The Water Cycle
Lesson 1b: From Liquid to Gas

Grade 5	**Length of lesson:** 45 minutes	**Placement of lesson in unit:** 1b of 6 two-part lessons on the water cycle
Unit central questions: How does water change in the world around us? Does Earth ever run out of water?		**Lesson focus question:** Does liquid water ever disappear? Explain your thinking.
Main learning goal: When liquid water is heated, it changes to a gas state (water vapor) that isn't visible. This process is called *evaporation*.		
Science content storyline: Water sometimes seems to disappear, such as when it boils away from inside a beaker. But the water still exists and is changing state from a liquid to a gas called *water vapor* that we can't see. The process of water changing from a liquid to a gas is called *evaporation*. Evaporation happens faster if heat is added.		
Ideal student response to the focus question: We can't make water disappear, but we can make liquid water seem to disappear when it becomes a gas. The gas, called *water vapor*, is invisible, so water seems to disappear, but it's still in the air. The process is called *evaporation*. Evaporation happens faster when we heat water.		

Preparation

Materials Needed • Science notebooks • Beaker from lesson 1a, with water-level starting and ending points marked • Chart from lesson 1a that shows a claim about why the water level went down in the beaker of boiling water and gives evidence to support that claim. (Ideally, the claim was that some of the water went into the air. If your students didn't come up with this idea, you'll have a different claim on your chart.) • Chart paper for the evaporation diagram (to be saved and used again in lesson 2), markers	**Ahead of Time** • Review the Water Cycle Content Background Document: sections 1.3 and 1.4. • Review Common Student Ideas about Matter, Molecules, and the Water Cycle and refer to it throughout this unit. • Decide on options for shortening the lesson (such as talking rather than writing). • Review the PowerPoint slides and modify them as you wish. • **Follow-up to activity:** Do you want students working in pairs to write or talk about a scientific explanation for why the water level went down in the beaker? • **Synthesize/summarize today's lesson:** Do you want students to write or talk about what happens to the water in wet clothes that are hung on a clothesline to dry on a hot, sunny day?

Lesson 1b General Outline

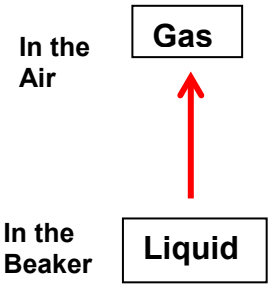
Time	Phase of Lesson	How the Science Content Storyline Develops
3 min	**Link to previous lesson:** The teacher and students review progress so far in developing a scientific explanation for why the water level went down in the beaker of boiling water.	• A good scientific explanation includes a claim that answers the question being investigated, evidence to support the claim, and logical reasoning using science idea and principles that explains why the evidence supports the claim.
1 min	**Lesson focus question:** The teacher introduces the focus question, *Does liquid water ever disappear? Explain your thinking.*	
3 min	**Setup for activity:** The class clarifies the claim and evidence they developed in the previous lesson for why the water level went down in the beaker of boiling water. The teacher prepares students to listen for science ideas that can help them add reasoning to their explanation.	• Science explanations include reasoning that uses science ideas to explain why the evidence supports the claim.
12 min	**Activity:** The teacher explains science ideas related to the boiling-water demonstration and interacts with students to construct a content representation of evaporation.	• When liquid water seems to disappear, it isn't really disappearing; it's changing state from a liquid to a gas called *water vapor*. The water vapor spreads out in the air, so we can't see it. The process of water changing from a liquid to a gas is called *evaporation*.
15 min	**Follow-up to activity:** Using the CER framework (claim, evidence, reasoning), students write (or talk about) a complete explanation for why the water level went down in the beaker.	• A scientific explanation provides a claim, evidence, and reasoning. A claim for why the water level went down in the beaker of boiling water is that some of the liquid water went into the air. Evidence to support this claim is that the water level went down, and bubbles at the top of the water in the beaker were popping into the air. Science ideas help strengthen this explanation. When heat is added to liquid water (as in the beaker), the water changes to a gas state called *water vapor*, which we can't see, and spreads out in the air around us.
10 min	**Synthesize/summarize today's lesson:** Students return to the focus question and write (or talk) about whether water disappears when clothes dry on a clothesline.	• We can make liquid water seem to disappear by heating it. When the Sun heats wet clothes, the liquid water in the clothes changes to a gas called *water vapor* that rises into the air. We can't see the gas, so it seems as if the liquid water disappears, but it's still in the air. This process is called *evaporation*.
1 min	**Link to next lesson:** The teacher links science ideas to the next lesson.	

