Notice and Wonder

Purpose: This routine supports students in becoming successful, perseverant problem solvers by leveraging multiple mathematical competencies and drawing on multiple sources of knowledge. Students observe a visual image, video, or other stimulus and share their natural noticings and wonderings. Notice and Wonder can be a short routine used to activate student thinking at the launch of a lesson, or a stand-alone routine to encourage curiosity and math reasoning. Because students are invited to bring their own ideas and questions into the classroom within this routine, regular use of this protocol helps to establish a safe classroom environment. "When students are given opportunities to pose mathematics problems, to consider a situation and think of a mathematics question to ask of it – which is the essence of real mathematics – they become more deeply engaged and perform at higher levels" (Boaler, 2016, p. 27).

Approximate Duration: 5-15 Minutes

Planning for Notice and Wonder	
Step 0	**Identify a mathematical goal.** This routine is useful for eliciting student ideas and questions related to specific concepts, providing students an opportunity to enact the standards for mathematical practice, or fueling curiosity and developing math reasoning. Any of these purposes are worthwhile, and will shape how you plan your Notice and Wonder. **Choose a prompt** that will stimulate rich and productive noticings and wonderings for your students. The prompt could be a scenario, a visual image, a data set, a problem situation, or a word problem stem with the question removed. **Determine a plan for gathering and recording student responses.** *How will you manage the flow of sharing noticings and wonderings? Where will you record noticings? Where will you record wonderings? How will you draw connections among ideas?*
Notice and Wonder Routine	
Step 1	**Show an image, video, graphic, scenario, math visual or word problem stem.** Teacher may read the prompt if necessary, but provides no additional information creating space for student conjecture.
Step 2	**Independent Think Time. (Approx. 2-5 minutes)** Students consider the prompt "*What do you notice? What do you wonder?*" Students may think quietly or engage in a quick write depending on the purpose for engaging in this routine. If students are keeping a personal list of noticings and wonderings they may add to the list as new ideas are shared.
Step 3	**Partner Discussion. (Approx. 1-2 minutes)** Students to turn and talk with a partner and take turns sharing their noticings and wonderings
Step 4	**Whole Group Discussion: Noticings** Students share noticings. Teacher records student ideas without providing evaluative feedback, rephrasing, or asking questions. Repeat the process to elicit multiple noticings from the group. If a wondering is shared during this phase of the discussion, record the question in the space where you will record wonderings during the next phase of the discussion or ask the student to hold the idea for later. In either case, refocus the discussion and continue to elicit noticings until this phase of discussion is complete.
Step 5	**Whole Group Discussion: Wonderings** Students share wonderings. Teacher records student questions without providing evaluative feedback, rephrasing, or asking questions. Repeat the process to elicit multiple wonderings from the group. Additional noticings inspired during this phase of the discussion may be added to the previous list.

Mathematically Productive Instructional Routines
Process & Resources Overview

Step 6	**DECISION POINT:** At this point, many mathematical questions/observations have arisen. Depending on your purpose for engaging in a Notice and Wonder: • Students explore a question of their own choosing • Students pursue solutions to a specific question determined by the teacher and related to the mathematical goal • Students evaluate and reflect on the list of wonderings, discussing which could be answered with mathematics • Celebrate the list of noticings and wonderings generated and remind students that posing problems is one of the most important part of doing mathematics.
Reflecting on Notice and Wonder	
Step 7	As appropriate to the goals for this routine, engage the students in written or verbal reflection. • *Which noticings and wonderings were important to our work today?* • *Were there noticings and wonderings we didn't really use in our work today?* • *What were we paying attention to as we noticed things that were important mathematically?* • *What did we miss? Did that cause us to get stuck? How can we avoid missing things?* • *What kinds of things did you notice today?* • *What did other people notice that you didn't? How can you remember to notice those types of things in other situations?*

Supporting students with Notice and Wonder

Ideas for Noticing	**Ideas for Wondering**
• *What do I notice about…* *…*quantity, shape, size, orientation, space, relationships, patterns? • *What do I know about this situation?* • *What information is given? What information is missing?* • *What situation or problem does this remind you of?*	• *I wonder what will happen if …* • *I wonder what this means …* • *I wonder if this pattern will continue …* • *Does it have to be that way?* • *How does this situation work?* • *Is there another way to think about this?* • *Is this is always true?* • *What questions might someone else ask about this situation/visual?*

References and Resources:

The Math Forum Introduction to Notice and Wonder	This document provides an overview of this routine and describes various formats for getting started. http://mathforum.org/pubs/notice_wonder_intro.pdf
Ever Wonder What They'd Notice?	Annie Fetter's Ignite Talk describes the origins and the power of engaging students in this routine. https://www.youtube.com/watch?v=a-Fth6sOaRA
Notice and Wonder in Elementary School	This blog post includes video and resources for engaging elementary students. http://mathforum.org/blogs/suzanne/2011/12/01/wooden-legs-videos/
Notice and Wonder in High School	This blog post includes video and resources (including links to many more blog posts) for engaging high school students. http://mathforum.org/blogs/max/noticing-and-wondering-in-high-school/
Notice and Wonder Recording Sheet	This sheet provides scaffolds for student thinking and an organizer for capturing student ideas. http://mathforum.org/pow/samples/MathForumNoticeWonderRecordSheet.pdf