LE 7 Overview

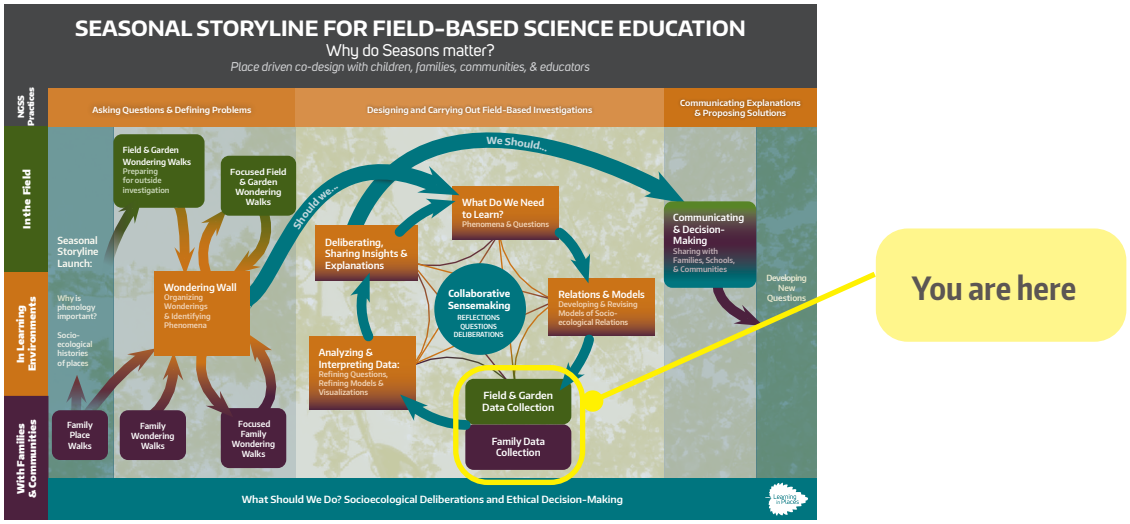
Overview: Designing an Investigation and Collecting Data to Answer "Should We" Questions

This process of planning and carrying out investigations enables us to move from opinions, beliefs, or initial ideas about phenomena to making claims from evidence. Abundant research demonstrates that students' initial ideas about a phenomenon or a key concept can be difficult to change. These initial ideas are often rooted in experience and their own conceptual models about how the world works. Unlike memorizing "facts" about phenomenon, however, students in this Learning Engagement wield their own observational and sensemaking capabilities to collect first-hand data that will help them revise or refine their own original concepts [LEs 8-9].

In this learning engagement, students will design their own investigations and collect data in the field, classroom, and their neighborhoods. As they make sense of the data in Learning Engagement 8, the data become evidence that can support claims about phenomena. This will help to answer investigation questions and make decisions around "Should We" questions.

Big Ideas About Nature-Culture Relations To Have In Mind As You Plan For Learning Engagement

In addition to providing an opportunity for students to engage in place-based investigations, these learning activities help teachers and families learn more about what phenomena students and families notice around their neighborhoods and schools, and what they wonder about in those places. This is a key first step in **ethical decision-making:** as learners notice and wonder about places they are connected to, their wonderings will reflect questions about human decisions that may have been made or could be made in the future that affect all who inhabit those places. By starting with places they are already familiar with, this bundle will give students practice learning and investigating outdoors.



LE 7 LEARNING GOALS

This bundle of learning engagements incorporates both school and family learning activities to engage students and families in wondering and observing socio-ecological phenomena. By the end of this bundle, students will be able to:

1. design field science investigations that help answer/refine our investigation question(s) and class "Should we" question
2. try out and refine data collection protocols to make accurate claims about our phenomena
3. collect a robust data set of field observations that allow them to find patterns across our data set

CONNECTIONS TO NGSS

» **Crosscutting Concepts:**
Patterns, Cause and effect, Scale, proportion, and quantity, Structure and function, Stability and change
[NOTE: several of these might apply depending on the focal phenomena]

» **Science Practices:**
Asking Questions and defining problems, Planning and carrying out scientific investigations

» **Disciplinary Core Ideas:**
LS1: From molecules to organisms; LS3: Heredity; LS2: Ecosystems; LS4: Biological Evolution ESS2: Earth's systems; ESS3: Earth and Human Activity [NOTE: Applicable DCIs will depend on the focal phenomena you and students have chosen.]

