DOINGWHATWORKS

Presentation

FULL DETAILS AND TRANSCRIPT

Concrete to Abstract Sequence

Indian Land Middle School, South Carolina • April 2010

Topic: Response to Intervention in Elementary-Middle Math
Practice: Intentional Teaching

Highlights

- A special education class of seventh and eighth graders learns how to solve two-step equations.
- There is a warm-up review of solving one-step equations.
- Students follow the steps to solve equations using concrete materials (integer chips).
- Students work in pairs with concrete materials, explaining the steps to each other.
- The teacher transfers from concrete to representational by using the SMART Board to demonstrate understanding.
- The teacher and assistant check for understanding appropriate mathematics skills at each grade level.
- The teacher moves students to abstract problem solving.
- Students practice through scavenger hunts and ticket-out-the-door problems.
- The teacher describes value of the concrete-representational-abstract sequence.

About the Site

Indian Land Middle School
Indian Land, SC

Demographics
78% White
12% Black
5% Hispanic
5% Other
22% Free or Reduced-Price Lunch

A special education teacher from Indian Land Middle School, Tiffany Evans, is featured. She has taught at the school for five years, with current assignments including Tier 2 and Tier 3 interventions and special education classes. Ms. Evans has worked closely with Dr. Bradley Witzel, from Winthrop University, to learn to design and deliver explicit instruction during interventions, using visual representations and following a concrete-representational-abstract (CRA) sequence of instruction. Features of math intervention at Indian Land include:

- Use of a variety of visual representations to demonstrate mathematics concepts,
- Explicit presentation of a concrete-representational-abstract sequence of instruction,
- Standards-based intervention instruction,
- Formative assessment strategies,
- Peer teams for communication of problem-solving steps.

Full Transcript

Slide 1: Welcome

Welcome to Concrete to Abstract Sequence.

Slide 2: Introducing Tiffany Evans

My name is Tiffany Evans. I'm a special education teacher at Indian Land Middle School, in Indian Land, South Carolina. I teach sixth-, seventh-, and eighth-grade students.

My class is a math group of seventh- and eighth-grade students with varying abilities, some ranging three to four grade levels below what they are currently in and some all the way up to just one grade level below.

Slide 3: Today's lesson

We've been working on basic math skills—addition, subtraction, a lot of multiplication facts—and we've worked our way up to building to two-step equations. The goals for my lesson today were to get students to learn how to solve two-step equations using inverse operations of addition, subtraction, multiplication, or division.

Prior to this lesson, we worked on learning the basic math facts with multiplication, division drills, addition and subtraction drills. We solved one-step equations starting with concrete manipulatives and going to abstract problem solving. To activate their prior knowledge, we went back and reviewed some one-step equations from prior in the year just to build on that to get to our two-step equations.

In most lessons, I try to build up from representational to abstract. It's not always possible to do in one lesson. Fortunately, because we had a prior knowledge built up, my students were able to go from using cups and integer chips all the way to abstract problem solving.

Slide 4: Whole-group instruction

I started my lesson with a warm-up of one-step equations. Students worked independently to solve one-step equations using inverse operations. There were six problems, and once they were finished, students took turns coming to the SMART Board to demonstrate how to solve the equations. Once the class was finished with the warm-up, we began a SMART Board lesson that was interactive with the demonstration of using cups and integer chips. We had a balance, and they saw if they moved one thing off one side, then it tilted over, so they needed to do the same thing to the other side. And once they did that, each student was paired up with another student, and they had cups and integer chips at their desk. My students have a tendency to learn better when they are manipulating things with their hands. They need to actually see *how* something works.

As they were working in pairs, I circulated through the room, as did my assistant, and we had a checklist that we checked off individual pairs as we saw them actually using the manipulatives correctly. If they weren't quite using them correctly, we would work with them independently and help demonstrate to them. And as they mastered that concept, we would have students come to the SMART Board and actually demonstrate on the SMART Board by moving objects around and actually teach it to the class. And once they could teach it to the class, then we knew they had a thorough understanding of using the manipulatives.

Slide 5: Representation to abstract

The students were able to transfer the information of actually physically holding the cups and chips and go to the SMART Board and use their hands still to move it around, but they were able to actually talk about it

and explain the process to other students.

Once my students had started drawing the pictures and solving equations pictorially, they are saying, "Can't we just solve the equations? We know how to do this. Let's do the numbers." So we went straight on to abstract problem solving, and they would have an equation such as $2x + 3 = 6$, and they learned how to do the inverse operations and solve the equations. They each had their whiteboard and would solve an equation, and when I said, "Go," they would hold up their answer and we'd give a thumbs-up if it was right, or if it was wrong, then we moved on from there and actually had an activity that was a whole-group activity throughout the classroom.

Slide 6: Check for understanding

Throughout my lessons, I feel it's important to constantly check for understanding to use all types of formative assessment to see if my students are understanding what's going on. With the group of students I have, since they are already struggling in math, it's very important for me not to go beyond what they are capable of doing without them mastering the first skill. I need to constantly check and recheck and make sure they are understanding things prior to moving on. Otherwise, they get even further behind in class.

Slide 7: Scavenger hunt practice

At the conclusion of going through the abstract reasoning with students, we went into a scavenger hunt activity. We frequently do these where there are folded sheets of paper on the wall. Each one has a letter on it, and once they solve it, it will actually spell, "Math is cool."

They have a starting point. Lift the flap up, and there's an equation they have to solve. Once they solve the equation and get an answer, they walk around the classroom and find another sheet of paper that has that answer at the bottom. Then they write the letter down for that sheet, solve another equation, and then go and look for that answer. It's a great activity to get students working in pairs or in groups, and it's great for me to be able to walk around and monitor them as they go. So if students are struggling, I can sit and work with them independently as others go on.

Slide 8: Next lesson

We had a quick quiz with only five questions on the SMART Board, and students used the clicker system to answer, so I could get immediate feedback to see how they were doing. I was very impressed. I had one student that got 60 percent, two with 80 percent, everyone else got 100 percent on that quick quiz. So I was very impressed at the results.

The majority had mastered solving two-step equations at that point, and then at the end of class they had a Ticket Out the Door and absolutely everyone got the right answer in solving the equation.

Our next lesson, we will actually be solving equations where we have variables on both sides of the equation. So we'll go back and use some more concrete representation with the cups and integer chips again, and move back on to the abstract level where the students were today.

Slide 9: Value of CRA

I have a variety of learners—some are visual, some auditory, some kinesthetic learners—and they all learn in different ways. I found that taking them from concrete manipulatives to drawing pictorial representations to doing abstract problems has been the best method for them to actually grasp a concept and retain that information. My students have performed remarkably well in using concrete representations. If they can draw a picture of it, then that's showing me that they actually are understanding the problem. They are not just being able to go through a sequence and solve an algorithm.

Slide 10: Learn more

To learn more about Concrete to Abstract Sequence, please explore the additional resources on the Doing What Works website.