Learning to See the Resources Students Bring to Sense-Making: Social Justice and Equity

Facilitator's Guide

Spring 2020

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Module Overview:

Learning to see the Resources Students Bring to Sense-Making: Social Justice and Equity contains the materials to be used in work sessions at the district, school, or department level. Participants will build their capacity to identify the range of intellectual resources students use as they make sense of phenomena. Participants will explore how equity and justice relate to culture-based approaches to pedagogy, followed by a focus on how to identify and leverage the resources students use in moments of sense-making.

The duration and scope of the sessions may be customized to accommodate local needs and conditions. While the sessions are designed to provide flexibility for districts and schools it is recommended that participants engage in all three sessions. If you choose to alter or use only certain component, please carefully read through the facilitator guide so that participants will gain a clear understanding of how they may ensure equity within the science classroom.

Materials:

The following materials are part of this module:

- *Learning to See the Resources Students Bring to Sense-Making: Social Justice and Equity* Facilitator's Guide
- *Learning to See the Resources Students Bring to Sense-Making: Social Justice and Equity* slide presentation

All materials are available on the KDE website at kystandards.org

Goals:

The goals of the Learning to See the Resources Students Bring to Sense-Making: Social Justice and Equity Module are for districts or schools to:

- Explore equity dimensions of sense-making through the science and engineering practices
- Learn to see different ways students contribute to making sense of phenomena—and connect to science
- Better appreciate that navigating multiple ways of knowing is the basic human condition—not the exception
- Make a commitment to shape instruction that supports diverse sense-making

Intended Audiences:

Participants
Module participants may include, but are not limited to, classroom teachers, department chairs, preservice teachers, special educators, instructional specialists/coaches, school administrators and district leadership.

Facilitators
Module session facilitators may include, but are not limited to, district leadership, school administrators, instructional specialists/coaches, department chairs, special educators, classroom teachers and preservice faculty.

Using This Facilitator's Guide:

This facilitator's guide provides suggestions for structuring each session in this module. This includes recommended learning experiences to prompt thinking and meaningful discussions, as well as guidance on talking points to use with the provided slideshows. Also included are background notes for facilitators to assist in guiding discussions among participants.

Information presented in this module is derived from two primary sources: *A Framework for K-12 Science Education (2012)* and *Helping Students Make Sense of the World Using Next Generation Science and Engineering Practices (2017).*

Planning Ahead:

- Determine who to invite as participants.
- Reserve adequate space and equipment. Tables should be set up to support small-group discussion.
- Consider how you might handle participants who may not be in attendance at all work sessions. It might be worthwhile to consider how those participants might access missed sections of the module between work sessions in order to feel as prepared as the other participants.

Preparation:

Facilitator Work Session Supplies Needed:

These items will be needed consistently throughout each section of the overall module. Supplies needed for specific sections of the module will be listed prior to the facilitator's notes for that section.

- Computer with access to the *Learning to See the Resources Students Bring to Sense-Making: Social Justice and Equity* slide presentation
- Technology with projection capability
- Copies of handouts needed for the session
- Issues Bin
    - The Issues bin can be used by the participant to note ideas, questions, or issues constructively while the other attendees continue to focus on an activity or lesson. This may be a poster or you may prefer to have a digital Issues Bin where participants can access a Google document, for example, to post questions and that you can modify as the participants work through the sections of the module.
- Chart paper (optional unless otherwise indicated)
- Self-Sticking Notes (optional)
- Colored markers (optional unless otherwise indicated)

Work Session Consideration:

Building a Community

Building a community is important for any group that will work together, especially if participants have not worked together before. The concept is the same as building a safe, respectful, productive classroom climate. Incorporating community-building into each session builds trust, shows participants that they are valuable as individuals and engages them in the learning process. It is also useful for creating a professional learning network where participants can be supported in their work. Community-building can be as simple as allowing participants to introduce themselves and their role in the school/district, developing or refining group norms, allowing for questions and/or the sharing of answers to reflection questions or individual discovery task items that are included in the module sessions. Again, time allotted for community-building will allow participants to have a voice and be engaged as active contributors and learners in the sessions.

Resources for deeper learning:

- Bang, M., Brown, B., Calabrese Barton, A., Rosebery, A., & Warren, B. (2017). Toward more equitable learning in science. In C. Schwarz, C. Passmore, & B. J. Reiser (Eds.), *Helping students make sense of the world using next generation science and engineering practices* (pp. 33-58). Arlington, VA: NSTA Press.
- Rosebery, A. S., Warren, B., & Tucker-Raymond, E. (2016). Developing interpretive power in science teaching. *Journal of Research in Science Teaching*, *53*(10), 1571-1600.
- Britsch, S. J., & Heise, K. A. (2006). One Mode Is Not for All. *Science and Children, 43*(4), 26–29.
- Ruiz-Primo, M.A., & Furtak, E. M. (2007). Exploring Teachers' Informal Formative Assessment Practices and Students' Understanding in the Context of Scientific Inquiry. *Journal of Research in Science Teaching,* 44(1), 57-84.
- National Research Council. (2012). *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. Washington, DC: The National Academies Press.
- National Research Council. (2014). Developing Assessments for the Next Generation Science Standards. Washington, DC: The National Academies Press.

Note:

This resource has been modified from ACESSE Resource G and is provided through OER (Open Educational Resources) Commons Platform and provided through a Creative Commons license (CC BY-SA). The Advancing Coherent and Equitable Systems of Science Education (ACESSE, or "access") project brings together partners for educational research and practice to tackle a pressing problem in education: how to make state systems of science education more equitable and coherent. The project is based on deep collaboration between the University of Colorado Boulder, University of Washington and the Council of State Science Supervisors (CSSS). It is funded by the National Science Foundation (NSF) through Award DRL-156 1300.

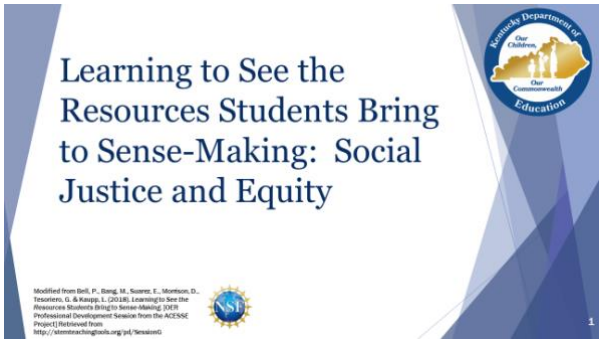
Learning to See the Resources Students Bring to Sense-Making: Social Justice and Equity

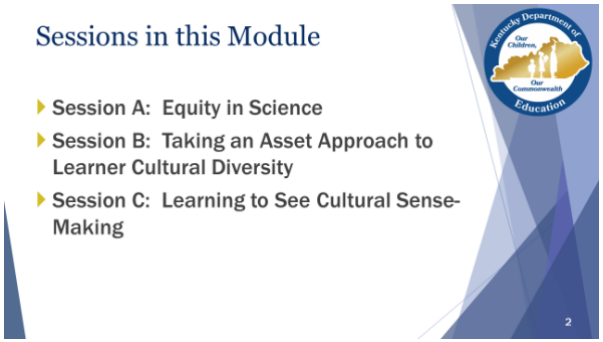
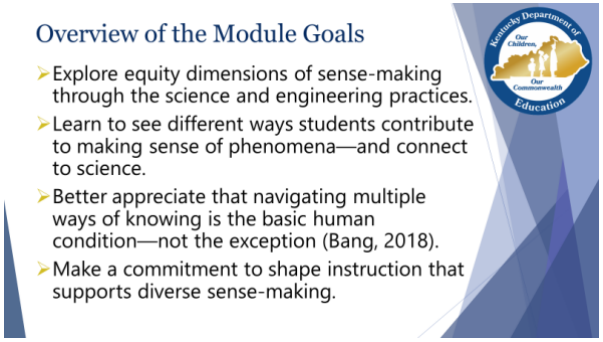
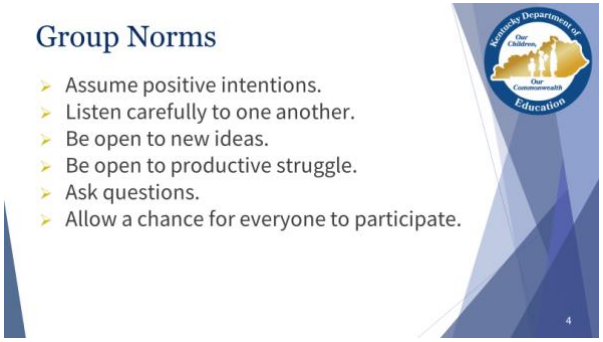
Preparation for Session A: Equity in Science

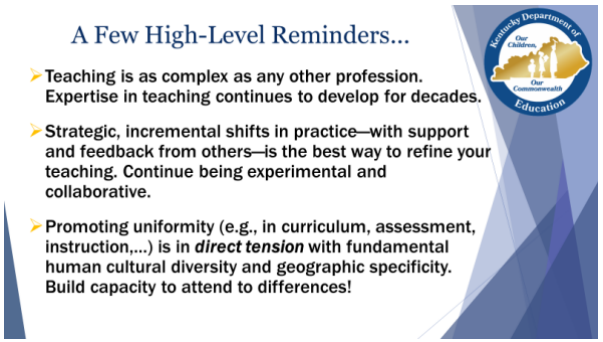
Materials for Session A:

