

Observations and Data Collection for Making Sense of Phenomena Framework

Why are observations and data collection important in field based investigations and socio-ecological sense-making?

Observations are a multi-sensory way of noticing and learning about socio-ecological phenomena in the world. We can observe by seeing, hearing, smelling, feeling, and even tasting things in the world. People the world over have been engaged in observational practices to build their knowledge systems. Observations are also a primary source of information in scientific inquiries. Through scaffolding and guidance, systematic observations can become a form of data collection. Data collected in the field can then be used as evidence to explore scientific questions. Adding incoming observational data to learners' scientific models, and incorporating this with other forms of data - such as community and research from print and digital media - are important processes that lead to sensemaking, deliberating, and making decisions about socio-ecological phenomena. This framework is intended to support educators in facilitating and scaffolding observations and data collection in field-based learning environments.

Using observations in socio-ecological sensemaking

Observations are a way of perceiving the world around us, and systematic observations can lead to sensemaking about socio-ecological phenomena. Conducting observations is not the same as simply noticing things. Observations are systematic, or methodical, practices of noticing across places and over time. During field investigations, educators can scaffold observations with questions and prompts that are relevant to the phenomenon or investigation question of interest. This framework highlights three ways of scaffolding observations including 1) using multiple senses, 2) observing across spatial scales, and 3) observing across temporal scales

Connecting data collection with socio-ecological sensemaking

Scaffolding observations will help learners collect data that is relevant to scientific inquiry. Data collection is a record of observations, and allows learners to see measurable change of phenomena over time and across places. Determining what data to collect in an investigation requires careful planning, as it will become evidence for learners to use when making claims about socio-ecological phenomena. This framework describes three types of data that support socio-ecological sensemaking: 1) field investigations, 2) community-based research, and 3) research from print and digital media.

How to use this framework

Learner Sense-Making: Use this framework to help learners become systematic in their observations and engage with real world phenomena and family, community, and scientific knowledges. Data collected from observations can help learners see change over time, across places, and across scales. Educators can scaffold learner observations and data collection by asking them to think about:

- a) their family knowledges and practices;
- b) the goals of the activity or investigation;
- c) what they have observed in another place and/or at another time

Educator Reflection: Use this framework to reflect on your own observation and data collection practices. Think about what you noticed in the field, and how that related to your prior experiences, family and community knowledges and practices. Think also about how the data that was collected could contribute to an ongoing database. In implementation, reflect on the observations and data that learners' collected. Think about how you scaffolded these to connect to the goals of the activity, and learners' family and community knowledges and practices.

Collaborative Practice: Use this framework to engage learners in the collaborative practice of coordinating observations while outdoors. For example, this can be done by asking small groups of learners to share their observations of the same phenomenon across multiple times or places. Coordinating observations can lead to robust datasets that can be used in socio-ecological sensemaking, deliberations, and decision-making.

Planning and Implementation: Use this framework to plan where learners will conduct field investigations that will align with the phenomenon of interest, and design instructional prompts that help focus attention or data collection in ways that support scientific thinking and connect to family and community knowledges and practices.

Co-Design and Assessment: Use this framework to guide your co-planning with other educators by sharing where you conducted field investigations and what you observed. This can help create collective knowledge and build community. Use this framework to guide the use of formative assessments that help you understand how learners are making connections between observations over time and across places. Also consider how observations support data collection, and how data is used in learner sensemaking and ethical deliberations and decisions about socio-ecological systems.

