
Believes
#LATeacherLeaders
TL
SUMMIT 2022
MAKING A COMEBACK!

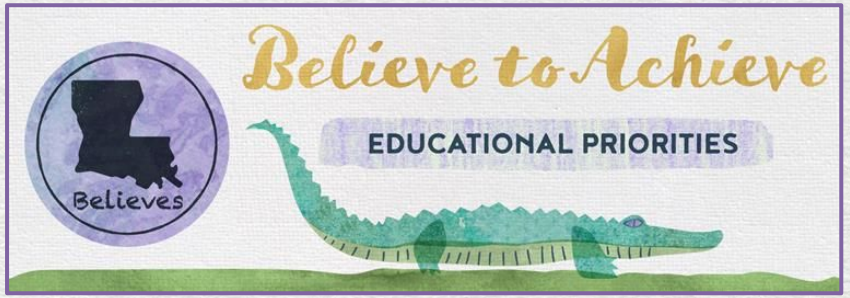
Recognizing and Leveraging Student Resources in Sense-Making in Science and Engineering

Session Context

This session is designed to address two of Louisiana's Believe to Achieve Educational Priorities:

- Remove barriers and create equitable, inclusive learning experiences for all children
- Provide the highest quality teaching and learning environment

The session includes material and resources from ACESSE Resource G cited below:



Bell, P., Bang, M., Suárez, E., Morrison, D., Tesoriero, G. & Kaupp, L. (2019). *Learning to See the Resources Students Bring to Sense-Making*. [OER Professional Development Session from the ACESSE Project] Retrieved from http://stemteachingtools.org/pd/sessiong

Session Goals

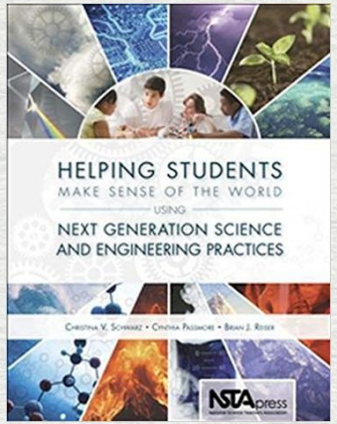
- Reflect on the crucial role of educators in supporting the development of positive science identities.
- Build “interpretive power” for recognizing student resources for sensemaking.
- Plan for leveraging student resources in sensemaking discourse.

Building Positive Science Identities

Science Learning is Cultural

"Human beings, no matter who we are, where we live, or what language we speak at home, develop our ways of knowing, talking, valuing, and acting as we live our day-to-day lives inside family and community. These ways of living are what is now understood as culture. Indeed, across communities, human beings make sense of the world in ways that are both similar and different."

—Bang, Brown, Calabrese Barton, Rosebery & Warren (2017, p. 35)



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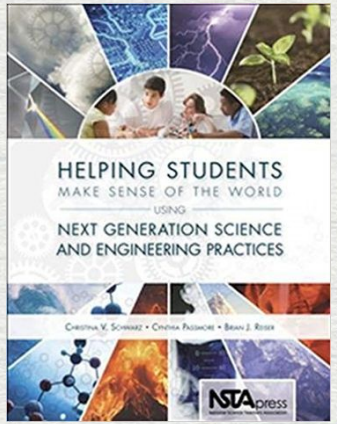
Teachers are the Key

"By attending closely to what students actually say and do in science, teachers can expand the relationships that are possible among themselves, their students, and science. In this way, they can begin to create more equitable opportunities to learn in science for historically underserved students."

—Bang, Brown, Calabrese Barton, Rosebery & Warren (2017, p. 33)



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Building Interpretive Power

Reflect

What does it look like when students make sense of phenomena? Describe it.

How do you make sense of the phenomena in your world?

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What are Student Resources?

- Student resources are the ways of speaking, knowing, acting and valuing that students use to make sense of the world.
- Students develop these resources as they live their daily lives within their families and communities.

Conceptual Charades

Ground Rule: Hint giver may not speak or write in English

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Cellular Respiration

CHARADE!

Ecosystem

CHARADE!

DEBRIEF

What are all of the different resources people ended up using to communicate?

How was this experience similar and different than listening to a classroom discussion?

What are some ways you communicated that your group may not have picked up on?

What can we learn from this focus on trying to understand one another?

Build Your Interpretive Power

"Interpretive power refers to teachers' attunement to (a) students' diverse sense-making repertoires as intellectually generative in science, and (b) expansive pedagogical practices that encourage, make visible, and intentionally build on students' ideas, experiences, and perspectives on scientific phenomena" (page 1).

Rosebery, A., Warren, B., & Tucker-Raymond, E. (2015). Developing interpretive power in science teaching. Journal of Research in Science Teaching, 53(10), 1571-1600.

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Recognizing and Leveraging Student Resources

Read through the examples of student resources on the second page of this document and think about which resources you have already seen or experienced.

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Leveraging Student Resources in Science

Some additional examples of student resources are listed below along with implications for sense-making and for how teachers can respond to best leverage these resources.

Non-academic Language

Resources for Sensemaking

- Students can use metaphors and stories to explain scientific phenomena.
- Students use their everyday language and experiences to make sense of scientific phenomena

Planning for Equitable Science Discourse

Reflection

When thinking about planning for a sensemaking discussion, what are some things that we might think about?

The resources for planning discussions are designed to complement and be used in conjunction with the Planning Guide for Science Instruction. Keep some of these questions in mind as we engage with the materials and the other tools designed to guide discussion planning.

