Key Steps to Successfully Implementing the 5 Practices in Your Classroom

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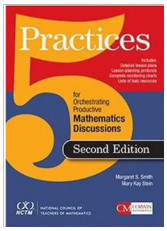
"The 5 Practices"



- Provides a model for developing and sustaining a discourse-rich math classroom
- Helps teachers balance attention to mathematics and to students
- Supports an equitable mathematics classroom

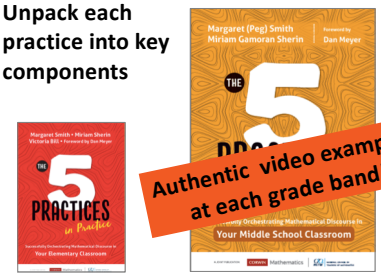
Smith, M.S. & Stein, M.K. (2018). *Five Practices for Orchestrating Productive Mathematics Discussions– Second Edition*. Reston: VA. National Council of Teachers of Mathematics.

A Deeper Dive into the 5 Practices

- Where can I *see* teachers using the 5 Practices?
- Where can I find *more detail* on the 5 Practices?
- Where can I get *help* on some of the challenges of using the 5 Practices?

New Book Series: The 5 Practices in Practice

Unpack each practice into key components



Authentic video examples at each grade band!

Explore ways to address challenges associated with each practice

Smith, M. S., & Sherin, M. G. (2019). *The 5 Practices in practice: Successfully orchestrating mathematics discussions*. Corwin. (Co-published by NCTM)

The 5 Practices in Practice

0. Goals/Tasks | 1. Anticipating | 2. Monitoring | 3. Selecting | 4 Sequencing | 5. Connecting

Today we'll [illegible] responses

What do we already know about the 5 Practices?

0. Setting Goals and Selecting Tasks

0. Goals/Tasks | 1. Anticipating | 2. Monitoring | 3. Selecting | 4 Sequencing | 5. Connecting

Setting Goals involves specifying what you want students to learn about mathematics as a result of engaging in a particular lesson.

Selecting Tasks involves identifying a high-level task that aligns with your goals and provides all students with access.

1. Anticipating Student Responses

0. Goals/Tasks | 1. Anticipating | 2. Monitoring | 3. Selecting | 4 Sequencing | 5. Connecting

Anticipating involves considering the strategies students are likely to use to solve a task and how to respond to the work that students will likely produce.

2. Monitoring Student Work

0. Goals/Tasks | 1. Anticipating | 2. Monitoring | 3. Selecting | 4 Sequencing | 5. Connecting

Monitoring involves attending to what students are doing and saying, asking questions to assess and advance students' thinking, and keeping track of students' approaches.

3-4. Selecting and Sequencing Student Solutions

0. Goals/Tasks → 1. Anticipating → 2. Monitoring → **3. Selecting** → **4 Sequencing** → 5. Connecting

Selecting involves determining which student work will be the focus of whole-class discussion so that key math ideas are highlighted and all students have opportunities to share their ideas over time.

Sequencing involves purposefully ordering solutions in order to build a coherent storyline around the mathematics that is accessible to all students.

5. Connecting Student Solutions

0. Goals/Tasks → 1. Anticipating → 2. Monitoring → 3. Selecting → 4 Sequencing → **5. Connecting**

Connecting involves asking questions that help students make connections among the student strategies shown and between the strategies and the lesson goals.

A Focus on Anticipating

0. Goals/Tasks → **1. Anticipating** → 2. Monitoring → 3. Selecting → 4 Sequencing → 5. Connecting

Today we'll look closely at **anticipating student responses**

Key Components of Anticipating

What it Takes	Key Questions
A. Getting Inside the Problem	How do you solve the task?
	How might students approach the task?
	What challenges might students face as they solve the task?
B. Planning to Respond to Student Thinking	What assessing questions will you ask to draw out student thinking?
	What advancing questions will help you move student thinking forward?
C. Planning to Notice Student Thinking	What strategies do you want to be on the lookout for as students work on the task?

Challenges Associated with Anticipating

Challenge	Description
1. Moving Beyond the Way *You* Solved the Problem	Teachers often feel limited by their own experience. They know how to solve a task but may not have access to the array of strategies that students are likely to use.
2. Creating Questions that Move Students Towards the Mathematical Goal (and not just the answer)	Teachers need to ask questions that are driven by the mathematical goals of the lesson to ensure that students *understand* key mathematical ideas, and are not just producing a solution to the task.
3. Being Prepared to Help Students Who Cannot Get Started	Teachers need to be prepared to provide support to students who do not know how to begin work on the task, without telling them exactly what to do and how.