Connections to expert thinking:

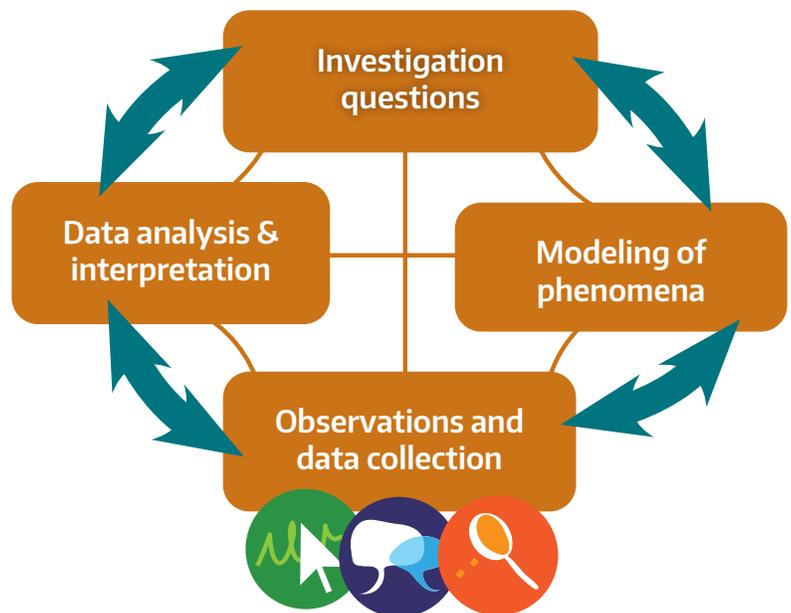
Observations spark wondering, elicit questions, and support data collection in the field. Field researchers use observations throughout their scientific inquiry to make claims and justify them in order to build knowledge. For instance, researchers studying the effects of climate change on endemic butterfly species use systematic observations of spatial and temporal relationships among butterflies, plants, climate patterns, other animal and human communities. This data set, coupled with community relationships and input, lead to robust sets of data that are then used for socio-ecological sensemaking and deliberations. Findings are then used in local and regional decisions and policies.

Scaffolding Observations and Data Collection in Socio-Ecological Sensemaking Framework

Systematic observations of phenomena over time can lead to deeper understanding of phenomena in the world. These observations can lead to data collection, and when coupled with other forms of data, will contribute to ethical deliberations and decision-making about socio-ecological phenomena.

Scaffolding Observations:

- a) **Commit to making place designing routine:** Become familiar and comfortable with the learning affordances and constraints of the places you and learners will be observing and gathering other types of data. This will help you support learners to make their outdoor field observations and data collection more generative.
- b) **Encourage multi-sensory observations:** Observations are a way of perceiving the world using multiple senses. Looking, hearing, smelling, feeling, tasting (safely) are different but complementary ways to observe.
- c) **Scaffold observations across scales:** Observe phenomena across multiple spatial and temporal scales. This leads to deeper understanding of the relationships, behaviors, structures, and functions of species and kinds, and how they are connected to places, lands, and waters
 - 1) **Spatial scales:** Observe phenomena at different different places, including: above-around-below, or across multiple places (such as home, neighborhood, schoolyard).
 - 2) **Temporal scales:** Observe phenomena at different times, including over the course of a day, weekly, monthly, seasonally, and over decades.
 - 3) **Size scales:** Zoom in and zoom out to observe phenomena at different sizes, for example: look closely at a water droplet on a leaf, or look broadly at the canopy of the forest.
 - 4) **Population scales:** Observe different populations scales, for example: a single bird to a flock of birds.
 - 5) **Toggling across scales:** Support learners in recognizing interactions across spatial and temporal scales. [add agent-aggregate].
- d) **Support learners' intellectual leadership:** Learners' observations signal prior experiences, what is valued or important in their lives, as well as what they find interesting. Ask learners to lead observation or investigation walks, or ask them elaborate on their observations to better understand and engage with their perspectives and practices.
- e) **Engage with family, home, and community knowledges and practices:** Ask learners to observe phenomena and collect other types of data with their families in their home community or neighborhood. In the field, ask learners about how what they are observing is similar or different to what they have observed elsewhere.
- f) **Engage with science practices:** Remind learners about the purpose of the activity or investigation, and prompt learners to observe phenomena that support the goals of that activity.



