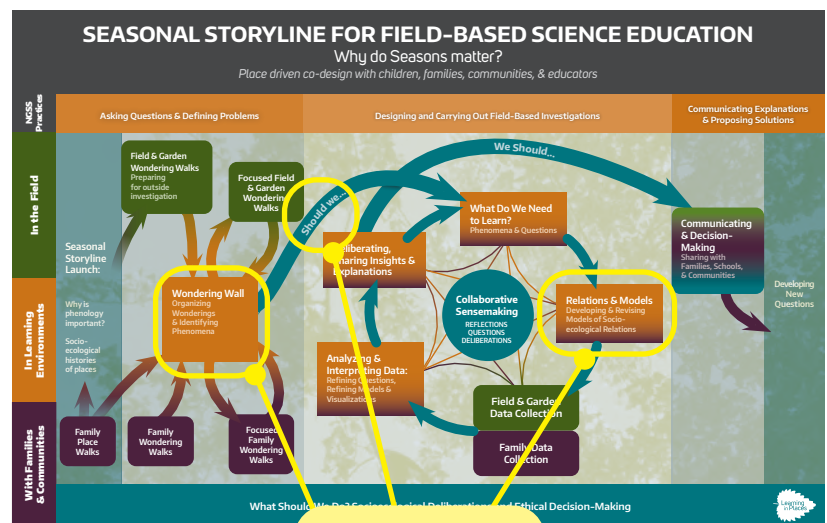


In LE4, **students and families are now introduced to “Should We” questions** (LE 4.2), which will anchor the rest of the Seasonal Storyline and support students’ ethical deliberation and decision-making. They use their own decisions and decision-making practices (LE 4.1) to better understand what “Should We” questions are, as well as the important dimensions involved in deliberating and engaging in decision-making. **Students will ask “Should We” questions related to the 3–4 themes and/or phenomena that they identified on their Wondering Wall**, and they will select the “Should We” question they want to focus on for the rest of the Seasonal Storyline. Students will then pick one or two focal phenomena that are related to their “Should We” question (LE 4.2). In the last part of LE 4, **students will create an initial model for their “Should We” question**, including their focal phenomena (LE 4.3). This will prepare them to take additional Wondering Walks in LE 5 in order to collect more observations and ask additional wonderings, which will help them to deepen their understanding of the “Should We” question and related focal phenomena.

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

Humans engage in deliberation and decision-making related to nature-culture relations all the time even if they aren't aware of that. Those decisions can be helpful or harmful to nature-culture relations. In this learning engagement, you will support students to become more aware of their decisions and their decision-making processes, and how they can use their wonderings about elements of nature-culture relations to explore decision spaces that are important and consequential to them and their families. From the **Nature-Culture Relations framework**, we learn that nature-culture relations are especially central to science and the ways in which scientists imagine, conceptualize, and investigate phenomena. Many 21st century challenges to social and ecological systems’ health and resilience are caused by unsustainable and imbalanced human-nature relationships and practices. These imbalances are changing ecosystems across the earth to the point that scientists have called these a new era in the earth’s history—the anthropocene. A key opportunity and need of the 21st century is for local and global communities’ to adapt to changing lands and waters and develop sustainable relations with the natural world. Importantly, issues of power and historicity continue to shape nature-culture relations and our ability to cultivate just, sustainable and culturally thriving societies. It is important for educators to recognize how nature-culture relations and the demands of the 21st century pervade all aspects of learning in formal, informal, and everyday learning environments—particularly in science education. This learning engagement helps to make some of this visible by supporting students to use their and their families’ wonderings to ask “Should We” questions related to nature-culture relations that will drive investigations throughout the rest of the storyline, and ultimately lead to them deliberating and making decisions about their “Should We” questions.



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LE 4 LEARNING GOALS

By the end of the LE 4 learning engagement, students will be able to:

- » Analyze classroom and family decision-making along several dimensions (for example, purpose of any decision, how decisions are shaped by place, who is involved in any given decision, who benefits and who might not benefit from any given decision, options that are considered during decision-making and why, values that guide decision-making and how/why)
- » Use their and their families' wonderings to form a guiding "Should We" question and to identify related, focal phenomena
- » Construct an initial model of their "Should We" question that includes their focal phenomena

CONNECTIONS TO NGSS/ FIELD-BASED SCIENCE

- » **Crosscutting Concepts:** Patterns; Cause and Effect; Scale; Systems and System Models, Energy & Matter; Structure and Function; Stability and Change [NOTE: several of these might apply depending on students' "Should We" question and their focal phenomena]
- » **Science Practices:** Asking questions; Developing and using models; Planning and carrying out investigations; Analyzing and Interpreting data; Obtaining, evaluating, and communicating information
- » **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 Engagements in LE4

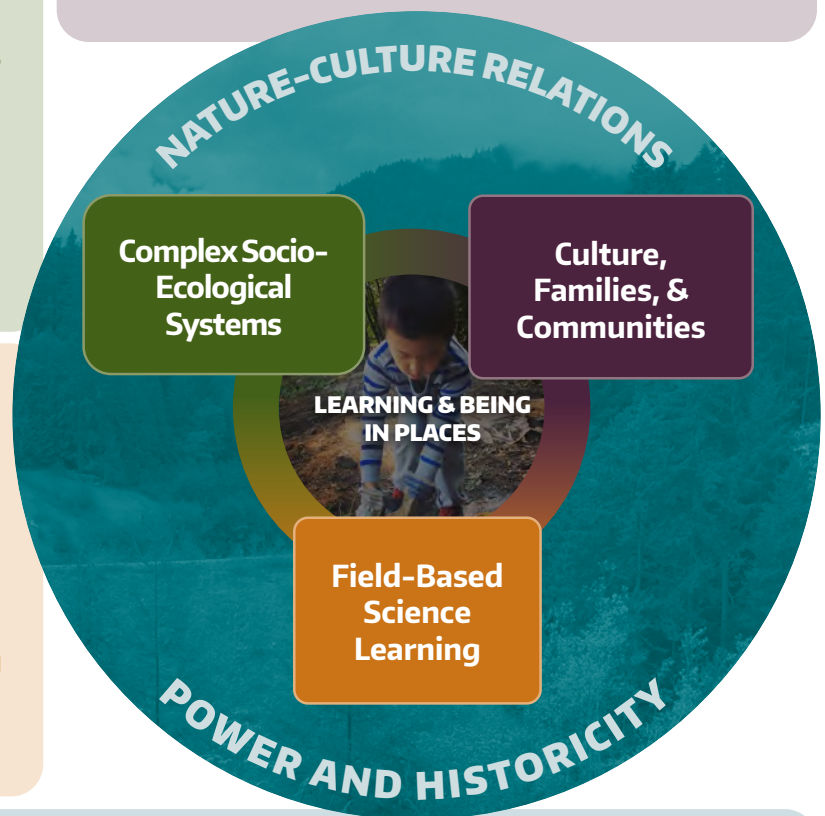
- **LE 4.1 What "Should We" Do?: Exploring Classroom and Family Decision-Making:** In this lesson, students explore and reflect on their family and classroom decision-making by analyzing decisions that they and their families make, as well as documenting and analyzing decisions they make in their classroom. Students and their families will analyze a big decision they have made to reflect on their decision-making processes, as well as to reflect on how their decisions are situated in place, and influenced by things like values and family knowledges and practices.
- **LE 4.2 Asking "Should We" Questions from Wonderings and Identifying Focal Phenomena:** In this lesson, students will learn what "Should We" questions are, and then they will ask "Should We" questions related to the 3-4 phenomena that they highlighted on their Wondering Wall from LE 3.1. After asking a variety of "Should We" questions, they pick the one they want to focus on for the rest of the Seasonal Storyline. Then, they identify at least two related, focal phenomena.
- **LE 4.3 Modeling the "Should We" Question and Related Focal Phenomena:** In this lesson, students and families create an initial model of the class "Should We" question, that includes the related focal phenomena. Students unpack their beginning understanding of what their "Should We" question involves. They then learn from their families' models, and add to their models with ideas and thinking from their families' models.