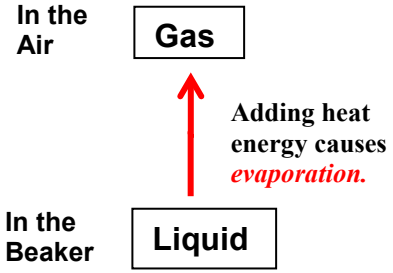
Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
3 min	**Link to Previous Lesson** **Synopsis:** The teacher and students review progress so far in developing a scientific explanation for why the water level went down in the beaker of boiling water. **Main science idea(s):** • A good scientific explanation includes a claim that answers the question being investigated, evidence to support the claim, and logical reasoning using ideas and principles that explain why the evidence supports the claim.		**Show slides 1 and 2.** **NOTE TO TEACHER**: *Show the beaker of water from the previous lesson. Hold it up so students can see the water-level markings at the beginning of the demonstration and after the water boiled.* Our unit central questions are *How does water change in the world around us? Does Earth ever run out of water?* Last time, we observed some changes that happened in this beaker when the water boiled. What observation did we make that we're trying to explain? To explain that observation scientifically, what do we need to do? **Show slide 3.**	Water went into the air. The water level went down after the water boiled. We need to make a claim, give evidence, and give reasoning.	Is that something we actually observed? *[Students should respond no.]* Yes, we saw or observed that the water level in the beaker went down after the water boiled.

			Do we have a complete scientific explanation for why the water level went down in the beaker? **Show slide 4.** Let's summarize these ideas about building a scientific explanation. Look at this slide. We have a claim and evidence, but we need to add reasoning that uses science ideas, right?	We have a claim and some evidence, but we need to add our reasoning. Science ideas.	What do we need to include in our reasoning?
1 min	**Lesson Focus Question** **Synopsis:** The teacher introduces the focus question, *Does liquid water ever disappear? Explain your thinking.*	Set the purpose with a focus question or goal statement.	**Show slide 5.** Today we're going to complete our scientific explanation about why the water level went down in the beaker of boiling water. This will help us answer our focus question, *Does liquid water ever disappear? Explain your thinking.*		
3 min	**Setup for Activity** **Synopsis**: The class clarifies the claim and evidence they developed in the previous lesson for why the water level went down in the beaker of boiling water. The teacher prepares students to listen for science ideas that can help them add reasoning to their	Make explicit links between science ideas and activities **before** the activity.	**NOTE TO TEACHER:** *Show the chart from lesson 1a where the class came up with evidence to support the claim that some of the water went into the air.* Let's look at our scientific explanation so far. What are our claim and evidence? **Turn and Talk (1 min):** Discuss this question with a partner.		

	explanation. **Main science idea(s):** • Science explanations include reasoning that uses science ideas to explain why the evidence supports the claim.		**Whole-class share-out:** Let's share out. What are our claim and evidence? Listen carefully to see if you agree, disagree, have something to add, or want to ask a question. Now I'm going to tell you about some science ideas that will help you develop good scientific reasoning to add to our explanation.	Our claim is that some of the water went into the air. And our evidence is that the water level went down. We agree, but we also thought the bubbles popping at the top of the water were evidence that the water was going into the air. We agree, but we have a question: Why can't we see the water going into the air?	Does anyone agree, disagree, or want to add on? Do you have any questions?
12 min	**Activity** **Synopsis**: The teacher explains science ideas related to the boiling-water demonstration and interacts with students to construct a content representation of evaporation. **Main science idea(s):** • When liquid water seems to disappear, it	Make explicit links between science ideas and activities **during** the activity.	Let's talk about how scientists think about what is happening with the water in the beaker. Did the water really disappear? **NOTE TO TEACHER:** *You're now going to explain to students how scientists think about this phenomenon. To highlight the science ideas, record key points so that all students can see them, or have students summarize these ideas so you can refer back to them later.*		

	isn't really disappearing; it's changing state from a liquid to a gas called *water vapor*. The water vapor spreads out in the air, so we can't see it. The process of water changing from a liquid to a gas is called *evaporation*.	Select content representations and models matched to the learning goal and engage students in their use.	**Show slide 6.** The liquid water in the beaker didn't really disappear; it only seemed to disappear when it changed from a liquid form to a gas form. When water is a gas, we call it *water vapor*. Water vapor is still water, but it's more spread out in the air, so we can't actually see it. But it's in the air all around us. Water didn't get destroyed; it just changed from a liquid that we can see to a gas that we can't see. The process of changing from liquid to a gas is called *evaporation*. We're going to explore these ideas more over the next few lessons, but for now let's capture this scientific explanation in a diagram. **NOTE TO TEACHER:** *Draw only the two boxes and the arrow in the following diagram. The other pieces will be added during a class discussion with students.* ***Use chart paper so this can be saved and added to in lesson 2.***		

			 **Show slide 7.** **Turn and Talk:** Talk with a partner about the questions on the slide: • What does the arrow represent? • Where did we see liquid water in our observations? • Where was water a gas in our setup? **Whole-class discussion:** What did you come up with? **NOTE TO TEACHER:** *Add the labels "In the Air" and "In the Beaker" to the diagram.* 	The arrow shows a liquid to a gas. The liquid water turns into a gas. We saw the liquid water at the top of the beaker. Water was liquid in the beaker, and it went into the air as a gas.	Can you say a little more? What do you mean by "a liquid to a gas"? Which liquid water?

