



Presentation

FULL DETAILS AND TRANSCRIPT

Connecting Abstract and Concrete Representations of Concepts

May 2008

Topic: How to Organize Your Teaching

Practice: Abstract-Concrete Connections

Highlights

- Research studies have found that by illustrating abstract concepts with concrete representations and helping students see the connections between them, teachers improve the likelihood that students will master what is being taught.
- Teaching a new concept in purely abstract terms can make it difficult for students to fully understand what is being taught. On the other hand, teaching a new concept in exclusively concrete terms can limit a student's ability to understand how to apply the concepts to other situations.
- Several ideas for approaches to making connections between abstract and concrete representations are described.

Full Transcript

Slide #1

Welcome to the overview on Connecting Abstract and Concrete Representations of Concepts.

Slide #2

Ms. Burroughs is preparing a lesson on weather and isn't sure how to approach it. Every year her students have a hard time with some of the more abstract concepts, like evaporation and precipitation.

As she plans, she thinks about some of the ideas students have expressed in the past, thinking that clouds were made of "cotton and air," or that they are "thickened air fibers." She knows that simply describing how clouds are formed won't be enough for most of them to really understand the material. She looks online and finds some fun activities, but they won't really help students see the connections between what they are doing in the activity, and the larger concepts she's trying to teach.

Slide #3

What does it mean to help students see the connections between abstract and concrete representations of concepts?

Slide #4

The same abstract idea can be represented in a number of different ways. The use of multiple representations--pictures, diagrams, charts and models-- helps students visualize and understand difficult concepts. Research has found that when teachers make connections between abstract and concrete representations students are better able to apply what they have learned across a range of situations.

Slide #5

Let's look at how this works in practice. Well-labeled graphics or illustrations combined with clear verbal descriptions help students better understand key processes and concepts. Graphics do not have to be realistic to be useful. In fact, sometimes an abstract image will illustrate an idea better than a realistic illustration. Regardless of the type of graphic representation it's important that teachers draw students' attention to the relevant similarities between the visual representation and the abstract idea.

Slide #6

Visual representations like number lines, blocks, and algebra tiles can help students understand abstract math concepts. While teaching a new concept in exclusively concrete terms can limit a student's ability to apply the concepts to new situations, showing how manipulatives relate to a larger concept or equation can promote better understanding of the abstract principle involved.

Slide #7

Teachers can also provide models of phenomenon that are difficult to understand or see, like how temperature affects the density of water or how the layers of the earth are formed. The teacher's role is vital here, as she draws students' attention to the ways in which a concrete model of a subject relates to an abstract concept. The teacher can show how the model supports the concept, as well as the model's limitations.

Slide #8

Making connections between abstract and concrete representations may look different across subject areas:

A middle grades math teacher can help her students understand how to calculate rate by introducing an equation, showing a diagram, asking students to graph the speed of a car, and having students do their own experiments. The teacher's role is critical as she helps her students see the connections between the equation, their predictions, and the results of the experiment.

An elementary science teacher might give students hands-on experiences in science as they learn about the properties of solids, liquids and gasses, for example. It's important that teachers help students connect what they are observing to what is happening on a molecular level.

Social studies teachers can connect abstract ideas to scenarios that are interesting and familiar to students. Take, for example, the idea of taxation without representation. A teacher can make connections between the experience of the colonists under British rule and students' frustrations when school administrators create rules without consulting them. She might have students consider how their experiences are similar to and different from the colonists.

Slide #9

Teachers need to be aware of the limits and benefits of providing initial instruction using concrete representations. Not every concept needs to be introduced with a concrete representation or situation. In fact, sometimes teaching in the abstract from the beginning produces superior results.

Slide #10

So, what does all this mean for students?

Connecting abstract and concrete representations helps students to transfer their knowledge to new problems and settings - a major goal of education. When teachers highlight the connections between the abstract idea and concrete experience or representation they build bridges to difficult concepts.

Slide #11

Ms. Burroughs developed lots of concrete activities for her students to learn about evaporation, condensation, and precipitation. She had students act out how ocean water evaporates to become clouds, and then had the class create diagrams that illustrated how water moves from the sky to the earth and back to the sky again. She gave them a homework project that had them collect dew in their back yards. As her students came up with their own questions and explanations about weather, and proudly used their new vocabulary, it was clear to Ms. Burroughs that they really understood the lesson.

Slide #12

To learn more about connecting abstract and concrete representations of concepts, please explore the additional resources on the Doing What Works website.