Module 5: Workshop 13

What are the Common Core instructional shifts in Math and Science? How do we see the instructional shifts reflected in sample assessment questions?
Instructional Objectives / Goals

• Participants will know the six Common Core Instructional Shifts in Mathematics.
• Participants will know the rationale and research base behind these instructional shifts.
• Participants will know how to implement the instructional shifts in their classrooms.
• Participants will know how sample assessment questions relate to the six instructional shifts.
Instructional Objectives / Goals

- Participants will know how the instructional shifts impact the teaching of science. Participants will become familiar with the Common Core instructional shifts in mathematics. They will know how the instructional shifts came about in the wake of the TIMSS study, and they will learn about the TIMSS study’s implications for teaching. They will leave with teaching strategies that help their students develop focus and coherence through rigorous lessons and problem-solving activities. Participants will also be able to analyze rigor on the TASC Readiness Assessment, and the will understand how teaching mathematics with applications to science can effectively prepare students for both subtests.
Warm-Up / Review

• For group discussion: “Since the implantation of the TASC, what changes have you made in your instruction? What led you to make those changes?”

• Once each group has had a chance to share, the facilitator should ask participants about which shifts have been the most difficult to make.

• To end the warmup, the facilitator will tell participants that this workshop will address the instructional shifts set forth by the Common Core and the Next Generation Science Standards.
Lesson Topic 1

• In the first part of the lesson, participants will learn about the findings of the Third International Mathematics and Science Study (TIMSS) and how it led to the development of the Common Core State Standards and the Six Instructional Shifts in Mathematics.

Lesson Materials

• Handout outlining the findings of the TIMSS study.
Activity 1

The facilitator will distribute the handout Two Teaching Approaches to One Concept for group analysis and discussion. The facilitator should begin by asking participants to read through the problem and both teaching approaches.

For the last part of the lesson, the facilitator will distribute the Growing T Problem for Teachers handout. Participants should be given time to solve the problem individually. At this point in the activity, the participants should only work on solving the Growing T Problem. The facilitator should direct them to wait before moving onto the second part of the handout.

In pairs or small groups, participants should work on the second part of the handout. Specifically, they should think of ways to structure and scaffold a problem-solving activity based on the visual pattern. They should develop specific questions that help students arrive at a rule without giving too much away.
Questions to Answer

• What is the significance of the TIMSS study?
• How can I make time for and support problem solving in my classroom?
• How can I scaffold problem-solving activities so that students have time to make conclusions on their own without me giving them the answer?
• How are the instructional shifts reflected in sample assessment questions in math and science?
Wrap Up

The facilitator will lead the whole group in a discussion of the Growing T Problem and make connections to the findings from the TIMSS study discussed earlier.

The facilitator will distribute the handout The Growing T Problem Students. Participants will analyze the student version of the Growing T Problem and talk about the scaffolding in place on this version of the problem. Participants will consider whether their students will need more or less support than is already given.

If time allows, participants will also discuss adaptations of the problem, or other visual patterns that could be used to develop algebraic thinking and pattern recognition.

The facilitator will recommend that participants try the student version of the Growing T Problem in an ABE or HSE class, noting that the goal for a higher-level class would be the creation of a function, while the goal for a lower-level class may be to describe what the \( n \)th figure would look like without using algebra.

Participants should visit [www.visualpatterns.org](http://www.visualpatterns.org) and look for other linear visual patterns that could be used in their classrooms.

For extended study, participants should read the CollectEdNY review of the TIMSS videos, located at [http://www.collectedny.org/2015/04/a-window-into-international-education/](http://www.collectedny.org/2015/04/a-window-into-international-education/). The review describes a particular math lesson and provides links to video and source material for the lesson itself.
Lesson Topic 2

• In this lesson, participants will analyze the Six Instructional Shifts in Mathematics and how they apply to the ABE/HSE classroom. They will also explore the difference between a difficult problem and a rigorous classroom task.