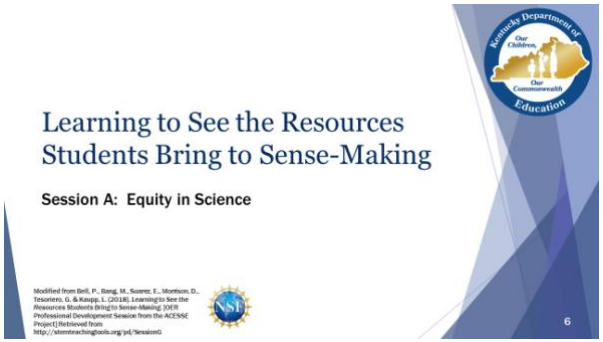
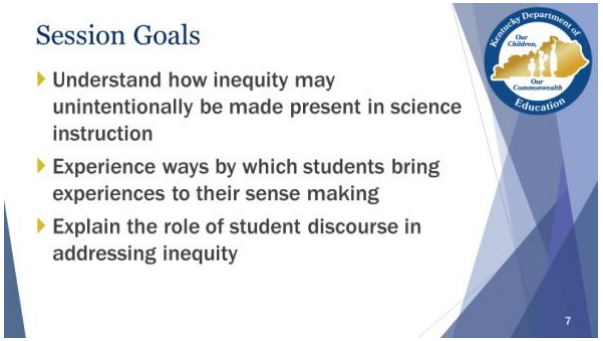
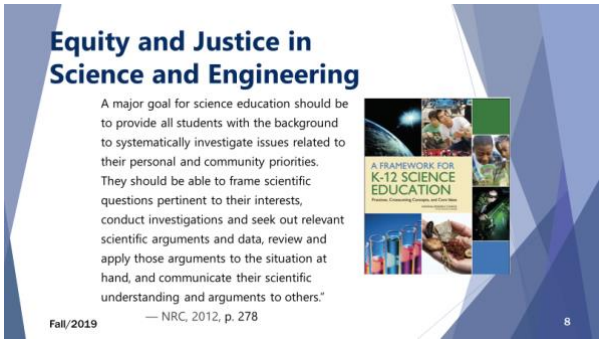
- Issues Bin Poster:
    - Poster can just be labeled "Issues Bin". The Issues bins can be used by the participant to note ideas, questions, or issues constructively while the class continues to focus on an activity or lesson. This may be a poster or you may prefer to have a digital Issues Bin where participants can access a Google document, for example, to post questions and that you can modify as the participants work through the sections of the module.
- STEM Teaching Tool #47: How can I promote equitable sensemaking by setting expectations for multiple perspectives?—1 copy/person

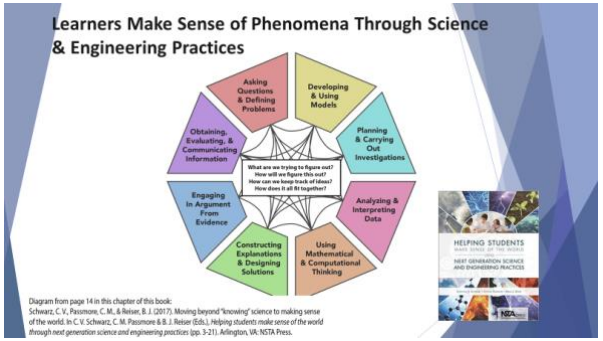
Session A: Equity in Science

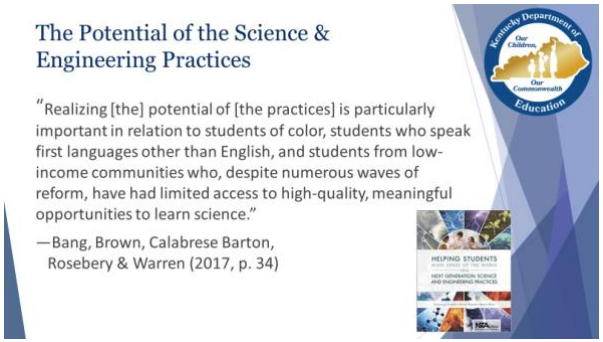
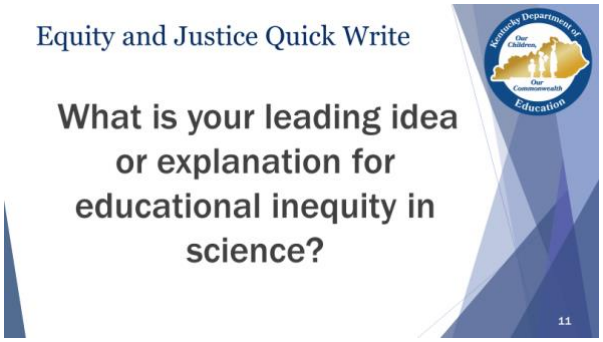
Facilitator Notes	Accompanying Slide(s)
Officially welcome participants. **Explain:** "This module is designed to build your capacity on identifying the range of intellectual resources students use as they make sense of phenomena. We will explore how equity and justice relate to culture-based approaches to pedagogy. We will then focus on how to identify and leverage the resources students use in moments of sense-making."	

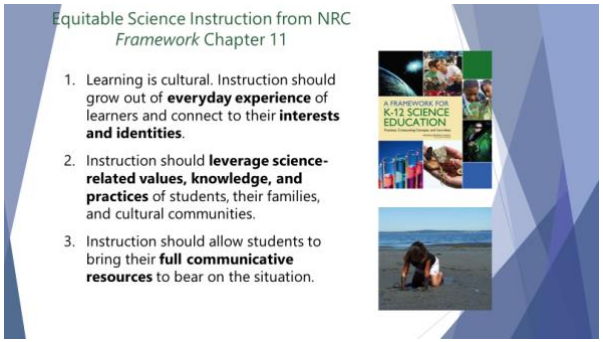
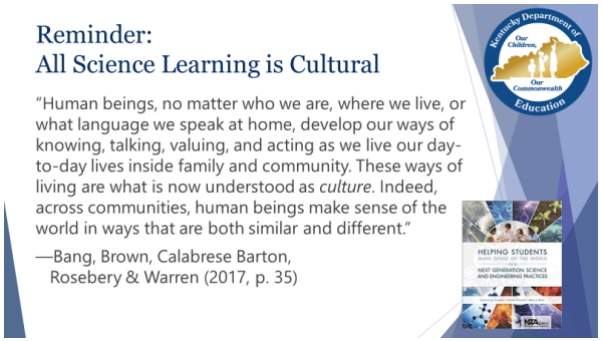
Facilitator Notes	Accompanying Slide(s)
Use the information on this slide to share the components of this module.	
Use the information on this slide to review the overarching goals of this module.	
Explain: "Group norms can help to create a safe space where participants feel comfortable sharing their ideas and experiences. This slide is a starter. Take a moment to read the norms." *After people are finished, ask if anyone would like to revise, edit or add any norms to the list. If so, make changes on the slide; if not, move on to your discussion of the Issues Bin.*	

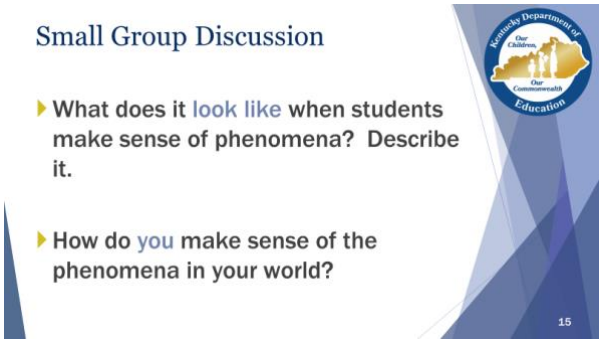
Facilitator Notes	Accompanying Slide(s)
Explain: "I realize you may not want to pose every question to the whole group, or we may not have time in the session to get to every question. Therefore, I want us to have a place for to address those issues." *Introduce participants to the Issues Bin. The Issues bin can be used by the participants to note ideas, questions, or concerns while the group continues to focus on the learning. This may be a poster or a digital parking lot (i.e., a Google document) where participants can post these issues. The purpose of the Issues Bin is to provide participants with a safe way of asking questions or suggesting ideas. Participants should feel free to add to the Issues Bin throughout the module.* *Remember that you may not know all of the answers to the questions and that is okay. Some issues may be addressed in future sections of this module. If the question is pressing and doesn't appear to be addressed in this module, talk to your district team and determine who would be the best person to contact at the KDE. You may also e-mail questions or feedback to KDEScience@education.ky.gov*	
Facilitator Notes: *The information provided in this module may be somewhat uncomfortable for educators. Participants will be asked to engage in deep discussions which may challenge their beliefs, especially when thinking about their own students. The information on this slide is a reminder that teaching is not static; that educators grow in their profession.*	

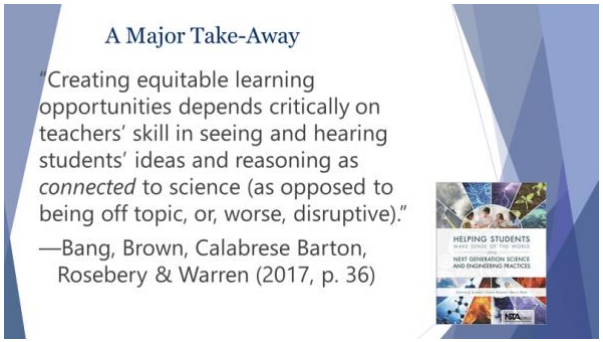
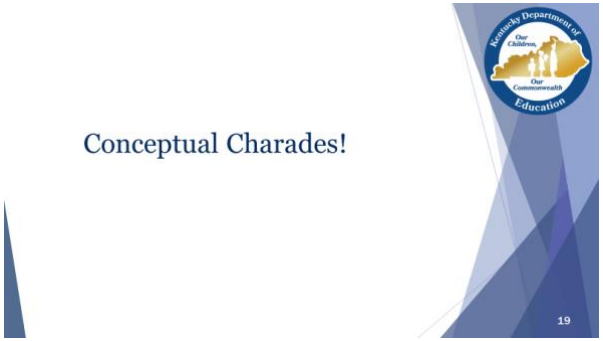
Facilitator Notes	Accompanying Slide(s)
	
Facilitator Notes: *Use the information on this slide to set the stage for the expected learning in this session.*	
Explain: "Design challenges relate directly to a big idea in the *Framework for K-12 Science Education* about equity. A major goal for science education should be to provide all students with the background to systematically investigate issues related to their personal and community priorities. That is, students need to be able to see how science and engineering are relevant and can address goals and problems that matter to young people. They should be able to frame scientific questions pertinent to their interests." *Facilitator Notes:* *A core assumption is that science instruction should connect directly to students' experiences and interests, can help them develop identities as people who do science and engineering and, if*	

