



# Learning Frameworks

## Wonderings, “Should We”, and Investigation Questions in Field-Based Science

### Why are wonderings, “Should We”, and investigation questions critical in field-based investigations and socio-ecological deliberation and decision-making?

Research has shown that when learner questions are centered in science activities, those questions can drive sense making and guide the formation of field-based investigations. Additionally, learner questions can offer insight into how they understand scientific concepts, and importantly, how they are making connections to personal experiences and/or family and community knowledges and practices. Making these connections visible is critical in the design of effective and equitable science learning environments. In order to support this, educators can model and scaffold how to ask questions that lead to ethical deliberations and decision-making about socio-ecological systems.



Although there are many other types of questions that learners and their families may ask, we focus on Wonderings, “Should We,” and Investigation questions as important for scaffolding ethical deliberation and decision-making related to complex socio-ecological systems.

# How to use this framework

**Learner Sense-Making:** Make space for learners to wonder and ask questions during outdoor and indoor learning activities. Encourage learners to bring wonderings and questions from family activities to the learning environment. Ask learners to elaborate when they pose a question to help uncover ideas that may not be initially visible. The wonderings and questions that learners pose can offer insight into personal connections, and/or family and cultural knowledges and practices. “Should We” questions should stem directly from student wonderings, and should be the connection between wonderings and investigations.

**Collaborative Practice:** Learners and educators should work collaboratively to ask questions in order to build knowledge in the classroom and to figure out what phenomena to investigate. Educators should make wonderings and questions visible, and help learners make connections and build upon other ideas. Additionally, educators can create cross-learning environment collaborations by sharing “Should We” and Investigation questions with families and other educators to get input or connect to other ongoing investigations.

**Co-Design and Assessment:** Use this framework to guide your co-planning with other educators by continually revisiting learner wonderings and questions. Bringing a list of learner and family wonderings and questions to co-design sessions will help you and other educators assess what practices and knowledges are being surfaced in the classroom, as well as what instructional moves you will need to consider to continue to support learners’ wonderings and question asking. Share “Should We” and investigation questions, and help each other design investigations that will support learners’ explorations of, and ultimately their deliberations and decision-making about, these questions.

**Planning and Implementation:** When planning instruction, implementing plans, and reflecting on how these plans unfolded during instruction, think about where and when space was made for learners to generate, share, consider, and explore wonderings and questions. Some things to think about include: a) how will you track and make visible the myriad of wonderings and questions? b) how will you help facilitate connections across these wonderings and questions to help learners generate “Should We” and related Investigation questions? c) how are learners making connections to phenomena that have meaning for their families and communities.

**Educator Reflection:** Reflect on your own practice related to authentically centering learner and family wonderings and questions in your instruction. Identify if and how you create a space to incorporate learner and family wonderings into your learning environment, and into your instruction. Reflect on the kinds of “Should We” questions you ask and make decisions around every day. Try to think about the positions from which you make those decisions--as a parent, a teacher, a caretaker? What information did you need to gather in order to make those decisions? Reflect on the process of how “Should We” questions can be explored beginning with the generation of investigation questions that will guide learners’ investigations and ultimately, their ethical deliberation and decision-making about their “Should We” questions. Identify supports you might need to help you support learners as they engage in wondering, sense-making, question generation, investigations, deliberations, and decision-making.

## Connections to expert thinking:

Wonderings and questions are central to all scientific endeavors. Wonderings lead to scientific questions. These questions guide research and investigations, and in turn generate more wonderings and questions! For example, an ecologist will often observe and wonder about phenomena in the world before engaging in field research. This endeavor may be driven by personal histories, values and ethics in their home communities, and current directions in the scientific field. Importantly, all science is a cultural endeavor, and the types of questions that are asked, and linkages to sense making and deliberations, have implications for decisions about socio-ecological systems.