Engaging the Rhizome

Complex Socio-Ecological Systems: LE 4 introduces students to elements of decision-making and ways of thinking about making decisions that they will use throughout the rest of the storyline to investigate, deliberate about, and ultimately make decisions about their socio-ecological “Should We” question. For example, students consider who was involved in making a decision, who was not involved, and why?; Who or what was impacted by the decision and how?; Why was the decision necessary and/or important? What was the purpose of making it?; and How does place shape the decision that is ultimately made? In addition, students gain practice with modeling aspects of complex socio-ecological systems when they model their “Should We” question and related, focal phenomena. They revisit the 5 socio-ecological dimensions (see LE 2.3) to help them decide what to include in their model to make their initial understandings of their “Should We” question and related, focal phenomena visible.

Field-based science Learning: This learning engagement incorporates scientific practices that are critical to field-based science learning: (a) analysis of various types of data, and (b) modeling of socio-ecological phenomena. As noted, students learn about “Should We” questions in this learning engagement, which begins their exploration of how to engage in ethical deliberation and decision-making about socio-ecological phenomena embedded in complex socio-ecological systems.

Culture, families, and communities: Students will explore and analyze their and their families' decision-making in preparation for identifying a “Should We” question and related focal phenomena (based on their and their families' observations and wonderings). As you have seen in previous learning engagements, incorporating family understandings, knowledges, ideas, and practices ensures that you and students are able to engage in deeper sense-making because you have a richer dataset to consider. In addition, you position family knowledge and practice as a critical component of student sense-making and classroom science learning, thus helping students see that their families' ways of knowing and doing can make important contributions to science.



Power and Historicity:

Making decisions, like any other activity is powered and historicized, and students will be introduced to questions in this learning engagement that will help them surface where power resides in socio-ecological systems (and with who and what), and why it is important to consider that with respect to their deliberations and decision-making. More generally, and as you have learned in LEs 1-3, classroom and outdoor teaching and learning are always done from powered positions. When student and family ways of knowing, doing, wondering, decision-making, 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 connected to what they learn in school, they understand that school science is related to their lives and their communities.



Lesson Plan

LE4.1: What “Should We” Do?: Exploring Classroom and Family Decision-Making

Purpose

The goal of LE 4.1 is to **give students opportunities to explore and reflect on their family and classroom decision-making by analyzing decisions that they and their families make.** Students will document and analyze decisions they make in their classroom. Students and their families will analyze a big decision they have made to reflect on their decision-making processes, as well as to reflect on how their decisions are situated in place, and influenced by things like values and family knowledges and practices. These explorations of decision-making are important preparation for LE 4.2 where students will ask “Should We” questions related to the 3-4 themes and/or phenomena that they highlighted on their Wondering Wall (see LE 3.1).

Why this is important

Asking “what should we do,” and deliberating in order to make a decision is something that people do all the time. Deliberations and decisions can be informed by personal experiences, values and beliefs, cultural norms, social networks, and evidence from a myriad of sources. Before students generate “Should We” questions related to the 3-4 themes and phenomena they identified when creating their Wondering Wall, it is important to support them in thinking about decisions and decision-making in their lives, including at home and in their classroom at school. Learning-related research is clear that people sense-make and reason about new concepts, ideas, and practices (like the concept of a “Should We” question), using what they already know, do, and have experienced. This is why you want to begin this learning engagement by asking students to explore, reflect on, and analyze their, and their families’, decisions and decision-making processes. Then, students can reference the activities and discussions in this LE when they start to ask “Should We” questions related to complex socio-ecological systems and the nature-culture relations and power and historicity that are part of and shape those systems. Two Learning in Places frameworks will provide important information for you about “Should We” questions, deliberation, and decision-making: (a) the **Wonderings, “Should We,” and Investigation Questions framework**, and the (b) **Ethical Deliberation and Socio-Ecological Decision-Making framework**.

Engaging family and community knowledge and practices

LE 4.1 provides another opportunity for you and students to learn from families, this time about a big family decision that they made and who and what were involved in making that decision. Learning from families about their decisions will ensure that you and students are considering different types of decisions, and not only classroom-based decisions and decision-making. Additionally, you will get to learn how families made their decisions. This will help students start to explore what “Should We” questions are in LE 4.2, and how they might deliberate and ultimately make decisions about them. As you have seen in previous learning engagements, incorporating family knowledges, ideas, wonderings, and practices ensures that you and students are able to engage in deeper sense-making because you have a richer dataset to consider. In addition, you position family knowledge as a critical component of classroom science learning, thus helping students see that their families’ ways of knowing and doing make important contributions to science.

LEARNING GOALS

By the end of this lesson, students will be able to:

1. Analyze classroom and family decision-making along several dimensions (for example, purpose of any decision, how decisions are shaped by place, who is involved in any given decision, who benefits and who might not benefit from any given decision, options that are considered during decision-making and why, values that guide decision-making and how/why)

CONNECTIONS TO NGSS

- » **Crosscutting Concepts:** Cause and Effect
- » **Science Practices:** Asking questions; Analyzing and Interpreting Data; Obtaining, evaluating, and communicating information
- » **Disciplinary Core Ideas:** ESS3.C: Human Impacts on Earth Systems; ETS1.A: Defining and Delimiting an Engineering Problem

ASSESSMENT OPPORTUNITIES

- » LE4.1b What “Should We” do: Exploring daily decisions in our classroom
- » Student talk (questions they ask, wonderings they voice, ideas and reflections they voice) during small and whole-group discussions about family and classroom decisions and decision-making

Teacher background information

In LE 4, students are introduced to “Should We” questions. The “Should We” questions that students generate in LE 4.2, and the “Should We” question they ultimately decide they most want to explore and investigate, will drive the rest of the Seasonal Storyline. Because “Should We” questions motivate ethical deliberation and decision-making, support students to start thinking about decisions they make frequently, and how they and their families go about making decisions that are consequential to them. Doing this work will help students better understand what “Should We” questions are. Remember that the goal of LE 4.1 is to support students in analyzing and reflecting on the decisions they make in their classroom, as well as the decisions they make with their families at home. This will help them understand some of the component parts of decisions, and the processes of decision-making.

Centering equitable practices:

- **Use family decisions and analyses of those decisions as a rich source of information to support students’ sense-making about ethical deliberation and decision-making:** Avoid judging families’ decisions and decision-making processes and strategies. Like other activities, deliberation and decision-making are powered and historicized (see the **Power & Historicity Framework**), and your role is not to judge or evaluate families’ decisions and decision-making practices. Remember that the goal of this learning engagement is to help students better understand, through their analyses and discussions, complicated decisions (like those that complex socio-ecological “Should We” questions motivate) and how different people engage in deliberation and decision-making about those decisions.
- **Encourage student idea generation, wonderings, questions, comments, and suggestions.** Avoid a rush to judgment that any student’s ideas, wonderings, questions, comments, and/or suggestions are silly, misinformed, nonsensical, or off target. Instead, ask clarifying questions. Ask how other students would incorporate whatever was said into ongoing discussions (other students might have perspective on peers’ commentary and questions that you don’t). Assume a sense-making stance, and a ‘desire to participate’ stance, and let those guide your actions as a teacher and facilitator.

To prepare for this lesson

1. Read the **Wonderings, “Should We,” and Investigation Questions Framework**, and the **Ethical Deliberation and Socio-Ecological Decision-Making Framework**. These will provide you with more background on “Should We” questions, deliberating about them, and ultimately making decisions about them. These frameworks will give you a sense of the types of practices and sense-making in which students will be engaged throughout the rest of the storyline, and why “Should We” questions are so important. Having that bigger picture in mind will help you frame and scaffold discussions, ask probing questions, and facilitate students’ sense-making related to the classroom and family decisions and decision-making that they are analyzing during this learning engagement.
2. Complete both LE 4.1a and 4.1b (the family tool and student tool) before you ask families and students to use them. This will give you a good sense of student and family activity in this learning engagement. Based on the information asked for in each tool, and knowing the goal of this lesson, as well as the importance of “Should We” questions, ethical deliberation, and decision-making in the Seasonal Storyline, plan questions and discussion prompts and strategies that you want to use to facilitate rich discussions and support student learning related to their analysis of decisions and decision-making. Anticipate student and family questions and concerns and plan how you will address them. Consult the **Discussion, Reflection, and Deliberation Framework** to give you ideas for discussion and reflection strategies to use.
3. Send home **LE4.1a What “Should We” do: Reflecting on a big family decision** at the very beginning of this learning engagement so that families have enough time to decide on a family decision that they want to analyze, and then engage in that work. While families are selecting and responding to questions about their decision, you and students will be documenting some decisions you make in your classroom and analyzing those.