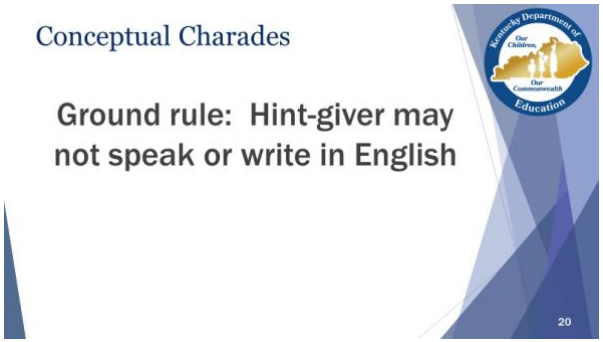
Facilitator Notes	Accompanying Slide(s)
desired, as people who are scientists and engineers. Students should have opportunities to conduct investigations and seek out relevant scientific arguments and data, review and apply those arguments to the situation at hand and communicate their scientific understanding and arguments to others. *Promoting equity means students need to have direct opportunities to engage in science and engineering practices to investigate their questions and design solutions to problems they care about. These relate also to justice aims for science education. Design challenges especially present opportunities for students to see how science and engineering practices can support goals for citizenship and community improvements, like addressing gaps in where trees are planted in the city or creating forums for youth to design and participate in democratic debates about the ethics of genetic engineering.*	
Explain: "The science and engineering practices support sense-making. They are a game changer—they put students in positions of being knowers, doers and makers. Students flow between different practices in ways that respond to making progress in their unfolding investigation. This is a representation of that process. The science and engineering practices can powerfully support learning if they are configured to be inclusive. *Facilitator Notes:* *The focus is on the science and engineering practices as these define a process through which students should make sense of the world around them.*	

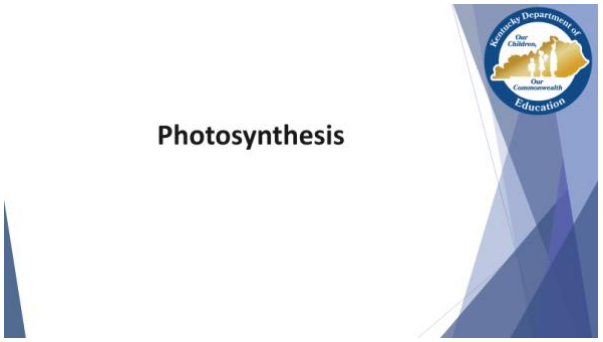
Facilitator Notes	Accompanying Slide(s)
Explain: "The central focus on science and engineering practices in the three-dimensional model of science learning in the NRC *Framework* has a huge equity potential." *Read slide* "In this and subsequent sessions we will explore how students share their reasoning and sense-making through the practices." *Facilitator Note:* *NRC refers to the National Research Council, which is the working arm of the United States National Academies. It produces reports that shape policies, inform public opinion, and advance the pursuit of science, engineering, and medicine.*	
Explain: "Let's think about the students and communities we serve." *Facilitator Notes:* *Read the slide and have participants complete a quick write (3 minutes). After 3 minutes, have table groups or elbow partners share their thinking for about 5 minutes. Complete a large group debrief where you may wish to chart some of the ideas or explanations to which you may be able to refer as you move through this, and subsequent, sessions.* **Note: Some individuals and groups may be hesitant to share their perspective. It is a good time to remind the educators that it is likely very similar to when our students hesitate when talking about a challenging topic like equity in the classroom; we should remember that and realize that we need to help create a learning community that can engage in important conversations like that.*	

Facilitator Notes	Accompanying Slide(s)
Explain: "This is a summary of the Equity and Diversity chapter in the NRC *Framework.*" *Read slide* *Facilitator Notes:* *Connect any of these to what was shared after the quick write, if applicable.*	
Explain: "As educators, we need to remember that students bring their own culture and experiences to the table. Those students whose experiences resemble school are advantaged in that we can follow their "thinking." We need to learn how to better understand how our students' culture informs their sense-making."	
Explain: "The NRC Framework highlights that all science learning is a cultural accomplishment. Let's review a definition of 'culture' to keep that idea centered in our thinking." *Read slide* "How students observe phenomena, interpret it, explain it and shape it, as well as how they learn from others, what they value and how they fundamentally think about the universe, are all culturally shaped by the communities of which they are a part."	

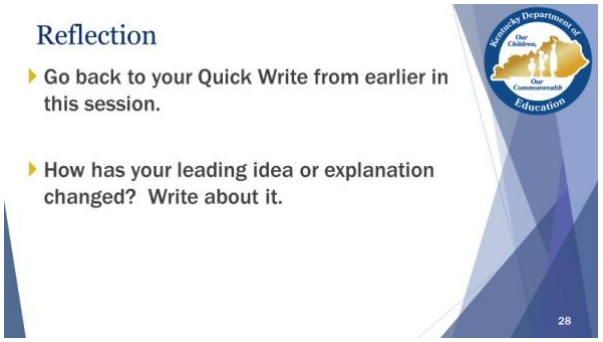
Facilitator Notes	Accompanying Slide(s)
Explain: "Think about the students and communities you serve." *Facilitator Notes:* *Provide 5 minutes for table groups or elbow partners to discuss these questions. Debrief these descriptions with the room.*	
Explain: "As we find our way into thinking about the ways we judge the contributions and responses that come from students, it is crucial to remember 'whose interests are being served?' based on how we respond to those contributions. Whose contributions are we ruling 'out of bounds' for being related to science or to a moment of sense-making, and which are 'on the mark'? And what criteria are in play at that comment? Of course, this question is broadly useful as educational decisions happen and initiatives unfold." *Facilitator Notes:* *Educators often think about "what is the right answer" or about a single approach to a problem or issue. Students, however, bring their own experiences to the table, which teachers should not discount.*	
Facilitator Notes: *Sense-making is a complex process. Have participants read this brief and make note of any questions or insights they have.* *The focus of this brief is collaboration and coming to consensus through discourse. Lead a discussion around the second reflection question found in this brief. Also ask: How is providing opportunities for student discourse addressing student equity?*	

Facilitator Notes	Accompanying Slide(s)
Explain: "This is the main take away of this session. Teachers routinely navigate moments where they make the quick decision about whether a student response or contribution is relevant to a given moment of sense-making. These are crucial equity moments. We must work to try and connect those contributions to the science involved in a moment—even if we don't immediately understand it. Ask for clarification if you need it. Ask another student to explain the idea another way so you can see the connection." *Facilitator Note:* *Pause here a few moments for participants to ponder.* "Be generous and open to what students bring to a moment. We know that language may not be clear as people sort through their ideas—this is true for everyone learning a new complicated subject. Assume positive intent and positive contribution." *Facilitator Note:* *Pause here a few moments for participants to ponder.*	
Explain: "Let's play a game. We need to learn to see the sense-making resources of others. This game, Conceptual Charades, is a great way to do that." *Facilitator Notes:* *Some people may not have played charades before; therefore, you may wish to quickly poll people. This resource (https://www.fun-stuff-to-do.com/charade-clues.html) provides some general rules of the game. It is suggested that groups for this learning experience be no larger than five total people.*	

Facilitator Notes	Accompanying Slide(s)
Explain: "One person at each table/group will be trying to get the rest of you to guess a specific concept. The one ground rule is that the hint giver cannot speak or write in English. Anything else is fair game. Now, identify a person at your table to be the hint-giver. Everyone else should close their eyes. I'm going to show the clue in 3—2—1…" *Facilitator Notes:* *Advance slide*	
Facilitator Notes: *Show this slide until all hint givers see it (approximately 15 seconds), then advance to the next slide.*	
Explain: "And Charade!" *When all groups are done:* "Did anyone use the standard charade signals to be successful? Did it let you finish more quickly? If so, that is a cultural assumption you are taking advantage of. For this next round, don't use charade signals. You should identify a new person at your table/group to be the hint-giver. *(Wait a few seconds)* Everyone else should close their eyes. I'm going to show the clue in 3—2—1…" *(Advance Slide)*	

Facilitator Notes	Accompanying Slide(s)
Facilitator Notes: *You may need to identify "standard charade signals" for participants. These can be found in the previous resource.* *Some of the cultural assumptions people may have used include:* • *Number of words* • *Assumptions of previous experiences* • *Non-verbal clues and/or body language* • *Prior knowledge* • *Hearing or seeing other groups during charades*	
Facilitator Notes: *Show* this *slide until all hint givers see it (approximately 15 seconds), then advance to the next slide.*	
Explain: "And Charade!" *When all groups are done:* "Did anyone use a different language to communicate? You were only told not to use English. Did you use a different language? Think about communication resource you may have. Now identify a new person for this last round. *Wait a few seconds.* Everyone else should close their eyes. I'm going to show the clue in 3—2—1…"	

Facilitator Notes	Accompanying Slide(s)
Facilitator Notes: *Show this slide until all hint givers see it (approximately 15 seconds), then advance to the next slide.*	
Explain: "And Charade!" *When all groups are done:* "Let's debrief the game for a minute. What are all of the different meaning-making resources people ended up using? How was this experience similar and different than listening to a classroom discussion? Is there something we can learn from this stance of deeply trying to understand one another? Let's bring this open, generous stance to communication resources as we learn to see the range of resources that students use in learning situations."	

Facilitator Notes	Accompanying Slide(s)
Explain: "In this session, we've explored how individuals use different ways of making sense of their world. Based upon what we've learned, what cultural assumptions do students bring to the classroom that give some an advantage in classroom conversations?" *Facilitator Notes:* *Facilitate a discussion around this question.*	
Facilitator Notes: *Have participants reflect on their learning by going back to their quick write from earlier. Let them know that they will come back to this quick write at the end of Session C. This can be a record of how participants' learning how influenced their thinking over the course of this module.* *Ask for volunteers to share.*	

Leaning to See the Resources Students Bring to Sense-Making: Social Justice and Equity

Preparation for Session B: Taking an Asset Approach to Learner Cultural Diversity

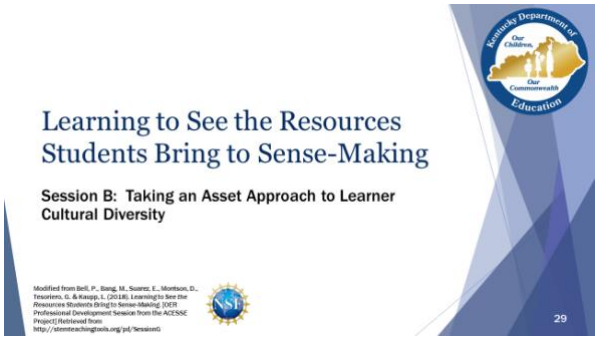
Materials Needed:

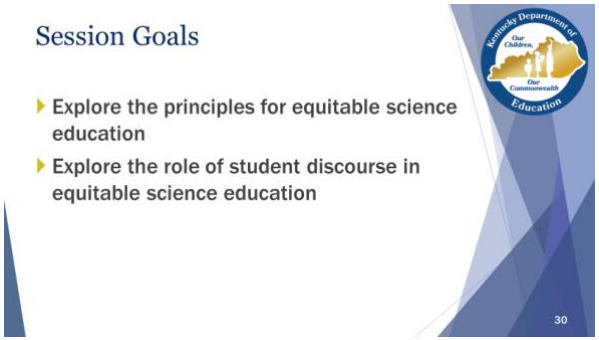
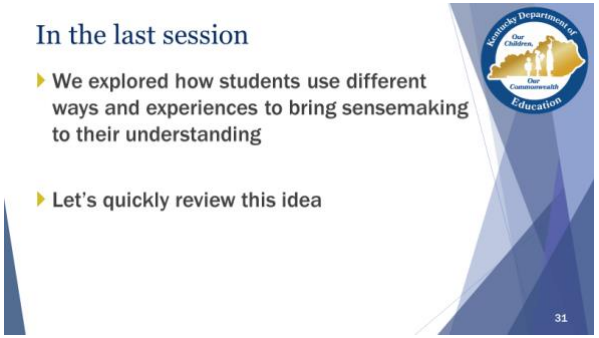
- Vignette "But What Would Granny Say?" (pp. 47-50 found at https://www.researchgate.net/publication/321918340_Helping_Students_make_Sense_of_the_World_through_Next_Generation_Science_and_Engineering_Practices) 1 copy/person
- STEM Teaching Tool #16 Research Brief: The Informal Formative Assessment Cycle as a Model for Teacher Practice 1 copy/person
- "Three Principles Towards Equitable Science" slide # 34 1 copy/person
- Access to internet and speakers for playing video

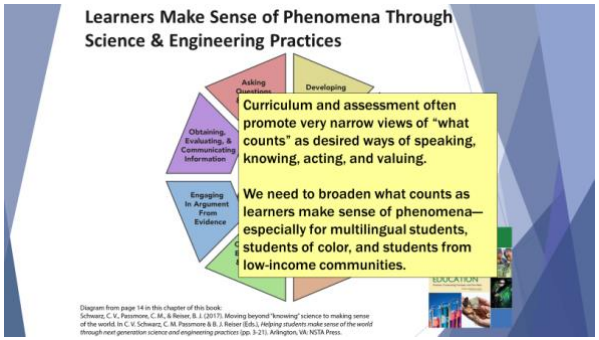
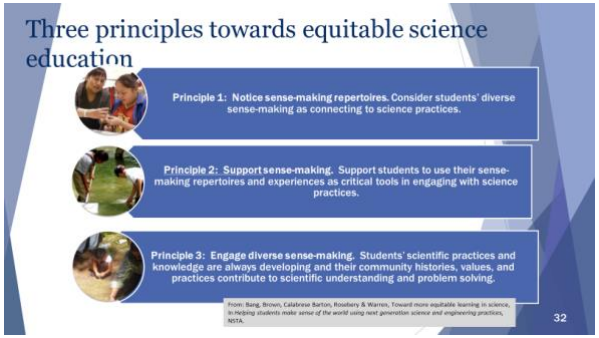
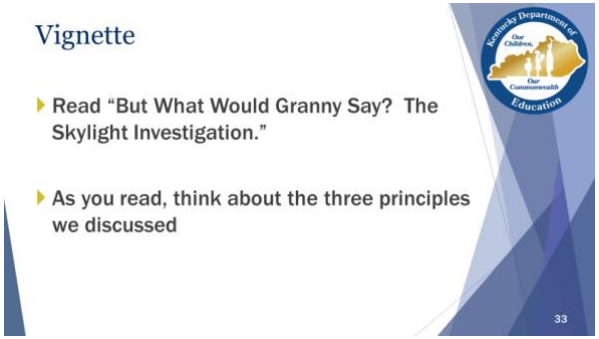
Optional Materials:

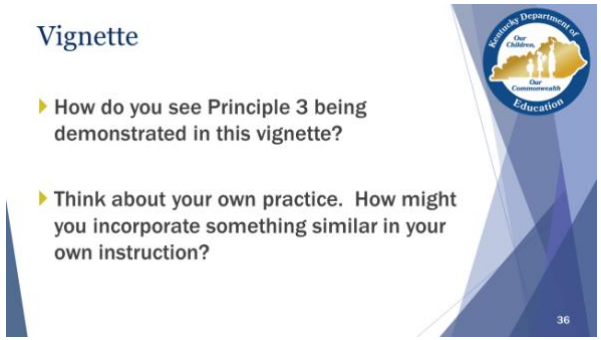
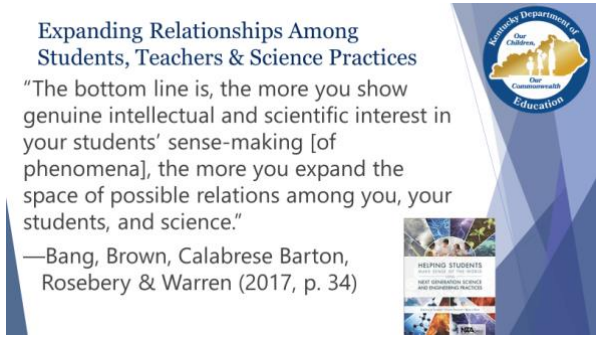
- STEM Teaching Tool #10 Teaching STEM in Ways that Respect and Build Upon Indigenous Peoples' Rights (Background)
- STEM Teaching Tool #11 Implementing Meaningful STEM Education with Indigenous Students and Families

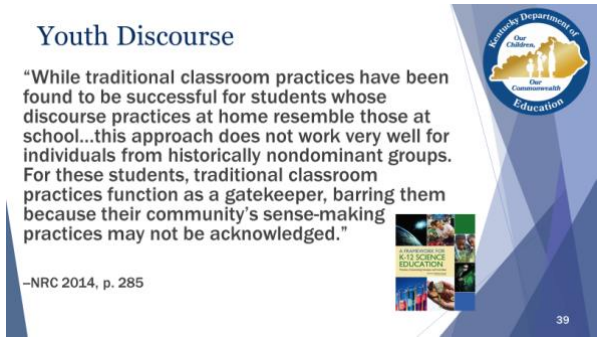
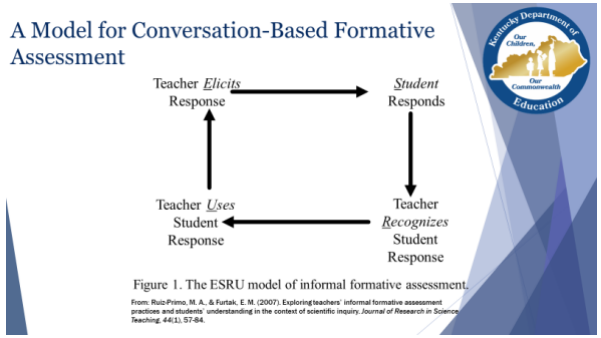
Session B: Taking an Asset Approach to Learner Cultural Diversity

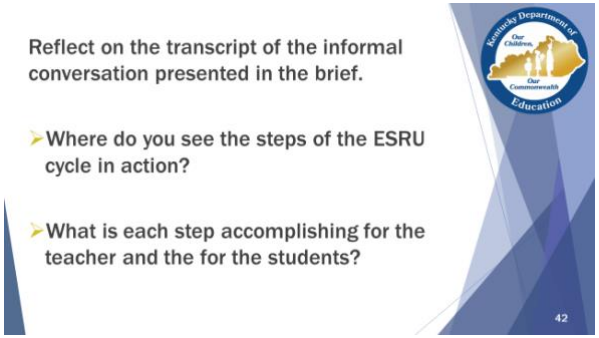
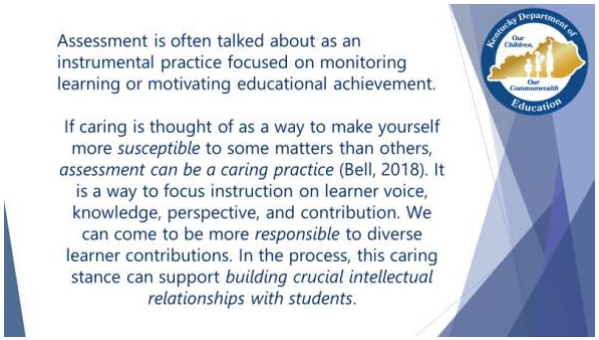
Facilitator Notes	Accompanying Slide(s)
	

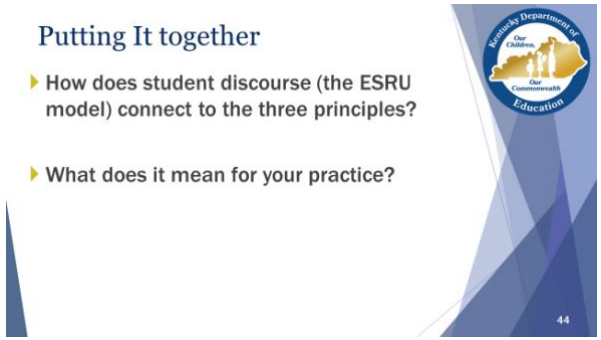
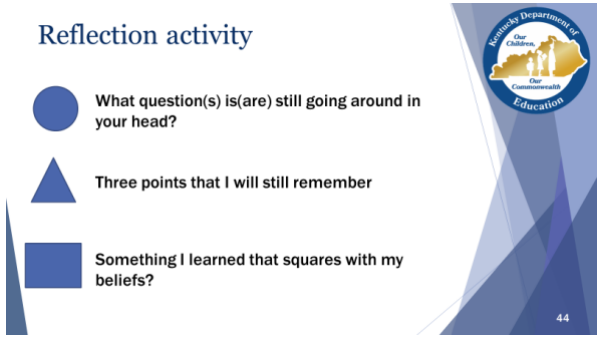
Facilitator Notes	Accompanying Slide(s)
Facilitator Notes: *Use the information on this slide to set the stage for the expected learning in this session.*	
Explain: "In our previous session we explored how individual can bring different experiences as they make sense of information. We'll quickly review this idea by watching this short video clip."	
Facilitator Notes: *After showing this video clip ask participants "How did Sheldon, Leonard, Penny and Amy use their experiences and culture to make sense of the words as they were playing Pictionary?"*	

Facilitator Notes	Accompanying Slide(s)
Explain: "Let's revisit the science and engineering practices." *Click slide to get to the yellow text and read.* "We need to work in instruction to keep the science practices broadly inclusive to the cultural variation in our learning community. It is powerful to think of a practice—like modeling—as n invitation for students to show you how they represent a system, its relationships and its dynamics. Modeling should be a process of getting them to relate, reveal and refine their ways of knowing."	
Explain: "These are the three equity principles identified in the NSTA publication explaining the science and engineering practices. They are a powerful set of general principles for expansive teaching." *Facilitator Notes:* *Each participant should have a copy of the principles.* *Summarize each of the three principles.*	
Facilitator Notes: *Provide participants with a copy of the vignette "But What Would Granny Say" which is found on pp. 47-50 in text found at* *https://www.researchgate.net/publication/321918340_Helping_Students_make_Sense_of_the_World_through_Next_Generation_Science_and_Engineering_Practices* *Allow approximately 10 minutes for reading and silent reflection.*	

Facilitator Notes	Accompanying Slide(s)
Facilitator Notes: *Facilitate a discussion of these two questions. You may wish to suggest that participants jot down their ideas about their own practice, as they will be asked to develop a plan of action during Session C.*	
Explain: "Not only does the NRC *Framework* emphasize the importance of inclusive instructional strategies, but so does the NRC report describing the development of science assessment. The principles we've been discussing should meaningfully carry over to assessment practices." *Facilitator Notes:* *The focus in this statement goes back to the discussion in Session A around student discourse. Students should be given the opportunity to bring their experiences and understandings to meaning making instead of focusing on a single, "correct" answer/response.*	
Explain: "Teachers need to be in intellectual relationships with each of their students. If they aren't, how can we expect students to learn and come to identify with science. Developing relationships is hard, but rewarding, work. Recognizing the assets that students bring to sense-making is a powerful way to develop these intellectual relationships."	

