



**ECOLOGY PROJECT  
INTERNATIONAL**



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# EDUCATIONAL FRAMEWORK

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# INTRODUCTION

## Educating, Inspiring, & Empowering New Leaders

At EPI, we strive to change the way youth connect with nature by engaging them with authentic hands-on science that makes a difference in conservation. Learning with EPI - whether across the country, across the globe, or in your community - is a life-changing experience.

EPI was founded around three principal values: **scientific literacy, environmental protection, and cultural exchange.**

We acknowledge the challenges facing our planet today and aspire, together with our students and teachers, to help create a motivated, informed, critical, and creative citizenry who, based on a better understanding of nature and their role in it, practice positive behaviors with respect to the environment.



### MISSION

Improve & inspire science education & conservation efforts through field-based student-scientist partnerships

### VISION

Create an ecologically literate society where the world's youth are empowered to take an active role in conservation



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# ENVIRONMENTAL LITERACY

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## What is Environmental Literacy?

In order for our participants to become stewards of conservation, they need to understand and value nature, obtain the necessary and relevant skills to take action, and have the right dispositions to guide their behavior. In other words, they need to be **environmentally literate**.

While there are many definitions of environmental literacy, EPI draws upon the United Nations Educational, Scientific and Cultural Organization's (UNESCO) original concept and the North American Association of Environmental Education (NAAEE)<sup>1</sup> revision to define an environmental literate person as: "someone who demonstrates the **knowledge, dispositions, competencies** and **behavior** to actively engage—individually or as a group—in addressing environmental challenges."

Inherent within this definition of environmental literacy are specific attributes guiding EPI's core programming and alumni engagement. Within each of these components there are specific milestones and standards that EPI uses to measure alumni involvement in conservation.

### Knowledge:

Demonstrate knowledge and understanding of the environment, and the circumstances and conditions affecting it, with an emphasis on biodiversity and ecosystems.

Demonstrate knowledge and understanding of society's impact on the natural world (e.g., population growth, development, resource consumption rate, climate change, etc.)

### Dispositions:

Demonstrate the interest, sensitivity, responsibility and the intention to act for the sustainable use of natural resources.

### Competencies:

Demonstrate the skills and abilities to investigate and analyze environmental issues, and make accurate conclusions about effective solutions.

### Behavior:

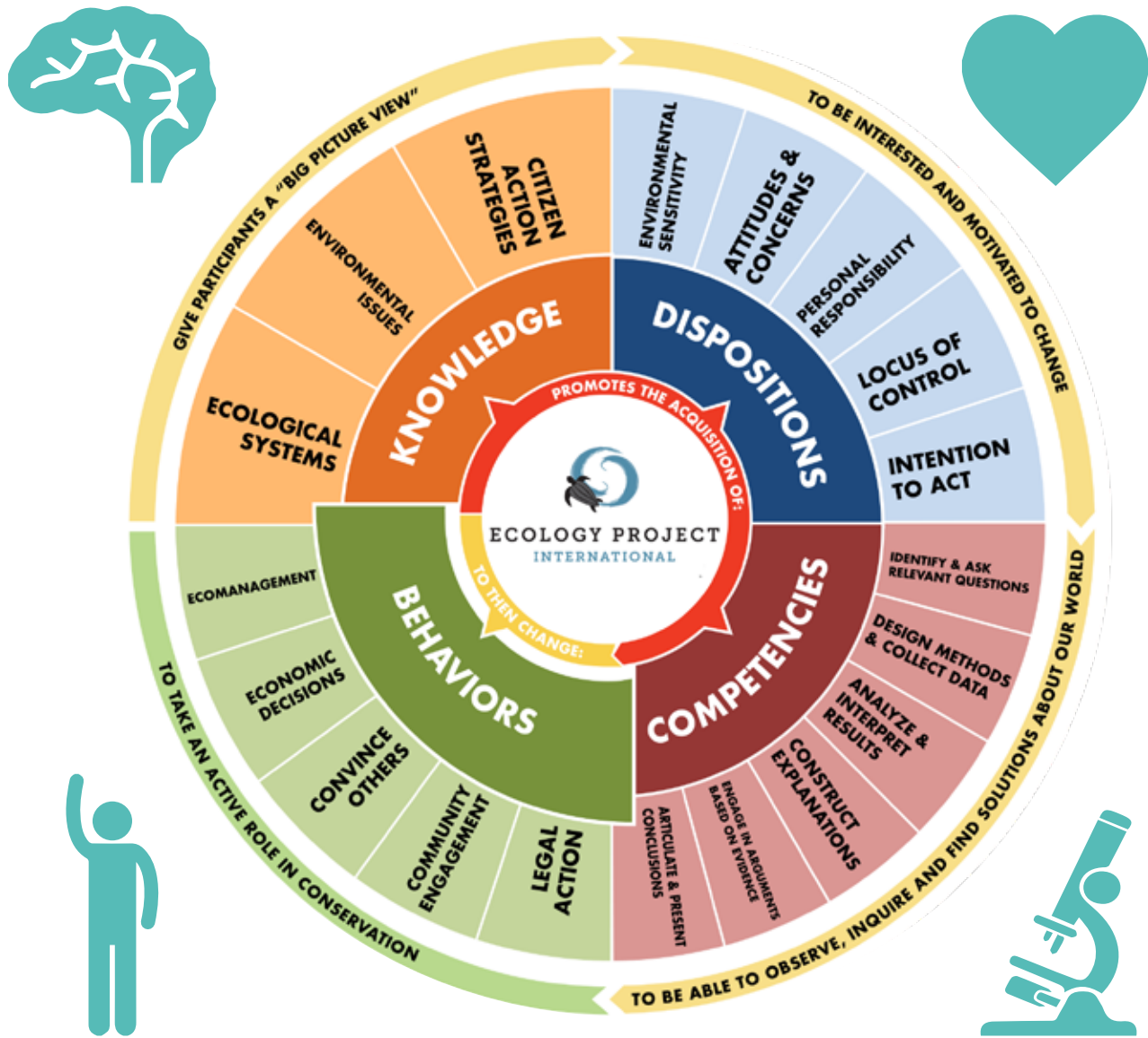
Take individual and collective action towards addressing environmental challenges (e.g., participating in local and global actions, designing solutions that inspire action on environmental issues).

