Video Link and Info for Principle 4: Visualizing and Connecting

Discussing relationships among mathematical ideas using visual, verbal, and symbolic representations builds robust conceptual understanding.

https://vimeopro.com/wested/math-pathways-and-pitfalls-principle-4

Have You Wondered?

Asking your students to model mathematical ideas in different ways can help them to think and reason about the concepts. Think about what you do to encourage and support students to present their ideas and understanding. Watch the video segments to see why it is important to pick the most appropriate representation to help students understand the mathematics more efficiently and reliably.

Using the Principle With *Math Pathways & Pitfalls*

When preparing to apply the Visualizing and Connecting principle, Ms. Kean selected a *Math Pathways & Pitfalls* lesson that would elicit different representations or models from the students. She chose the lesson “Making Equal Ratios.”

Her lesson goals:

- Use scale factors to find equal ratios.
- Introduce the concept of lowest terms ratio, or base ratio.
- Use diagrams or tables to illustrate equal ratios and the base ratio.

- Read, write, and interpret ratio symbols.

The starter problem:

> Kyle painted a room at the community center with a mixture of 6 quarts of red paint to 8 quarts of white. Suppose he wants to paint a larger room or a smaller room the same color. What are two other equal ratios of paint that he could use?

Teaching Practice 1: **Have students model ideas in different ways.**

Ms. Kean spends some time giving examples of what the problem means. As students work on the problem on their own, she walks around, observes, and asks questions. Notice that students are using different models to represent the problem in pictures and in symbols.

Teaching Practice 2: **Discuss one or more representations in depth to develop a mathematical idea.**

In this video clip, the class discusses the work of Erica, the fictional student in the *Math Pathways & Pitfalls* lesson with the "OK" solution. Ms. Kean asks the students to study Erica's representation before talking in pairs and then has a student come to the board to really talk about the graphical representation in depth. She also makes sure the student can identify the symbols that would go with the pictures, alluding to scale factor and equal ratios the entire time.

Teaching Practice 3: **Help students connect visual, verbal, and symbolic representations of mathematical ideas.**

In this final video clip, Ms. Kean asks students to show, in multiple ways, how to find equal ratios for the base ratio of 2:5. She asks students to explain their scale factor and to show what they mean with a picture. Notice how students are encouraged to represent and connect their mathematical ideas graphically or pictorially.

Using the Principle With District-Adopted Materials

Mr. Shinoda selected a lesson on comparing fractions because this mathematical idea lends itself to using visual as well as symbolic representations.

The following is the problem that students are discussing in this clip:

> Homer and Bart had a pizza eating contest, but they can't figure out who won. Homer ate 7/8 of his pizza and Bart ate 3/4 of his pizza. If both pizzas were the same size, who ate more?

Teaching Practice 1: Have students model ideas in different ways.

Mr. Shinoda asks the students to work on their own and then discuss the problem with a partner. He calls on two students to show how they represented their solution.

Teaching Practice 2: Discuss one or more representations in depth to develop a mathematical idea.

Now you will see a second video clip from this lesson. This time, students are comparing decimals. Mr. Shinoda presents a problem comparing distances run by two basketball players in tenths and hundredths of a mile. He again asks students to work on their own and then with a partner. He asks students to come up and show their representations on the board and asks questions to help them articulate their thinking.

Teaching Practice 3: Help students connect visual, verbal, and symbolic representations of mathematical ideas.

In this final clip, Mr. Shinoda reviews the different representations that students drew on the board. He makes a point of showing how the solutions compare 75 hundredths and 8 tenths (or 80 hundredths), although the representations are different. Watch how Mr. Shinoda uses three different representations to compare and clarify solutions to one problem.