# Wonderings, “Should We”, and Investigation Questions Framework

## Wonderings

Wondering is central to sophisticated scientific field-based observation and questioning. Observations generate curiosity, wonderings, and questions that open up opportunities for learners to engage in speculative thinking about possible relationships, drawing their attention to the unknown. Wondering helps learners consider a broader range of human and more-than-human perspectives when making sense of the values underlying deliberation and decision-making processes. **Who gets to wonder, and whether or not these wonderings are taken up in a learning environment, is a deeply powered and historicized act.** Paying attention to wonderings and letting them guide activities in learning environments makes space for learners to not only be heard and centered in investigations, but also leads to ethical deliberations that are personally meaningful to learners' and their families and communities. A focus on wondering in field-based science contexts opens up space for learners to deliberate and ask questions about the roles and responsibilities of humans within the natural world. Wondering is essential to ethical decision-making and considering what possible futures we imagine, what actions we should take, and what values guide those actions. When a learner asks, “I wonder who put this wall here?”, opportunities arise to imagine both past and future actions, perspectives of more-than-humans, and past roles and future responsibilities of humans. In this way, and with facilitation, wonderings lead to questions that form the basis for “Should We” questions.



## “Should We” Questions

Asking “what should we do,” and deliberating in order to make a decision is something that all people do everyday. Deliberations and decisions can be informed by personal experience, values and beliefs, cultural norms, social networks, and evidence from a myriad of other sources. In field-based science, deliberating and then making decisions involves utilizing knowledge, clarifying values and goals, and exploring potential impacts on humans and more-than-humans, at micro and macro scales, across multiple timescales, and from powered positions. Socio-ecological “Should We” questions (1) explore relationships between humans and the natural world, (2) explore multiple possibilities and how each possibility could impact families, communities, and the natural world, and (3) encourages us to make more ethical and accountable decisions within the natural and social world. “Should We” questions ask us to think about scales of time, including seasons, and processes of change. They ask us to take on others’ perspectives and ask, “who would we help with our decision? Who might we harm?” “Should We” questions require deliberation and action even with uncertainty. “Should We” questions require that we think about power and historicity as part of our deliberations and decision making. Asking “Should we” questions as part of science learning is important because they:

- center social *and* ecological (socio-ecological) systems in deliberations and decisions;
- stem from learner and family wonderings;
- give purpose, direction, and cohesiveness to subsequent investigation questions;
- create spaces for learners and their families to *reason & deliberate* about socio-ecological systems and decisions by using observations and evidence;
- create space for *ethical decision-making* around nature-culture relations.

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## Investigation Questions

Investigation questions about the social (human) and natural world (more-than-human) are a unique type of question that can be explored through systematic observation and other field-based science methods. Scientists use investigations to explore questions and better understand related phenomena. They collect and then analyze data and utilize evidence from that work to interrogate their questions and model relationships, which includes generating more questions that lead to more investigations! In *Learning in Places* this process of planning and carrying out investigations enables movement from initial ideas about phenomena related to learners' "Should We" questions, to making claims from evidence about those phenomena in preparation for ethical deliberations and decision-making related to "Should We" questions. Investigation questions are important because they:

