination of carefully constructed external and internal evaluations, we measure our impact and ensure that our educational framework remains highly relevant to the increasingly diverse group of students we serve.



Part one of this publication celebrates evaluation milestones from the past decade of our history.



Part two introduces the internal education review that is dramatically altering the way evaluation is integrated into the daily life of NatureBridge.



CORE EDUCATIONAL FRAMEWORK

All NatureBridge programs are guided by our Core Educational Framework, which reflects the organization's values, chosen instructional methods, and strategic outcomes. The framework is divided into the following sections:

Inputs—Unique considerations for each student include developmental/cognitive levels, cultural perspectives and experiences, and prior knowledge or academic exposure.

Outcomes—NatureBridge-specific areas of impact include personal growth, group development, academic impact, and responsible environmental behavior.

Strategies—Proven teaching methods at the core of every NatureBridge program include thematic teaching, inquiry-based learning, multiple intelligence theory, advocacy-free critical thinking, and small group cooperative learning.

Evaluation—Formal reflection process, internal and external, supports every aspect of NatureBridge programming.



EVALUATION TIMELINE

We have been evaluating and learning from our own practices for more than a decade. The timeline to the right highlights some of our most significant evaluation milestones.

- 1997 Diversity Initiative launched to increase access to environmental education for underserved communities.
- 1998 Stanford University School of Education commissioned to conduct a year-long evaluation of programs.
- 2000 *Raising Standards in Environmental Education*, an executive summary of the 1998-99 Stanford evaluation findings published.
- 2001 Diversity Initiative launched internally; Stanford School of Education commissioned for a more extensive year-long evaluation.
- 2002 *Striving for Excellence*, a summary of the 2001-02 Stanford evaluation findings published.
- 2003 Second year follow-up evaluation completed in Olympic National Park; updated Core Educational Framework released addressing 2002 evaluation findings.
- 2004 NatureBridge partners with the National Geographic Education Fund and hires LaFrance Associates to evaluate field science outcomes across campuses.
- 2006 Internal evaluation of field science conducted in Golden Gate National Recreation Area with a focus on multicultural environmental education.
- 2007 Internal education review piloted in Yosemite National Park using empowerment evaluation to study scientific inquiry.
- 2008 Internal education review conducted in Olympic National Park using empowerment evaluation with a focus on stewardship; second year of empowerment evaluation conducted in Yosemite National Park also focused on stewardship.



INQUIRY-BASED LEARNING

Inquiry is an approach to teaching that emphasizes content in the context of scientific process. In the inquiry method, teachers help students define their own questions and drive their own learning.

As a learning organization, we reflect the spirit of inquiry in our ongoing evaluation activities. By asking difficult questions and gathering increasingly sophisticated data, we are able to reflect more rigorously on our practice.

- In 1999, the practice of inquiry was still relatively new to NatureBridge. The Stanford evaluation recommended going deeper, covering fewer topics, and encouraging students to drive more of the scientific exploration themselves.
- By 2002, 95% of observed field science programs contained some elements of inquiry. Evaluators noted more full-day research, the presentation of science as a circular rather than linear experience, and a shift in how educators modeled their own scientific curiosity through questioning.
- In 2003, NatureBridge honed its inquiry practice in Olympic National Park in a year of follow-up evaluation. Significant findings included increased attention to assessing students' prior science knowledge and an increase in student-generated research questions.
- By 2004, classroom teachers were acknowledging the strength of the NatureBridge approach — 94% of surveyed classroom teachers agreed that students were learning the scientific process through participation in NatureBridge inquiry-based programs.
- In 2007, scientific inquiry selected as the singular focus for the year-long internal education review in Yosemite National Park. The process and findings of this review are described in further detail on page 16.



NATUREBRIDGE

INQUIRY-BASED METHODS

Albert Einstein

“Not everything that can be counted counts and not everything that counts can be counted.”

Less is More

Our field science programs have been restructured to allow for increased depth of study in fewer content areas.

A Focus on Field Research

New support positions and more sophisticated field equipment have enabled more in-depth field research experiences.

Advanced Professional Development

Ongoing training and mentoring support educators in developing skills specific to science research.

