Achieve

SCIENCE TASK ANNOTATION

ANNOTATION KEY

EQUITY
Supporting a wide range of diverse students.

SCENARIOS
Information provided to elicit performances.

SEPs
Opportunities to demonstrate science and engineering practices.

DCIs
Opportunities to demonstrate understanding of disciplinary core ideas.

CCCs
Opportunities to demonstrate understanding of crosscutting concepts.

SENSE-MAKING
Opportunities for reasoning about phenomena and problems.

ASSESSMENT PURPOSE
Highlights how the task features connect to intended assessment use.

Next Generation Science Assessment

JOHN'S EXPERIMENT: HEATING SAND

John wishes to answer the following question:

"Does heating two different types of sands (black and white sand) equally cause the same change in temperature to occur?"

He created the following hypothesis.

Hypothesis: Black sand and white sand are different substances. If they are heated equally, the temperature changes for the black and white sand will be different.

This question drives the task. It is grounded in an implicit observation of a phenomenon: that not all sand is exactly the same, and the differences between black and white sand might be the result of different substances comprising each type of sand. While the scenario is somewhat specific, it is not made clear to students why this is a worthwhile investigation, limiting how well this task will engage all students.

SCENARIOS EQUITY

The concept of different kinds of sand might not be accessible to all students without further support, such as a real picture of black and white sand to illustrate the differences.

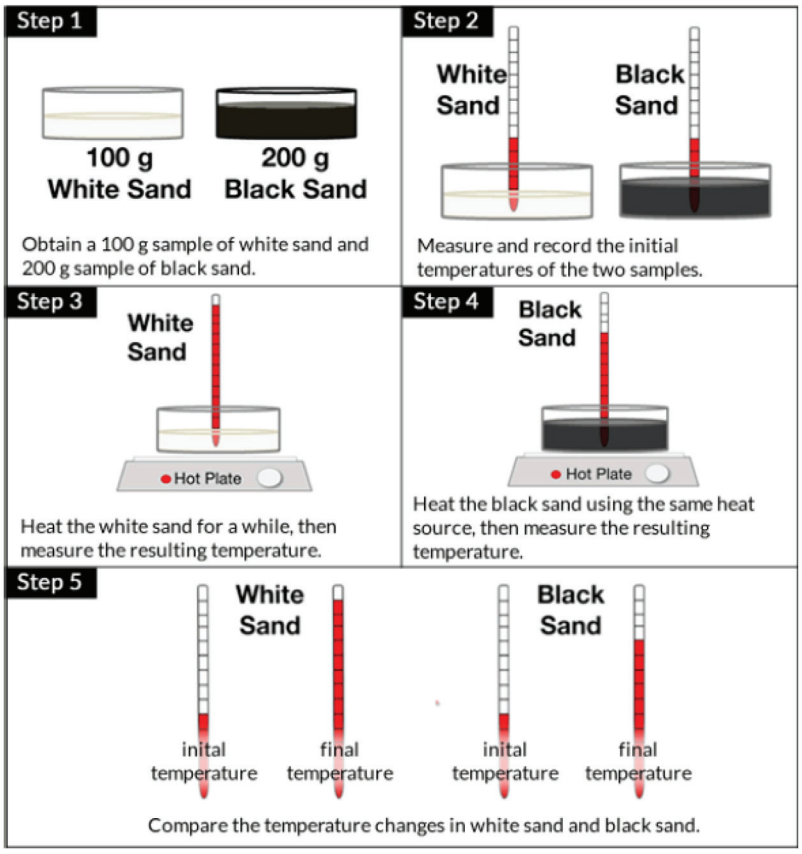
SCENARIOS EQUITY

Question 1: Do you agree or disagree with John's hypothesis? Provide a reason to support your decision.

Successfully answering this question requires that students use their understanding that different substances are made up of different particles, and that those differences can influence changes in temperature when energy is added. This most closely connects to part of the 6-8 PS3.A DCI element "the temperature of a system is proportional to the average kinetic energy and potential energy per atom or molecule...the details of this relationship depend on the type of atom or molecule and the interactions among the atom in the material...".

DCIs

JOHN'S EXPERIMENT: HEATING SAND (CONTINUED)



Question 2: John designed an experiment to determine if the same amount of energy transferred causes the same temperature change in different types of sands (above). However, John's teacher found **two** mistakes with John's procedure. Be sure your model includes pictures and a key.

Look at the procedure to the left. Describe **two** ways you would change John's procedure and explain why those changes are needed.

In this task, identifying the errors requires students to bring an understanding of SEP #3 (Planning and Carrying Out Investigations) to the table, and explaining why the changes are needed require that students connect their understanding of how differences in mass and heating time to SEP #3 to describe how these errors can impact the final observed temperature of the samples. This is an example of students using DCIs and SEPs together in service of sense-making—here, to evaluate experimental design.

Specifically, students are using part of the 6-8 DCI identified in Q1 with part of the SEP #3 element "...evaluate and/or revise the experimental design..." It should be noted that this example lies at the cusp of the 3-5 and 6-8 expectations—while the investigation involves multiple variable that need to be controlled to support the goals of the experiment (6-8), it is a very simple experiment with no mention of number of trials or the need for precise procedures (closer to 3-5).

This question requires that students understand that mass and heating time can influence the final temperature of the sample—while this generally relates to the idea of "cause and effect", it is explicitly part of the DCI and SEP. The 3-5 Cause and Effect element "Cause and effect relationships are...used to explain change" is superficially and implicitly assessed.

SEPs DCIs CCCs SENSE-MAKING

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