Lesson Materials
• Handout on the Six Instructional Shifts
• Handout detailing Difficulty versus Rigor
• Handout titled Two Types of Functions Questions
Activity 2

• The facilitator will direct participants back to the list of shifts that they have already made—from the warm-up activity—and align them with the shifts set forth by the Common Core.

• After the discussion of shifts, the facilitator will introduce the concept of *rigor* and differentiate it from *difficulty*.

• Participants will reflect on the difference between a difficult mathematical task and a rigorous mathematical task by analyzing the handout Two Kinds of Functions Questions.
Questions to Answer

- What are the six instructional shifts, and what do I need to do to make them in my classroom?
- Which shifts have I already made?
- Which shifts do I need more support in order to make?
- What is rigor, and how does it differ from difficulty?
- How can I ensure that I am using rigorous tasks in my mathematics classroom?
Wrap Up

• Facilitator will lead a closing discussion on the Six Instructional Shifts.
• Assessment: In a five- to ten-minute free-write, participants will individually reflect on the Six Instructional Shifts and write about changes that they plan to make in their classrooms in the future.
Lesson Topic 3

• The workshop will continue to analyze the concept of rigor as it applies to the types of questions that would appear on the mathematics subtest of the TASC.

Lesson Materials

• Handout Rigor on the TASC Mathematics Subtest
Activity 3

- The facilitator will distribute the handout Rigor on the TASC Mathematics Subtest. Both of these problems are very similar to those on the 2014 and 2015 Readiness Exams, respectively.

- After the processing of the solution, participants will look back to the Six Instructional Shifts handout and indicate which shifts are reflected in the rigorous version of the problem. Participants should be guided to think about the instructional strategies involved in building content knowledge for the problem, and they should think about ways to teach multiple approaches to the problem. In addition to thinking about conceptual understanding, participants should think about which computational skills/strategies (fluency) would be needed to solve the problem in a test environment.
Questions to Answer

• How can we effectively teach key science standards through mathematics applications?
• What do applied mathematics questions on the science subtest look like?
Wrap Up

• Individually, participants will further reflect on the Six Instructional Shifts and the implications they have for teaching students preparing for the TASC.
  – Question for assessment: “One of my biggest challenges in helping students to understand and solve rigorous problems is ______. In future lesson, I plan to try ______.”
  – Participants should think about the prompt and write for about five minutes. When everyone has finished, the facilitator will ask volunteers to share what they wrote.
Lesson Topic 4

- Participants will continue unpacking the Six Instructional Shifts in Mathematics by examining how they apply to the science subtest. Participants will solve and discuss two applied mathematics problems and discuss the teaching implications for each.
Activity 4

• Participants will solve two applied math problems similar to those that would appear on the TASC science subtest.
• The facilitator will distribute the handout Applied Math on the TASC Science subtest.
• After the discussion, the facilitator should then instruct participants to turn the handout over and solve the problem on the second page.
• The facilitator will lead a discussion of how these problems reflect the Six Instructional Shifts in mathematics.
Questions to Answer

• How can we effectively teach key science standards through mathematics applications?

• What do applied mathematics questions on the science subtest look like?
Wrap up

• The facilitator will lead a closing discussion about the benefits of interdisciplinary lessons.

• For assessment, the participants will answer the following prompt, which they will share with the group at the end of the lesson.
Overall Wrap Up

• Note: this part will be done in a discussion format
• What is something we worked on today that you would want to try in your classroom?
• What kinds of support will you need to feel comfortable preparing students to pass the math and science subtests on the TASC?
• What is something we discussed in this workshop that you would be interested in exploring further?
Project Homework

• Participants will create sample math exercises that have applications to science. Their responses will be shared with other participants in the workshop via email, Wiggio, etc.
• Participants will read “Characteristics of a Japanese Math Lesson.”
• For further reading, participants should read Stigler and Hiebert’s “A World of Difference.” Interested participants should be directed to their book *The Teaching Gap*, which offers a more complete description of the TIMSS study, its findings, and its implications for teaching and professional development in the United States.
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