Setting Goals and Selecting a Task

As a result of engaging in the lesson Mrs. Saroney wanted her 6th grade students to understand that:

1. When you scale a fraction up or down you have not changed the amount it represents; equivalent fractions represent the same area and name the same position on a number line.
2. When you are dividing by a fraction, the remainder is expressed as a fraction of the divisor.
3. When you find "how many ___ are in____?" you are doing division. That is, in a ÷ b you are trying to find how many times b is contained in *a*.

Pizza Party Task

You ordered pizza for your birthday party. When the party was over you still had 4 5/6 pizzas left over. Your mother decided to freeze the remaining pizza. She put 2/3 of a pizza (one serving) in each freezer bag.

1. How many servings would your mother be able to freeze?
2. How much more pizza does your mother need to make another serving?

Draw a picture, build a model, construct a number line, or make a table to explain your solution.

Adapted from Nolan, E.C., & Dixon, J.K. (2016). *Making Sense of Mathematics for Teaching Grades 6-8: Unifying Topics for an Understanding of Functions, Statistics, and Probability*. Bloomington, IN: Solution Tree Press.

Aligning Goals and Task

As a result of engaging in the lesson the teacher wanted her students to understand that:

1. When you scale a fraction up or down you have not changed the amount it represents; equivalent fractions represent the same area and name the same position on a number line.
2. When you a… expressed a…
3. When you find "how many ___ are in____?" you are doing division. That is, in a ÷ b you are trying to find how many times b is contained in *a*.

Since the mixed number and the fraction in the task did not have the same denominator, students would need to be able to rewrite 2/3 as 4/6 and know that they were equivalent.

Aligning Goals and Task

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2. When you are dividing by a fraction, the remainder is expressed as a fraction of the divisor.

The 1/6 of a pizza left over after making 7 servings needs to be interpreted as ¼ of a serving.

3. When you find "how many ___ are in____?" you are doing division. That is, in a ÷ b you are trying to find how many times b is contained in *a*.

Aligning Goals and Task

As a result of engaging in the lesson the teacher wanted her students to understand that:

1. When you scale a fraction up or down you have not changed the amount it represents; equivalent fractions represent the same area and name the same position on a number line.

What division actually means whether you are working with fractions or whole numbers.

3. When you find "how many ___ are in____?" you are doing division. That is, in a ÷ b you are trying to find how many times b is contained in *a*.

Features of Tasks Worthy of Discussion

- Require thinking and reasoning
- Can be entered and solved in multiple ways
- Require explanation or justification
- Provide opportunities to make connections between different representations

Key Components of Anticipating

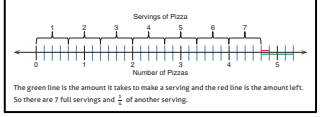
What it Takes	Key Questions
A. Getting Inside the Problem	How do you solve the task?
	How might students approach the task?
	What challenges might students face as they solve the task?

Explore the Pizza Party task:

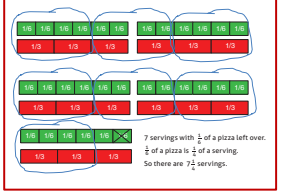
- How would you solve the task?
- How might students approach the task?
- What challenges might students face as they solve the task?

Mrs. Saroney's Anticipated Solutions

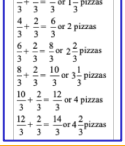
A. Double Number Line



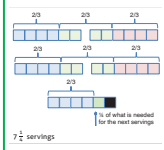
D. Fraction Tiles



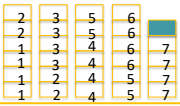
B. Repeated Addition



C. Tape Diagram



E. Visual Model



Challenges Associated with Anticipating

Challenge	Description
1. Moving Beyond the Way *You* Solved the Problem	Teachers often feel limited by their own experience. They know how to solve a task but may not have access to the array of strategies that students are likely to use.

What can you do?

Moving beyond how you solve the task

"A best practice for anticipating strategies for a specific task is to sit with a team of teachers to identify all of the possible inroads, rather than completing this as a teacher in isolation."

- Try using different representations.
- Solve the task with colleagues (math or non-math!)
- Connect with others on social media.
- Collect student solutions to the task over time.

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Key Components of Anticipating

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	What advancing questions will help you move student thinking forward?

