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Heating and Cooling [kindergarten]

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UNDERSTANDING BY DESIGN

Unit Cover Page

Unit Title: Heating and Cooling

Grade Level: K

Subject/Topic Area(s): Science

Designed By: Kyla McGlynn

Time Frame: 10 days

School District: East Central ISD

School: Highland Forest Elementary

School Address and Phone: 3736 SE Military Drive, San Antonio, TX 78223 (210) 333-7385

Brief Summary of Unit (Including curricular context and unit goals):

Students will practice making, recording and discussing their observations of materials that have changed through heating and cooling. Students will be able to identify if a material has been changed by adding or removing heat, and will accurately record the change through drawings and labels.

Stage 1 – Desired Results

(2) Scientific investigation and reasoning. The student develops abilities to ask questions and seek answers in classroom and outdoor investigations. The student is expected to:
(D) record and organize data and observations using pictures, numbers, and words; and
(E) communicate observations with others about simple descriptive investigations.

(5) Matter and energy. The student knows that objects have properties and patterns. The student is expected to:
(B) observe, record, and discuss how materials can be changed by heating or cooling.

Transfer

Students will independently use their learning to…

-investigate how properties of materials can be changed based on the condition of their surroundings

-carefully observe things and events to discover patterns in nature

Meaning

Understandings	Essential Questions
Students will understand that…. -a material can change when heat is added or taken away -scientists make careful observations	-What happens to a material when it is heated? -What happens to a material when it is cooled? -How do you know if a material has changed? -Why do scientists make observations?

Acquisition

Knowledge	Skills
Students will know… -materials can change when heat is added or taken away -how to make an observation -changes can be studied	*Students will be able to…* -observe and identify if a material has changed due to heating or cooling - record an observation and discuss changes of a material due to heating or cooling

Stage 2 – Evidence

CODE (M or T)	**Evaluative Criteria**	

	(for rubric)	
	-drawing and labeling properties of chocolate bar in three different situations -telling partner two predictions -meaningful contribution to discussion	Performance Task(s) *Students will demonstrate meaning-making and transfer by…* Students observe and record properties of chocolate bar using pictures and words. -Students tell partners what they predict will happen to chocolate bar when it is left out in the sun for the afternoon. Students check and record properties of chocolate bar in the sun using pictures and words. -Students tell partners what they predict will happen to chocolate bar when it stays in the freezer overnight. Students check and record properties of chocolate bar after freezer. -In small groups, students discuss how the chocolate bar changed in the sun and the freezer. --- Other Evidence (e.g., formative) -Thumbs up/down -Partner talk -Ticket out the door -Hot and cold game

Stage 3 – Learning Plan

CODE (A, M, T)	Pre-Assessment *How will you check students' prior knowledge, skill levels, and potential misconceptions?* Observe and record statements in science talk about heating and cooling.	
A, M	**Learning Activities** **Day 1: Science Talk, What We Know About Heating and Cooling** Students engage in science talk, discussing the following questions: - How can you make something warmer? -How can you make something colder? Record students' answers, noting any misconceptions. Show students a bowl of water; explain that it has been sitting out all day. Ask if they think it is warm or cold. Allow students to test with finger. Record picture and short description of water temperature on chart paper while students record in science journal. Add ice to the water and allow students to predict if it will be cold, warm or the same. Allow them to test water with finger to determine temperature. Record picture and short description of	Progress Monitoring (e.g., formative data) Observation

	water temperature on chart paper while students record in science journal. If weather allows, put bowl of water outside to be warmed by sun. Students predict if the water will be warmer or cooler than the water with the ice cubes. Students test water. Record picture and short description of water temperature on chart paper while students record in science journal. Discuss and compare all pictures. Affirm and celebrate that students are scientists. Tell them that scientists are people who observe and write down things that they notice about the world. Tell them that we'll be practicing our best science skills by observing (looking closely) at the different materials for the next two weeks. **Day 2: The Power of Observation**	Science journal
M	Greet students as scientists and tell them that they will have an opportunity to practice observation skills. Remind them that observing means looking closely. Have them copy signal for observe (circles around eyes, like glasses). -Place 3 objects on overhead/elmo and allow students to look closely at objects. Allow a few students to share what they noticed. -Hiding objects with a manila folder, add another object, then reveal to students. Ask for thumbs up or thumbs down if there has been a change. Allow a few students to share what they noticed. -Add another object, change positioning, spacing of objects. Ask for thumbs up/down if there has been a change. Allow a few students to share the changes they observed. -Pretend to change order of object, but leave same as before. Ask for thumbs up/down if there has been a change. Allow a few students to share what they observed.	Thumbs up/thumbs down.
T	-Ask and discuss: Why is it important to observe an object? **Day 3: Penny Observation** Greet students as scientists and tell them that they will be playing the penny memory game to further practice their observation skills. Scientists use careful observation to gather information about an object. First, allow students draw a penny from memory in their science journals. Encourage students to do their best job, even if they don't remember much.	Observation