<sup>1</sup> Hollweg, K. S., Taylor, J. R., Bybee, R. W., Marcinkowski, T. J., McBeth, W. C., & Zoido, P. (2011). Developing a framework for assessing environmental literacy. Washington, DC: North American Association for Environmental Education.

# ENVIRONMENTAL LITERACY

## Components of Environmental Literacy

EPI's Environmental Literacy Wheel visually represents the four dimensions of our educational framework (Knowledge, Dispositions, Competencies, and Behaviors) and their sub-components.



## Component Details

### Knowledge\*

Environmental literacy entails knowledge of:

- **Physical & Ecological Systems** such as interdependent relationships in ecosystems; cycles of matter and energy transfer in ecosystems; climate change and how the effects of human activities on Earth's climate are modeled. This area includes humans as variables in ecosystems and Earth systems, which includes concepts associated with: the ecosystem services and natural capital on which humans (and all life) depend; adverse human impacts to these systems; and humans as agents in the protection and restoration of these systems.
- **Environmental Issues** including (1) knowledge of a variety of environmental situations that arise from biophysical impacts apparent in the natural world, and the causes and effects of those impacts; and (2) knowledge of environmental issues that arise from human conflicts about environmental problems and solutions, including the causes and effects of those conflicts.
- **Citizen Participation & Action Strategies** includes knowledge of forms of citizen participation, action and community service intended to preserve or improve the environment.



\*Adapted from NAAEE Framework for Assessing Environmental Literacy

## Component Details

### Dispositions\*

Dispositions are important determinants of behaviors, both positive and negative, toward the environment. A participant's dispositions toward the environment are thought to influence their willingness to recognize and choose among value perspectives, as well as their motivation to participate in public deliberations about environmental issues. They include:

- **Sensitivity** – care and positive feelings towards the environment;
- **Attitudes, Concern, & Worldview** – learned predispositions to respond in a favorable or unfavorable manner toward objects, events, & other referents;
- **Personal Responsibility** – a personal commitment and use of thoughtful processes that lead individuals to avoid or reduce behaviors that contribute significantly to negative environmental impacts, and the undertaking of behaviors that contribute significantly to positive impacts.
- **Locus of Control / Self-Efficacy** – the belief and/or feeling people hold that they individually or collectively will be able to influence or bring about the environmental change for which they are working; and
- **Motivation & Intention** – willingness and verbal commitment to act based on beliefs or attitudes.

*\*Adapted from NAAEE Framework for Assessing Environmental Literacy*



## Component Details

### Competencies\*

Competencies are clusters of skills and abilities that our participants can develop and practice when analyzing an environmental issue. Competencies allow participants to catalyze their knowledge and dispositions to develop creative solutions to problems or opportunities.

Our definition of competences relies heavily on scientific-related practices and processes. However, we do not believe that there is one distinctive approach common to all science (e.g. a single “scientific method”). Instead, we provide participants the opportunity to apply and practice science through hands-on field investigations rather than by learning scientific process theory. The competencies they practice on our programs include:

- **Identify & Ask Relevant Questions** – Basic practices of the scientist include: Formulating empirically answerable questions about phenomena; establishing what is already known; and determining what questions have yet to be satisfactorily answered.
- **Designing Methodology & Collecting Data** – A major practice of scientists is planning and carrying out a systematic investigation, which requires the identification of what is to be recorded and, if applicable, what are to be treated as the dependent and independent variables (control of variables). Observations and data collected from such work are used to test existing theories (hypothesis) and explanations or to revise and develop new ones.
- **Analyzing & Interpreting Data** – Investigations produce data that must be analyzed in order to derive meaning. Because they usually do not speak for themselves, scientists use a range of tools—including tabulation, graphical representation, visualization and statistical analysis—to identify the significant features and patterns in the data. Sources of error are identified and the degree of certainty calculated.



\*Adapted from NAAEE Framework for Assessing Environmental Literacy

## Component Details

### Competencies, continued

- **Constructing Explanations** – Asking students to demonstrate their understanding of the implications of a scientific idea by developing their own explanations of phenomena based on observations or data they collect.
- **Engaging in Argument Based on Evidence** – In real life, the production of knowledge is dependent on a process of reasoning that requires the scientist to make a justified claim and, in response to other people, attempt to identify the claim's weaknesses and limitations. Argumentation is also needed to resolve questions involving, for example, the best investigation design, the most appropriate techniques of data analysis, or the best interpretation of a given data set.
- **Articulating and Presenting Conclusions Effectively** - Communicating in written, visual and spoken form is another fundamental practice of science; it requires scientists to describe observations precisely, clarify their thinking, and justify their arguments.



## Component Details

### Behaviors\*

Our definition of environmentally responsible behaviors include:

- **Eco-management:** The ways in which individuals can work directly in and with the physical world to help prevent or resolve environmental issues. Examples include picking up litter or waste, creating habitat for native plants and animals, installing erosion and pollution control measures, and participating in large-scale ecological and environmental restoration projects.
- **Convince Others:** Approaches that can be used when individuals or groups appeal to others in an effort to convince them to take an action that they believe to be a necessary or correct response to an environmental issue. Three approaches can be taken with persuasive argument: logical, emotional, or coercive. A logical argument presents a series of facts that lead to one of the other action types or modes. An emotional approach may or may not present factual information, but its goal is to appeal to another person's emotions to encourage action. Coercion is forced persuasion: someone forced into acting by threat of retribution. Appeals can be either interpersonal (e.g., encouraging family and friends to recycle) or public (e.g., writing a letter to the paper).
- **Economic Decisions:** The use of monetary support or financial pressure to help prevent or resolve an environmental issue. Consumer action can have a direct impact, as in the act of buying or selling, or an indirect impact, as in choosing to bike rather than drive.
- **Community Engagement:** Action that puts pressure on any political agency or individual in an effort to persuade them to make positive environmental change. Examples include voting, campaigning for candidates, and lobbying for legislation or funding.
- **Legal Action:** Use of the legal system to support or enforce existing laws designed to lead to an improved or maintained environment. Examples include reporting violations to authorities and providing testimony.



