Identifying and Addressing Unfinished Learning in Science

This resource provides action steps for addressing unfinished learning due to COVID-19 and/or prior disruptions in science instruction. It reflects a prioritization of current grade-level content as well as supports for identifying and addressing key ideas that support student learning. The document is meant to support teachers in two objectives: 1) planning and preparing for grade-level instruction and 2) identifying and addressing unfinished learning in service of Tier 1 Instruction. Action steps, guiding questions, and a description of the outlined action are provided for each objective.

Plan and Prepare for Grade Level Instruction

Action Steps	Description
Identify standards addressed in current grade-level specific units. *What do students need to learn?*	■ Use state standard documents to identify grade-level standards. ■ Use **NGSS DCI Progression Matrix** to identify key science ideas students will learn.
Evaluate curricular materials for key components of science instruction. *How do students need to engage with the content?*	■ Drive instructional experiences through explaining and figuring out phenomena (a puzzling event). Identify what students are figuring out and ensure making sense of that phenomena guides all learning tasks. ■ Use learning activities that engage students in grade-level appropriate indicators of the science and engineering practices and the crosscutting concepts: o What are students doing to engage with the content to develop new science ideas? o Through what lens are students considering the science? ■ Review the specific guidance from high-quality curriculum materials for addressing unfinished learning, if available.

Equity Considerations

Access to grade-level content is a key component to ensuring all students have the opportunity to engage with content in meaningful and coherent ways. A reality of limited instructional time in science—especially in elementary schools—has tangible impacts on student outcomes and disproportionately impacts students of color, students in poverty, students with disabilities, and students learning English. Science standards provide expectations not only for the content being learned, but for the ways students actively engage with the content and the way they are asked to think about the content. Therefore, ensuring that grade-level content is prioritized will serve to eliminate opportunity gaps for historically underserved students due to oversimplification of content, lack of productive struggle, and lack of access to substantive science instruction.

Identify and Address Unfinished Learning Through Tier 1 Instruction

Action Steps	Description
Elicit student ideas *How do we find out what knowledge students bring to the classroom?*	■ Develop rich tasks to introduce a puzzling event (phenomena) that are accessible and can reveal consequential ideas about content. *For example: Video of grocery store aisle destruction during an earthquake* ■ Provide students with the opportunity to make observations, ask questions, and provide causal hypotheses about the event. *For example: What do you see going on here? What did you notice when ____ happened? How do you think this happens? What do you think causes this?*
Provide learning tasks to support changes in student thinking *What learning experiences*	■ Use the **NGSS DCI Progression Matrix** and K–12 Science Framework to identify key ideas students need to understand in order to successfully explain the target phenomena. ■ Consider ideas elicited and identify gaps in

Action Steps	Description
can help students fill recognized gaps in understanding?	knowledge that need to be addressed. ■ Ensure that students have the opportunity to develop new ideas that address identified gaps within the Tier 1 instructional plan. This includes: ○ Introducing ideas to reason with ○ Engaging with data or observations ○ Using knowledge to revise models or explanations
Utilize embedded formative assessment *What do we keep track of changes in student thinking?*	■ Plan opportunities within learning tasks to make student thinking visible throughout. ○ Utilize student models, explanations, and arguments to assess current student thinking. ■ Structure opportunities for consensus building within the class and physically track newly learned science ideas as they are discovered. ○ Utilize strategies such as evidence anchor charts, building class consensus models, and class discussion (e.g. Scientists' Circles) to track changes in student thinking.

Equity Considerations

Choose phenomena that are local, relevant to students, and value their community connections. In a remote learning environment, it is even more vital to leverage the home as a place where the world can be observed and questioned.

- Examples:
  - Students who live in areas prone to hurricanes might be interested in diving into local weather reports and asking "*Why are more hurricanes predicted this year?*" to explore weather patterns.
  - Younger students can make observations in their kitchens and ask "*Why do some things stick to the refrigerator?*" to explore magnetism.
  - Time outside can be leveraged to have students consider "*Why do some people get sunburned more easily than others?*" to explore electromagnetic radiation and variation in traits.
- Resources:
  - **Qualities of a Good Anchor Phenomenon for a Coherent Sequence of Science Lessons** by William R. Penuel and Philip Bell
  - **Focusing Science and Engineering Learning on Justice-Centered Phenomena across PK-12** by Deb Morrison, Philip Bell, & Abby Phinehart

Productive science discourse positively impacts the achievement of all students; however, it is key to note that discourse supports more equitable experiences of students who have historically not been represented within science education and whose voices have been devalued in classrooms. In planning for eliciting student ideas,

- Consider who has the opportunity to voice ideas in the classroom.
- Structure activities that allow all students to independently express ideas (e.g. Stop and Jot, Notice and Wonder chart) and have systematic ways to highlight, share, and post all ideas. Class thinking should be tracked through consensus building activities such as scientist's circle, group consensus model, or driving question boards.