**Introductory Module to the Science Practices**

*Time: 45 minutes*

**Goals:**

* Encourage participants to think about science as a set of science practices and not just a body of facts that need to be memorized
* Provide an overview of the three groups (investigating, sensemaking and critiquing) as well as the eight science practices
* Reflect on how similar and different participants’ current science instruction is compared to the focus on science practices.

**Materials:**

* Shadow Investigation Handout
* Diagram with 3 groupings of science practices
* Flashlights (or cellular phones with flashlights), objects, ruler, and white paper for investigation
* Reading for extension

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| **Activity** | **Description** | **Time** |
| Conduct shadow investigation | * Present to the group:
	+ The idea that historically science education has focused on the memorization of science content while current standards call for a shift to thinking about science as a set of practices.
	+ In order to think about this shift, we are going to begin by conducting a short investigation on shadows.
* Have the group conduct a think-pair-share about shadow question: *When you are outside, how does the shadow of your body change during the day?*
* Have the group conduct the shadow investigation breaking into small groups of 2 or 3 if there are multiple participants.
* After completing the investigation, discuss the conclusion questions with the group:
	+ Write a claim that answers the question – How did the shadow change when you moved the flashlight? Use evidence from your observations to support your claim
	+ Given the findings from today’s investigation, why do you think the shadow of your body changes during the day?
* Key points to highlight during the discussion:
	+ During this introductory conversation, the main point is to engage the participants in the investigation and to hear their initial ideas. If their ideas are not connected to the observations in the investigation, you may want to prompt them to think about what evidence from the investigation they used to support those ideas. Overall, this is a beginning discussion that you will return later in the session after introducing the eight science practices.
 | 20 min |
| Watch video on science practices | * As a group, watch the video from the teaching channel that introduces the science practices.
	+ <https://www.teachingchannel.org/videos/science-engineering-practices-achieve>
* After watching the video, discuss the following questions:
	+ How is the vision of science practices similar and different from what is currently in the science curriculum?
	+ How could you envision using the science practices in your classroom?
* Key points to highlight during the discussion:
	+ Students should be actively engaged in the science practices and not just observing others doing science (e.g. teacher demos) or memorizing science content.
	+ The science practices are what we want students to be doing. As students engage in these practices, they will gain greater proficiency in the practices. Participating in these practices also enables students to develop a stronger understanding of the disciplinary core ideas.
* *Note – If you would prefer to do a short reading and discuss it instead of a video, see the extension at the end of the agenda.*
 | 10 min |
| Present 3 groups for science practices | * Present to the group:
	+ Considering all 8 science practices can be a bit overwhelming at first. One way to help think about this is to think about the 8 practices in 3 different groups – Investigating Practices, Sensemaking Practices and Critiquing Practices.
	+ Science is fundamentally about making sense of the natural world. In order to do this, scientists engage in a number of *Investigating Practices* in that they ask questions and carry out investigations to gather data about the world. Once scientists have data they engage in *Sensemaking Practices* in that they analyze the data looking for patterns, construct explanations and develop models to better understand how or why different natural phenomena occur. Finally, these processes can often result in competing ideas, such as multiple alternative explanations. Consequently, scientists often engage in *Critiquing Practices* where they engage in argument from evidence and evaluate multiple possibilities.
	+ Explain that we will be diving into all 8 science practices, but the three groups are one entry point to help us think about the practices.
* Ask if there are any initial questions about the 3 groups or the 8 science practices.
* *Note – If you would like more information about the 3 groupings visit this website -* [*http://www.sciencepracticesleadership.com/diagram.html*](http://www.sciencepracticesleadership.com/diagram.html)
 | 5 min |
| Discuss shadow investigation | * Lead a discussion evaluating the Shadows investigation considering what we have learned from the video and the discussion of the three groups of science practices. Discuss the following questions:
	+ Considering the 8 Science Practices in the three groups of Investigating, Sensemaking, and Critiquing, which of these practices did you engage in? Why do you think so?
	+ What are the strengths of this lesson? How could it be improved?
* Key points to highlight during the discussion:
	+ The shadow investigation includes a number of the science practices.
	+ Of the three *Investigating Practices* it includes – “Planning and carrying out investigations” and “Using mathematics and computational thinking”. In its current form, it does not focus on asking questions, because the teacher provides the scientific question instead of it being generated by the students.
	+ Of the three *Sensemaking Practices* it includes – “Analyzing and interpreting data” and “Constructing explanations”. The investigation does not include students developing or using models, though it could be adapted to include this practice.
	+ Of the two *Critiquing Practices*, it does not currently include either of these practices. However, a teacher could choose to have students engage in argument through talk around the different claims that they develop at the end of the investigation.
 | 5 min |
| Reflect on instruction and next steps | * Lead a discussion around the following questions:
* How often does your current instruction provide opportunities for the three groups of science practices (Investigating, Sensemaking and Critiquing)?
	+ Is there one group where there are more opportunities?
	+ Is there one group where there are less opportunities?
* Key points to highlight during the discussion:
	+ Participants’ current instruction could vary significantly in terms of the three groups of practices depending on their prior experiences with them. However, we have found that existing science curriculum often focuses more on the *Investigating Practices*. In addition, it can have some opportunities for *Sensemaking Practices* after the investigations, but it often does not take that next step. Finally, the *Critiquing Practices* have been particularly rare in current science curriculum.
* Mention the following points about the future modules:
	+ In the future modules, we will explore each group, and each individual science practice, in more depth.
	+ In the future modules, we will provide strategies to revise current science instruction to align more closely with this new focus on science practices.
 | 5 min |
| Extension reading –What do scientists really do? | * If teachers would like further experience with the science practices before the next meeting and/or if you have extra time you could have them read the excerpt from *Ready, Set, Science* about What Scientists really do. This reading pushes against the idea of the “scientific method” to provide a different vision of science as a set of practices.
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