MATERIALS

- » LE4.1a What “Should We” do?: Reflecting on a big family decision
- » LE4.1b What “Should We” do?: Exploring daily decisions in our classroom (student tool)

TIME

1-2 school days to document classroom decisions and answer questions about them; 30 minutes to explore family decisions and decision-making; 20 minutes to synthesize what students learned about decisions and decision-making

Instructional Sequence

Ask families to select and analyze a big decision that they have had to make

1. At the beginning of this learning engagement, send home **LE 4.1a What “Should We” do?: Reflecting on a big family decision**, and invite families to participate. This will give families time to select and analyze a decision, while you and students are documenting classroom decisions and analyzing those.

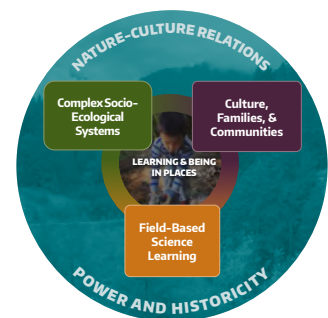
Documenting and answering questions about classroom decisions

1. Use **LE 4.1b What “Should We” do?: Exploring daily decisions in our classroom**. Decide whether you want each student to document decisions that they notice and/or make during one or two school days, or if you want students to do this work in small groups. Alternatively, you could document these decisions and answer questions about them as a whole class.
2. Explain to students: “Before we return to our Wondering Wall and the themes and phenomena we have identified, we are going to talk about decisions and decision-making.”
3. Ask students the following questions: Who can tell me what a decision is? What does it mean to make a decision? What decisions have you had to make recently? How did you do it? What kinds of decisions have you made in your family? What kinds of decisions do you make when you’re outside?”
4. Explain to students: “Talking about making decisions may seem unrelated to our Wondering Wall, but it’s not! We have some important questions to ask about our themes and phenomena on our Wall and in order to ask really powerful questions, we need to better understand decisions and how to make decisions.”
5. Explain to students: “In order to do that, we are going to do two things. First, we are going to ask you and your families to choose a big decision that you have had to make as a family and answer questions about that decision. Second, we are going to write down decisions that we make in one or two days here at school, and we are going to answer questions about those decisions.”
6. Explain to students: “For the rest of the day [or over the next few days], each time we make a decision in this classroom, we are going to stop, write down that decision, and answer questions about it.” Go over the elements of the student tool with students so that they know where to write their decisions and so that they know what questions about those decisions they are answering.

Families’ decisions and decision-making practices will provide students with important information and questions to ask as they pose “Should We” questions and start to explore those. Remember that the goal is for students to better understand complex decisions and decision-making processes. The goal is not to judge or evaluate family decisions and/or decision-making.

Assessment Opportunity:
Use this student tool to get a sense of what decisions students are noticing and how they unpack those decisions. What questions do they have? What support might they need?

Assessment Opportunity:
How do students already understand decisions and decision-making?



Continued next page...

7. Explain to students: “These can be decisions we make as a class or they can be decisions you make during small group time or they can be decisions you make by yourself. I am sure you have questions so let’s talk about them before we start noticing and writing down our decisions.”

Assessment Opportunity:

Student questions are a wonderful opportunity to get a better sense of their thinking.

Discussing classroom decisions

1. Now that you and students have recorded some daily classroom decisions, discuss what you recorded and reflected on. Your goal is to surface and highlight important elements of decision-making (using the questions you and students answered about the decisions you documented). You want students to use the following questions to talk about their classroom decisions:
 - a. Who was involved in making the decision? Who was not involved? Why?
 - b. Who or what was impacted by the decision and how?
 - c. Why was the decision necessary and/or important? What was the purpose of making it?
 - d. How did our classroom (or our school) shape the decision we made?

Analyzing decisions from multiple perspectives and the impact of decisions on multiple parts of a system is important to understanding the interconnectedness of socio-ecological systems.

Students will use these same types of questions to discuss their families’ analyses of their decisions. Students will continue to use these questions throughout the rest of the Seasonal Storyline so it is important that they discuss and use them in this learning engagement to think deeply about deliberation about decisions as part of decision-making.

2. Explain to students: “Now that we have written down some of our classroom decisions, let’s talk about them. Let’s try and better understand them.” There are different ways you can facilitate this discussion. For example, you can ask several students to share some example decisions and specifically ask them to talk about those decisions by responding to the questions above. In addition to asking students to share, and to bridge this discussion with the next discussion about their families’ decisions, you could tell them about a big decision that you have had to make. Then ask students to use the above questions to learn more about your decision. This will give them practice asking these types of questions relative to decisions and decision-making.

It is important for students to see their teachers engaging in the work that teachers are asking students and their families to engage in. By you sharing one of your big decisions and by inviting students to unpack that decision and your decision-making processes, you signal that everyone has to make decisions and engage in decision-making and that your decisions are also fair game for analysis. A caution here though. You are in a powered position in your classroom as a teacher and as an adult. Be mindful of that so that your decision or decision-making doesn’t somehow get positioned as the “right way” to do things.

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Discussing family decisions

1. At this point, families will have selected big decisions and answered questions about them. Families might have documented decisions and answered questions on the LE 4.1a What “Should We” do?: Reflecting on a big family decision activity sheet and some families might have done this work on blank sheets of paper. The format doesn’t matter; their thinking about their decisions and decision-making does! Additionally, some families might not have written anything down, but they might have had discussions so make sure that you ask students to share the discussions they had as a family. You do not have to have all family tools returned for you and students to discuss family decisions and decision-making practices. Use the family tools that you have and again, ask students to share family discussions.
2. Explain to students: “Now that we have talked about our classroom decisions, let’s talk about your families’ decisions and use the same questions to explore them in more detail.” Just like with your discussion of classroom decisions, there are many ways you could facilitate this discussion. You could have students present one of their family decisions for analysis (other students could ask the above questions and the student presenting could answer). You could have students get into small groups and they could present their family decisions to each other, and then ask each other the above questions. You could choose to have a few students present family decisions each day over the course of a week (or some other time scale). The point is that students should continue getting practice analyzing decisions using the dimensions present in the above questions. In addition to using those questions, add other questions into this discussion that were part of the family tool (LE 4.1a):
 - a. What data or evidence did you use to help you make your decision?
 - b. What values guided your decision?
 - c. What were the different options you considered when making your decision? How did you know it was the best decision to make?
 - d. How did the decision impact your future?
 - e. How does power and historicity shape this decision?

What “Should We” Do? Exploring Daily Decisions in Our Classroom

Name: _____

Date: _____

Daily Decision Log

What was the decision?	Why was the decision made? What was the goal or purpose?	Who or what was impacted by the decision?	Who was involved in making the decision?	How did our classroom (or our school) shape how we made the decision?

Students will use these questions, or versions of them, throughout the rest of the Seasonal Storyline to support their ethical deliberation and decision-making. It is important to consistently ask them to unpack decisions they are making so they get practice using these questions.

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1

Family Name: _____

An Example of a Big Decision Your Family Has Made

Big decision or event that has impacted your family.						
How did the need to make the decision come to be? What led up to it?	What values guided your decision?	How did the place you were or lived when you made this decision impact it?	How does the natural world impact this decision? How is the natural world impacted by this decision?	What options were considered? Why was this the best decision to make?	Who else was impacted by the decision and how?	How did the decision impact you in the future? What did it change in your life?

What data and evidence was informing your thinking? There are many different ways to engage with data and evidence. Not all evidence is the same. Making sure to engage with multiple forms of data and evidence is important (for example, collecting temperature data but also interviewing a community member)

How does power and historicity shape this decision? Ethical decision making requires that we must all carefully consider how powered dynamics and historicity shape socio-ecological phenomena as well as our decisions, and the impacts our decisions will have for different peoples and places. Decision making that fails to this enables the perpetuation of unjust systems.

