ANTARCTIC ART CONTEST

Teacher Guide to Art-Science Connection Prezi/Lesson

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<td>15 mins</td>
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Warm-up: (Slide 1)
• Question: Choose one question; students take 5 mins to draw their responses.
• Reflection: Ask for a few volunteers to share their drawings or allow 3 minutes for pair-share.
• Discussion: Answer discussion questions as a whole class. (Slide 2)
Teacher Notes:
• The purpose of this warm-up is to draw out any prior knowledge or student conceptions about Antarctica and/or Ice Crystals, while also helping students connect visual arts to their scientific ideas.
• Students may use a few words as labels, if necessary, but encourage them to think and express their ideas visually, through drawing, rather than in writing.
• The third discussion question, “What informed our drawings?” should get at the sources of information shaping student conceptions (i.e. school learning vs. media, etc). It should also set the stage for making “RAW” observations later in the lesson, by getting students to consider, “How do we know what we know?”
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<td>5 mins</td>
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Objectives (Slides 3-9): Read out loud. Explain any unfamiliar terms.
Teacher Notes:
• For the purpose of this lesson, “RAW” observation is where we collect data using just our five senses, and record it as is, without analysis, inference, or making conclusions about it.
• For example: Consider two sets of observations on the same object.
<table>
<tr><th>RAW Observations</th><th>Not RAW Observation</th></tr>
<tr><td>~ Tall
~ Vertical
~ Brown
~ Rough texture
~ Starts at the ground
~ 3 feet wide at the bottom
~ Above 15 feet, posts stick out horizontally from central vertical post, with even smaller posts sticking out of those
~ Bunches of green at the end of the smallest posts</td><td>~ A tree</td></tr>
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• WAIS Divide – West Antarctic Ice Sheet (WAIS) Divide, a field research station in Antarctica that is central to this lesson
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15-20 mins	**Activity 1: Image Study (Slide 10-14)** • **Instructions:** Read the prompts out loud. Make sure students understand what a "RAW" observation is before beginning. Have the necessary supplies ready (paper, pen/pencil, colors, etc) • **Image Study:** Select one image or allow 10 minutes for *each* image. For this activity, students can write as well as draw. • **Discussion:** After 10 minutes, discuss the questions below. Challenge students to stick with RAW observations, by asking how they know, if they arrive at any inferences or conclusions. • For the final discussion question (What questions do we have?), resist the urge to *answer* student questions. These will be used in the next slide. **Teacher Notes:** Ten minutes is a LOT of time to look at one image. This is intentional. We want students to look deeply at the images and notice details that they may overlook on first glance. If students think they are finished after just a few minutes, encourage them to keep looking, and make new observations. If they drew, ask them to write about what they drew. If they wrote observations, ask them to draw what they see.
5-10 mins	**Parking Lot: (Slide 15)** • Make a list of the questions students had about the images in Activity 1. • This list should be visible to the whole class. • Do not attempt or let students attempt to answer each other's questions yet. We will come back to them, but for now, we are just "parking" them. **Teacher Notes:** It may frustrate some students not to receive immediate answers to their questions. This, however, is an important part of science. We want students to arrive at those answers themselves by going through the lesson, rather than being given answers right away. If this comes up, encourage students to use their discomfort to search more intently for answers as the lesson continues.
5 mins	**Activity 2: Contour Drawing** (Slide 16) • Read instructions aloud. • Students can come up with their own (appropriate) hand gesture. • Draw on a clean sheet of paper. It might help if this paper is taped down to the desk, since students shouldn't look at it. • Encourage students not to "cheat" by peeking at their papers. Hold their hands out, away from the paper. **Teacher Notes:** The purpose of this activity is to encourage students to observe details, not to create a perfect drawing of their hand. This teaches precision and accuracy of observation. Remind students that

	making detailed observations, sometimes before you can see the big picture, is an important part of science and art!
2 mins	**Activity 3: Gesture Drawing (Slide 16)** • Read instructions aloud. • Use a clean side or new sheet of paper. • Stick to the time limits! • Optional: Can repeat with a new gesture. **Teacher Notes:** This activity emphasizes a different set of skills. It is intended to be quick, and to capture the "big-picture" idea of what they are drawing. Their drawings are not expected to be detailed or precise, but they should be complete!