\*Adapted from NAAEE Framework for Assessing Environmental Literacy

# ENVIRONMENTAL LITERACY

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## Our Foundation

To build our Educational Framework, we researched best practices, lessons learned, and the latest developments in environmental and science education. Our framework integrates and builds upon components from:

- UNESCO Belgrade Declaration on Environmental Education (1978)
- Framework for assessing environmental literacy from the North American Association of Environmental Education (2011)
- Framework for K-12 Science Education from the National Resource Council (2012)iii
- Framework for 21st Century Learning from the Partnership for 21st Century Skills (2012)iv
- North American Conservation Strategy from the Association of Fish and Wildlife Services (2011)v

# WHAT MAKES EPI UNIQUE

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## A Focus on Science-Related Competencies/Skills Development

There are many environmental education initiatives that contribute to gains in **knowledge** and shifts in **dispositions** towards conservation. What sets EPI apart is that in addition to contributing significantly to these attributes, our programming facilitates the development, application, and transference of **competencies**.

Our curriculum places a strong emphasis on competencies related to scientific inquiry as a process to increase critical thinking and creativity in our participants.

## Local Communities

For conservation efforts to succeed, local citizens must be involved. For that reason, we invest deeply in the communities where we work. Our in-country field offices, located at each of our program sites, allow us to form partnerships with researchers, national parks, and local communities. Further, more than 70% of EPI's participants are local residents living near our project sites: Belizeans, Costa Ricans, Galapagueños, etc.

## Our Lifelong Approach

EPI's core field programs develop the foundational knowledge, competencies, and dispositions necessary to create environmental literacy. Specifically, during all core programs, EPI:

- Provides first-hand experiences and curricula that build site-specific and global-scale knowledge about ecological concepts;
- Uses inquiry-based science and immersive, hands-on field research to help students develop the core competencies of environmental literacy; and
- Provides the opportunity to actively participate in real monitoring/research activities for the conservation of an endangered species or habitat, encouraging students to create the dispositions necessary for future action.

**Alumni programming** and **outreach activities** generally take place at the program sites\* and are designed to build on the competencies, knowledge and dispositions cultivated in participants during core programming. Additionally, these activities provide participants with concrete strategies and opportunities to take individual and collective action in their lives to address environmental challenges and opportunities. This secondary programming allows participants to network with other conservation practitioners, develop their identity with EPI, and engage with other people who share similar values.

Season-end events, including **student symposia** and **festivals**, allow students to continue to employ and develop skills learned previously during the EPI experience while connecting them with other conservation organizations and practitioners. These experiences provide participants with the networks, resources, and motivation necessary to continue to develop environmental literacy.

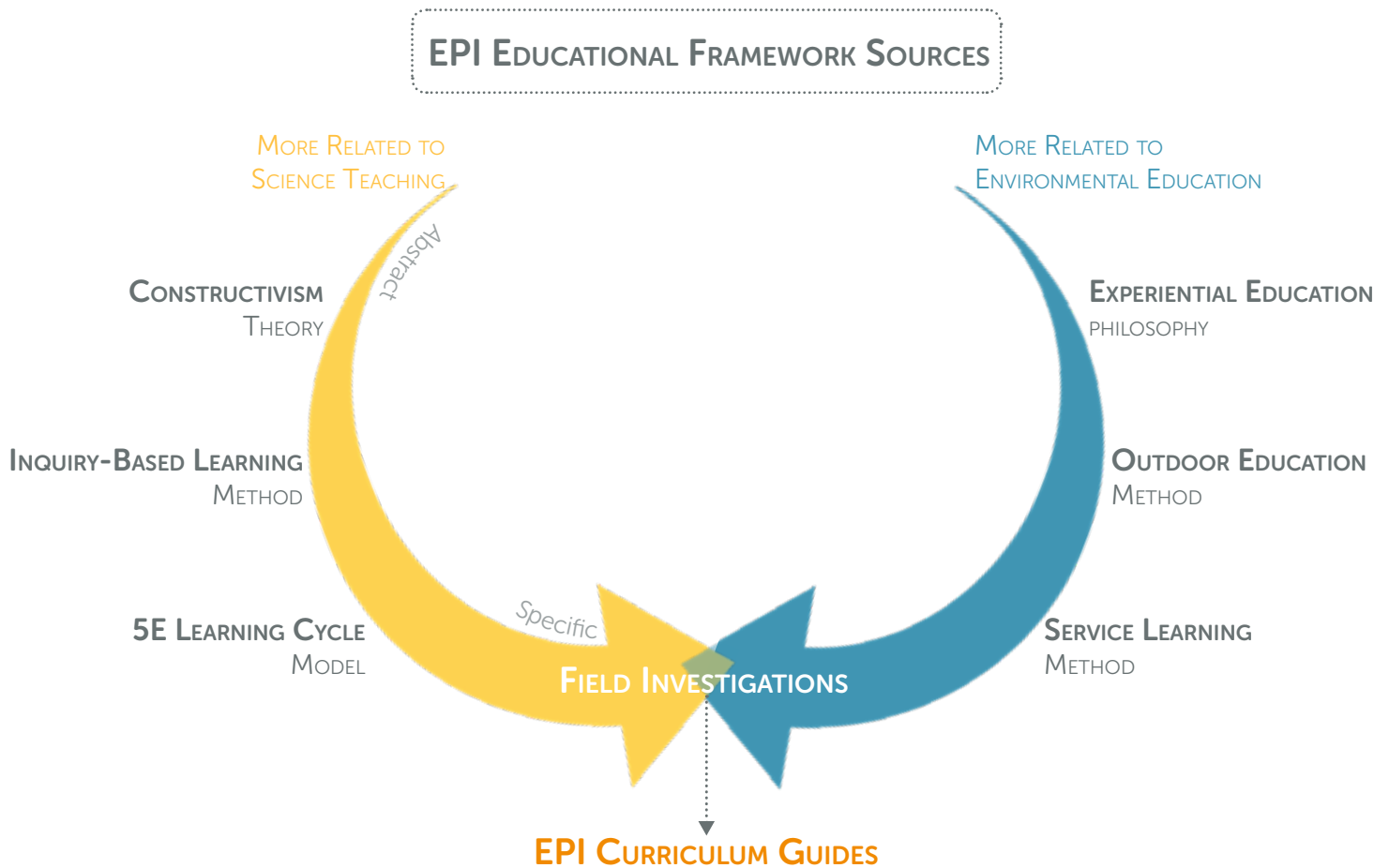
*\*Our U.S.-based alumni program is in its early stages. We are working to help connect our alumni after they return home, but we encourage our U.S. teachers to reach out to us for ideas on how to keep their students engaged post-course.*