There are additional questions that families respond to that students can also use to support their ethical deliberation and decision-making throughout the storyline.

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3



What “Should We” Do? Reflecting on a big family decision

Please return this sheet by: _____

Hello, Classroom Families!

Very soon we are going to use all of the wonderings and observations you have helped us collect to ask questions called “Should We” questions. To help us learn more about “Should We” questions, we are keeping track of different decisions we make at school and reflecting on how we make them.

Activity Purpose: To help us with this, we want to learn from you about a big family decision you have made, and how you went about making that decision. Please pick a decision and then answer some questions about that decision in the table we made for you. There is an example on the next page so you can see what we want you to do.

What you can do to support learning:

- Compare and contrast different decisions you and your family have made to uncover different knowledge, goals, and values involved in making decisions.
- Consider times when you’ve answered the same “Should we” question in a different way. Explore why that happened. Some examples: deciding what produce you buy at the grocery store and how the seasons make different fruits and vegetables available or deciding to drive, take public transportation or walk.
- This is an opportunity to share your family’s histories and values. You might also explore a familial or cultural practice or decision you make in the same way as previous generations in your family.



Example Decision

Big family decision or event. *Having grandpa move in with us.*

How did the need to make the decision come to be? What led up to it?	What values guided your decision?	How did the place you were when you made this decision impact it?	What were the different options considered? Why was this the best decision to make?	Who else was impacted by the decision and how?	How did the decision impact you in the future? What did it change in your life?
<ul style="list-style-type: none"> Grandpa was getting old and needed help doing his daily things. Grandpa was feeling lonely because grandma passed away. Parents were worried about him and so were our aunts and uncles. 	<ul style="list-style-type: none"> Family responsibilities are very important to us. Being kind and taking care of elders is important. Having multiple generations in one house strengthens our identity. 	<ul style="list-style-type: none"> We had enough extra space so grandpa could have a room of his own. We lived far enough away from him that daily trips to check on him and help him was expensive, time consuming, and used too much gas. 	<ul style="list-style-type: none"> We considered different family members grandpa could go live with. We considered having grandpa move closer to us so he could keep his own place. We considered a place where grandpa would live with other people his own age. 	<ul style="list-style-type: none"> Our aunts, uncles and cousins because they come to our house more but they have to travel further to see him. Grandpa used to visit with neighbors in his old neighborhood and he can't anymore. They miss him. 	<ul style="list-style-type: none"> Grandpa is a part of our everyday life and he is happier. We hear stories about his life. We have a garden now and we compost our food and leaf litter. We spend more money on & eat different foods. Our energy use has increased. We keep our toys off the floor more so grandpa won't trip.

What data and evidence was informing your thinking? We knew about life span data, we examined our energy use, we thought about our gas use and travel time.

How did the natural world shape this decision or is impacted by this decision? We didn't really think about this when we decided. We realize though that now grandpa has more places to walk but also our energy impacts are different. Also our food and water consumption is different. Grandpa also notices birds and plants more than we did so we pay attention more too.



Family Name: _____

An Example of a Big Decision Your Family Has Made

Big decision or event that has impacted your family.

How did the need to make the decision come to be? What led up to it?	What values guided your decision?	How did the place you were or lived when you made this decision impact it?	How does the natural world impact this decision? How is the natural world impacted by this decision?	What options were considered? Why was this the best decision to make?	Who else was impacted by the decision and how?	How did the decision impact you in the future? What did it change in your life?
<p>What data and evidence was informing your thinking? There are many different ways to engage with data and evidence. Not all evidence is the same. Making sure to engage with multiple forms of data and evidence is important (for example, collecting temperature data but also interviewing a community member)</p> <p>How does power and historicity shape this decision? Ethical decision making requires that we must all carefully consider how powered dynamics and historicity shape socio-ecological phenomena as well as our decisions, and the impacts our decisions will have for different peoples and places. Decision making that fails to this enables the perpetuation of unjust systems.</p>						



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What “Should We” Do? Exploring Daily Decisions in Our Classroom

Name: _____ Date: _____

Daily Decision Log

What was the decision?	Why was the decision made? What was the goal or purpose?	Who or what was impacted by the decision?	Who was involved in making the decision?	How did our classroom (or our school) shape how we made the decision?



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Lesson Plan

LE4.2: Asking “Should We” Questions from Wonderings and Identifying Focal Phenomena

Purpose

In LE 4.1, students explored their and their families’ decisions and decision-making processes. In LE 4.2, you will introduce students to the concept of a **“Should We” question**. Using the 3-4 phenomena you and students decided to focus on at the end of LE 3, you and students will now brainstorm “Should We” questions related to those phenomena, and evaluate those “Should We” questions in order to select one of them to use throughout the rest of the Seasonal Storyline. After they make that decision, students will identify at least two focal phenomena that are important for them to learn more about so they can better understand the various elements of their “Should We” question.

Why this is important

Asking “what should we do,” and deliberating in order to make a decision is something that all people do all the time. As students learned in LE 4.1, 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 using 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 human decision-making that is ethical and accountable to 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. Having students generate and then decide on a “Should We” question in this learning engagement will ensure that they can use the rest of the Seasonal Storyline to explore and investigate that question in a variety of ways in order to ultimately deliberate and make a decision about their question.

Engaging family and community knowledge and practices

You and students will generate “Should We” questions that relate to the 3-4 phenomena from your Wondering Wall that you identified at the end of LE 3.1. You and students used their and their families’ wonderings to construct the Wondering Wall and to generate the 3-4 phenomena that students will use in this learning engagement. In addition, students will be drawing, in part, on their understandings of their and their families’ decisions and decision-making when deciding which “Should We” question they want to focus on for the rest of the Seasonal Storyline. Students’ learning so far in the Seasonal Storyline would not be possible without their families’ knowledges and practices. As you have seen in previous learning engagements, incorporating these knowledges, ideas, wonderings, and practices ensures that you and students are able to engage in deeper sense-making because you have a richer dataset to consider. In addition, you position family knowledge as a critical component of classroom science learning, thus helping students see that their families’ ways of knowing and doing make important contributions to science.

LEARNING GOALS

By the end of this lesson, students will be able to:

1. Explain what a “Should We” question is and generate socio-ecological “Should We” questions
2. Use their decision and decision-making analysis questions from LE 4.1 to decide on a class “Should We” question
3. Identify at least two focal phenomena that are related to the class “Should We” question

CONNECTIONS TO NGSS

» Crosscutting Concepts:

Patterns; Cause and Effect; Scale; Systems and System Models, Energy & Matter Structure and Function; Stability and Change (NOTE: several of these might apply depending on the “Should We” question and related focal phenomena that students select)

» Science Practices:

Asking questions; Analyzing and Interpreting Data; Obtaining, evaluating, and communicating information

» 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 “Should We” question, and related focal phenomena you and students choose.]

ASSESSMENT OPPORTUNITIES

- » LE4.2b Asking “Should We” questions (student tool)
- » LE4.2c Deciding on a “Should We” question and identifying focal phenomena
- » Student talk (questions they ask, ideas they voice) during classroom discussions and other activities related to LE 4.2a, 4.2b, and LE 4.2c

Centering equitable practices:

- **Encourage student idea generation, questions, comments, and suggestions.** Avoid a rush to judgment that any student’s ideas, questions, comments, and/or suggestions about “Should We” questions and related phenomena are silly, misinformed, nonsensical, or off target. Instead, ask clarifying questions. Ask how other students would incorporate whatever was said into ongoing discussions (other students might have perspective on peers’ commentary that you don’t). Assume a sense-making stance, and a ‘desire to participate’ stance, and let those guide your actions as a teacher and facilitator.
- **Give students enough time to think and explore their and their peers’ ideas.** Selecting a “Should We” question from students’ and families’ observations and wonderings is a pivotal moment in the storyline. Avoid rushing through these activities. Give students time to explore what a “Should We” question is and then time to generate “Should We” questions from their and their families’ observations and wonderings captured on the Wondering Wall.

