Subtraction-Strategies in Action!

Summary

The small group activities in this plan help students learn to solve subtraction problems.

Main Core Tie

Mathematics Grade 2

Strand: OPERATIONS AND ALGEBRAIC THINKING (2.OA) Standard 2.OA.1

Additional Core Ties

Mathematics Grade 2

Strand: NUMBER AND OPERATIONS IN BASE TEN (2.NBT) Standard 2.NBT.5

Mathematics Grade 2

Strand: NUMBER AND OPERATIONS IN BASE TEN (2.NBT) Standard 2.NBT.7

Group Size

Small Groups

Materials

Shopping Spree

- *Place Value Mat*
  Play money
- *Shopping Spree*
  Tens cube

Two and Three Digit Subtraction Strategies

- *Subtraction Strategies*
  Scissors

Subtraction Showdown

- *Number cards*
  Small whiteboards
  Markers
  Calculators

Additional Resources

Books

Principles and Standards for School Mathematics, by National Council of Teachers of Mathematics; ISBN 9 780873534802

Developing Number Concepts; Place Value, Multiplication, and Division, Richardson, Kathy; ISBN 0-7690-0060-6 21882

Elementary and Middle School Mathematics; Teaching Developmentally, Van De Walle, John A.; ISBN 0-205-38689-X

Background for Teachers

Research has shown that children, if given the opportunity will invent several strategies to solve subtraction problems. The first step in teaching subtraction should include manipulatives in whole and small group instruction. This step is sometimes referred to as direct modeling, because the manipulatives directly model the meaning of an operation or story problem. This phase of instruction should be repeated several times, varying the steps and problems. Students should have plenty of

opportunities to discuss with the class how they solved problems. This step is an added benefit to the teacher because he/she can listen to students to see if they fully understand the operation of subtraction.

After students are able to solve problems using manipulatives, a second step should be introduced. Students should then apply their invented strategies to problems and use writing or drawings to support their methods. It is usually helpful if teachers model record keeping techniques while students explain their thinking in whole group situations. In this step, it is also vital that students have the chance to share their thinking processes with one another.

As an educator, you want your students to be successful with one or two strategies that make sense to them. The two invented strategies that will be introduced in the lesson are "Counting Up" and "Same Change." Counting Up is a natural strategy for students to use, because many of them solve basic subtraction facts using this method. An example would be 13 -- 5 =? Students think 5 plus what number equals 13? When a student uses this strategy with larger numbers, he/ she has to break the steps into smaller pieces.

Example: 94 -- 28. The student would think, "28 plus what number equals 94". He/she would start by counting on to 28, 29, 30 (plus 2). Then count by tens to get to 90. 30, 40, 50, 60, 70, 80, 90 (plus 60), and continue by ones, 90, 91, 92, 93, 94 (plus 4).

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  2        94-28 = 66
 60
+ 4
 66
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The Same Change strategy works on the basis that as long as we keep the same distance between the numbers we are subtracting the answer will be the same. Examples: 5-3=2, add 5 to each number, 10-8=2, subtract 1 from each number, 4-2=2. With larger numbers we want students to use compatible numbers that are easier to subtract, usually numbers in the tens group.

Example:

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 94
-28
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The student would think, "I add two to 28 and make it 30, an easier number to work with. Because I added 2 to 28, I have to make the same change to 94 so that the numbers stay the same distance from each other and the problem stays the same. 94 plus 2 equals 96. Now I can subtract."

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 96
- 30
 66
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Finally, you can introduce the traditional algorithm for subtraction but remember the importance of students being able to explain to you why it works.

Intended Learning Outcomes

5. Understand and use basic concepts and skills.
6. Communicate clearly in oral, artistic, written, and nonverbal forms.

Instructional Procedures

Invitation to Learn

Make an overhead of compatible pairs to make 10 and another one to make 20, or make a copy for each student. Have students raise their hands or connect the compatible pairs as they see them. The ideas with this activity is to get students accustomed to seeing combinations that work together and then look for these combinations in mathematical problems.

Instructional Procedures

Shopping Spree

Explain to the students that in this activity they will be using compatible pairs that make ten to

subtract their $10 bills. Ask the students if they have ever received money for a birthday or Christmas present. Ask a few students what they did with the money. Explain that they are going to play a game called "Shopping Spree," where the winner is the first person to spend all of their money.