Types of Data Collection:



Field Investigations: This includes collecting quantitative (numerical data such as counts) and qualitative (descriptive) data while in the field using observations.



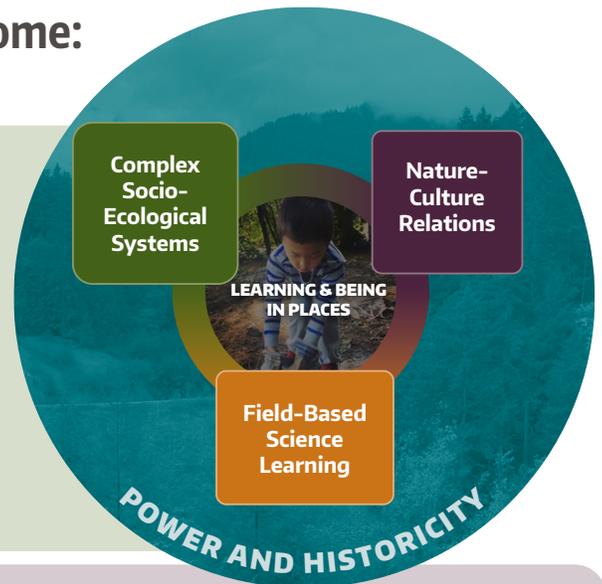
Community-Based Research: This includes reaching out to or interviewing community members about a part of the socio-ecological phenomenon the learners are exploring.



Background Research: This includes finding information that is already out there related to the socio-ecological phenomenon. For example: reference books, internet searches, podcasts, and more.

Connections to the Learning in Places Rhizome:

Complex Socio-Ecological Systems: Socio-ecological systems consist of networks of interacting relations - among humans, more-than-humans, and natural kind—across multiple spatial and temporal scales. Scaffolding deeper understanding of socio-ecological systems can be supported through observations and collecting data across places and over time. In turn, looking for patterns in data that has been collected in the field supports ethical deliberations and decision-making. Conducting observations in the field should become routine practices in your learning environment.



Nature-Culture Relations: What people attend to, or what they focus on, varies across cultures. What one learner observes may be important to their family, but may go unnoticed by another learner. Creating opportunities for learners to pursue or share observational phenomena that are interesting can make the activity more personally meaningful and can also create a diverse and collaborative classroom atmosphere. Heterogeneous knowledges and practices—bringing together diverse perspectives as valid forms of sensemaking in the classroom—are at the cornerstone of science as well. For example, recognize and value that learners and their families or communities may have different orientations to the role of humans in nature, and make space for these perspectives in the learning environment.

Field-Based Science Learning: Conducting routinized observations and collecting data outdoors are important scientific practices and contribute to sense making about scientific concepts. Field scientists, such as some types of biologists and ecologists, use observations and collect data to spark new insights, test hypotheses, or gather data. Making time for learners to observe in the field can lead to diverse questions and hypotheses, and to deeper understandings of scientific phenomena. Additionally, through observations and data collection learners can see measurable change in phenomena over time and across places. These are key in field-based science learning.

Power and Historicity: Providing learning experiences in which learners can explore, observe, and share their wonderings is critical in order to create equitable learning environments that incorporate multiple perspectives. While learners are always observing, what and how they observe, and what they then choose to share (or feel comfortable sharing) is layered with power and historicity. In schools and other learning environments behavior management and the policing of learners' (particularly Black and Brown learners) observations and connections that they make contributes to cycles of inequities in institutional learning environments. This can happen in subtle or significant ways by ignoring, discrediting, or silencing learner enthusiasm. Instead, create space and encourage learners and their families to share what they observe at home, in their neighborhoods, or in places that are important to them in order to bridge experiences between communities and learning environments.



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Suggested Citation

Learning in Places Collaborative. (2020). *Framework: Observations and Data Collection for Making Sense of Phenomena*. Bothell, Seattle, WA & Evanston, IL: Learning in Places.