Teacher background information

In the Seasonal Storyline, a “Should We” question is the type of question that will motivate ethical deliberation, field-based investigations, and decision-making. “Should We” questions are anchored in students’ and families’ observations and wonderings in place. “Should We” questions are related to: (a) the relationships between humans and the natural world (like other species and kinds, as well as places, lands, and waters), and (b) how human decisions impact the natural world. “Should We” questions ask us to think about different scales (time, space, size, and perspective), and processes of change (and how long it takes to make change). “Should We” questions lend themselves to being explored through a seasonal lens. As mentioned earlier, “Should We” questions motivate some action, or at least deliberation around an action. They rarely, if ever, have a “right” or “wrong” answer, and they can impact families, communities, and the natural world in different ways. Here are some example “Should We” questions that are based on observations:

1. We observed a vacant lot in our neighborhood.
 - a. Should we plant more trees [or other types of plants] there?
2. We observed that there are a lot of insects in a community garden in our neighborhood.
 - a. Should we use an insecticide in the community garden to kill the insects?
3. We observed that water is running off into a certain area of our neighborhood after it rains, and then a lot of birds visit the standing water.
 - a. Should we call the city to ask that they fix the slope of the concrete so water won’t pool in that spot after it rains?

As you can see from these examples, “Should We” questions do not lend themselves to easy and clear yes or no answers. “Should We” questions require exploration and investigation using a variety of scientific practices, tools, and sense-making. In addition, students’ “Should We” questions should:

- » be able to be explored using the 5 socio-ecological dimensions
- » involve multiple socio-ecological timescales (see LE 1, Bundle A)
- » require students to think about how their decisions would help create different social structures and futures (see Power and Historicity framework)
- » be connected to their neighborhoods and/or school yard (i.e., it should be connected to local place)
- » be interesting and important to students and their families
- » lend itself to field-based data collection
- » have a connection to the seasons

To prepare for this lesson

1. If you haven't done so already, make sure you familiarize yourself with the rest of the Seasonal Storyline. Knowing how students and families will explore and investigate, as well deliberate and ultimately make decisions about their "Should We" question will help you guide students in their selection of a complex "Should We" question in this lesson.
 - a. In addition, remember that toward the end of the Seasonal Storyline, students will use versions of the questions from LE 4.1 to help them deliberate and make decisions about their "Should We" questions. It is important that students select a "Should We" question in this learning engagement that is robust enough to deliberate about using these questions. As a reminder, these questions are:
 - i. Who was involved in making the decision? Who was not involved? Why?
 - ii. Who or what was impacted by the decision and how?
 - iii. Why was the decision necessary and/or important? What was the purpose of making it?
 - iv. How did our classroom, our school, and our neighborhoods shape the decision we made?
 - v. What data or evidence did we use to help you make our decision?
 - vi. What values guided our decision?
 - vii. What were the different options we considered when making our decision? How did we know it was the best decision to make?
 - viii. How might the decision impact our futures?
 - b. Plan ahead of time how you will facilitate students' decision-making about which "Should We" question they want to use throughout the rest of the storyline. The decision should be a principled one that takes multiple factors into account (for example, student and family wonderings and interests, phenology, the 5 socio-ecological dimensions, and the above decision-making criteria and questions from LE 4.1).
2. Revisit the **Wonderings, "Should We," and Investigation Questions framework** so that you understand how wonderings, "Should We" questions, and investigation questions (which students will generate in LE 6) relate to one another. This framework will help you understand more about the importance of "Should We" questions in reasoning about socio-ecological systems. Additionally, revisit the **Ethical Deliberation and Socio-Ecological Decision-Making framework**. Students' will eventually deliberate and make decisions about their "Should We" question. Understanding those processes as discussed in the framework will provide additional guidance for you about the type of "Should We" question that will lead to field-based investigations and then robust deliberation in preparation for making a decision.
3. Use each of the tools before you ask students to use them. This will give you a good sense of student activity in this learning engagement. Based on the information asked for in each tool, plan questions, discussion prompts, and strategies that you want to use to facilitate rich discussions and support students in brainstorming "Should We" questions (related to phenomena they identified in LE 3.1), evaluating them, and ultimately choosing one to use during the rest of the Seasonal Storyline. Through your use of the tools, anticipate student questions and concerns and plan how you will address them.
4. Remember that phenology is central to the Storyline for Field-Based Science Learning: Don't forget about the seasons and the impacts that they have on the focal phenomena that students and families are observing and wondering about. Think about how you will support students in thinking about important elements of "Should We" questions, including important connections to seasons that students should consider. For example, asking students questions such as, "How would this be different in another season? Why do you think it matters that both X & Y (2 phenomena) are happening in the same season? Why do you think this is happening in this season?" will get students thinking about the relationship between seasonal changes in life cycle, population growth, migration, intersections with temperature, rainfall, etc. This is the foundation of gaining an understanding of **phenology**. Visit the **Phenology framework** for more background.

MATERIALS

- » LE4.2a “Should We” Questions Slide Deck
- » LE 4.2b Asking “Should We” questions (student tool)
- » LE4.2c Deciding on a “Should We” question and identifying focal phenomena (student tool)
- » The classroom’s 5 socio-ecological dimensions graphic organizer you and students constructed in LEs 2 and 3 (this should be visible in the room)
- » The classroom’s Wondering Wall you and students constructed in LE 3 (this should be visible in the room)
- » Deliberation and decision-making questions from LE 4.1 (consider making a poster of these questions that you hang in your classroom so that you and students can consult them during the rest of the Seasonal Storyline)

TIME

20-30 minutes for students to explore what a “Should We” question is; 30-40 minutes for students to use their Wondering Wall to generate “Should We” questions related to their and their families’ observations and wonderings, and then to evaluate the “Should We” questions they generate; 20-30 minutes to decide on their class “Should We” question and then select at least two focal phenomena



Instructional Sequence

Introducing Students to the Concept of a “Should We” Question

1. Explain to students: “We just finished studying our classroom decisions and your families’ decisions so that we could learn how we make decisions and some important things to keep in mind when we make decisions.”
2. Explain to students: “Now, I want to introduce you to a special kind of question called a “Should We” question. When you hear “Should We,” what does that make you think about? What do you think that type of question would help us do? Does anyone have any thoughts?” Give students time to think about these questions and voice some of their ideas. You don’t have to comment on any of these ideas now (whether they are on target or not). This discussion is simply meant to hear students’ ideas (not to evaluate those ideas).
3. Now show students the “Should We” Questions slides (LE 4.2a) and walk them through the various questions and activities on those slides. Make sure to give them time to ask questions and voice confusions so that you can help support them in understanding what a “Should We” question is.

“Should We” questions are an important tool that students can use to understand elements of complex socio-ecological systems because they motivate exploration and investigation of those elements and ways of reasoning about them that are important in field-based science. “Should We” questions ultimately lead to ethical deliberation and decision-making.

Using the Wondering Wall to Generate “Should We” Questions

1. Call students’ attention back to their Wondering Wall that they constructed in LE 3.1.
2. Ask students: “Who can remind us of how we made this wall? What processes did we use to make this wall?” Allow students time to remind each other that they used their and their families’ observations and wonderings from their Wondering Walks, and then grouped them into themes and phenomena.

Assessment Opportunity:
Use students’ ideas, questions, confusions, etc. to give you a sense of how they are understanding the concept of a “Should We” question. Provide more examples of “Should We” questions and evaluate them using the checklist (slide 6) if you think students need more practice.

Asking questions that can be explored scientifically is an important part of field-based science and one of the scientific practices used in the Next Generation Science Standards.

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3. Ask students (if this hasn't come up already): "Who can remind us about the three [or four] phenomena we highlighted on our Wondering Wall? What are they? Why are they interesting and important to us?"
4. Explain to students: "Now that we've learned what a "Should We" question is, we are going to use our three [or four] phenomena from our Wondering Wall, and see if we can come up with "Should We" questions related to each one of those."
5. Students can use LE 4.2b to help them ask "Should We" questions related to each of the phenomena on their Wondering Wall. There are different ways you can facilitate this activity. For example, you can have a whole class discussion about this and document your discussion on a larger version of the chart in LE 4.2b, or small groups of students could do this work together and then report out to the whole class.

Assessment Opportunity:

This is another activity in this lesson that will help you better understand how students are understanding the concept of a "Should We" question.