# WHAT MAKES EPI UNIQUE

## A Student-Centered Approach

We strive to keep our Educational Framework updated, accurate, and relevant, but we recognize that this is only half of the equation. A common issue with today's environmental and science learning is that it is delivered through a teacher-centric, memory-based, and sometimes very rigid model which can be difficult for 21<sup>st</sup> century learners.

Based on successful formal and non-formal initiatives from around the world, we distinguish ourselves by offering a student-centered, constructivist, inquiry-based, experiential approach to learning.



# WHAT MAKES EPI UNIQUE

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## Constructivism

EPI's teaching philosophy and the lesson template that follows are based on the **Constructivist Learning Theory**. In brief, this theory argues that at all points in our lives we construct meaning about the world around us by combining prior knowledge with new experiences.

Rather than having our tabula rasa, or "clean slate," passively filled up for us by others, we are in a constant and dynamic process of making sense of the world. Though we have different experiences and different conceptions of the world around us, we all create knowledge in essentially the same way: First, we establish what we already know, or what we think we already know about a particular place, idea, or concept, formally or informally, consciously or subconsciously. Then, we have an experience of some sort or another. The experience might be totally new or a repetition of something we've done for years.



We then combine our prior knowledge (what we thought we knew) with the new experience, and thus create new meaning. Often, after constructing new meaning, we compare what we thought we knew (again, consciously or subconsciously) with what we just learned in order to help solidify or improve the meaning we construct. This process of reflection is an integral part of our construction of knowledge.

### An Example:

You head to your favorite trailhead for a hike on Memorial Day weekend at 7AM. Thinking back to last Memorial Day weekend, when you went on the same hike at 11AM, you tell yourself, "The place will be packed; it won't be a peaceful, quiet walk, and I'll be annoyed." Without realizing it, you establish your prior knowledge (*tons of people, busy, and loud*).

When you start hiking (*and begin the new experience*), you notice that the trail is nearly empty. You only see two or three people for the duration of the hike, and you're able to have a peaceful, relaxing time. Sitting in your car after your hike, you think, "Wow, that wasn't so bad. I thought it would be crowded again (*revisiting prior knowledge*), but it wasn't. Maybe it's too early on Memorial Day weekend for the trail to be very busy (*constructing new meaning*). After thinking this through, you conclude that at 11AM on Memorial Day weekend, the trail will be crowded (*prior knowledge*), but that at 7AM, it will be quiet (*new meaning*).

This entire process often takes place without us even realizing it, but the more we can formalize this process, the more students will learn. **It's important to match the way we teach with the way we learn.**

In practice, this means: Helping students awaken prior knowledge; leading them through an engaging "experience;" and giving them an opportunity to reflect afterwards about what they learned.

# WHAT MAKES EPI UNIQUE

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## Inquiry-Based Learning

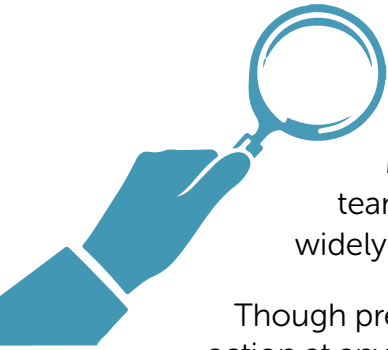
Inquiry-based learning methodology allows teachers to implement constructivism philosophy through a process guided by the interests and questions of their students. This is done in order to help them construct questions, collect evidence from the natural world, assess and explain the evidence collected, consider alternative explanations, and communicate and justify their explanations through collaborative discussions or presentations.

Although there are differences among the multiple conceptions of inquiry-based learning in many countries and organizations, there are common elements that are used by EPI:

1. Learners are engaged by scientifically-oriented questions;
2. Learners give priority to evidence, which allows them to develop and evaluate explanations that address scientifically-oriented questions;
3. Learners formulate explanations from evidence to address scientifically-oriented questions;
4. Learners evaluate their explanations in light of alternative explanations, particularly those reflecting scientific understanding; and
5. Learners communicate and justify their proposed explanations.



# EPI'S LEARNING MODEL



EPI uses a Learning Model to develop curriculum and lesson plans that are founded on constructivism and inquiry-based learning concepts. EPI's Learning Model is based upon the "Five E's" instructional model, which was developed by a team led by Roger Bybee as part of Biological Science Curriculum Study (BSCS). It is widely used in the US and internationally for teaching science.