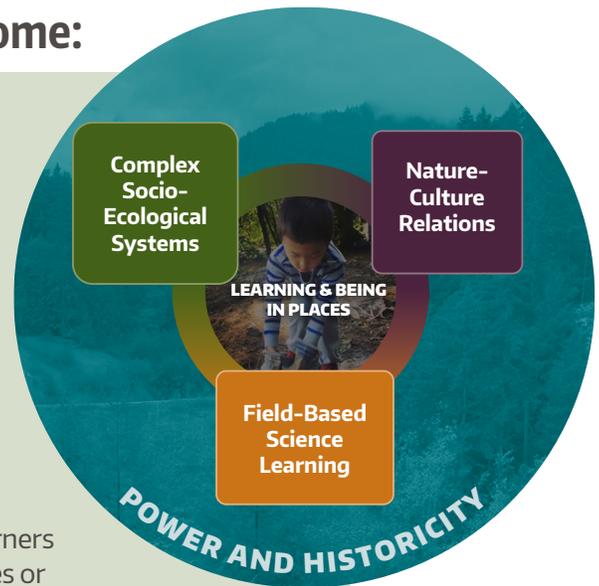
- support learners and educators as they plan investigations, including the use of data collection protocols and other instrumentation, that will allow them to explore their investigation questions and make claims about phenomena they are studying.
- support learners and educators to collect a robust data set including field observations and measurements, conversations with community and family members, and explorations of various media, such as books, podcasts, articles. Through subsequent data analysis, learners and educators generate patterns that help them make claims about the phenomena in which they are interested.
- support learners and educators by ultimately contributing to ethical deliberations using their data and their analyses of those data to make decisions about their "Should We" question.

Asking Questions



# Connections to the Learning in Places Rhizome:

**Complex Socio-Ecological Systems:** Socio-ecological systems refer to the interactions between human systems and ecological systems. The underlying premise is that humans are part of the natural world, and all of our systems (e.g. social, political, institutional) are always in relationship with ecological systems. Educators should incorporate wonderings and scaffold how to ask “Should We” and investigation questions that explore wonderings and support sense-making about complex socio-ecological systems. Educators can do this by building on the wonderings and questions that learners, their families, and their communities are asking, and helping them to deepen and/or reframe in ways that make explicit connections to socio-ecological phenomena. Ultimately, “Should We” questions should prompt learners to investigate or think about phenomena across multiple time scales or spatial scales.



**Nature-Culture Relations:** While asking various types of questions is an important part of science education, it is also a practice that varies across cultures. The questions that learners or families raise can offer insight into issues that matter to them or their communities. For example, when thinking about nature-culture relations, “Should We” questions can also prompt learners to think about their own connection to natural and social systems. For instance, how do learners’ wonderings, “Should We,” and investigation questions lead to ethical deliberation and decision-making that recognize that humans are part of the natural world? How do these questions explicitly or implicitly connect to family and cultural knowledges and practices?

**Field-Based Science Learning:** Conducting field investigations and constructing explanations from evidence are foundational to field-based science learning. Wonderings, “Should We,” and investigation questions drive the field investigations, help learners make sense of phenomena, and lead to new questions. It is important to note that even if learners’ or families’ questions seem unrelated to science investigations, educators should not make that assumption. Instead, educators should further explore these questions with learners and families so that connections among phenomena and initial questions are visible and so that educators understand how these questions are personally meaningful to learners and families and/or connected to larger socio-ecological systems.

**Power and Historicity:** Who gets to wonder and ask questions, and whether or not these are taken up in a learning environment, is a deeply powered and historicized act. Power is embedded in all relationships; between individuals, between individuals and institutions, between institutions and communities, and so on across time (historicity). This power shapes interactions between peers and between adults and young people routinely in learning environments in ways that can hinder or facilitate genuine curiosity and scientific questioning, particularly for those whose knowledges and inquiry practices do not mirror dominant ones. For example, research demonstrates that very young learners come to school with many questions, inquisitiveness, and personal interest; however, routine interactions, such as assessment, in schools shift young peoples’ thinking and discourse towards (re)producing known right answers to questions posed by an adult or privileged peer. Or the types of questions that drive learning and instruction solely mirror Western knowledge systems and maintain intellectual power with privileged adults and learners. Educators should make explicit connections to all learners’ wonderings and questions over time and across learning places (i.e., indoors, outdoors, and in homes and communities), which can support learners seeing their ideas and questions as generative to their own and others’ learning. Additionally, educators can learn more about heterogenous deliberation and decision making practices in learners’ homes and communities to develop a range of culturally thriving question asking practices that may look different than school-based questioning practices.



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## Suggested Citation

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