Selecting a "Should We" Question to Use During the Rest of the Seasonal Storyline

1. Explain to students: "Now that we have asked all of these "Should We" questions, we have to decide on one we want to learn more about."
2. Ask students: "Remember when we learned about "Should We" questions and we used a checklist to explore our example "Should We" question: Should we put a bird feeder outside our window?"
3. Explain to students: "We are going to use that same checklist to explore the "Should We" questions we just came up with related to our phenomena on our Wondering Wall."
4. Students will use Parts 1 and 2 of LE 4.2c to engage in this work. Part 1 gives them more practice using the checklist that they used in the "Should We" Questions slide deck (LE 4.2a), but this time, using their own "Should We" questions. Part 2 helps students select one "Should We" question they want to use as a class for the rest of the Seasonal Storyline.
5. There are various ways you can facilitate this activity. Students could work independently and/or as part of small groups while working on Parts 1 and 2 of LE 4.2c. You could also facilitate this activity as a whole group discussion.
6. As noted in the Preparing for This Lesson commentary, depending on how many "Should We" questions students generate, you will want to plan ahead of time about how you will help them make a decision about which "Should We" question they want to focus on for the remainder of the Seasonal Storyline. The decision should be a principled one that takes multiple factors into account (for example, student and family wonderings and interests, the 5 socio-ecological dimensions, the decision-making criteria and questions from LE 4.1). Remember that it is ok to say "look at all of the amazing "Should We" questions we have come up with from your and your families' wonderings! I need to take some time to think about which ones might be the best for us to use throughout the rest of our Seasonal Storyline and why those might be most helpful. I will try to narrow it down and come back tomorrow with some ideas about options we can consider!"

Remember that all decisions and decision-making processes are powered. Make sure you attend to who in your class is sharing, who isn't and how you could make sure their voices are included, who you tend to invite to talk and who you don't and why and how you could change that, etc. All students in your class should be part of the decision-making process about a "Should We" question.

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Selecting at Least Two Focal Phenomena Related to the Class' "Should We" Question

1. In this last part of LE 4.2, students will select at least two focal phenomena related to their class "Should We" question.
2. Students will use LE 4.2c, Part 3 to select these phenomena. Remember from LE 3.1 that phenomena are observable events, behaviors, relations, or ideas that can be investigated. Phenomena in field-based science learning are observable events, like trees budding, water flowing and pooling, leaves falling, bees on flowers, human allergies, concrete getting hot to the touch when it's in the sun, etc. All of these phenomena can be tied to the seasons (phenology) somehow, and students and families will be able to use field-based investigations to study and explain them. Knowing this about field-based phenomena will help you guide students in selecting at least two that are related to their "Should We" question.
3. Depending on the "Should We" question students chose, you and students might decide to use one (or more) of the phenomena already identified on your Wondering Wall. That's fine as long as they relate to the class "Should We" question! You and students can also decide to brainstorm new phenomena that might be important to understand relative to the "Should We" question (or you can use a mix of new phenomena and phenomena from the Wondering Wall).
4. Explain to students: "Now that we have selected our class "Should We" question, we are going to also select at least two phenomena that relate to our "Should We" question. We can use phenomena from our Wondering Wall and/or we can come up with new ones. They have to relate to our "Should We" question though. Does anyone have any suggestions?"

Asking "Should We" Questions

Name: _____ Date: _____

Phenomena from your Wondering Wall (write one in each box)

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"Should We" Questions (brainstorm as many as you can for each phenomenon)

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The green arrows signal that the "Should We" questions in each column should relate to the phenomenon from the column above.



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Part 1: Evaluating your “Should We” questions

Write each “Should We” question you brainstormed in LE 4.2b in a box below and then evaluate it using the criteria.

<p>“Should We” Question:</p> <hr/> <p>“Should We” Criteria (check all that apply):</p> <ul style="list-style-type: none"> <input type="checkbox"/> has no obvious right or wrong answer <input type="checkbox"/> involves the 5 socio-ecological dimensions <input type="checkbox"/> connected to our school yard and/or neighborhoods <input type="checkbox"/> We could collect data to investigate this question. <input type="checkbox"/> is interesting and important to us and our families <input type="checkbox"/> involves multiple timescales (see LE 1, Bundle A) <input type="checkbox"/> has a connection to the seasons <input type="checkbox"/> We could apply our decision-making processes (LE 4.1) 	<p>“Should We” Question:</p> <hr/> <p>“Should We” Criteria (check all that apply):</p> <ul style="list-style-type: none"> <input type="checkbox"/> has no obvious right or wrong answer <input type="checkbox"/> involves the 5 socio-ecological dimensions <input type="checkbox"/> connected to our school yard and/or neighborhoods <input type="checkbox"/> We could collect data to investigate this question. <input type="checkbox"/> is interesting and important to us and our families <input type="checkbox"/> involves multiple timescales (see LE 1, Bundle A) <input type="checkbox"/> has a connection to the seasons <input type="checkbox"/> We could apply our decision-making processes (LE 4.1)
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If students have generated more than four “Should We” questions, create more of these boxes so they can explore and evaluate all of them.



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LE 4.2c Deciding on a “Should We” Question and Identifying Focal Phenomena

Part 3: Identifying at least 2 focal phenomena

Now that your class has decided on a “Should We” question, identify at least two phenomena that are related to that question. These should be phenomena that you need to learn more about so that you can better understand your “Should We” question. Use your Wondering Wall to help you!

Our “Should We” question is:		
One related phenomenon is:	A second related phenomenon is:	A third related phenomena is:

Remember that you and your students can use some of the same phenomena from your Wondering Wall if you want (as long as they are related to you class “Should We” question), or you can brainstorm new phenomena, or use a mix of both.



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3

“Should We” Questions

What “Should We” do?

Pick the “Should We” Question

There are a lot of different kinds of questions. Which question on this slide do you think is a “Should We” question? Why do you think that?

What do you like
to do most
outside?

What kind of
flower is that?

What is your
favorite food?

How do I tie my
shoes?

Who is at the
door?

Why are we

reading a book
instead of doing
math?

Are you sad?

Should we put a
bird feeder outside
our window?

Pick the “Should We” Question

There are a lot of different kinds of questions. Which question on this slide do you think is a “Should We” question? Why do you think that?

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How do I tie my
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Who is at the
door?

Why are we

reading a book
instead of doing
math?

Are you sad?

Should we put a
bird feeder outside
our window?



“Should We” questions lead to making decisions!

To help us learn more about “Should We” questions and why we will ask them, let’s use the example from the last slide:

Should we put a bird feeder outside our window?

Does this question have a right or wrong answer?

- No!
 - “Should We” questions do not have a right or wrong answer. You might answer “yes” or “no” or even “maybe” depending on a lot of different things like what season it is, what types of birds are nearby, what other animals are nearby, whether anyone else has tried to put a bird feeder in this place before, and so much more.

Other important things to think about with “Should We”

Questions

Important things to consider about “Should We” Questions:

- We already said that they don't have a right or wrong answer
- They involve the 5 socio-ecological dimensions!
- They are somehow connected to our school yard and/or our neighborhoods
- We could collect data to investigate a “Should We” question.
- They should be interesting and important to us and our families.
- They involve multiple timescales (geographic time, plant and animal time, for example)
- They have a connection to the seasons
- We could apply our decision-making processes when trying to figure out “What should we do?”

Let's see how many boxes we can check for our example bird feeder "Should We" question

Our example: **Should we put a bird feeder outside our window?**

- This question doesn't have a right or wrong answer.
- This question involves the 5 socio-ecological dimensions!
- This question is connected to our school yard and/or our neighborhoods.
- We could collect data to investigate this "Should We" question.
- This question is interesting and important to us and our families.
- This question involves multiple timescales (geographic time, plant and animal time, for example).
- This question has a connection to the seasons.
- We could apply our decision-making processes when trying to figure out "What should we do?" about this question.

If we checked most of the boxes, this could be an interesting "Should We" question to explore!

What questions do you have about “Should We” questions?

Do you think you understand what a “Should We” question is?

What is an example of a “Should We” question that you have asked in your family?