Though presented in a linear fashion, there is commonly more than one component in action at any given time. This is an ideal model, but it is challenging to recreate in the field and isn't always possible, practical, or useful to do so. Think of it as a general and very flexible map. Individual instructors are responsible for selecting the route, speed, vehicle, etc.

## The 5 E's

### Engage

Access the learners' prior knowledge and help them become engaged in a new concept. Use short activities that promote curiosity and elicit prior knowledge. The activity should make connections between past and present learning experiences, expose prior conceptions, and organize students' thinking toward the learning outcomes of current activities.

#### Instructors **SHOULD**

- Raise questions

#### Instructors **SHOULD NOT**

- Explain answers
- Provide definitions or answers
- State conclusions
- Lecture

### Explore

Exploration should always happen before explanation. The main idea is to satisfy curiosity and build new knowledge that is based on an experience (ideally in an outdoor setting). Defining any important safety or research considerations before sending students out into the field is an important step in setting up a successful exploration activity.

#### Instructors **SHOULD**

- Establish basic limits
- Encourage participants to work together with minimum supervision
- Observe & listen
- Ask probing questions to redirect when necessary
- Provide sufficient time for participants to work through problems

#### Instructors **SHOULD NOT**

- Provide answers
- Tell or explain how to work through problems
- Tell students that they are wrong
- Give information or facts that solve problems
- Give step by step solutions

# EPI'S LEARNING MODEL

## Explain

Explanation is the time to assign new terms, vocabulary and examples, but not without first letting participants try to come up with their own versions and understandings of the knowledge and evidence they collected during their experience.

### Instructors **SHOULD**

- Encourage participants to explain concepts and definitions
- Ask for evidence and clarification from participants
- Use students' previous experiences as the basis for explaining new concepts
- Formally provide definitions, explanations and new labels

### Instructors **SHOULD NOT**

- Accept explanations without justification
- Neglect to solicit participants explanations
- Introduce unrelated concepts or definitions

## Elaborate/Expand

This section can be tricky in the field with limited time and resources. However, taking a few minutes to ask a few simple questions about how new experiences and information might be applied or related to other settings, environments, or issues can be an effective way to complete this component.

### Instructors **SHOULD**

- Expect participants to use formal labels and definitions
- Look for concept connecting with other concepts/topics
- Asks probing questions to help students see relationships between concepts/ topics and other areas

### Instructors **SHOULD NOT**

- Provide definitive answers
- Tell students that they are wrong
- Lecture
- Lead participants step by step

## Evaluate

Evaluation can (and should) take endless forms. It can be a quick oral review, a short written response, or a game. We strongly advise that, by the end of each activity, our instructors evaluate whether they reached the lesson objective and if EPI's environmental literacy goals were achieved. There are a few important things to keep in mind:

- Evaluation should not be ONLY linear and done at the end of each lesson; it can take place throughout the activities.
- Evaluation helps students review and remember what they learned.
- Evaluation allows instructors to identify if an idea or concept needs to be revisited.

# EPI'S LEARNING MODEL

## Experiential Learning

Experiential learning is the process of deriving meaning from direct experience, i.e., "learning from experience." An example of experiential learning is bird-watching and learning through observation and interaction with the environment, as opposed to reading about birds from a book. Thus, one makes discoveries and experiments with knowledge firsthand, instead of hearing or reading about others' experiences.

EPI's programs are based on this philosophy, and we believe that individuals learn best from their direct experiences with primary resources, i.e. ecosystems, cultures, natural systems, or wildlife.

Based on this philosophy, EPI uses outdoor education, service learning, citizen-science models, and field investigations to allow first-hand experiences guide the student experience.



## Outdoor Education

Outdoor education usually refers to organized learning that takes place in the outdoors. Outdoor education programs sometimes involve residential or journey-based experiences in which students participate in a variety of outdoor activities such as hiking, climbing, canoeing, ropes courses and group games.

## Service Learning & Citizen Science

Service learning is a method of teaching that combines classroom instruction with meaningful community service. This form of learning emphasizes critical thinking and personal reflection while encouraging a heightened sense of community, civic engagement, and personal responsibility. EPI promotes service learning through a variety of activities that allow participants to apply and reflect on knowledge they acquire while participating in volunteer work for the communities or conservation sites where we work.

Citizen science, also known as public participation in scientific research (PPSR), is a way for amateur or non-professional researchers to participate in scientific, often long-term, research projects. EPI participants contribute their time to a specific, long-term monitoring project at each of our sites.



# EPI'S LEARNING MODEL

## Field Investigations\*

Field investigations of the environment involve the systematic collection of data for the purposes of scientific understanding. They are designed to answer an investigative question through the collection of evidence and the communication of results. They contribute to scientific knowledge by describing natural systems, noting differences in habitats, and identifying environmental trends and issues.

### Why conduct field investigations?

Field investigations help students become systems thinkers, gain scientific inquiry skills, and understand that science does not only happen in a laboratory or classroom. Outdoor experiences in natural settings help increase students' problem solving abilities and motivation to learn in social studies, science, language arts, and math.

### Science beyond the laboratory or classroom:

Field investigations help students become informed citizen-scientists who add knowledge to the community's understanding of an area, make issues of concern visible, and share differing points of view about the preservation and use of the community's natural resources.

### How are field investigations different from controlled laboratory experiments?

Classroom science often overemphasizes experimental investigation in which students actively manipulate variables and control conditions. In studying the natural world, it is difficult to actively manipulate variables and maintain "control" and "experimental" groups, so field investigation scientists look for descriptive, comparative, or correlative trends in naturally occurring events. Many field investigations begin with counts (gathering baseline data). Later, measurements are intentionally taken in different locations (e.g., urban and rural, or where some natural phenomenon has created different plot conditions), because scientists suspect they will find differences. In contrast, in controlled experiments, scientists begin with a hypothesis about links between variables in a system. Variables of interest are identified, and a "fair test" is designed in which variables are actively manipulated, controlled, and measured in an effort to gather evidence to support or refute a causal relationship.