Facilitator Notes	Accompanying Slide(s)
Facilitator Notes: *This slide was shown in Session A. Remind participants that student culture and experiences (their assets) help shape their sense-making. As teachers, we need to take this into account as students gain understanding in the science classroom.*	
Explain: "As we pretend to do an 'on the fly' interpretation of student resources, here is a formative assessment model that is useful to keep in mind. How does it relate to how you do classroom assessment?" *Talking points for this model:* *Elicited questions used to initiate a sequence have the potential for providing information on the evolving status of student conceptions and understanding about scientific inquiry skills and habits of mind. Students responds to those questions. Recognizing students' responses in diverse ways is considered fundamental because it indicates to the student that his/her contribution has been heard and accepted into the ongoing classroom narrative and provides the opportunity for the teacher to pull out the essential aspects of student participation and to act on them. The teacher can then use the information in order to provide students with specific information on actions they may take to reach learning goals.* *The complete research paper may be found at https://onlinelibrary.wiley.com/doi/abs/10.1002/tea.21267.*	

Facilitator Notes	Accompanying Slide(s)
Explain: "STEM Teaching Tool #16 describes the framework for conversation-based formative assessment. It is closely related to what we will be doing in a moment. Therefore, take a few moments to read this brief."	
Facilitator Notes: *Allow approximately 10 minutes for reading. After this time, pose these questions to the group. Provide for small groups/tables to discuss and reflect.* *An analysis of this transcript can be found on page 73 of the research paper, previously linked.*	
Explain: "We should engage learners in understanding why we do formative assessment—through our words and our actions. Assessment can be part of the process of developing a trusting intellectual relationship with your students." *(Read slide)*	

Facilitator Notes	Accompanying Slide(s)
Facilitator Notes: *Facilitate a discussion around the first question posed.* *(Click for second question.)* *The second question may be discussed whole group, small group or be an individual reflection.*	
Explain: "This is a reflection activity called 'circle, triangle, square' that some of you may have used with your students. Take some time to reflect on this session and identify your circle, triangle and square." *Facilitator Notes:* *After participants have had time to personally reflect, you may wish to ask them to share, especially their circles as these may provide you with feedback for the next session.*	

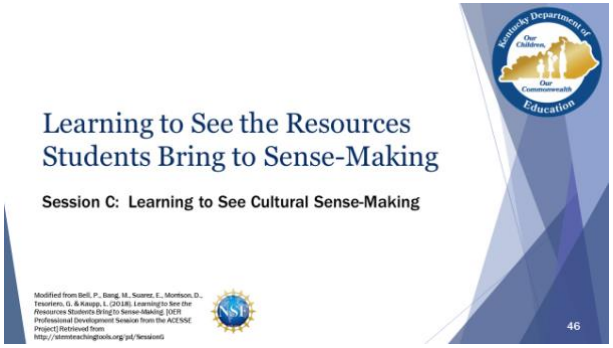
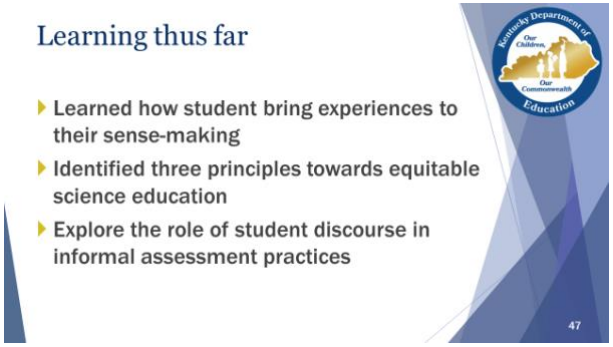
Learning to See the Resources Students Bring to Sense-Making: Social Justice and Equity

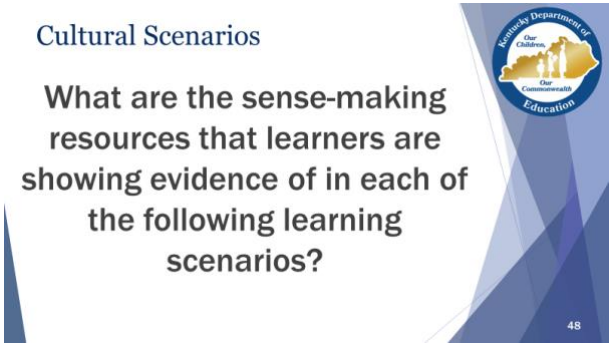
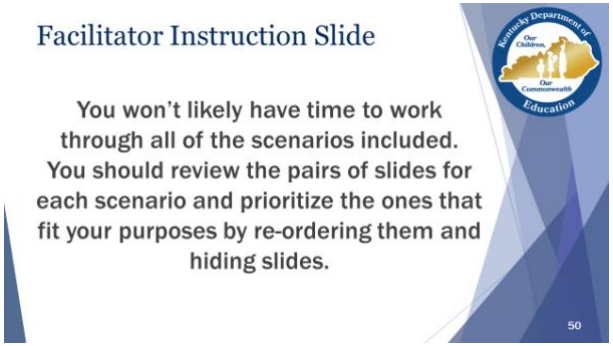
Preparation for Session C: Learning to See Cultural Sense-Making

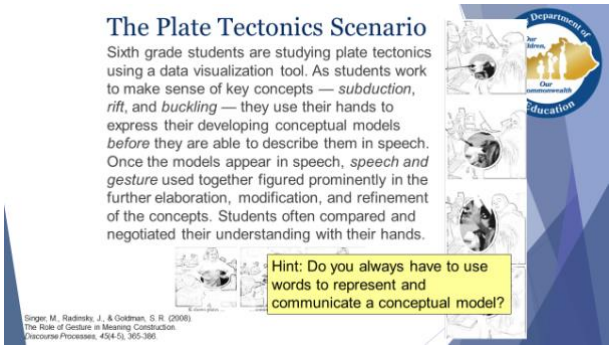
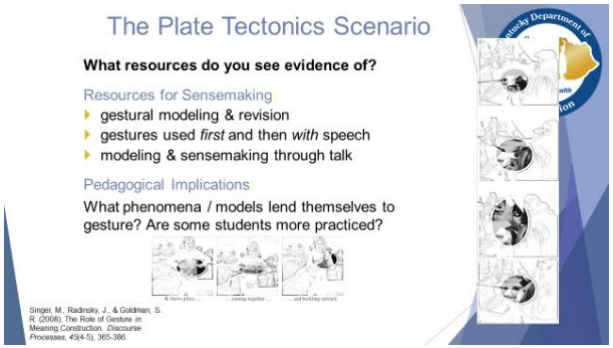
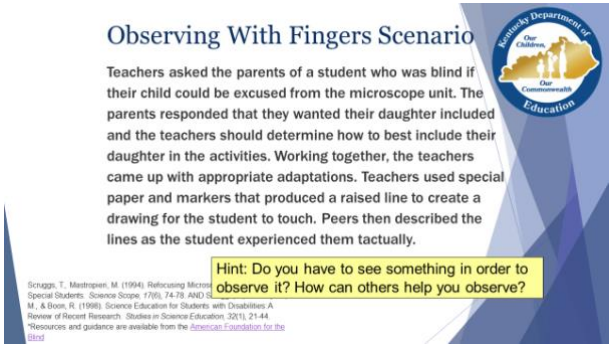
Optional Materials Needed:

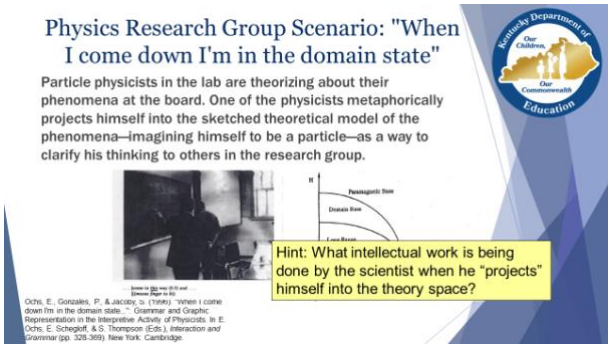
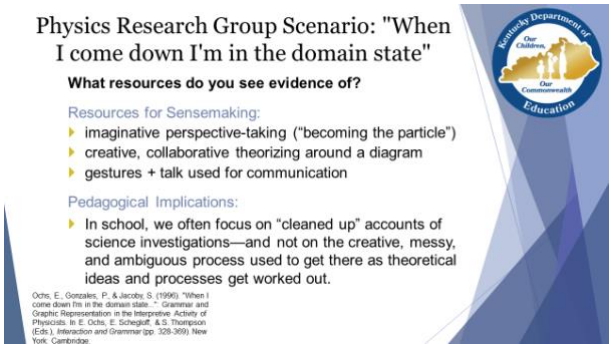
- STEM Teaching Tool #54 How to build an equitable learning community in your science classroom
- Chart paper and markers (for the optional learning experience)