Asking “Should We” Questions

Name: _____ Date: _____

Phenomena from your Wondering Wall (write one in each box)

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“Should We” Questions (brainstorm as many as you can for each phenomenon)

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LE 4.2c Deciding on a “Should We” Question and Identifying Focal Phenomena

Part 1: Evaluating your “Should We” questions

Write each “Should We” question you brainstormed in LE 4.2b in a box below and then evaluate it using the criteria.

<p>“Should We” Question:</p> <hr/>	<p>“Should We” Criteria (check all that apply):</p> <ul style="list-style-type: none"><input type="checkbox"/> has no obvious right or wrong answer<input type="checkbox"/> involves the 5 socio-ecological dimensions<input type="checkbox"/> connected to our school yard and/or neighborhoods<input type="checkbox"/> We could collect data to investigate this question.<input type="checkbox"/> is interesting and important to us and our families<input type="checkbox"/> involves multiple timescales (see LE 1, Bundle A)<input type="checkbox"/> has a connection to the seasons<input type="checkbox"/> We could apply our decision-making processes (LE 4.1)
<p>“Should We” Question:</p> <hr/>	<p>“Should We” Criteria (check all that apply):</p> <ul style="list-style-type: none"><input type="checkbox"/> has no obvious right or wrong answer<input type="checkbox"/> involves the 5 socio-ecological dimensions<input type="checkbox"/> connected to our school yard and/or neighborhoods<input type="checkbox"/> We could collect data to investigate this question.<input type="checkbox"/> is interesting and important to us and our families<input type="checkbox"/> involves multiple timescales (see LE 1, Bundle A)<input type="checkbox"/> has a connection to the seasons<input type="checkbox"/> We could apply our decision-making processes (LE 4.1)





LE 4.2c Deciding on a “Should We” Question and Identifying Focal Phenomena

Part 2: Deciding on a class “Should We” question

Now it's time to pick a class “Should We” question! Based on your evaluation of each of your “Should We” questions, which “Should We” question do you want to learn more about and why?

The “Should We” question we want to learn more about is: _____

We chose this “Should We” question because: _____

This is how we made our decision (what processes did you use to make your decision and why?):



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LE 4.2c Deciding on a “Should We” Question and Identifying Focal Phenomena

Part 3: Identifying at least 2 focal phenomena

Now that your class has decided on a “Should We” question, identify at least two phenomena that are related to that question. These should be phenomena that you need to learn more about so that you can better understand your “Should We” question. Use your Wondering Wall to help you!

Our “Should We” question is:

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One related phenomenon is:

A second related phenomenon is:

A third related phenomena is:

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Lesson Plan

LE4.3: Modeling the “Should We” Question and Related Focal Phenomena

Purpose

In LE 4.2, students selected a class “Should We” question and related focal phenomena. In LE 4.3, students and their families will start to learn more about the “Should We” question and its component parts, including the focal phenomena they identified. In this learning engagement, students and their families are going to create an initial model that depicts the important elements of the “Should We” question, including the related focal phenomena. This will prepare them to take a series of focused Wondering Walks in LE 5 to collect more observations and generate more wonderings related to their “Should We” question. In LE 6, students will use their additional observations and wonderings from LE 5.1 to revise their initial model.

Why this is important

Creating, critiquing, revising, and otherwise using scientific models is a very important practice in the sciences because it is one way scientists build and test knowledge. There are many types of scientific models; explanatory, computational, scale, and theoretical models, just to name a few. Models help scientists test, predict, explain, and imagine scientific phenomena. Students should have opportunities to generate, revise, and critique models as part of field-based science investigations. This is important work for many reasons. First, generating and revising models of scientific phenomena associated with complex socio-ecological systems is an important part of sense-making, deliberation, and decision-making. Secondly, working with models helps students visualize their thinking so that you, their peers, and their families better understand how they are thinking about the species, kinds, behaviors, relationships among them, and various scales being explored and posited in the model. Third, generating models and using them to explore various scientific phenomena that are part of complex socio-ecological systems help students make decisions about what field-based investigations they should plan and conduct. Scientific modeling is about sense-making and trying to understand why, how, under what conditions, etc. phenomena happen the way they do, and how place, time, and human intervention may impact them.

Engaging family and community knowledge and practices

You and students will invite their families to also create an initial model of their “Should We” question and related focal phenomena. Then, you and students will use families’ initial models to revise students’ initial models. As you have seen in previous learning engagements, incorporating families’ ideas and their thinking ensures that you and students are able to engage in deeper sense-making because you have a richer dataset to consider. In addition, you position family knowledge as a critical component of classroom science learning, thus helping students see that their families’ ways of knowing and doing make important contributions to science.

LEARNING GOALS

By the end of this lesson, students will be able to:

1. Create an initial model of their “Should We” question and related focal phenomena
2. Revise their initial model using their families’ initial models (adding important relationships or scales, for example) that students might not have considered in their initial model

CONNECTIONS TO NGSS

» Crosscutting Concepts:

Patterns; Cause and Effect; Scale; Systems and System Models, Energy & Matter Structure and Function; Stability and Change (NOTE: several of these might apply depending on the “Should We” question and related focal phenomena that students are modeling)

» Science Practices:

Developing and Using Models; Obtaining, evaluating, and communicating information

» 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 “Should We” question, and related focal phenomena you and students choose.]

ASSESSMENT OPPORTUNITIES

- » LE4.3b An Initial Model of Our “Should We” Question and Related Focal Phenomena (student tool)
- » Student talk (questions they ask, ideas they voice, suggestions they have) during classroom discussions and other activities related to creating their initial model and revising it based on families’ initial models

Centering equitable practices:

- **Encourage student idea generation, questions, comments, and suggestions.** Avoid a rush to judgment that any student’s ideas, questions, comments, and/or suggestions related to their initial model are silly, misinformed, nonsensical, or off target. Instead, ask clarifying questions. Assume a sense-making stance, and a ‘desire to participate’ stance, and let those guide your actions as a teacher and facilitator.
- **Support students in modeling their ideas about component parts of their “Should We” question and related focal phenomena.** Avoid any commentary that would lead students to believe that scientific modeling is a type of art project. Try and lessen students’ concerns about their drawing capabilities. Instead, encourage them to make their thinking visible through their initial models and convey to them that that is what is important (not how well they draw!). Related, when asking students to share their initial models, do not turn that into some type of “show and tell” activity by asking students to simply narrate what they modeled and then have other students comment on what they like or don’t like about it. Remember that scientific modeling is about sense-making and trying to understand why, how, under what conditions, etc. phenomena happen the way they do, and how place, time, and human intervention might influence that. When students share their models, therefore, it is important to ask questions such as, “What relationships do you notice in this model? What phenomena are in here? What predictions can we make about how X is related to Y from this model?” You should show students during your instruction how they can use their models to make predictions and hypotheses about the natural world, and consequently how ideas on their models will change as they conduct investigations.

Teacher background information

It is important to remember that scientific models are not static; they are not diagrams that scientists and students draw, and then abandon in favor of the next activity. They are dynamic and ever changing based on new information learned through investigations of phenomena, and discussions with others. Students might also change their models based on information they learn from media of various types, like books and podcasts, and their deliberations about “Should We” questions. Students should be revising their scientific models, and should be supported in discussing how and why they have made revisions. Students will begin to practice revising their initial models by using their families’ initial models in order to see if they need to add, rearrange, or rethink any element of their initial models.

To prepare for this lesson

1. Read the Modeling and Forming Explanations framework to better understand scientific modeling. This will help you support students’ modeling practice as one way they are making their thinking visible about the class “Should We” question and related focal phenomena. Because students will be revising their models throughout the rest of the Seasonal Storyline, you will have the opportunity to see how their thinking changes and deepens as they learn more about their “Should We” question and related focal phenomena by collecting a variety of data and analyzing those data.
2. Construct your own initial model before you ask students and families to construct theirs. This will give you a good sense of student and family activity in this learning engagement. You will be able to think through what you would include in an initial model of the class “Should We” question, how the focal phenomena play a role in the model and why, and what you still don’t understand about the “Should We” question that you think would be important to understand in order to deliberate about that question and make decisions about it. This will help you better support students. While you are creating your initial model, anticipate student questions and concerns and plan how you will address them.
3. Invite families to construct an initial model of the class “Should We” question and focal phenomena at the beginning of this learning engagement. That way, families can construct their initial models at home while students construct their models at school. Families should have ample time to engage in this activity.
4. Plan in advance how you are going to facilitate this learning engagement. Will each student create an initial model? Will small groups of students create initial models and then groups share with each other? Will you and students create a whole-class initial model? A combination of these participation structures?
5. Once families send back their initial models, make sure you explore them before you and students use them to help students revise their own initial models. Document similarities and differences between family and student initial models. Document families’ questions. Doing this work will enable you to ask questions that will help students attend to important features of families’ models.