Assessing and Advancing Questions

Assessing Questions

- Based closely on the work that students have produced
- Clarify what students have done and what students understand
- Give the teacher information about what students understand

Advancing Questions

- Use what students have produced as a basis for making progress toward the lesson goals
- Move students beyond current thinking by pressing them to extend what they know to a new situation
- Press students to consider something they are not currently thinking about

Smith, M.S., Steele, M.D., & Raith, M.L. (2017) *Taking Action: Implementing Effective Mathematics Teaching Practices in Grades 6-8.* Reston, VA: National Council of Teachers of Mathematics. (p.86)

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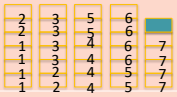
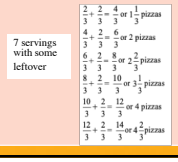
Mrs. Saroney's Anticipated Solutions

Strategy	Assessing Questions	Advancing Questions
Student draws a diagram showing 4 5/6 pizza divided into sixths 	What would you want to ask students who produce these solutions in order to **assess** what they understand and **advance** them towards the lesson goals?	
Student uses repeated addition 		

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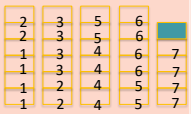
Student draws a diagram showing 4 5/6 pizza divided into sixths 	• Can you tell me what you did? • Why did you divide the rectangles into sixths? • Why is one rectangle a different height? • What do the numbers in your drawing represent? • What did you figure out? • What does the shaded box represent?	• What does your drawing say about how much pizza is left over? • About how many servings are left over?

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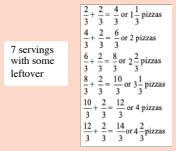
Student uses repeated addition  	• Can you tell me what you did? • Why did you continue to add 2/3? • How did you know when to stop adding? • What does the 7 mean?	• What fraction of a pizza was left? • What part of a serving does this represent? • Can you use a different representation to explain what you found?

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3. Being Prepared to Help Students Who Cannot Get Started	Teachers need to be prepared to provide support to students who do not know how to begin work on the task, without telling them exactly what to do and how.

Helping Students Who are Struggling to Get Started

Imagine that you launched the Pizza Party task by asking questions to ensure that students understood the context and seemed clear on what they needed to do to answer the question.

What type of guidance could you provide to students who could not get started on the task that would support their productive struggle without taking over the thinking for them?

What assessing and advancing questions might you ask?

Helping Students Who are Struggling to Get Started

- Ask students what they understand about the task and problem context without suggesting a particular approach to use.

Strategy	Assessing Questions	Advancing Questions
Student cannot get started	• What can you tell me about the problem? • What is the problem asking? • How much pizza do we have? • How much pizza goes in each freezer bag?	• Can you represent what's going on in some way? • Do we have enough pizza for 1 serving? 2 servings? 3 servings?

Helping Students Who are Struggling to Get Started

"When students can't get started on a problem, it's generally not because they have no relevant knowledge… more often, for some reason, they are unable to connect what they know with the task at hand."

- Ask students what they understand about the task and problem context
- Avoid suggesting specific steps to try or having another student show them what to do.
- Develop classroom routines so students who are not sure how to begin have access to questions they can consider and resources they can use to explore the task.

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Planning to Notice Student Thinking

Noticing is not an unqualified virtue…key is what to attend to and how to interpret it (Ball, 2011)

What do you want to be on the look out for as you observe students working on the task?

- Goal is to prepare yourself to attend to aspects of the lesson that you expect to be significant
- And also to be open to new ideas and strategies that arise!

Monitoring Chart

Strategy	Assessing Questions	Advancing Questions	Who and What	Order
Student cannot get started	What can you tell me about the problem? What is the problem asking? How much pizza do we have? How much pizza goes in each freezer bag?	Can you represent what's going on in some way? Do we have enough pizza for 1 serving? 2 servings? 3 servings?		
Draw a diagram showing 4 5/6 pizzas with groups of 2/3 – may or may not correctly identify the left over 1/6 as ¼ of a serving	Can you tell me what you did? Why did you divide the rectangles into sixths? Why is one rectangle a different height? What do the numbers in your drawing represent? What did you figure out? What does the shaded box represent?	What does your drawing say about how much pizza is left over? About how many servings are left over?		
Use repeated addition – may or may not know when to stop and how to label the 1/6 that is left over	Can you tell me what you did? Why did you continue to add 2/3? How did you know when to stop adding? What does the 7 mean?	What fraction of a pizza is left? What part of a serving does this represent? Can you use a different representation to explain what you found?		
Other				

Voices from the Classroom

"If you've taken the time to anticipate before class, then during class you can focus on what students are doing and not have to come up with everything in the moment. And of course, you can't anticipate everything – but doing it helps you be ready to notice the things you *did* anticipate and what you *didn't* anticipate.

Key Take Aways

- Anticipating what students are likely to do and how you will respond prepares you to support students during the lesson.
- Thinking through solutions and questions before the lesson reduces the in-the-moment decisions you need to make.
- Don't be limited by what you could anticipate.
  - Anticipating allows you to predict much of what is likely to happen during instruction. But you need to keep your eyes and ears open for other viable approaches that students might use.
- Anticipating lays the foundation of the remaining practices – monitoring, selecting, sequencing, and connecting.