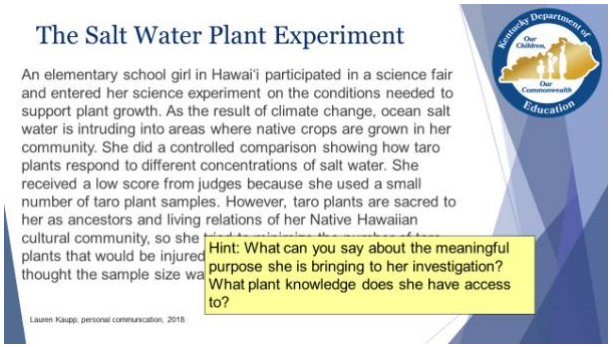
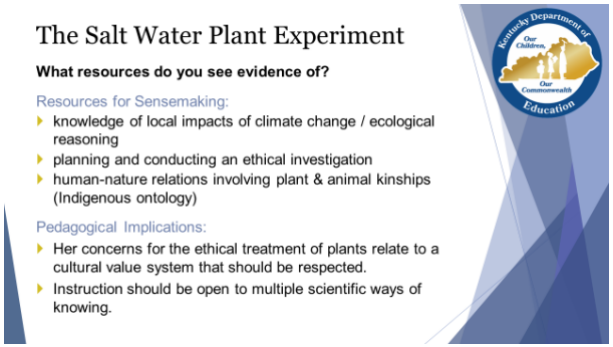
Session C: Learning to See Cultural Sense-Making

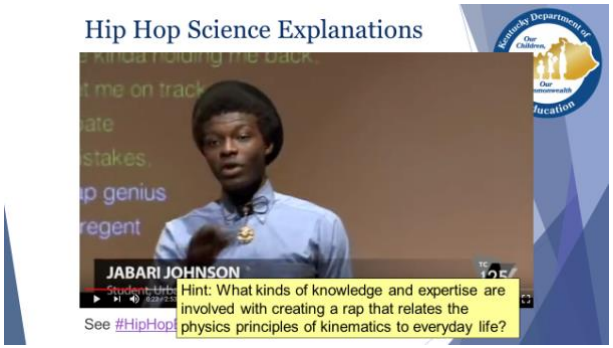
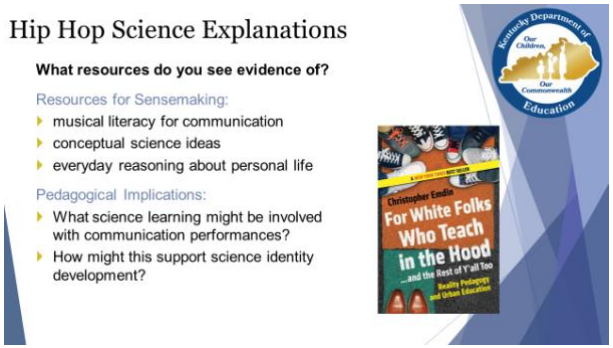
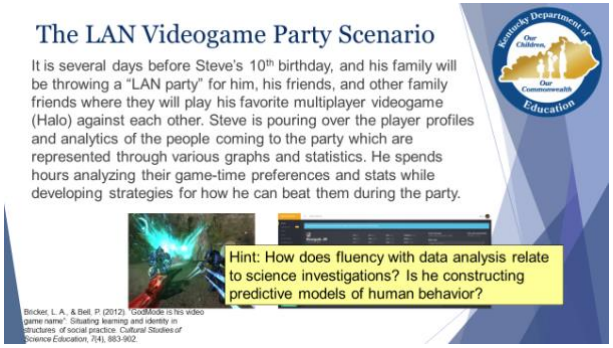
Facilitator Notes	Accompanying Slide(s)
	
Facilitator Notes: *Remind participants of the learning they have experienced thus far.*	

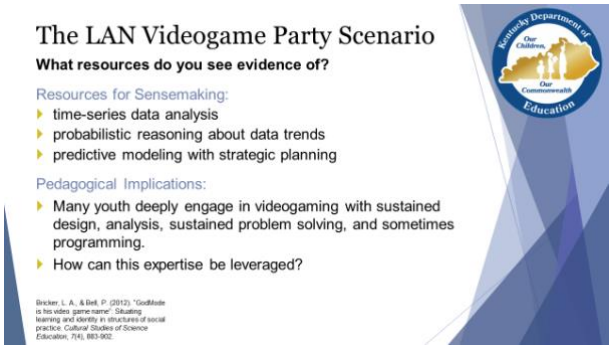
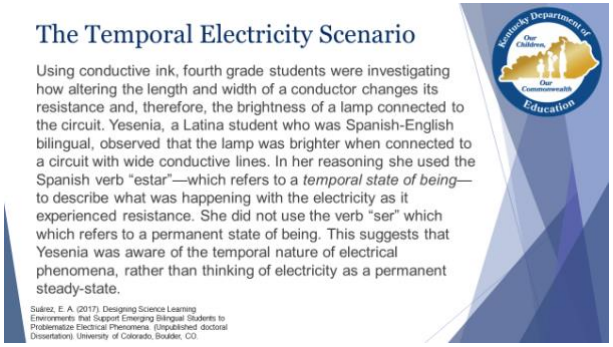
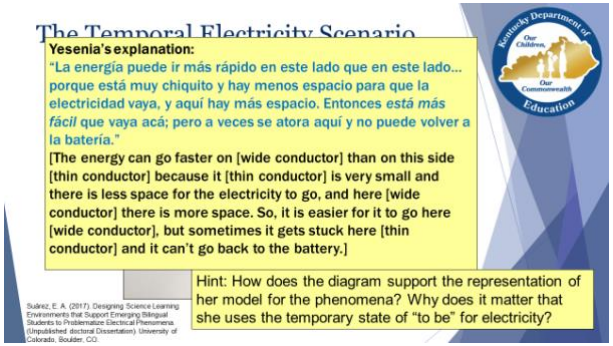
Facilitator Notes	Accompanying Slide(s)
Facilitator Notes: *Use the information on this slide to set the stage for the expected learning.*	
Explain: "We are going to closely look at a series of learning scenarios (situations). Here is our guiding question for each one."	
Facilitator Notes: *This is a hidden slide* *Participants will examine a scenario to identify the sense-making resources that learners are using. The following slide deck contains 10 scenarios. Each scenario will require 10-15 minutes. If time is a factor, identify the 5 or 6 scenarios that are more likely applicable to your participants. Hide, or remove, any slides you have chosen not to use.*	

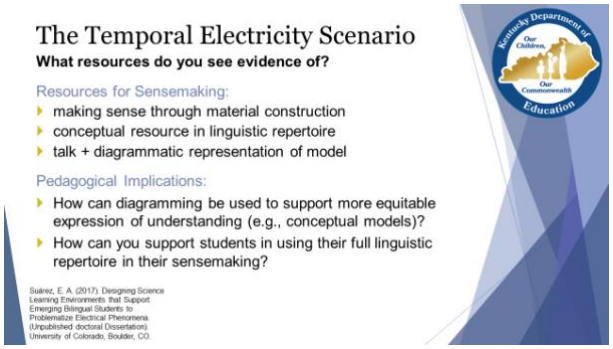
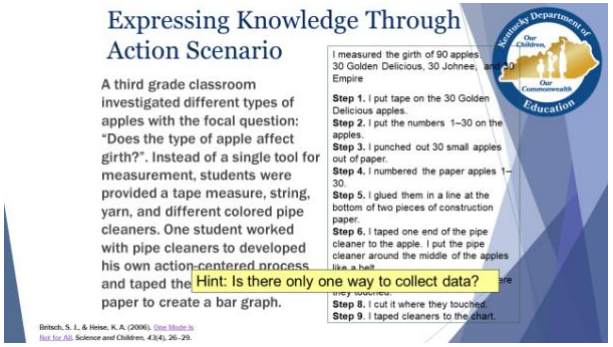
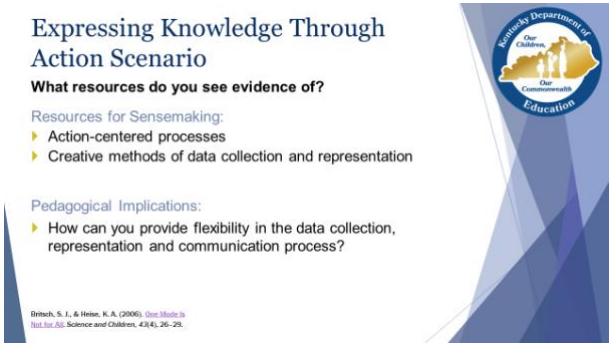
Facilitator Notes	Accompanying Slide(s)
Read the scenario; see if people need any clarification. **Explain:** "At your tables, look for evidence of each kind of sense-making resource you see. Be ready to share what you identify. After you are done with that, think through if that kind of resource is something you've seen in your teaching." *After a minute or so of table thinking, click to reveal the clue to the room.* *After approximately 3 minutes of table discussion, transition to the next slide.* *After transition, click to show the question. Solicit responses from the room as to what resources they see evidence of.* *Click to show and discuss the resources identified by the developers of the scenario.* *Click to show and discuss the connections of these resources to practice.*	 
Read the scenario; see if people need any clarification. **Explain:** "At your tables, look for evidence of each kind of sense-making resource you see. Be ready to share what you identify. After you are done with that, think through if that kind of resource is something you've seen in your teaching." *After a minute or so of table thinking, click to reveal the clue to the room.* *After approximately 3 minutes of table discussion, transition to the next slide.*	

