

Towards Effective Science Teaching and Learning for Students With Significant Cognitive Disabilities



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Introductions

- Lindsay Ruhter
- Sarah Koebley
- Meagan Karvonen



Vignette

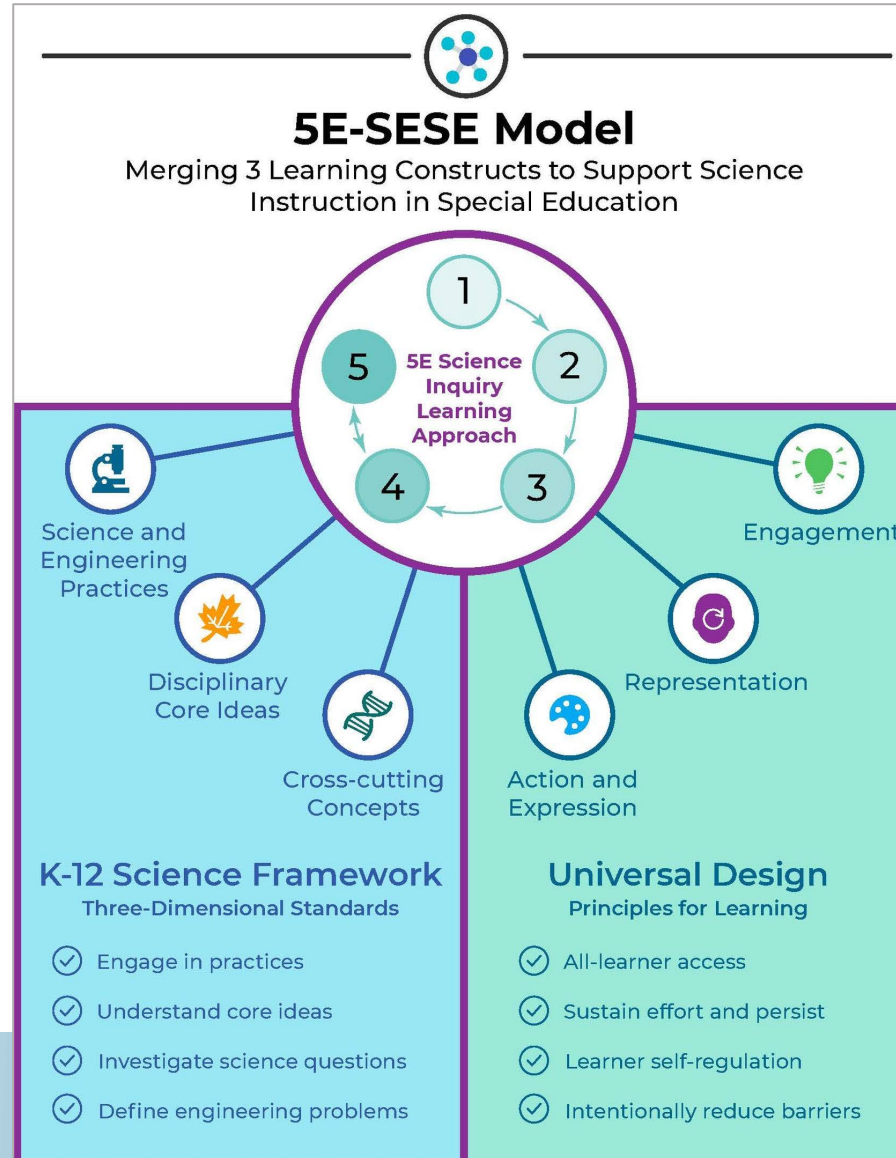
- *I am teaching photosynthesis to my students with extensive support needs. Is photosynthesis just food for plants? Do plants even need food the way that humans need food? How am I going to teach something this abstract to my students?*



Project Overview

- 5E Model Professional Development in Science Education for Special Educators (5E-SESE)
- incorporates three existing, highly successful learning approaches
 - multi-dimensional next-gen science standards,
 - the 5E model of instruction for inquiry-based learning,
 - Universal Design for Learning Principles for accessibility in learning approaches

5E-SESE Model



Improvements to 5E-SESE PD system

- Phase 1 Usability Study in Fall 2019
- Improved user experience (streamlined navigation, broke up large sections of text on screen, more interactive features)
- Improved lesson plan and embedded lesson plan completion within module

Improvements to Design

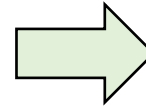
A tale of two lessons

Some teachers are talking about their plans for teaching 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."