		Highlight key science ideas and focus question throughout.	**Show slide 8.** Heat is necessary for evaporation. In the boiling water, the hot plate caused the water to heat up, change to a gas, and rise into the air. This process is called *evaporation*. **NOTE TO TEACHER:** *Add the label "Adding heat causes evaporation" to the diagram.*  **ELL support:** Make sure to fully explain the diagram to ELL students to avoid confusion. **Show slide 9.** So we changed the liquid to a gas by heating it. The gas is water vapor we can't see. This process is called *evaporation*. It's an important vocabulary word, so make sure you write it in your science notebooks.		
15 min	**Follow-Up to Activity** **Synopsis:** Using the CER framework (claim,	Make explicit links between	**Show slide 10.** **Pairs:** To practice using these new ideas, I'd like you to work with a		

	evidence, reasoning), students write (or talk about) a complete explanation for why the water level went down in the beaker. **Main science idea(s):** • A scientific explanation provides a claim, evidence, and reasoning. A claim for why the water level went down in the beaker of boiling water is that some of the liquid water went into the air. Evidence to support this claim is that the water level went down, and bubbles at the top of the water in the beaker were popping into the air. Science ideas help strengthen this explanation. When heat is added to liquid water (as in the beaker), the water changes to a gas called *water vapor*, which we can't see, and spreads out in the air around us.	science ideas and activities **after** the activity. Engage students in constructing explanations and arguments.	partner and write down [*or talk about*] an explanation for why the water level went down in the beaker of water. Construct a claim, evidence, and reasoning **using the science idea of evaporation**. In your reasoning, use words like *liquid water*, *water vapor*, *gas*, *heat*, and *evaporation*. Be ready to share your ideas with the class. **ELL support:** Have these terms and definitions easily accessible to ELL students (e.g., on posters or in their science notebooks). **NOTE TO TEACHER:** *During pairs work, students are asked to construct a written explanation about the boiling water. If time is short, you could have them do this work orally instead.* *As students are working together, circulate and be on the lookout for pairs you would like to share out at the end. Be sure to pick one pair of students who have a strong (but not necessarily perfect) explanation, and one or two pairs who have made a good start but could use some suggestions for improvement.* **Pairs work time.** **NOTE TO TEACHER:** *Give students 5–10 minutes to work on their explanations, and then have about three pairs share their ideas.*		

			Whole-group share-out: Let's hear what you came up with. I'm going to ask several pairs to share their explanations. I'd like everyone else to listen carefully and provide helpful feedback to improve them. Be thinking about things you agree or disagree with, anything you want to add, or any questions you want to ask. **NOTE TO TEACHER:** *Use a document camera to show students' written work.*	*Example of a strong response:* **Claim:** Some of the water in the beaker went into the air. **Evidence:** There is less water in the beaker after the water boiled. **Reasoning:** The water in the beaker changed to a gas and went into the air through the process of evaporation. They could add that heat causes evaporation. They could add that the water in the beaker was liquid. They could add that water in the gas form is called *water vapor*. *Example of a response needing some changes:*	Who has feedback or questions to share with this pair?

				Claim: We had the same claim. The liquid water went into the air. **Evidence:** The bubbles popping at the top of the water. **Reasoning:** Air in the bubbles went into the air. This is called *evaporation*. Did you say "air in the bubbles went into the air"? I don't understand what you're saying.	Who has feedback or questions to share with this pair? That's a good question! Let's clarify what's in the bubbles. [Correct answer: *water vapor*]
10 min	**Synthesize/Summarize Today's Lesson** **Synopsis:** Students return to the focus question and write (or talk) about whether water disappears when clothes dry on a clothesline. • **Main science idea(s):** We can make liquid water seem to disappear by heating it. When the Sun heats	Highlight key science ideas and focus question throughout. Engage students in making connections by	**Show slide 11.** Let's return to our focus question, *Does liquid water ever disappear? Explain your thinking.* **Show slide 12.** To help us answer this question, let's think about a scenario where people hang their wet clothes outside on a clothesline. On a hot, sunny day the clothes will dry. Did the water in the clothes disappear?		

	wet clothes, the liquid water in the clothes changes form to a gas called *water vapor* that rises into the air. We can't see the gas, so it seems as if the liquid water disappears, but it's still in the air. This process is called *evaporation*.	synthesizing and summarizing key science ideas.	**Individuals:** Answer this question in your science notebooks and make sure to explain your thinking. Use words like *evaporation*, *liquid water*, *water vapor*, *gas*, *heating*, *cooling*, *disappear*. **NOTE TO TEACHER:** *If time is short, you can have students answer the question in a Turn and Talk instead of in writing.*  ***Optional Embedded Assessment Task*** *If time allows, have a few students read their answers aloud and receive feedback and critiques from you and their classmates. If there isn't enough time, do this at the beginning of the next lesson.*		
1 min	**Link to Next Lesson** **Synopsis:** The teacher links science ideas to the next lesson.	Summarize key science ideas. Link science ideas to other science ideas.	**Show slide 13.** Today we talked about what happens when we heat water. We learned that when liquid water is heated, it changes to an invisible gas called *water vapor* that rises into the air. This process is called *evaporation*. This is a very important idea. Tomorrow we'll see if the opposite will happen—that is, whether water vapor can change back to liquid water.		