Group the students into pairs. To each student pass out a *Place Value Mat*; play money - ten $100 bills and fifteen $10 bills per student, a Shopping Spree recording sheet and a cube numbered 00--90.

Each student starts out with 10 $100 bills or $1,000. Students should place the money on the *Place Value Mat*. The students take turns rolling the number cube and taking away the dollar amounts equal to the number on the cube. Students need to trade their $100 bills to ten $10 bills to subtract.

If a student rolled 50 on his/her first roll then he/she would trade a hundred dollar bill for 10 ten-dollar bills. He or she would say $1,000 subtract $50.00 is $950 and write down that amount on the *Place Value Recording Sheet*.

Play continues until one of the students spends all of their money and the student's *Place Value Recording Sheet* is at 0. The goal of the game is to have students see compatible numbers 10 -- 90, and also to use the strategy of "counting up" for subtraction.

Two and Three Digit Subtraction Strategies

Pass out the *Subtraction Strategies* foldable to each student. Explain how to fold the paper and where to cut the flaps.

Model a subtraction problem and solve together using "Counting Up." Then have the students make up a problem on their own, write it on the opposite side of the flap, and solve it using the same method. Continue using the "Same Change" strategy.

Subtraction Showdown

Organize the students into groups of four.

Pass out a set of *Number cards*, three whiteboards with markers, and one calculator to each group.

One student is the caller and the other three students are problem solvers. The caller turns over two cards and makes a two-digit number. The caller turns over two more cards and makes another two-digit number. The greatest number is the minuend (first number or the number being reduced) and the second number is the subtrahend (second number or the number being taken away from another number) in the subtraction problem.

The three problem solvers write down the problem and solve it using any method that they want, and the caller uses the calculator to solve the problem. When everyone is done the caller calls out "Showdown," and the three students turn over their boards to show everyone their answers. If everyone is correct, the team celebrates. If someone makes a mistake then the team helps the student find his/her error and then everyone celebrates.

Everyone passes his or her equipment clockwise to the next person. The new caller repeats the same process and the problem solvers solve the new problem.

Extensions

Curriculum Extensions/Adaptations/ Integration

For special needs learners, simplify Shopping Spree by using two 1-6 cubes and start with $100. Special needs students could use the digit cards 0-5 when playing Show Down.

Have advanced learners make three-digit subtraction problems when playing Show Down.

Family Connections

Write a note home to family members explaining that you will be teaching their children different strategies for subtraction before you teach the standard algorithm. Give parents some examples, and ask them to support you by helping their children learn these strategies too.

Have students share their Subtraction Strategies foldable with family members.

Assessment Plan

Walk around the room while students are participating in the activities. Do they understand place value when they are playing Shopping Spree? Can the students find the difference to the next hundred? Do they understand place value and are they lining up their equations properly? Are they able to solve the problems? What strategies are they using most often?
Have the students write in their journals one new thing that they learned from the activity.

Bibliography

Research Basis

Burns, Marilyn (April 2004). 10 Big Math Ideas. *Instructor Magazine*. 16-19.
In this article, Marilyn Burns describes ten "Big Ideas" that every math class should include. She explains that success comes from understanding, and to foster students' understanding, they need to explain their thinking to each other as well as write down their thoughts about mathematics. Mathematics should be presented in a real-world context so that it has meaning for our students. Manipulatives should be used to help make abstract ideas concrete. Our activities need to meet the needs of all of our learners, and as educators we need to remember that confusion and partial understanding are natural to the learning process. She reminds educators that learning should be a long-term goal not a lesson objective. Finally, Burns says that there's no one-way to think about any mathematical problem. Always encourage students to share their thoughts and ideas of how to solve problems.
Tomlinson, Carol Ann. (Oct 2003). Deciding to Teach Them All. *Educational Leadership*. 61 (2) 6-11.
In this article, Carol Ann Tomlinson talks about principles that can be applied to academically diverse classrooms to help every learner succeed. She states that a teacher's first job is to provide an inviting and thoughtful curriculum. Each student should be required to think at high levels, and should find his or her work challenging and interesting. Students should have an opportunity to work together as a whole class and in various small groups. Tomlinson warns against grouping students in only a few ways, because students tend to see themselves and others in limited ways. Assessment should be an ongoing process in the classroom, with everything that a student says or does being potential assessment data. Lastly, for a class to be equitable for all learners, students should be graded on their growth as a learner.

Authors

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