Integrating Inquiry into Organizational Culture

Inquiry-focused performance indicators have been integrated into our educator evaluation tools and processes.



BUILDING RELEVANCY FOR A CHANGING STUDENT POPULATION

Launched in 1997, the NatureBridge Diversity Initiative sought to increase access to environmental education for traditionally underserved students. This marked the beginning of a critical transformation that continues to influence all aspects of our organizational life.

- The 2000 evaluation affirmed our strong reputation, diverse organizational partnerships, and early successes in recruiting more students from underserved and under-resourced communities. The report recommended expanding educator trainings and developing new programming reflective of communities served.
- By 2002, NatureBridge had invested significant resources in better serving diverse audiences. Educators increasingly demonstrated knowledge of students' homes, lives, and cultures. Teaching methods were more appropriate for English language learners. Educators, however, still needed more support in translating training content into everyday practice.
- In 2006, NatureBridge conducted an in-depth examination in Golden Gate National Recreation Area of its capacity to deliver multicultural environmental education. In conjunction with targeted trainings, NatureBridge documented improvements in:
 - drawing out students' personal connections to the environment;
 - demonstrating historical knowledge of cultural ties to the environment; and
 - utilizing communication methods more appropriate for diverse audiences.



PUTTING OUR COMMITMENT TO DIVERSITY INTO ACTION

Retaining a More Diverse Student Body

A substantially increased scholarship pool has allowed more students from all walks of life to experience our transformative programs.

Integrating Diversity into Organizational Culture

Access for all participants is no longer a stand-alone effort but has been integrated into all regular programming and budgeting.

Building Stronger Bridges to Communities

New community-based programs and staff positions better recognize and reflect the cultural differences of served communities.

Meeting the Needs of Diverse Clients

Ongoing professional development focuses on the learning needs of diverse audiences, building relevance to students' home lives.

Building in Accountability

Diversity and community-related performance indicators have been integrated into educator evaluation tools and processes.



BUILDING STEWARDSHIP

More than a decade of evaluation has significantly influenced the way we execute high quality stewardship education.

95% of client teachers agreed that “students learned more about how to protect the environment.”



- The 2000 Stanford evaluation described the central focus of hands-on service learning and suggested that client teachers were bringing stewardship themes, projects, and curriculum back to their classrooms.
- The 2002 Stanford evaluation described how educators most often translated stewardship as an “appreciation for the natural world” while also broadening the theme to include “care of self” and “care of others.” Evaluation recommendations included training educators in addressing controversial environmental issues and more thoroughly integrating stewardship throughout programs.
- During NatureBridge’s 2003-04 partnership with the National Geographic Education Fund, teacher surveys affirmed NatureBridge’s effectiveness in encouraging stewardship.
- NatureBridge focused 2008-09 empowerment evaluations in Yosemite National Park and Olympic National Park on environmental stewardship.



INSPIRING YOUTH TO SERVICE

We have made great strides over the past decade in integrating stewardship education into our programs.

Integrating Stewardship

The Core Educational Framework was redesigned to ensure stewardship themes are addressed on each day of a NatureBridge program.

Training Educators

Professional development supports educators in effectively addressing controversial environmental issues.

Building Cross-Campus Consensus

Annual NatureBridge Education Summits build consensus between all campuses around stewardship goals and provide a forum for sharing best practices.



Encouraging an appreciation for the natural world is strongly associated with developing environmental sensitivity, a factor shown to significantly contribute to responsible environmental behavior.

Hungerford, H.R. & Volk, T. (1990). Changing Learner Behavior through Environmental Education. *Journal of Environmental Education*. 21(3), 8-21.

LONG-TERM IMPACT ON TEACHERS AND CLASSROOMS

Some of the most promising findings of the past decade's evaluations indicate that we are having great successes in formally and informally influencing teacher practice.

According to the 2000 Stanford evaluation, “One of [NatureBridge’s] potentially most powerful long-term impacts involves teacher changes. The success of NatureBridge’s teacher trainings was evident: participating teachers consistently praised the quality of the teaching and the value of both program content and philosophy.”