M	Second, allow students to look/observe penny for one minute (use timer), then hide penny. Students draw what they remember from both sides of the penny. Discuss how this drawing is different from their first drawings. Third, allow students to observe the penny carefully with a hand lenses (remind students how to use hand lenses) and draw what they see on both sides. Using a student's drawings as an example, discuss as a class what they notice about the last drawing. Where there details missed before? Why is it important for scientists to record their observations?	Science journal Discussion/observation
A, M	**Day 4: Heat Sources** Greet students as scientists and tell them that they will be using their observation skills (signal) to understand more about heat. Read *All About Heat* by Lisa Trumbauer (Rookie Read About Science). Ask: Where does heat come from? Chart some sources of heat. Students record heat sources in their journals. Students experiment with how they feel standing in the sun verses standing in shade. Further discuss sun as source of heat. Ask students if any of their parents hang wet clothes outside to dry. Tell students we will hang one wet shirt inside our classroom, and one wet shirt outside in the sun. Students feel shirts and record properties of both in science journal. Remind students to observe carefully (signal). At end of the day, students observe both shirts and record their properties. In a class discussion, ask students to compare the shirts. Ask: Why is one shirt drier? What happened to the water on it?	Science journal Discussion/observation
A M,T	**Day 5: Ice Cube Race** Greet students as scientists and tell them that we are going to figure out how to create heat in the classroom. In pairs, students race to melt two ice cubes in plastic baggie in the shortest amount of time. Record the time that each pair finishes. Compare melted cubes with a control (bag of two ice cubes untouched). Discuss what strategies students used to melt ice cubes. Identify how this produced heat to melt cubes. (So students understand how their bodies produce heat, have students put their hands together and start rubbing them together really fast to make them warm). Students record a strategy to melt the ice cubes using pictures and words in science journal. Ticket out the door: How can you produce heat with your body? or What happens to ice when you add heat to it?	Science Journal Ticket out the door
A	**Day 6: Cool Juice** Greet students as scientists, and tell they that we are going to	

M	figure out how to cool materials today. Read *Hot and Cold* by Alan Fowler. Discuss: What does cooling mean? What happens when we cool something? Identify cooling as taking heat away from a material. Students observe juice in a small cup and record observations in science journal (tastes, feels, what it looks like). Remind students it is important to record observations so they can know if the material changes or not. Students tell partners what they think will happen when the juice is put in the freezer.	Science journal Partner talk Science journal Partner talk
M	**Day 7: Heating and Cooling Exploration centers** Greet students as scientists and tell them that we are going to carefully observe (signal) materials to see if they have been heated or cooled. Students observe and record state of juice after it comes out of freezer. Students share and describe observations with partners. Allow students to explore materials in small groups at each table. 1. Bowl of room temperature grapes, bowl of frozen grapes 2. Bowl of ice cream, bowl of melted ice cream 3. Bowl of popcorn kernels, bowl of popped popcorn 4. Bowl of carrots, bowl of cooked carrots	Observation
M	Observe students and informally ask what they notice about properties of each food. Ask students to compare the properties of the food at each table, then determine if the second food was heated or cooled.	Observation
T	**Day 8: Play Hot and Cold Game.** Greet students as scientists, and tell them that we will play a game to see if they can use their observation skills to notice if a material has been changed by heat, or if it has been cooled. In Hot and Cold PowerPoint, students will see pictures of a material before it was heated or cooled, then after it was heated or cooled. Student holds up red card if material was changed by heat, blue card if the material was cooled. Facilitate discussion about how students know if second material was heated or cooled.	Performance Task
M,T	Conduct science talk: Are there more ways to heat something or more ways to cool something?	

M,T	**Day 9: Performance task.** Tell students that they will use their best observation skills to notice and record how chocolate changes when it is heated and cooled. Students observe and record properties of chocolate bar using pictures and words. -Students tell partners what they predict will happen to chocolate bar (in plastic baggie) when it is left out in the sun for the afternoon. Students check and record properties of chocolate bar in the sun using pictures and words. -Students tell partners what they predict will happen to chocolate bar when it stays in the freezer overnight.	
M,T	**Day 10: Finish performance task.** -Students check and record properties of chocolate bar after freezer. -In small groups, students discuss how the chocolate bar changed in the sun and the freezer.	

Materials List

-eight bowls (use one on first day, eight on seventh day)

-ice

-variety of small objects for observation game (second day)

-penny for each student (third day)

-two t-shirts (fourth day)

- plastic bag with two ice cubes for each pair of students (fifth day)

-small cups half filled with juice for each student (sixth day)

-grapes, half frozen, half room temp (seventh day)

-popcorn kernels, popped popcorn (seventh day)

-melted ice cream, frozen ice cream (seventh day)

-raw carrots, cooked carrots (seventh day)

-sandwich plastic bags with 1/3 of chocolate bar for each student (performance indicator)

Heating and Cooling Performance Task

Name: _____

		

Heating and Cooling Performance Task Rubric

	Exceeding	Meeting	Approaching
recording	Student draws and labels three or more properties	Student draws and labels/dictates one or two properties	Students draws observation and fails to label/dictate a property OR Student inaccurately draws observations OR Student omits one or more observation drawings
predicting	Student makes two detailed predictions and explains reasoning behind prediction	Student makes two predictions	Student makes only one prediction or no reasonable predictions
discussing	Student contributes two meaningful observations to discussion	Student contributes one meaningful observation to discussion	Student contributes inaccurate or unrelated observation to discussion OR Student does not contribute to discussion