5 - 10 mins	**Discussion (Slide 20)** • Allow students to share their drawings, with a neighbor or the class, if they'd like. • Then, discuss the questions provided. **Teacher Notes:** The two activities combined should allow students to experience very two different styles of observation, which translate into two very different products. It may be hard for some students to see the benefits of each one, particularly if their products are not of the quality they'd like. Activity 2 required them to observe details without judgment (like RAW observations), while Activity 3 was focused on the "big picture." Both are critical in art and science.
15 mins	**Science Concepts (Slide 21-2)** **Image 1: (Slide 23)** Let students review the image before discussing the questions. Remind them that they are not expected to know the answers, but you want to see what they understood, based on their own observations during Activity 1. *What are we looking at?* Ice crystals! This is the image of a very thin section of ice, seen through polarized lenses, and magnified through a microscope. *What is each shape?* Each unique shape is an individual ice crystal. *What do the different colors represent?* Depending on how each crystal is oriented (which direction each crystal faces), it refracts the light a different way. The colors are indications of this. So crystals that are oriented in a similar direction have similar colors. Crystals with very different colors are oriented in very different directions. *What are the rainbow patterns?* In some spots, you see what looks like a distorted rainbow pattern.

	This happens because of the way one ice crystal meets another at a boundary. If the boundary is tilted with respect to the light, it will distort the light as it passes through, like a prism. *What are the dots inside each shape?* The small dots are air bubbles trapped within the ice. *Why are some shapes bigger than others?* Because ice crystals come in all different sizes! They all start small, but can grow at different rates, or they might break in two. **Image 2: (Slide 28)** *What are we looking at?* This is a graph of data from ice cores collected all around Antarctica. The graph shows the change in the ratio of "heavy" Oxygen (18 Isotope) to "light" Oxygen 16 over the years. "heavy" Oxygen requires more energy (in the form of heat in the atmosphere) to move around, so more heavy oxygen will end up in snow in Antarctica when the cloud temperatures are higher *What are the numbers at the top and bottom?* The age of the ice, measured in kiloyears (1000 years). 0 (right side) is the present, and 30 (left side) is 30,000 years ago. *What are the numbers on each side?* This is a measure of the ratio of heavy to light oxygen atoms (heavy oxygen atoms have 2 extra neutrons). Note that the numbers are negative, a big negative number here means there is little "heavy" oxygen. A small negative number means that there is more "heavy" oxygen in the ice. *What is each squiggle?* Each squiggle is the data collected from ice cores at a single location within Antarctica. It shows how O18 (and therefore global temperature) has changed over time, from 30K years ago to the present. *What do the different colors represent?* The map at the bottom right shows what color is assigned to what location. *What are the lines inside some squiggles?* The average value along the curve. What we use to look at a signal trend while minimizing the noise. *What does this image mean?* This image shows that oxygen isotope data from ice cores all around Antarctica show a similar pattern over the past 30K years. Oxygen isotopes are a way we measure past temperatures, in Antarctica, more oxygen 18 "heavy" oxygen, means the temperatures The squiggles all go up and down a lot, which shows that there is variation every year between summer and winter and decade to decade. But it also shows that, overall, the increasing trend from left

	to right, in the atmosphere indicates that temperature has been rising in the past 30K years. There are some big dips and spikes, but the general trend is up. **Other questions?** If there are other questions about the images that still have not been addressed, you can do so now. Refer back to the class parking lot, and check off the questions that have been understood. See what answers students can piece together themselves. Look up any questions that are still unknown.
5 mins	**WAIS Divide Video (Slide 33)** Watch the short video, put together by the Wall Street Journal, which gives a short introduction to the science of ice cores at WAIS Divide. **Teacher notes:** This is a short introductory video, but other resources can be found at the following link to replace or supplement the one provided, depending on your students' needs. http://www.waisdivide.unh.edu/multimedia/video.shtml
35 mins + 5 mins	**Draw: (Slide 34)** Give students an extended amount of time to create artwork based on the science-art concepts explored today, what they learned about Antarctica, and/or inspired by images of WAIS Divide. Remind students of the Antarctica Art Contest, and encourage them to continue working on their pieces for submission before Sept 30, 2015!
10 mins	**Cool-down: (Slide 35)** Students can respond orally or write down their responses to turn in as an exit slip.