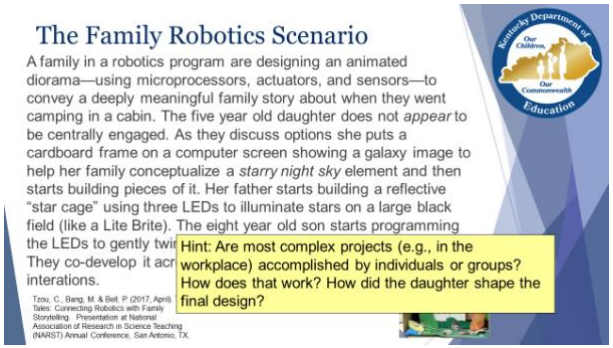
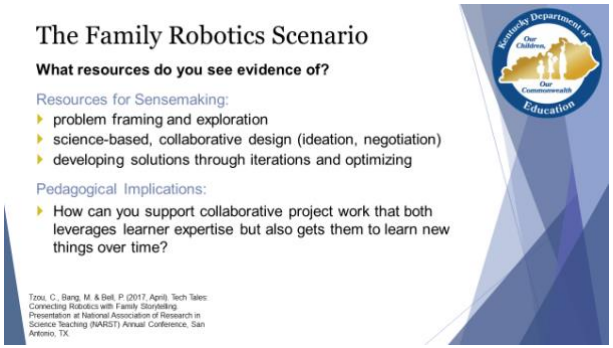
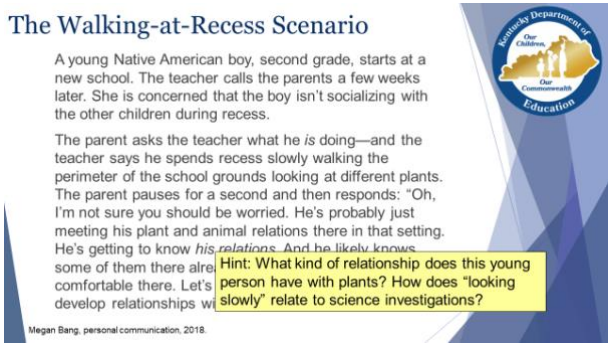
Facilitator Notes	Accompanying Slide(s)
After transition, click to show the question. Solicit responses from the room as to what resources they see evidence of. *Click to show and discuss the resources identified by the developers of the scenario.* *Click to show and discuss the connections of these resources to practice.* *(source: https://afb.org/default.aspx)*	
Explain: "This scenario is about scientists making sense of phenomena." *Read the scenario; see if people need any clarification.* **Explain:** "At your tables, look for evidence of each kind of sense-making resource you see. Be ready to share what you identify. After you are done with that, think through if that kind of resource is something you've seen in your teaching." *After a minute or so of table thinking, click to reveal the clue to the room.* *After approximately 3 minutes of table discussion, transition to the next slide.* *After transition, click to show the question. Solicit responses from the room as to what resources they see evidence of.* *Click to show and discuss the resources identified by the developers of the scenario.* *Click to show and discuss the connections of these resources to practice.*	 

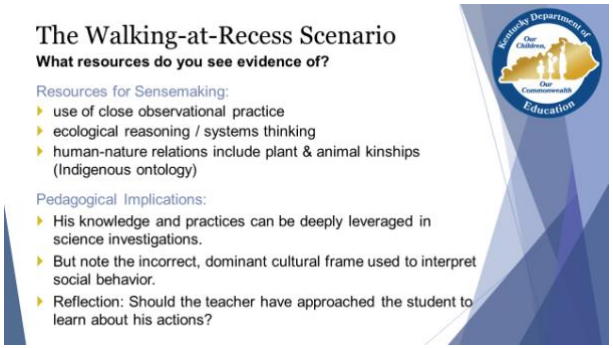
Facilitator Notes	Accompanying Slide(s)
Read the scenario; see if people need any clarification. **Explain:** "At your tables, look for evidence of each kind of sense-making resource you see. Be ready to share what you identify. After you are done with that, think through if that kind of resource is something you've seen in your teaching." *After a minute or so of table thinking, click to reveal the clue to the room.* *After approximately 3 minutes of table discussion, transition to the next slide.* *After transition, click to show the question. Solicit responses from the room as to what resources they see evidence of.* *Click to show and discuss the resources identified by the developers of the scenario.* *Click to show and discuss the connections of these resources to practice.* *Background information for this scenario can be found at:* *http://ksdl2.ksbe.edu/loi/moolelo-kalo.html* *http://www.kumukahi.org/units/ka_hikina/haloa* *https://www.hawaiibusiness.com/native-hawaiian-culture-is-science/*	 

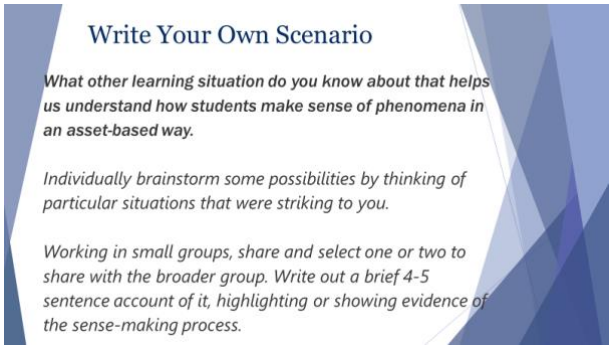
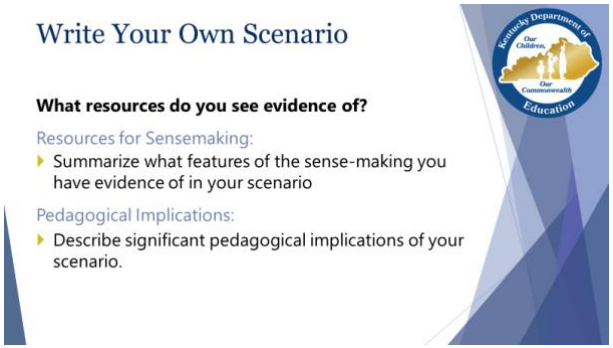
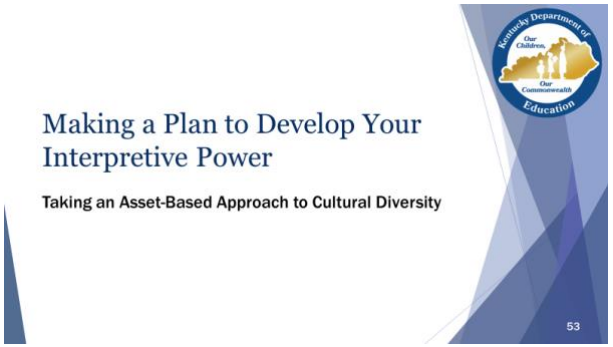
Facilitator Notes	Accompanying Slide(s)
Show the video; see if people need any clarification. *The video may be found at https://www.youtube.com/watch?v+959aWmNsjUs* **Explain:** "At your tables, look for evidence of each kind of sense-making resource you see. Be ready to share what you identify. After you are done with that, think through if that kind of resource is something you've seen in your teaching." *After a minute or so of table thinking, click to reveal the clue to the room.* *After approximately 3 minutes of table discussion, transition to the next slide.* *After transition, click to show the question. Solicit responses from the room as to what resources they see evidence of.* *Click to show and discuss the resources identified by the developers of the scenario.* *Click to show and discuss the connections of these resources to practice.*	 
Read the scenario; see if people need any clarification. **Explain:** "At your tables, look for evidence of each kind of sense-making resource you see. Be ready to share what you identify. After you are done with that, think through if that kind of resource is something you've seen in your teaching." *After a minute or so of table thinking, click to reveal the clue to the room.* *After approximately 3 minutes of table discussion, transition to the next slide.*	

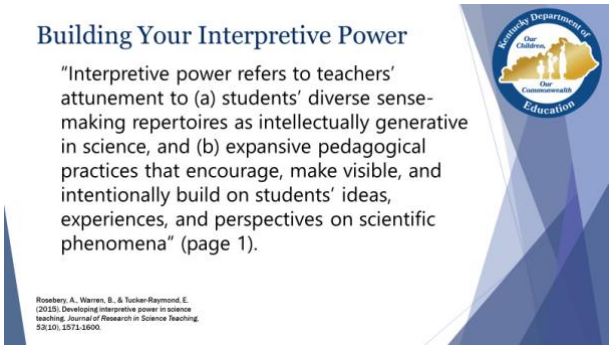
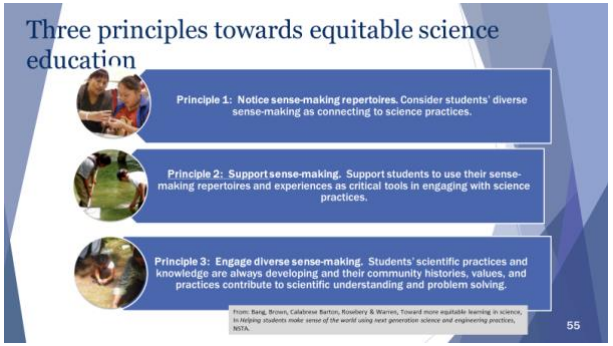
Facilitator Notes	Accompanying Slide(s)
After transition, click to show the question. Solicit responses from the room as to what resources they see evidence of. *Click to show and discuss the resources identified by the developers of the scenario.* *Click to show and discuss the connections of these resources to practice.* *Background: People may ask if it is ethical for a 10-year-old boy playing this videogame. This comes from a field study of family life. It happened, but that does not mean that it is recommended.*	
Read the scenario; see if people need any clarification. **Explain:** "At your tables, look for evidence of each kind of sense-making resource you see. Be ready to share what you identify. After you are done with that, think through if that kind of resource is something you've seen in your teaching." *Click to show the student response.* *After a minute or so of table thinking, click to reveal the clue to the room.* *After approximately 3 minutes of table discussion, transition to the next slide.* *After transition, click to show the question. Solicit responses from the room as to what resources they see evidence of.* *Click to show and discuss the resources identified by the developers of the scenario.* *Click to show and discuss the connections of these resources to practice.*	 

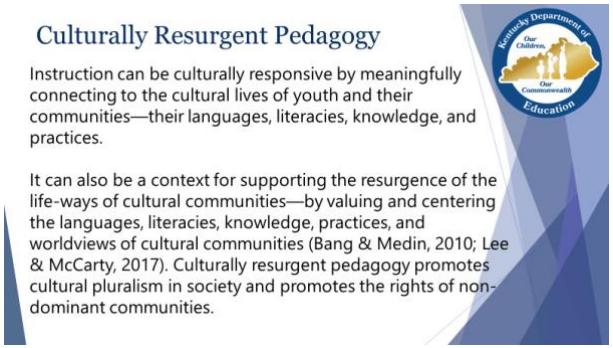
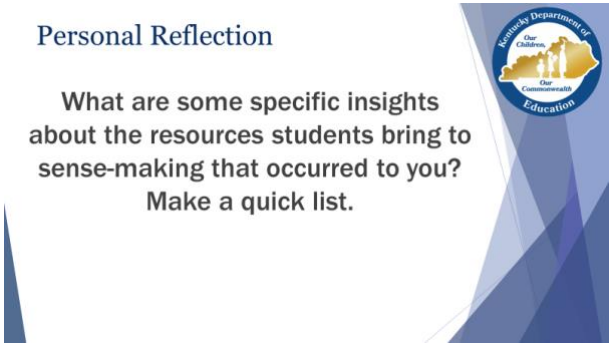
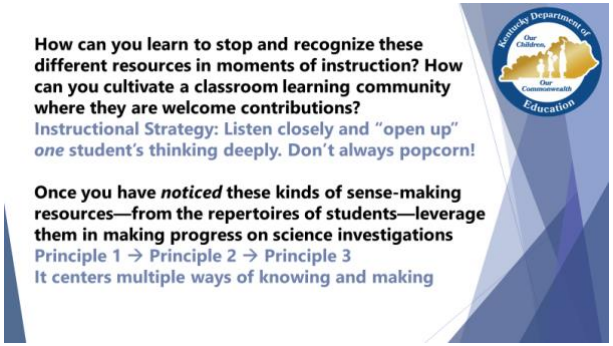
Facilitator Notes	Accompanying Slide(s)
	