*\*Adapted from Pacific Education Institute - Field Investigations Guide*





# EDUCATIONAL ALIGNMENT

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## EPI & Other Educational Frameworks

We strive to keep our curriculum and pedagogy aligned with the latest resources so that our programs provide relevant and productive experiences for participants.

One of our primary concerns is maintaining alignment with the latest versions of well-recognized science and environmental education standards so that participating teachers can apply the techniques, tools, and content we utilize into their work back home.

The following pages summarize each of the frameworks and standards we use to guide our learning model and programmatic philosophy.



# EDUCATIONAL ALIGNMENT

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## EPI & Other Educational Frameworks

### U.S. Next Generation Science Standards

Following the release of the Framework for K-12 Science Education, a team of writers with guidance from 26 state review teams developed the Next Generation Science Standards (NGSS). The National Research Council, the National Science Teachers Association, the American Association for the Advancement of Science, and Achieve released the NGSS in April 2013.

EPI's curriculum and approach to ecological knowledge and competencies is well aligned with the NGSS framework.

The scientific method section of the core EPI curriculum is divided into two sections: **Ecological Knowledge** and **Scientific Inquiry for Conservation**. The following pages identify the connections between each general section of our curriculum and the NGSS.



# EDUCATIONAL ALIGNMENT

## U.S. Next Generation Science Standards (NGSS)

NGSS related to EPI **Ecological Knowledge** lessons:

### MS-LS2 ECOSYSTEMS: INTERACTIONS, ENERGY, AND DYNAMICS

Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

MS-LS2-1. [Clarification Statement: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources.]

Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

MS-LS2-2. [Clarification Statement: Emphasis is on predicting consistent patterns of interactions in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. Examples of types of interactions could include competitive, predatory, and mutually beneficial.]

Develop a model to describe the cycling of matter and flow of energy among living and non-living parts of an ecosystem.

MS-LS2-3. [Clarification Statement: Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems, and on defining the boundaries of the system.]

[Assessment Boundary: Assessment does not include the use of chemical reactions to describe the processes.]



# EDUCATIONAL ALIGNMENT

## HS-LS2 ECOSYSTEMS: INTERACTIONS, ENERGY, AND DYNAMICS

Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.

HS-LS2-3.

[Clarification Statement: Emphasis is on conceptual understanding of the role of aerobic and anaerobic respiration in different environments.]

[Assessment Boundary: Assessment does not include the specific chemical processes of either aerobic or anaerobic respiration.]

Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

HS-LS2-2.

[Clarification Statement: Examples of mathematical representations include finding the average, determining trends, and using graphical comparisons of multiple sets of data.]

[Assessment Boundary: Assessment is limited to provided data.]

Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

HS-LS2-6.

[Examples of changes in ecosystem conditions could include modest biological or physical changes, such as moderate hunting or a seasonal flood; and extreme changes, such as volcanic eruption or sea level rise.]

Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

HS-LS2-7.

[Clarification Statement: Examples of human activities can include urbanization, building dams, and dissemination of invasive species.]



# EDUCATIONAL ALIGNMENT

## HS-LS4 BIOLOGY EVOLUTION: UNITY AND DIVERSITY

Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

HS-LS4-4.

[Clarification Statement: Emphasis is on using data to provide evidence for how specific biotic and abiotic differences in ecosystems (such as ranges of seasonal temperature, long-term climate change, acidity, light, geographic barriers, or evolution of other organisms) contribute to a change in gene frequency over time, leading to adaptation of populations.]

Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

HS-LS4-5.

[Clarification Statement: Emphasis is on determining cause and effect relationships for how changes to the environment such as deforestation, fishing, application of fertilizers, drought, flood, and the rate of change of the environment affect distribution or disappearance of traits in species.]

Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.

HS-ESS3-2.

[Clarification Statement: Emphasis is on the conservation, recycling, and reuse of resources (such as minerals and metals) where possible, and on minimizing impacts where it is not. Examples include developing best practices for agricultural soil use, mining (for coal, tar sands, and oil shales), and pumping (for petroleum and natural gas). Science knowledge indicates what can happen in natural systems—not what should happen.]





# EDUCATIONAL ALIGNMENT

## U.S. Next Generation Science Standards (NGSS)

NGSS related to EPI **Scientific Inquiry for Conservation**: EPI's curriculum includes a wealth of field-based investigations to foster scientific inquiry based on a group's prior skills and knowledge. This student-driven inquiry ultimately leads to developed and/or improved competencies from our Environmental Literacy Wheel, which relate to the Science and Engineering Practices dimension of the NGSS.

**Through our field-based investigations, we promote:**

### ASKING QUESTIONS & DEFINING PROBLEMS

Asking questions and defining problems in grades 6-8 builds on grades K-5 experiences and progresses to specifying relationships between variables, as well as clarifying arguments and models.

Asking questions and defining problems in 9-12 builds on K-8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and designing problems using models and simulations.

### PLANNING & CARRYING OUT INVESTIGATIONS

Planning and carrying out investigations to answer questions or test solutions to problems in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or design solutions.

Planning and carrying out investigations in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models. Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-PS1-3)

# EDUCATIONAL ALIGNMENT

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## ANALYZING & INTERPRETING DATA

Analyzing data in 6-8 builds on K-5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

Analyze displays of data to identify linear and nonlinear relationships. (MS-LS4-3)

Analyze and interpret data to determine similarities and differences in findings. (MS-LS4-1)

Analyzing data in 9-12 builds on K-8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.

Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible. (HS-LS3-3)



## CONSTRUCTING EXPLANATIONS BASED ON EVIDENCE

Constructing explanations and designing solutions in 6-8 builds on K-5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories. Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena. (MS-LS2-2)

Constructing explanations and designing solutions in 9-12 builds on K-8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories. Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS2-3)

Design, evaluate, and refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and trade-off considerations. (HS-LS2-7)

# EDUCATIONAL ALIGNMENT

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## ENGAGING IN ARGUMENTS BASED ON EVIDENCE

Engaging in argument from evidence in 6-8 builds on K-5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).

Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-LS2-4)

Engaging in argument from evidence in 9-12 builds on K-8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.

Make and defend a claim based on evidence about the natural world that reflects scientific knowledge, and student-generated evidence. (HS-LS3-2)



## OBTAINING, EVALUATING, & COMMUNICATING INFORMATION

Obtaining, evaluating, and communicating information in 9-12 builds on K-8 experiences and progresses to evaluating the validity and reliability of the claims, methods, and designs.

Communicate scientific information (e.g., about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically). (HS-LS4-1)

# EDUCATIONAL ALIGNMENT

## U.S. Common Core Standards

The Common Core is a set of high-quality academic standards in mathematics and English language arts/literacy (ELA). These learning goals outline what a student should know and be able to do at the end of each grade. The standards were created to ensure that all students graduate from high school with the skills and knowledge necessary to succeed in college, career, and life, regardless of where they live.

EPI provides participants the opportunity to gain an in-depth understanding of issues of global relevance using inquiry, experiential learning, service learning, and reflection.



# EDUCATIONAL ALIGNMENT

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## U.S. Common Core Standards

### ENGLISH LANGUAGE ARTS STANDARDS: SCIENCE & TECHNICAL SUBJECTS



#### Grades 9-10

CCSS.ELA-LITERACY.RST.9-10.1

Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

CCSS.ELA-LITERACY.RST.9-10.3

Precisely follow a complex multi-step procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

CCSS.ELA-LITERACY.RST.9-10.4

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.

CCSS.ELA-LITERACY.RST.9-10.7

Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

CCSS.ELA-LITERACY.RST.9-10.9

Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

CCSS.ELA-LITERACY.RST.9-10.10

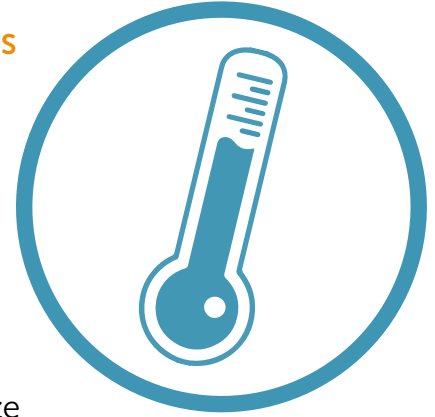
By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently.

# EDUCATIONAL ALIGNMENT

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## U.S. Common Core Standards

### ENGLISH LANGUAGE ARTS STANDARDS: SCIENCE & TECHNICAL SUBJECTS



#### Grades 11-12

CCSS.ELA-LITERACY.RST.11-12.2

Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

CCSS.ELA-LITERACY.RST.11-12.3

Follow precisely a complex multi-step procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

CCSS.ELA-LITERACY.RST.11-12.4

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.

CCSS.ELA-LITERACY.RST.11-12.5

Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

CCSS.ELA-LITERACY.RST.11-12.7

Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

CCSS.ELA-LITERACY.RST.11-12.8

Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

CCSS.ELA-LITERACY.RST.11-12.9

Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

CCSS.ELA-LITERACY.RST.11-12.10

By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

# EDUCATIONAL ALIGNMENT

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## U.S. Common Core Standards

### ENGLISH LANGUAGE ARTS STANDARDS: WRITING

In presenting their research findings through a poster or report, EPI participants will need to synthesize it, demonstrating understanding of the subject under investigation. They will also need to provide a conclusion statement that follows from and supports their arguments and is based on evidence, and they need to introduce precise claims to establish or disprove relationships among their claims.



#### **Grades 9-10**

##### CCSS.ELA-LITERACY.W.9-10.1.A

Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among claim(s), counterclaims, reasons, and evidence.

##### CCSS.ELA-LITERACY.W.9-10.1.E

Provide a concluding statement or section that follows from and supports the argument presented.

##### CCSS.ELA-LITERACY.W.9-10.7

Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

# EDUCATIONAL ALIGNMENT

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## U.S. Common Core Standards

### ENGLISH LANGUAGE ARTS STANDARDS: SPEAKING & LISTENING

Collaboration, critical thinking, and problem solving are essential components of an EPI program. During our field programs participants collaborate with peers and a diverse mix of local partners, researchers, and students to work towards common goals. Students work in teams to design, implement, and analyze different field investigations to respond to questions.



They also research, role play, and present new ideas and create new perspectives on and solutions to sustainable development issues. They then present their findings to their peers and researchers/station staff and discuss and defend their conclusions based on the evidence they collected and their data sources.

At the conclusion of the experience, students transfer and reflect upon their experiences, culminating in a letter they write to themselves to summarize their learning and define opportunities to apply what they learned when they return home.

#### Grades 9-10

##### CCSS.ELA-LITERACY.SL.9-10.1

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9-10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

##### CCSS.ELA-LITERACY.SL.9-10.2

Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

##### CCSS.ELA-LITERACY.SL.9-10.3

Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.

##### CCSS.ELA-LITERACY.SL.9-10.4

Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning. The organization, development, substance, and style of the presentation should be appropriate to purpose, audience, and task.

##### CCSS.ELA-LITERACY.SL.9-10.5

Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

# EDUCATIONAL ALIGNMENT

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## U.S. Common Core Standards

### ENGLISH LANGUAGE ARTS STANDARDS: SPEAKING & LISTENING



#### Grades 11-12

CCSS.ELA-LITERACY.SL.9-10.1

CCSS.ELA-LITERACY.SL.11-12.1

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

CCSS.ELA-LITERACY.SL.11-12.2

Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

CCSS.ELA-LITERACY.SL.11-12.3

Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

CCSS.ELA-LITERACY.SL.11-12.4

Present information, findings, and supporting evidence to convey a clear and distinct perspective, such that listeners can follow the line of reasoning. Alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

CCSS.ELA-LITERACY.SL.11-12.5

Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.