Learning Engagement in LE7

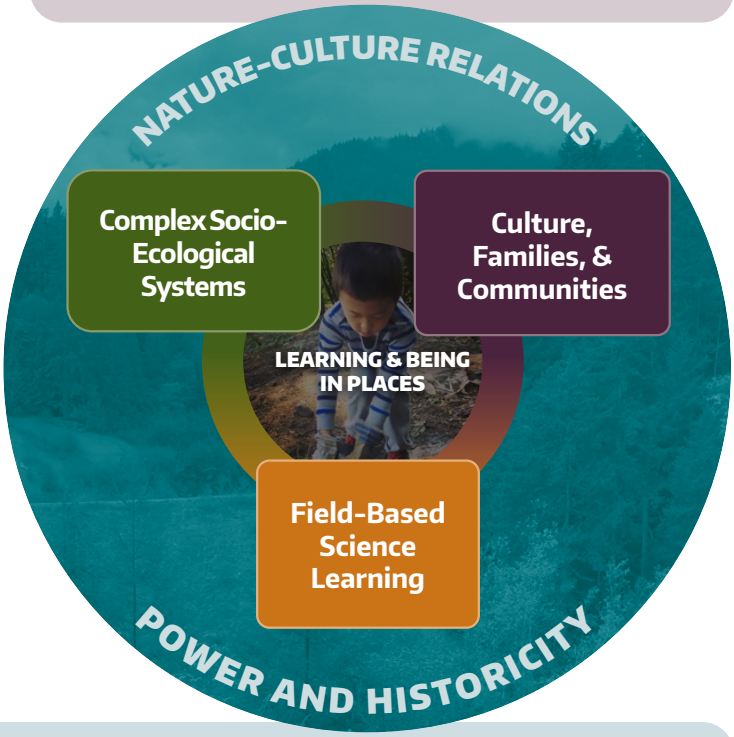
LE7.1 has **three parts** that engage students in designing an investigation and collecting data. First you will use students' questions from LE6.2 to design an investigation that will include family and school investigations as well as background and community research. Next, students engage in co-designing the investigation. Finally, students use data collection protocols to collect data with their families and at school, and use additional tools to conduct community and background research.

Engaging the Rhizome

Complex Socio-Ecological Systems: There are many types of relationships within and across systems. These relationships include predator-prey, helping or hurting, causal relationships (X causes Y to happen), among others. Research demonstrates that even young learners begin to understand causal relationships among organisms and natural components within a system. Revisiting models allows students to create increasingly complex models as they synthesize observations across space and over time as they move through the storyline.

Field-based science Learning: This learning engagement incorporates scientific practices that are critical to field-based science learning: (a) modeling of socio-ecological phenomena which also engage students in (b) argumentation from evidence as they decide on how to represent relationships in their models, which sets students to (c) ask questions to frame their field-based investigations.

Culture, families, and communities: Families play a central role in this learning engagement by engaging with their child in field-based science investigations and in conducting community-based research.



Power and Historicity:
When students see their families as valuable sources of information and as educators, it is empowering. It signals to students that families' perspectives, knowledge, and lenses on the natural world are important because they are helpful in better understanding socio-ecological phenomena. The activities in this learning engagement are designed, in part, to make visible to students that scientists are not the only people who engage in modeling as a practice to better understand the world. Students, families, and teachers can expertly engage in this sensemaking practice too!

Power and Historicity while learning outdoors:
As you have learned in LEs 1-5, classroom and outdoor teaching and learning are always done from powered positions. When student and family ways of knowing, doing, wondering, etc. are included in classroom learning, and positioned as equal to the knowledge, ideas, and wonderings generated in school, it signals to students and families that family knowledge is important and valued in the classroom. As a reminder, when students see themselves, their families, and the places that are important to them play a central role in what they learn in school, they understand that school science is related to their lives and their communities. This also signals to students that science does not stop when they leave school, and that their "Should We" models and investigation questions are relevant in their own neighborhoods as well as at school. Also, we are always making decisions from contexts of power and historicity. For example, we could choose we could choose to ignore historicized racial inequities in places when deciding on our actions, or we could choose to include BIPOC (Black, Indigenous, People of Color) people in our community research to understand all of our collective perspectives and be better informed as we deliberate. How we conduct our investigations is crucially important to the quality of the data that we collect, and consequently the kinds of evidence-based claims we can make as we deliberate.