The evaluation also described a second, unexpected avenue of teacher influence: schools’ adoption of our field science practices as a result of teachers’ observation of the program. Follow-up interviews documented how NatureBridge field science content and/or pedagogy were, in many cases, integrated into classroom activities throughout the school year.

The 2002 Stanford study reaffirmed our impact on teachers, noting that “[NatureBridge’s] teacher trainings incorporate many of the best practices in teacher professional development.” Such practices included offering a multi-day training experience, incorporating both individual and group follow-up activities, and providing ongoing communication.

The 2004 National Geographic Education Fund partnership more thoroughly explored the NatureBridge impact on teachers. Excerpted findings are detailed below.

For NatureBridge teacher trainings, teachers agreed that the program:

- expanded their own understanding of the environment;
- provided content and practices that were directly applicable to their classroom; and
- helped them reflect on their own teaching practice.

For NatureBridge field science, teachers felt more confident:

- teaching about the environment and environmental processes;
- designing more student-led activities; and
- encouraging a spirit of inquiry and curiosity about the world.



STRENGTHENING TEACHER IMPACT

It has become clear that participation in NatureBridge programs positively and profoundly influences teacher practice in their schools and classrooms. We have made noteworthy strides in this area, as detailed below.

“We will go back to our classroom armed with tons of ideas for further exploration, discussion, and experimentation. This has inspired us to study our own area, in Sacramento, in greater depth.”

Jack Donachy, Fifth-Grade Teacher
Sutterville Elementary, Sacramento, CA
2008

Expanding Program Offerings

New teacher trainings in Yosemite National Park, Olympic National Park, and Santa Monica Mountains National Recreation Area complement existing trainings in Golden Gate National Recreation Area.

Focusing Curriculum

Multi-day trainings are structured around a central theme or concept.

Building Teacher Networks

Campuses use a variety of communication pathways to stay connected to program participants.



ADDITIONAL EVALUATION FINDINGS

NatureBridge Educators

The 2000 Stanford evaluation repeatedly emphasized the quality of the NatureBridge teaching staff, standards of excellence in hiring and training, and professional culture of learning.

“Without a doubt, [NatureBridge’s] teaching staff is central to the success of field science programs. They are a principal motivation behind participating teachers’ decisions to attend. Their content knowledge, passion, and creativity in working with children are outstanding.”

(2000 Stanford Evaluation, Final Report)

Team Building

Teacher interviews in 2000 suggested the central role team building plays at NatureBridge — after programs, students are better communicators and problem solvers. Though pervasive across all NatureBridge programs, team building at that time was not an explicit NatureBridge outcome area. Today, it is appropriately recognized in NatureBridge’s revised Core Educational Framework as one of the organization’s four primary outcome areas.

Teaching to Multiple Learning Styles

The 2000 Stanford evaluation noted the pervasive NatureBridge practice of teaching to students’ multiple intelligences, noting that at least three of four different learning modalities were used in 98% of programming. The 2002 Stanford data affirmed the consistency and pervasiveness of this important NatureBridge practice.





Equitable Learning Environment

Providing an equitable learning environment for all program participants is of paramount importance to NatureBridge. Multiple measures of equity from 2000 are highlighted in the table below. Findings from 2002 remained relatively constant with 2000 levels.

In the 2000 evaluation, equity was defined as “having high standards for every student, employing activities that promote equal access to materials and ideas, and creating norms for behavior where all students are active and influential participants whose opinions matter to the group.”

	Percentage of Different Students Who Talk	Percentage of Student Engagement	Ratio of Boy Talk/ Girl Talk	Ratio of Teacher Centered/Student Centered Activities
Mean Value	93% (78/83 students)	90%	0.96/1 (255/266)	3/2 (56/40)
Sample Size	8 days of observation	69 data points over 16 days of observation	18 days of observations	21 days of observation





“It is amazing to watch students change and grow so much in such a short period of time. They take risks, work together, and get to experience one of the most beautiful places in the world as a school community.”

Liz Daoust, Sixth-Grade Teacher
The Girls Middle School, Mountain View, CA
2008

“Wilderness is where plants and animals do the talking and humans do the listening.”

Sixth-Grade Field Science Student

“I never realized how interconnected I am to the people around me and to the nature around me. I want to be a better producer and not just a taker.”

