1. Lesson Plan Example (Alex) - Essential Element

Activity/Lesson Title: Conservation of Matter

EE.5.PS1-2: Measure and compare weights of substances before and after heating, cooling, or mixing substances to show that weight of matter is conserved.

Teacher: Sam **Grade Level:** 5

Professional Development in SCIENCE EDUCATION for SPECIAL EDUCATORS

2. Science and Engineering Practice

Using Mathematics & Computational Thinking – Measure and compare quantities such as weight to address science and engineering questions and problems

3. Disciplinary Core Idea

PS1.A Structure and Properties of Matter.

- The amount of matter is conserved when it changes form, even in transitions when it seems to vanish.
- No matter what the reaction or change in properties that occurs, the total weight of the substances does not change. (Mass and weight are not distinguished at this grade level)

4. Crosscutting Concept:

Include also connections to DLM ELA or Mathematics EEs

- Scale, Proportion, and Quantity – Standard units are used to measure and describe physical quantities such as weight.
- EE.W.5.8 Gather and sort relevant information on a topic from print or digital sources into given categories.
- EE.5.MD.A.1.b Use standard units to measure weight and length.

5. Linkage Level Descriptors

- Initial: Recognize the change in state from liquid to solid or from solid to liquid of the same material.
- Precursor: Compare the weight of an object before and after it changes from a liquid to a solid and from a solid to a liquid.

[Note: Target Linkage Level Descriptor is the Essential Element listed in #1]

6. Student UDL Accessibility Supports

Include everyday supports used during instruction

- Limited use of hands, in a wheelchair, and communicates using a head switch and an assistive technology device that presents 8 choices per page; prefers tactile objects for representations.

7. Student Prior Experiences, Prior Knowledge

- Compared and measured liquid quantities successfully; completed lessons about hot, cold, freezing, and melting.
- Alex responds well to science concepts presented through stories; likes using science equipment during experiments.
- This lesson will be designed for the Target Level for Alex.

8. Phenomenon to Explore

Question to investigate or design problem to solve

- What happens to the weight of substances when they seem to vanish (e.g., dissolve or evaporate)?
- What happens to the weight of substances when physical properties change (e.g., melting or freezing)?

9. Possible Alternative Conceptions

Derived from items listed in #2, 3, 4

- Substances that cannot be seen do not have weight (e.g., when substances dissolve or evaporate).
- Weight changes when physical properties change (e.g., when substances melt or freeze).

10. UDL Barriers and Possible Solutions

Considering this lesson's specific science content and phenomenon

- Alternate weighing tools (i.e., talking scales) may be needed for students with visual impairments.
- Students with mobility issues that involve the use of their hands may need assistance weighing objects.

11. Engage

11a. Think:

- How to access student prior learning?
- How to use the CCC to connect everyday language with scientific language of the phenomenon?
- How to support student participation by scaffolding the SEP?

11b. Teacher will:

- Tell students a short story about making lemonade.
- Ask students what they think will happen to the weight of the sugar when it dissolves in the water.
- Ask students what questions they have about mixing sugar and water.
- To assist students who may need communication support, prepare possible questions that reflect common misconceptions and ask students to choose the question they would like to investigate.

Possible questions include:

"What happens to the weight of sugar when it dissolves in water?"

"How does the weight of the sugar water mixture compare to the weight of the sugar and water separately?"

"Does sugar become weightless when it dissolves in water?"

11c. Students will:

- Talk about the story and share experiences of drinking lemonade.
- Share ideas about what they think will happen to the sugar and water.

12. Explore

12a. Think

- What is invisible or inaccessible about the phenomenon and how can the Explore phase make it more visible?
- How can students collect data in a way that reveals patterns in data?
- How to stress careful observation and asking good questions vs. looking for only the "right answer"?

12b. Teacher will:

- Provide sugar, water, plastic containers, and a weight measuring device.
- Ask students how they can find out the answer to the question.
- Guide students to measuring the weight of the water and sugar separately and the weight of the mixture.
- Provide direct instruction as needed on how to determine the weight of the contents of a container, by either taring the scale with the empty container or subtracting the weight of the empty container from the weight of the full container.
- Provide direct instruction as needed on weight units or how to use the weight measuring device.
- Guide students to adding the weight of the water and the sugar to compare it to the weight of the mixture.

12c. Students will:

- Carry out the experiment.
- Use a calculator to add weights.
- Compare the weights and decide if they are the same, or if one is bigger than the other.
- Make observations and ask questions.

13. Explain

13a. Think

- How can students connect science topic, phenomena, data, and everyday experiences?
- How can students connect everyday language and scientific language?
- What reasoning helps students see or explain the invisible?

13b. Teacher will:

The students should have noticed that the weight of the mixture is the same as the weight of the sugar plus the weight of the water.

- If the weights were not the same, help them figure out why.

For example:

a. Was sugar or water spilled during mixing?
b. Were the container weights subtracted (or the scale tared) so that only the weights of the contents were examined?
c. Was any spilled material on the scale?

- Repeat the measurements if any procedural errors were noted.
- Guide students through questioning to the understanding that weight is a property of the sugar that does not change.

The weight of the sugar does not change when the sugar dissolves. We know that because the weight of the sugar added to the weight of the water to become the weight of the mixture. When a property stays the same, scientists say that it is conserved. Weight stays the same, or is conserved, when things are mixed. Weight is conserved, or stays the same, even when substances cannot be seen with our eyes, such as when the sugar dissolves in the water.

- Have students read a short informational text passage that describes this phenomenon.

13c. Students will:

- Explain findings using the Claim-Evidence-Reasoning (CER) Framework:
  - » I think **(claim)** *weight of sugar stays the same* .
  - » I think this because **(evidence 1)** *weight of lemonade mixture is the same as weight of sugar plus water* and **(evidence 2)** *I read about this in a science book* .
  - » The science finding that helps me explain this claim is **(reasoning)** *weights of the materials that I compared and saw that they were the same* .

14. Elaborate

14a. Think

- How can I enrich or extend student ideas?
- Are there related science concepts or processes that would support student learning?

14b. Teacher will:

- Monitor students to allow them to do as much of this second application independently as they possibly can.
- Ask how else they could tell that the sugar or salt did not disappear.

14c. Students will:

- Examine another example, such as putting salt in water.
- Explore/explain process for this different context.
- Explore tasting the water to see if it is salty or sweet.
- Respond to prompts to complete extended explanations such as:
  - » My findings helped me use evidence to support my claim because *I saw that the same thing happened with the salt mixture.*
  - » I got similar results with *a salt mixture experiment. Salt disappeared in the water but the weight of the salt mixture was the same as the salt and water weighed separately* **(additional exploration or similar phenomena)**.

15. Evaluate

15a. Think

- What information do I need to collect to inform my teaching throughout the lesson?
- What do I need to see or hear from my students that assures that they have learned the science content?

15b. Teacher will:

- Monitor, discuss and question student responses to questions during the lesson.

15c. Students will:

- Respond to questions posed by teacher.
- Complete projects and assessments.