Planning Guide for Science Instruction

Time Estimate: 60 minutes

crementally develop an understanding of the anchoring phenomenon and science concepts?

tate sequences of lessons to determine where incremental sense-making occurs in the unit of study, to make

t meet the intent of the standards and the needs of all students.

urre… nit of study	Annotation Discussion Questions
rmance expecta…(s).	What Science and Engineering Practice(s) will students use?
	Where are … conceptual checkpoints for the Disciplinary Core Idea(s)?
	How will students apply the C… …ting Concept(s)?
Identify competing ideas that students may have about phenomena.	How will you leverage these ideas during student sense-making and argumentation?
Identify instructional routines you'll use throughout the unit of study (e.g. Science Instructional Model)	What strategies, routines, and discussion protocols will you use for each lesson set?
	What tools and resources will you use to plan facilitation?
Determine how student understanding will be assessed after the lessons set.	…
	Note key understandings you will look for or listen for in each task.
	Identify places students may have competing ideas. What strategies will you use to support student sense-making?

From LDOE Planning Guide for Science Instruction

The unit we will explore is the 6th grade unit, Cells and Systems, which centers around the question “How do living things heal?” Before we dive into the unit, what are some ideas that you think students might bring to a unit about healing?

Learning Plan Snapshot

Lesson 1 • Learning Plan Snapshot

Part	Duration	Summary	Slide	Materials
1	10 min	**NAVIGATION** Share about experiences when students were moving their bodies and times when they were unable to.	A-B	
2	15 min	**EXPLORE AN INTERESTING PHENOMENON** Introduce a similar phenomenon to notice and wonder about--a middle school student injured in PE and his journey to recovery.	C-F	*Emergency Room Report*, *Post-Operation Report*, *Recovery Reports*, chart paper, marker
3	10 min	**RECORD EVIDENCE FOR HEALING** Co-construct a definition of what it means to heal, and identify events in the injured foot's healing process.	G-H	*Recovery Reports*, *Evidence for Healing*, sticky note, marker, tape, Word Wall poster, chart paper
4	10 min	**CREATE A TIMELINE FOR HEALING** Facilitate a Building Understandings Discussion to organize our ideas about important events in the healing process that provide evidence that the foot is healing.	I	Healing Timeline poster, markers, sticky notes

End of day 1

Science Discussion Planning Tool

Louisiana STUDENT STANDARDS SCIENCE

Science:
Educator Resource

Science Discussion Planning Tool

This tool is designed to assist teachers with planning for and reflecting upon sensemaking discussions in the science classroom. It can be used in conjunction with the Planning Guide for Science Instruction and Science Talk Moves or other curriculum specific discussion tools to annotate high quality science curriculum for teachers who wish to take a deeper dive into strategic planning for productive discourse.

BEFORE THE DISCUSSION

Analyzing the lesson in the teacher guide where the sensemaking discussion occurs:

- What is the question students are trying to answer through this discussion?
- What is the intended outcome of the discussion? (ex. coming to consensus on something we just experienced? Figuring out improvements to our model? Designing an investigation? Getting students to realize they have new questions?)

Examine the linked document. We will be utilizing this resource to assist with planning a discussion in the example unit.

Lesson 1 Teacher Guide

We will be examining pages 7-15 in the teacher Edition

Lesson 1: What happened in the student's foot so they could walk again?

Previous Lesson *There is no previous lesson.*

This Lesson

Anchoring Phenomenon

4 days

We share experiences of moving our bodies and also times when we were unable to. We read doctor's notes about an injured patient and see images of his foot injury and the healing process. We create a timeline of important events that show evidence of healing. We develop models to explain how parts of the foot work together to allow the patient to walk. We brainstorm related phenomena of other times we have seen healing in humans and other living things. We develop questions for our Driving Question Board (DQB) and ideas for possible investigations to answer these questions.

Next Lesson *We will investigate how the parts of a chicken wing work together when moving. We will map the parts of the chicken wing to the parts of the human foot to compare how they function together. We will revise the investigation to figure out how the wing's function is affected due to an injury.*

Annotate pgs. 13 & 14 in the Teacher Edition, the discussion and lesson components leading to the discussion with these questions in mind. Reference "Leveraging Student Resources in Science" and "Talk Moves" as needed.

BEFORE THE DISCUSSION

Analyzing the lesson in the teacher guide where the sensemaking discussion occurs:

- What is the question students are trying to answer through this discussion?
- What is the intended outcome of the discussion? (ex. coming to consensus on something we just experienced? Figuring out improvements to our model? Designing an investigation? Getting students to realize they have new questions?)
- What are the key elements of the model or explanation you want the students to grapple with? (It may be helpful to create an explanatory model for this phenomenon for yourself or to annotate a sample model.)
- What other ideas might students have? What questions might they ask? What connections might they make?

Considering talk moves and strategies to use when leading the discussion:

- What will you say to launch the discussion?
- What are some things you will say to encourage your students to work with one another's ideas?
- If students seem to think they have explained the phenomenon but you know they need to go deeper, what kinds of questions could you ask to help students see the need to extend or revise their explanations?
- What will you say to help close the discussion to synthesize what it is you all agree on and/or what new questions you have?

Session Goals

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- Plan for leveraging student resources in sensemaking discourse.

Consider the goals above and reflect on your next steps.

Resources for Further Exploration

- **Planning Resources:**
  - Planning Guide for Science Instruction
  - Leveraging Student Resources in Science
  - Science Discussion Planning Tool
  - Science Talk Moves
- **Diving More Deeply:**
  - Helping Students Make Sense of the World Using the Next Generation Science and Engineering Practices Chapter 3 - Bang, Brown, Calabrese Barton, Rosebery & Warren (2017)
  - STEM Teaching Tool Practice Brief 47 “How can I promote equitable sensemaking by setting expectations for multiple perspectives?”