Manchester College
Education Department

Lesson Plan by Daniel Haffner

Lesson: Solving Multi-Step Equations (Ch. 2.3)
Length: 75 minutes
Age or Grade Level Intended: 8th grade
Academic Standard(s): A 1.2.2. Solve equations and formulas for a specified variable.
Performance Objective(s):
Given 10 problems, the students will solve the equations for the specified variable with 80% accuracy.

Assessment:
The students will be assigned a set of problems to complete. The teacher will check the problems to see if they are correct.

Advance Preparation by Teacher:
- Teacher's manual of Algebra I textbook (Prentice Hall Math)
- Smart board and pen
- Textbooks for each student
- Paper and pencils for each student
- Internet access
- Class notes for student with LD

Procedure:

Introduction

1. Project the comic strip from http://math.sfsu.edu/beck/papers/comix07.slides.pdf (slide 13 -More Sidney Harris). (Gardner's: Visual-Spatial)
2. Give students time to read and understand the comic. Discuss with students why the comic is funny. Then discuss with students how it connects to class and why showing one's work is important.(Bloom's: Knowledge, Comprehension; Gardner's: Interpersonal, verbal-linguistic)
3. Tell students that today they are going to be learning about how to solving multi-step equations and that showing their work is going to be the key to understand today's lesson.

Step by Step

1. Project notes on the overhead.
2. Work through example 1: combining like terms, with the students
    1. 2c+c+12=78 combining like terms will be 3c+12=78 and subtracting -12 from each side will give 3c=66. Last divide by 3 on each side to get c=22.
    2. 4b+16+2b=46 combining like terms gives 6b+16=46 and subtracting -16 from each side gives 6b=30. Last divide by 6 on each side to get b=5.

(Bloom's: Knowledge, comprehension, application; Gardner's: logical-mathematical, visual-spatial)

3. Now let the students work through the TRY THIS section. Walk around and see who is getting it and who is struggling. (Bloom's: Knowledge, comprehension, application; Gardner's: logical-mathematical, visual-spatial, intrapersonal)
4. Work through each problem asking individuals for each step, and taking it one at a time. (Bloom's: Knowledge, comprehension, application; Gardner's: logical-mathematical, verbal-linguistic)
5. Now work on example 2: Real-World Problem Solving, with the students
    1. Talk through the problem and try to see if the students can help come up with an equation.
    2. Equation should be: 44=2x+12, now have then combined like terms to get 32=2x, then divide both sides by 2 to get x=16. So the length of the garden is 16 ft.
    (Bloom's: Knowledge, comprehension, application; Gardner's: logical-mathematical, visual-spatial)
6. Now have the students work through the TRY THIS example on the notes (give them plenty of time so they will understand it for the homework). (Bloom's: Knowledge, comprehension, application; Gardner's: logical-mathematical, verbal-linguistic)
7. Repeat steps 2 through 6 with remaining examples and TRY THIS sections
8. Summary
    1. Step 1. Clear the equation of fractions and decimals.
    2. Step 2. Use the Distributive Property to remove parenthesis on each side.
    3. Step 3. Combine like terms on each side.
    4. Step 4. Undo addition or subtraction.
    5. Step 5. Undo multiplication or division.
9. Assign students the following for the day's practice/homework assignment: page 91, #1-50: multiples of 5. (Bloom's: Knowledge, comprehension, application; Gardner's: logical-mathematical, visual-spatial, intrapersonal)
10. Allow students time to work quietly and individually.

Closing

1. Tell students that any work not done is homework for the night.
2. Ask students to name the five steps for solving multi-step equations. Tell students they will be building on those five steps tomorrow. (Bloom's: Knowledge, comprehension; Gardner's: logical-mathematical, verbal-linguistic, interpersonal)

Adaptations

Learning Disability: The students receive a copy of the instruction notes.

Reflections

I felt that some liked the comic strip helped explain why it is important to show the work. Some students hate to show their work, but after I explained to them that if they show me their work than I will know if they truly understand how to solve equations or not and I can't teach my lessons accordingly. I also felt like they understood how to solve the equations with integers and decimals, but when the equation had fractions I should have had more equations ready so that they could have more practice with fractions. My cooperating teacher told me later that I needed to explain why or at least ask the students why they must follow certain steps in the problem. She explained that by asking the students to explain why something works in an equation I can check to see if they understand it or not. I do feel like the students know how to solve multi-step equations with integers because I saw them successfully completing their homework by themselves. However, I still think they need more time with fractions because those parts of the lessons caused a lot of confusion and many students still had questions even after I tried to answer them. Next time, I will balance out the examples I have with integers and fractions so the students are comfortable with both.

In addition to teaching the content of my lesson, my cooperating teacher provided other feedback that will help future lessons go well. First, I need to pick on other students to answer questions, even if they are not volunteering. Second, I need to work on the timing of my lessons. My teacher explained that how to pace the lesson will come with experience but it was still frustrating after a first lesson. However, I enjoyed using the technology in the lesson, like the interactive whiteboard, and my teacher was impressed with how I incorporated it. The students were interested the lesson partly because I started with displaying comic strips on the whiteboard and they were only use to seeing math problems on it. Overall, I think the lesson went well and the students responded positively to it. This gives me hope for future lessons I might teach or even when I come in the spring.

2-3 Solving Multi-Step Equations

Example 1: Combining Like Terms

Solve each equation.

$2c + c + 12 = 78$

$4b + 16 + 2b = 46$

TRY THIS:Solve each equation. Check your answer.

$3x - 4x + 6 = -2$

$7 = 4m - 2m + 1$

$-2y + 5 + 5y = 14$

$-3z + 8 + (-2z) = -12$

Example 2: Real-World Problem Solving

GARDENING A gardener is planning a rectangular garden area in a community garden. His garden will be next to an existing 12-ft fence. The gardener has a total of 44 ft of fencing to build the other three sides of his garden. How long will the garden be is the width is 12 ft?

TRY THIS: A carpenter is building a rectangular fence for a playground. One side of the playground is the wall of a building 70 ft wide. He plans to use 340 ft of fencing material. What is the length of the playground if the width is 70 ft?

Example 3: Solving an Equation With Grouping Symbols

Solve $-2(b - 4) = 12$.

TRY THIS: Solve each equation. Check your answer.

$3(k + 8) = 21$

$15 = -3(x - 1) + 9$

Example 4: Solving an Equation That Contains Fractions

Solve $2x/3 + x/2 = 7$.

TRY THIS:

$m/4 + m/2 = 5/8$ $\qquad\qquad$ $2/3x - 5/8x = 26$

Example 5: Solving an Equation That Contains Decimals

Solve $0.5a + 8.75 = 13.25$.

TRY THIS:

$0.025x + 22.95 = 23.65$ $\qquad$ $1.2x - 3.6 + 0.3x = 2.4$

SUMMARY

Step 1: Clear the equation of fractions and decimals.

Step 2: Use the Distributive Property to remove parenthesis on each side.

Step 3: Combine like terms on each side.

Step 4: Undo addition or subtraction.

Step 5: Undo multiplication or division.