Both teachers plan to represent the content tactually, visually, and/or orally to best match student needs. Additionally, both teachers plan for students to make responses and build products using options that best match students' communication systems (e.g., build posters using photographs of concepts and matched vocabulary; response options using pictures, photographs, symbols, or assistive technology as needed to make choices on a worksheet, describe concepts, identify weights, or make explanations; graphic organizers to make comparisons).

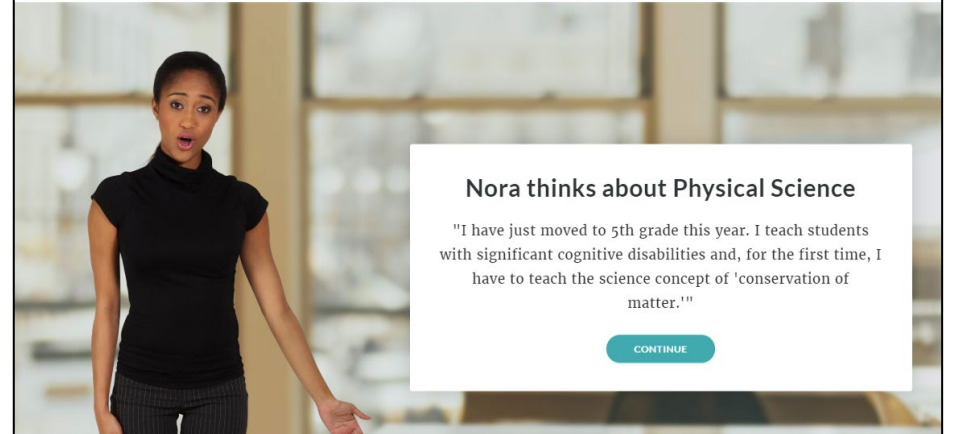


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Lesson 2 of 15

A Teacher's Questions



Nora thinks about Physical Science

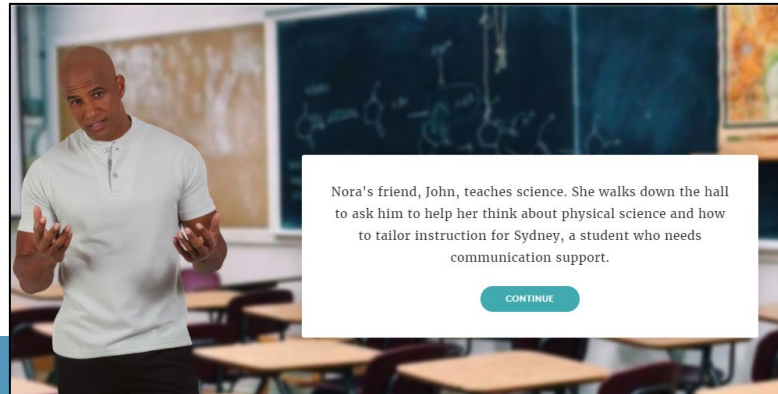
"I have just moved to 5th grade this year. I teach students with significant cognitive disabilities and, for the first time, I have to teach the science concept of 'conservation of matter.'"

CONTINUE

Liz's lesson



1. Liz asks students to describe the properties of a stick of butter. Liz melts one of the sticks of butter in the microwave and then asks students to describe the melted butter. Liz then asks students, "How do you think the weight of the solid butter compares to the weight of the liquid butter?" Liz records students' ideas and their reasons for these ideas.
2. Liz's students test their ideas. Students weigh the butter, melt the butter, and then weigh the melted butter. Students determine if the weight of the butter changed when it melted.
3. Liz asks students if their data supported their initial ideas. Liz helps the students reach the conclusion that the weight did not change, and then introduces the science concept of "conservation of weight." She helps students explain why the weight stayed the same using the ideas of conservation and a closed system.
4. Liz asks students the same question about the weight of ice and melted ice. The students make and test their predictions, and explain what happened using the new science concept.
5. Liz's students create a "before and after" poster that describes what they saw and explains what happened using the new science concept.