# EDUCATIONAL ALIGNMENT

## International Baccalaureate (IB)

### GLOBAL FOCUS FOR HIGH SCHOOL STUDENTS

Many of EPI's programs combine international travel and service learning. Although our programs are designed to be educational, we also search to create an interactive and experiential set of activities that involve collaboration with researchers, local students and communities at large to understand global issues.

Collaboration, meaningful service, and cross-cultural understanding are at the core of our program philosophy. These themes closely align with many of the outcomes of the IB diploma program. Specifically, an EPI program may support students working towards two graduation requirements: **Creativity Action** and **Service (CAS)** hours and the Extended Essay topic.

### WORLD STUDIES EXTENDED ESSAY

The World Studies Extended Essay (WSEE) became an official alternative to the traditional extended essay in 2011 with first examinations starting in 2013.<sup>1</sup> This extended essay option requires students to research and write about a topic of global significance. The WSEE is an IB requirement separate from EPI, but students will have access to educational resources and experiential learning opportunities that can help them develop their topic and foster "global consciousness."<sup>2</sup> By researching, building knowledge, and contributing to conservation efforts of global significance, students are exposed to global education using non-traditional mediums and gain a new appreciation of cultures and the challenges facing the developing world. Our programs encourage students to make real-world contributions to conservation in a foreign community. The program culminates with a project that requires students to reflect and transfer their experiences to their lives back home, making learning relevant and meaningful.

<sup>1</sup> International Baccalaureate Organization. (2012). Diploma programme curriculum – core requirements. Retrieved from : <http://www.ibo.org/diploma/curriculum/core/>

<sup>2</sup> International Baccalaureate Organization. (2012). World studies extended essay. Retrieved from: <http://www.ibo.org/diploma/curriculum/core/WSEE.cfm>



# EDUCATIONAL ALIGNMENT

## International Baccalaureate (IB)

### **CREATIVITY, ACTIVITY, & SERVICE (CAS) HOURS**

Students may use their EPI experiences for CAS credit hours. Our programs are inherently active pursuits that incorporate service and creativity and are supervised by professional educators and experts. We also provide an easy method for documenting CAS hours, and we enjoy working with CAS coordinators to arrange a seamless transfer of information to the school.

Our service learning is framed around a major issue in global development: the conservation of species or habitats of global significance. This issue provides a meaningful rationale for student projects. EPI is the only organization in Latin America that is partnering students with scientists in the field, allowing our participants to help solve global challenges by 1) understanding their role and responsibility towards conservation and the power of their individual and collective actions, and 2) contributing their physical labor to help in the conservation and monitoring of endangered species and/or habitats of global significance.

Our hope is that we inspire the next generation of environmentally literate conservation leaders, global thinkers, and problem solvers by facilitating experiences that allow youth to foster new perspectives, develop new skills, encourage creative solutions and teamwork, and promote the transference of their experiences back into their daily lives through reflection.

The design philosophy of EPI programs is closely aligned with the outcomes of the CAS program. Through project planning, active and creative participation, and then reflecting on these experiences, students achieve many of the outcomes outlined in the CAS program.

# EDUCATIONAL ALIGNMENT

## International Baccalaureate (IB)

### CREATIVITY, ACTIVITY, & SERVICE (CAS) HOURS

#### CAS Outcomes<sup>1</sup>

##### **Outcome 1: Increase your awareness of your strengths and areas for growth**

International travel and new experiences allow students to step out of their comfort zones and experiment with new skills. As a result, untapped strengths often rise to meet new challenges, and new perspectives inspire previously unknown interests.

##### **Outcome 2: Undertake new challenges**

New challenges are a common theme in an EPI program. Understanding new ideas, traveling to new places, developing new skills, living in a small group, and collaborating on solutions in unique environments are just a few areas in which students can undertake new challenges.

##### **Outcome 3: Plan and initiate activities**

On EPI programs, students learn to work with peers and residents to learn about and help solve global issues facing local communities.

##### **Outcome 4: Work collaboratively with others**

Collaboration is an essential component of most EPI activities and of traveling in a group. Creative collaboration will be used to solve different types of physical and mental challenges and encourage students to use diverse skills.

##### **Outcome 5: Show perseverance and commitment on your activities**

The group participating in an EPI program will become a team. As a team, everyone will need to be committed to the projects and shared responsibility of both working and living together. Perseverance will be necessary to maintain group cohesion and successfully complete the project.

##### **Outcome 6: Engage with issues of global importance**

All EPI programs are focused on issues, species, and habitats of global significance.

##### **Outcome 7: Consider the ethical implications of your actions**

A final component of an EPI program is to encourage students to reflect and transfer their experiences back into their daily lives.

##### **Outcome 8: Develop new skills**

Exposure to new situations, new concepts, and new challenges will help students develop a variety of skills. Everything from learning how to use tools to designing fundraising campaigns and outreach projects will require students to adapt and develop new skills.





# SEE YOU ON COURSE!

## Educating, Inspiring, & Empowering New Leaders

In order to achieve our vision of an ecologically literate society where the world's youth are empowered to take an active role in conservation, we work hard to create unique, hands-on, and high impact learning opportunities.

We want to change the way youth connect with nature, science, and conservation, and to do so, we focus not just on what they learn but also on how they learn.

Together with our incredible teachers and instructors, we continue to expand our curriculum to address the most pressing conservation issues our planet is facing, as well as meet the emerging needs of our 21<sup>st</sup> century learners.



For student, teacher, and staff stories from the field, visit our blog:  
[ecologyproject.org/blog](http://ecologyproject.org/blog)



For student and teacher pre-course curriculum resources, visit:  
[ecologyproject.org/classroom-tools](http://ecologyproject.org/classroom-tools)

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