Fourth-Grade Field Science Student



INTERNAL EDUCATION REVIEW



Over the past decade, we have had the privilege to learn from several exceptional external evaluations. Without a doubt, these transformative learning experiences helped establish our rich culture of learning and evaluation.

External evaluations, however, require a tremendous outlay of resources and may not be financially sustainable in the long run. They also miss the opportunity to develop deeper evaluation expertise in-house. Our new internal education review process addresses both issues in one effective and sustainable system.

Internal education reviews are year-long, in-depth, formative evaluations. They are designed to complement our already thorough data collection practices through more in-depth analysis over longer periods. The reviews rotate between our campuses on an annual basis, allowing a year for preparation, a year for evaluation, and a year for follow-up.



EMPOWERMENT EVALUATION



NatureBridge selected the empowerment evaluation model to guide the internal education review process. Originally developed by Dr. David Fetterman of Stanford University, empowerment evaluation is ideal for staff-driven formative assessment focused on program improvement. The model empowers internal players to drive the process but makes strategic use of outside technical expertise to ensure rigor.



YOSEMITE EMPOWERMENT EVALUATION

“Coming from an inner-city school, our students have acquired an appreciation for nature that could not have been captured in any other place than Yosemite with this program.”

Sandra Bravo
Teacher
Valencia Valley School

In 2007, the pilot year of the NatureBridge internal education review process, scientific inquiry was selected as the focus in Yosemite National Park—to understand how much scientific inquiry occurs on campus, what it looks like, and what additional resources would deepen inquiry-based practices.

The table below outlines the four-pronged evaluation approach.

Data Collection Tools	Sample Size, Period 1	Sample Size, Period 2
Field Evaluation of Educators	112 hours	80 hours
Online Educator Survey	19 field educators (54%)	(not done in Pd. 2)
Written Client Evaluations	56 evaluations (32%)	68 evaluations (53%)
Client Exit Interviews	11 interviews (56%)	11 interviews (46%)



YOSEMITE FINDINGS

Fueled by the empowerment evaluation experience, NatureBridge reported gains in both scientific inquiry practice and capacity to design and conduct evaluations.

	Tangible Gains	Intangible Gains
Inquiry-Specific	<ul style="list-style-type: none"> • Described and quantified scientific inquiry in programs • Developed new resources and designed new trainings 	<ul style="list-style-type: none"> • Clarified the value of scientific inquiry in programming • Clarified expectations around teaching scientific inquiry
Evaluation-Specific	<ul style="list-style-type: none"> • Identified, prioritized, and rated essential activities • Defined specific goals, strategies, and evidence for activity areas • Developed evaluation tools and trained data collectors 	<ul style="list-style-type: none"> • Engaged staff at multiple levels • Demonstrated commitment to bottom-up approach • Clarified organizational priorities and values

“[NatureBridge] educators are very good at drawing out questions and ideas and guiding the students to inquire on their own.”

Teacher
Al-Arqam Islamic High School
Sacramento, CA



FINAL REFLECTIONS

Over the past decade, NatureBridge has learned a tremendous amount about what encourages and what obstructs the process of evaluation. A few of these lessons learned are highlighted below.

Tensions in the Evaluative Process

- Staff turnover challenges the longevity of an evaluation.
- Expectations of veteran clients sometimes dilute new organizational efforts and directions.
- Evaluation priorities sometimes differ between NatureBridge as a whole and individual campuses.

Strategies for Evaluation Success

- New evaluations should build off previous evaluation work while exploring new directions.
- The more engaged staff are from the beginning, the more likely they are to be invested in evaluation findings.
- Accountability for evaluation findings must be explicitly designed into the evaluation process.



ACKNOWLEDGEMENTS

NatureBridge is grateful to the many individuals and institutions that have encouraged our evolution as a learning organization.

Evaluators:

Barbara Schneider, Ph.D.; J. Myron Atkin, Ph.D.; Sandra Funke, M.S.; Nicole Cheslock, M.A.; LaFrance Associates, LLC

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- YOSEMITE
- GOLDEN GATE
- OLYMPIC
- SANTA MONICA MOUNTAINS
- CHANNEL ISLANDS

Special thanks to

