Using Anchored Instruction to Teach Mathematical Problem Solving

Objective: To teach students to compute fractions and solve both word- and contextualized- problems.

Setting and Materials:

Settings: Inclusive class

Materials: Video to present the problem students will be working on (see below), schematic plans for a bench, 2 x 4s, tape measure, saw, tools to assemble a bench (e.g., nails, hammer, screwdriver, drill), paper, and pencils.

Fraction of the Cost Video (http://team.wceruw.org/products.html)
This 8-minute video begins with three students, one with Down syndrome, debating how to afford to build a skateboard ramp. The owner of a skateboard stole told them the ramps behind the store were not or sale, but provided them with websites where they can access ramp plans.

In the next scene, the three friends print a copy of a ramp plan, and after looking at it wonder if they have the money to purchase the required materials. As they are discussing this, they find an ad for (a) 2 x 4s, (b) wood screws, and (c) 4-ft x 8-ft sheets of plywood. They decide to pool their money. One student has $19, a second is allowed to use 10% of her savings (i.e., $210), and the third must simply keep a minimum of $50 in his savings account, which currently has $73. The third student also remembers there are left over 2 x 4s in his garage.

In the final scene, the students are measuring the left over lumber in the third student's garage. Then, the question is posed. The question asks students to show how they can build the ramp with the money and materials they have. To do this the students must (a) use the wood in the most economical way, (b) calculate the percentage of money from a savings account they can use, (c) calculate the cost of materials including sales tax, (d) convert feet to inches, (e) read schematic plans, (f) develop a table to track materials, and (g) compute mixed fractions.

Content Taught

Students learn to solve both word- and contextualized-problems using various math skills. These include computing fractions, computing money, identifying the lengths of materials they will need, converting measurements from feet to inches, and analyzing combinations of materials to use as little as possible.

Teaching Procedures

Prior to Instruction
1. Review adding and subtracting fractions with students for four days prior to instruction.
    i. Day 1 – Emphasize the meaning of fractions as they relate to whole numbers.
    ii. Days 2-4 – Have students practice computing simple and mixed fractions in class and for homework.

Fraction of the Cost Video-Based Problem
(http://team.wceruw.org/teachers_manual.html#AllTogether)
1. Have students work in pairs.
2. Display the video (described above) for all.
3. Provide copies of the video to the students and direct them to summarize the problem in the video.
4. Students should spend the next several days navigating the video for information, computing solutions to problems, and suggesting tentative solutions. During this time, the teacher should visit the groups to check their progress, redirect them to relevant scenes if they have questions, and encourage them to keep working if they are unsure how to proceed.

Transfer Problem
(http://team.wceruw.org/Related_Problems/related_problems_Bench.html)
1. Show the students plans for a bench or them to make.
2. Direct them to first compute how to use the 2 x 4s in the most economical way and make a list of materials.
3. Have them construct the bench.

Evaluation

Fractions Computation Test. This was an 18-item test worth 36-points to assess students' ability to compute fractions. Twelve items were on adding mixed fractions and 6 items were on subtracting mixed fractions. One-point was given for correctly rewriting the fractions before computing them to ensure common denominators and one-point was given for having the correct answer reduced to the lowest terms.

Word-Problem Test. This was an 18-item, 36-point test designed to assess students' ability to solve single- and multi-step problems. All problems were written at a 4th grade level or lower. Students could earn one-point for selecting the correct procedure (i.e., correct numbers and operations), and one-point for the correct answer.

Contextualized-Problem Test. This was a 36-point assessment to measure students' ability to solve the problem in the *Fraction of the Cost* video. Students were asked to

show how to solve the problem in a 6" x 6" work area. Partial or full credit was awarded on 15 measures in 5 major categories: (a) computing money, (b) indicating the lengths of lumber students measured, (c) converting those lengths from feet and inches to inches, (d) showing combinations of lengths to cut lumber with as little waste as possible, and (e) calculating total cost of materials.

Lesson Plan Based on:

Bottge, B. A., Heinrichs, M., Mehta, Z. D., & Hung, Y. (2002). Weighing the benefits of anchored math instruction for students with disabilities in general education classes. Journal of Special Education, 35, 186-200.

IDEAs that Work
U.S. Office of Special Education Programs