Read the scenario; see if people need any clarification. **Explain:** "At your tables, look for evidence of each kind of sense-making resource you see. Be ready to share what you identify. After you are done with that, think through if that kind of resource is something you've seen in your teaching." *After a minute or so of table thinking, click to reveal the clue to the room.* *After approximately 3 minutes of table discussion, transition to the next slide.* *After transition, click to show the question. Solicit responses from the room as to what resources they see evidence of.* *Click to show and discuss the resources identified by the developers of the scenario.* *Click to show and discuss the connections of these resources to practice.*	 

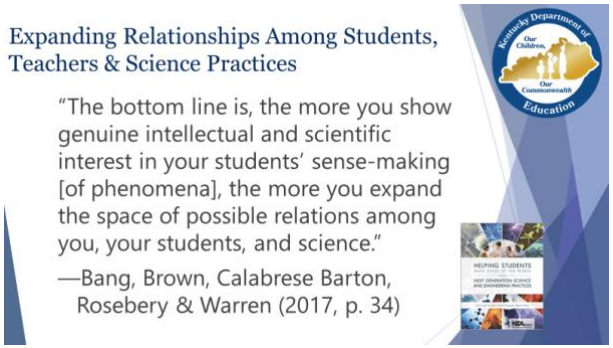
Facilitator Notes	Accompanying Slide(s)
Read the scenario; see if people need any clarification. **Explain:** "At your tables, look for evidence of each kind of sense-making resource you see. Be ready to share what you identify. After you are done with that, think through if that kind of resource is something you've seen in your teaching." *After a minute or so of table thinking, click to reveal the clue to the room.* *After approximately 3 minutes of table discussion, transition to the next slide.* *After transition, click to show the question. Solicit responses from the room as to what resources they see evidence of.* *Click to show and discuss the resources identified by the developers of the scenario.* *Click to show and discuss the connections of these resources to practice.*	 
Read the scenario; see if people need any clarification. **Explain:** "At your tables, look for evidence of each kind of sense-making resource you see. Be ready to share what you identify. After you are done with that, think through if that kind of resource is something you've seen in your teaching." *After a minute or so of table thinking, click to reveal the clue to the room.* *After approximately 3 minutes of table discussion, transition to the next slide.* *After transition, click to show the question. Solicit responses from the room as to what resources*	

Facilitator Notes	Accompanying Slide(s)
they see evidence of. *Click to show and discuss the resources identified by the developers of the scenario.* *Click to show and discuss the connections of these resources to practice.*	
Explain: "And there are other kinds of resources students bring to bear…. • Stories and experiences • Ways of building artifacts or crafting media • Sensory feelings they associate with specific natural phenomena" *Facilitator Notes:* *Allow participants to reflect for a moment before moving on. Remind participants to think about their previous learning and the experiences students bring to the classroom.*	

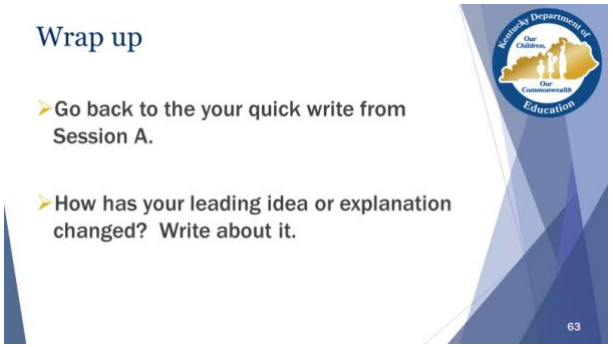
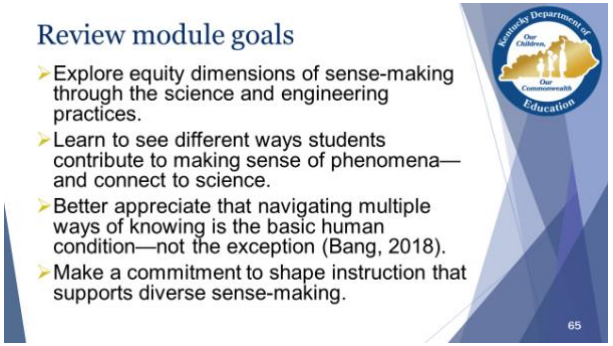
Facilitator Notes	Accompanying Slide(s)
Facilitator Notes: *This optional learning experience provides participants the opportunity to develop their own scenario. If you choose to include this, it is recommended that participants work in small groups. You may suggest that participants think about their own experiences with students in their classrooms; what differences those students have and what adjustments teachers may have put into place to address those differences.* *You may wish to set up an electronic document or folder where participants my share their scenarios with the entire group.* *These two slides provide a template for participants to follow.*	 
Explain: "Based on what we have learned about the diverse resources students bring to sense-making, let's develop an action plan for how to shift our practice."	

Facilitator Notes	Accompanying Slide(s)
Explain: "Education researchers have a concept to describe the form of teacher expertise we have been developing. They call it 'interpretive power.'" *Read Slide* "Let's revisit the principles that help map out this interpretive power expertise." *Note:* *The full article may be found at https://www.researchgate.net/publication/281304123_Developing_interpretive_power_in_science_teaching.*	
Explain: "We have primarily explored just the first of the three principles. We have just begun to make sense of it." *Facilitator Notes:* *Remind participants how they saw the principles in action in the vignette "What Would Granny Say?" as well as its connection to the ERSU model. Previously, participants analyzed cultural scenarios in which students brought different ways to make meaning of phenomena.*	

Facilitator Notes	Accompanying Slide(s)
Explain: "There are different approaches to culture-based pedagogy. Culturally relevant and responsive approaches are common. Culturally sustaining approaches are increasingly popular. We want to explore culturally resurgent pedagogy that supports the continuance of the life-ways of non-dominant communities." *Read Slide*	
Facilitator Notes: *Allow 3-5 minutes for individuals to create a brief list of insights.*	
Explain: "In terms of stance you should adopt, it is one that is generous and open to what students produce. You should develop a norm for the messiness and ambiguity that comes with sorting out complex, new ideas. Once we learn to see diverse resources for sense-making, we need to learn how to leverage them in instruction—or how to let them 'diffract' into our sense-making experience."	

Facilitator Notes	Accompanying Slide(s)
Explain: "I want to remind us about a major take-away here. How can we work to have all of these different kinds of sense-making resources connected to science in meaningful ways that we continue to explore as a community—for the purposes of building relationships to each other and to science."	
Explain: "All students must be ensured a sense of 'belonging' in the learning environment in STEM education. They should have a rightful presence to these learning experiences and knowledge. Relevant scales of justice include racial, socioeconomic, gender, environmental, indigenous sovereignty, sexual orientation and migration history. In addition, there are important intersectionalities, such as being a woman of color in STEM education. The second idea here highlights that the institutions we work in are imperfect; there are systems, infrastructures and routines that produce inequities. Working towards equity and justice means that we actively 'de-settle- these resources of inequity. Examples of things that need de-settling include: • Course pathways where there is implicit or explicit tracking that is unfair • Curriculum may include exclusionary storylines or phenomena • Pacing guides may not make room for responsive instruction and genuine sense-making • Narrow expectations around how to talk or write And then in response, we need to work to create a more expansive cultural learning pathways for youth. Equity discussions can sometimes frame critiques but not think through possible ways to respond and support learning."	

Facilitator Notes	Accompanying Slide(s)
Facilitator Notes: *Relate these points to the equity dimensions discussed during the course of this module.*	**The Equity Stance of Seeing The Diverse Sense-Making Resources of Students** • In terms of **rightful presence**, we should recognize and legitimize the ways of knowing that learners bring to make sense of phenomena • In terms of **de-settling**, we want to disrupt narrow ways of speaking, knowing, acting, and valuing when making sense of phenomena (e.g., known-answer questions, strict turn-taking) • We can **extend cultural learning pathways** by leveraging the sense-making resources of youth to help them develop a relationship to science and better identify with the endeavor—promote their sense of belonging
Explain: "Here is the wrap up. Based on the main take-away what is a concrete commitment you can make to have a more generous and open stance to the intellectual treasures (i.e., assets) that students share with you. This work takes some concerted effort to get going, but then it becomes routine. Reflect on a specific thing you've learned that relates to something you want to work on in your practice. Name it. Write it down. Put it somewhere where it will nudge you to keep working on it over time. And then move on to the next concrete commitment." *Facilitator Notes:* *Below are a few ideas if participants have a hard time generating an idea or if you wish to model what was intended.* • *In order to better attend to the diversity of student's ideas, I will work to ask them to rephrase their connecting idea when I don't understand it, and I will know I am making progress if I come to see the meaning behind the connection they are making.* • *Ask more questions about their responses when I don't understand the connection to science/our efforts.* • *To monitor how I respond on-the-fly to student ideas. Am I only seeking out what I*	**Making a Specific Commitment** **From your list, identify one 'take-away' related to how *you* will respond to students' contributions.** **What will you commit to try out in your practice to shift deeper into an asset-based view of sense-making? A possible prompt: "In order to _____, I will work to , and I will know I am making progress if _____**

Facilitator Notes	Accompanying Slide(s)
believe is the 'right' answer? • *I will use my interest in a student's thinking every day to further develop an intellectual relationship with that student.* *You may also wish to refer participants STEM Teaching Tool #54 as a way to generate ideas as they develop their commitment statement.* *After participants have generated their commitments, ask them to share.*	
Facilitator Notes: *Have participants go back to the quick write from Session A. Allow time for participants to reflect on their learning through responding to this original question.* *Ask for volunteers to share how their learning idea or explanation about educational inequity has changed.*	
Facilitator Notes: *This resource was modified from the NSF ACESSE Project grant. The developers would like feedback to help them improve this resource. Please ask participants to complete this 5 minute survey. Clarify that this is information for the ACESSE team to refine the module and not about you as the facilitator.* *https://tinyurl.com/ACESSEResourceG*