Nora's friend, John, teaches science. She walks down the hall to ask him to help her think about physical science and how to tailor instruction for Sydney, a student who needs communication support.

CONTINUE

Improvements to Interactivity

Introduction

Welcome to the 5E-SESE Physical Science Module:
5E and Physical Science: Guiding Learning Using the Concept of Conservation of Matter



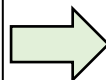
KEY QUESTIONS:

1. How does matter and weight change when substances are heated, cooled, or mixed together?
2. Why does pizza taste so good?
3. How do three-dimensional science standards, Universal Design for Learning, and DLM linkage levels assist in planning for high quality science instruction?
4. How can lesson planning transform complex scientific concepts into engaging learning experiences for students?

Click on the play button for a brief video on "The Chemistry of Pizza." As you view the video, consider the key questions for this module.




- Why is Pizza So Good?:
<https://www.acs.org/content/acs/en/pressroom/reactions/videos/2014/the-chemistry-of-pizza.html>



YOUTUBE

SIMPLE EXPLANATION OF THE LAW OF CONSERVATION OF MASS



SIMPLE EXPLANATION OF THE LAW OF CONSERVATION OF MASS

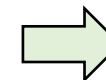
Science Kids show an easy to understand illustration of the Law of Conservation of Mass.

VIEW ON YOUTUBE >

Cookie Crumbles

Imagine you have a whole cookie. You break the cookie into tiny pieces and crumbs. You weigh all of the pieces and crumbs. How do you think the weight of the whole cookie compares to the weight of all the cookie crumbs?

- a. The whole cookie weighs more than all of the cookie crumbs.
- b. All of the cookie crumbs weigh more than the whole cookie.
- c. The whole cookie and all of the cookie crumbs weigh the same.



Imagine you have a whole cookie. You break the cookie into tiny pieces and crumbs. You weigh all of the pieces and crumbs. How do you think the weight of the whole cookie compares to the weight of all the cookie crumbs?



- The whole cookie weighs more than all of the cookie crumbs.
- All of the cookie crumbs weigh more than the whole cookie.
- The whole cookie and all of the cookie crumbs weigh the same.

SUBMIT

Improvements to Lesson Plan


1. SE-SESE Lesson Plan - Essential Element: <i>Teacher:</i> _____ <i>Grade Level:</i> _____		
2. Science and Engineering Practice:	5. Linkage Level Descriptors:	
3. Disciplinary Core Idea:	6. Student Accessibility Supports:	
4. Crosscutting Concept:	7. Student Prior Experiences, Prior Knowledge	
8. Phenomenon to Explore: <small>Question to investigate or design problem to solve</small>	9. Possible Misconceptions:	10. UDL Barriers and Possible Solutions:

Identifying Student Learning Needs

Author Hidden

Your Students

Students bring with them a variety of experiences, strengths, challenges, knowledge, interests, and characteristics to every learning situation. This lesson highlights tools, strategies, and supports for identifying and honing in on your students' specific learning profile.



Click on [this link](#) to open your saved **lesson plan**. Complete items #5 and #6 using the information presented above to summarize the linkage levels of EE.5.PS1-2, your students' specific accessibility support needs, and their prior experiences with this physical science content.

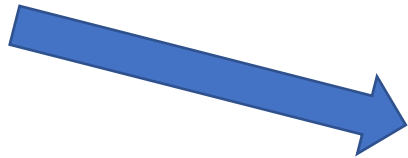
Implications for Equity

- UDL principles embedded within inquiry-based models of science teaching removes barriers for all learners, including those learners with significant cognitive disabilities who have historically been denied rigorous opportunities to learn science.

Time to Explore the 5E-SESE PD System!

- Please refer to the 5E-SESE handout to access the link to explore a sample 5E-SESE PD module.

May I review a self-directed module created for 5E-SESE?



Yes, you can! We created an example module for you to explore as a part of CEC L.I.V.E. to see how 5E-SESE incorporates both inquiry-based teaching and UDL to teach science to students with significant cognitive disabilities. Please use <https://360.articulate.com/review/content/544d4013-832d-4415-8610-121b94e5d186/review> to access the module. We would love to get your feedback!

- We'd love to hear your feedback! Feel free to use the Chat and Q&A features. Join us on Thursday, March 11th at 4:00 ET.

Thank You!

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