MATERIALS

- » LE4.2a Creating an Initial Model of Our “Should We” Question (family tool)
- » LE 4.2b Creating an Initial Model of Our “Should We” Question (student tool)
- » The classroom’s 5 socio-ecological dimensions graphic organizer you and students constructed in LEs 2 and 3 (this should be visible in the room)
- » The classroom’s Wondering Wall you and students constructed in LE 3 (this should be visible in the room)

TIME

30 minutes for students to create their initial models; 20-30 minutes for students to share their initial models and compare and contrast features of their models; 30 minutes for students to examine their families’ initial models and revise their initial models to incorporate families’ ideas and thinking

Instructional Sequence

Ask families to create an initial model of the class’ “Should We” question

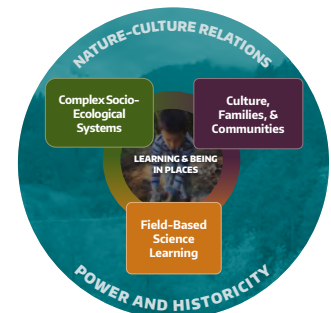
1. Send home **LE 4.3a Creating an Initial Model of Our “Should We” Question**, and invite families to participate. While students are creating their initial models in class, families will have time to create their initial models at home.

Students construct their initial models of the class’ “Should We” question

1. Explain to students: “Now that we have selected a “Should We” question and related focal phenomena, we want to draw our thinking about this. We are going to make what is called a scientific model. Has anyone heard the word model before? What do you think that means?” Accept all answers and ideas.
2. Explain to students: “Scientists’ models are more than just drawings. They are tools that scientists use to think with and to test out their ideas. They change as scientists’ ideas change through investigations. Those are the kinds of models we are going to create today.”
3. Explain to students: “We’re going to create an initial model, which means that these will be our first thoughts about what we think are the important parts of our “Should We” question and how we think those are related to each other.”
4. Explain to students: “Your task is to draw everything you think is involved with our “Should We” question and related focal phenomena, and then use arrows and words and other symbols that you choose to show everyone how you think all of those things fit together. Remember that we are using these drawings to see what we understand so far about our “Should We” question and also to identify what more we need to learn about.” You can also say, “It’s ok if you don’t yet know everything that is involved with our “Should We” question. We will add to our models as we learn more!”
5. Explain to students: “There are no right or wrong answers with your models. Also, these models are not art projects. They are scientific tools. Do not worry about the quality of your drawing. That is not what is important. Showing your ideas and thinking is what is important.”
6. Ask students: “What questions do you have?”

Families’ ideas and thinking about the “Should We” question that appear in their models will provide students with important information and questions to ask as they revise their initial models. By asking families to create initial models, students understand that their families’ ideas and thinking are important to school science.

Models are a very important part of scientific thinking and research. Scientists use them as tools to explain, predict, and test hypotheses. Remember that models are not just drawings and they are definitely not art projects. The quality of the drawings don’t matter; the ideas and the thinking are what is important.



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7. Answer student questions and then give them time to create their models. Remember that how you facilitate this activity is up to you (individuals creating models, small groups creating models and/or the whole class creating a model).
8. After you have given students' time to create their initial models (if you are facilitating this activity individually or in small groups), ask them to share their models with each other. Remember, this is not show-and-tell, with other students commenting about what they like or dislike. The goal is to visualize sense-making and thinking about the class "Should We" question. Ask students to share what they included in their model and why. Ask students to share what more information they think they need to learn. When students share the latter, document their ideas about that because that could help them pose investigation questions later in the Seasonal Storyline.
 - a. If students are having trouble sharing about their models, refer them to the 5 socio-ecological dimensions and ask them questions using elements of the 5 dimensions. Model how to do this and then invite other students to ask those types of questions too when their peers are sharing their models.

Continuing to use the 5 socio-ecological dimensions provides a framework for students to use to explore their models and think about other elements of the class "Should We" question that they might want to add into their model and/or learn more about.

Students consider families' ideas and thinking and add to their initial models

1. At this point, families will have sent their initial models to school with students. Explain to students: "Let's explore your families' initial models of our "Should We" question."
2. Ask: What did they include? What questions did they have? Did they include the same things you included? Did they include anything that was different?"
 - a. Remember that before you have this conversation with students, make sure you have explored families' initial models. Document similarities and differences related to students' initial models. Document families' questions. Doing this work will enable you to ask questions that will help students attend to important features of families' models.
3. Explain to students: "If you want to add anything from families models to your models and/or rearrange anything in your model, do it. But don't erase your original thinking. Use another color pencil or pen to add to your model or change them. That way, you will be able to see how your thinking changes as we keep exploring our "Should We" question."
4. Give students time to make changes to their models.
5. Ask students to share what changes they made and why.
6. Ask students: "Based on your initial models and your families' initial models, what do you think we need to learn more about related to our "Should We" question and related focal phenomena?" Document these ideas and suggestions. Students might be able to explore some of them in LE 5 when they take more walks and/or later in the Seasonal Storyline when they begin other types of field-based investigations.

Assessment Opportunity:
Anytime students make changes to their models in this learning engagement and throughout the rest of the Seasonal Storyline, you will be able to see how their thinking and sense-making is changing.

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Creating an Initial Model of Our “Should We” Question

Name: _____ Date: _____

Our class’ “Should We” question is: _____

Our class’ two focal phenomena are:

1. _____
2. _____

Students can create their models on the second sheet of this tool, or they can use a blank sheet of paper. Remember that each time they revise their initial model, they should use a different color pen or pencil so that it is easier to track how their ideas are changing over time.

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1



LE 4.3a Creating an Initial Model of Our “Should We” Question - Family Tool

Family Name: _____

The classroom “Should We” question is: _____

Our Family’s Initial Model of This “Should We” Question (draw and write in the space below; use a separate piece of paper if you want to)

Before you send home this family tool, be sure that students fill in the class’ “Should We” question so that their families know what it is.

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2



Creating an Initial Model of Our “Should We” Question

Please return this sheet by: _____

Hello, Classroom Families!

We are creating initial models of our class “Should We” question. We want to visualize our thinking about what species, kinds (like soil, water, the sun, rocks), and behaviors, relationships, and scales (like time, space, and size) might be important for us to think about so that we can better understand our “Should We” question. Our models will be drawings of everything that we think is an important part of our “Should We” question, and then how those things might be related to each other. To show relationships, we will use arrows. We will also write words to help clarify our thinking.

What we would like for you to do: We need your help again! We would appreciate it if you could also create an initial model of our “Should We” question. That way, we can learn from your initial models, and compare them with ours. It might be that we want to add some things from your models into ours to deepen our thinking about our “Should We” question.

What you can do to support learning:

- Brainstorm everything you think might be involved in or related to the class “Should We” question.
- Draw those elements and then use arrows and/or other symbols to represent how those things might be related.
- If you think different scales (space, time, size, perspective) are important to explore, represent that on your model.
- If you think it will be helpful, feel free to write labels and explanations of your drawings.
- Write down any questions you have. Those will be really helpful to us!
- Finally, don’t worry about your drawings and what they look like. We are interested in your ideas and your thinking!



LE 4.3a Creating an Initial Model of Our “Should We” Question - Family Tool

Family Name: _____

The classroom “Should We” question is: _____

Our Family’s Initial Model of This “Should We” Question (draw and write in the space below; use a separate piece of paper if you want to)

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Creating an Initial Model of Our “Should We” Question

Name: _____ Date: _____

Our class’ “Should We” question is: _____

Our class’ two focal phenomena are:

1. _____

2. _____



LE 4.3b Creating an Initial Model of Our “Should We” Question - Student Tool

My initial model of our “Should We” question and related focal phenomena looks like this:



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