



Using CRA (Concrete-to-Representable-to-Abstract) to Teach Algebra. Lesson 1: Concrete

Objective: To teach students the skills to solve complex algebraic expressions using concrete methods using the CRA model.

Setting and Materials:

Settings: Inclusion Classroom (General education classroom: 50 minute math/Algebra class)

Materials:

- 20 toothpicks that will represent the ones place value
- 4 popsicle sticks that will represent the tens place value
- 12 red plastic cups that will represent the coefficients
- 2 multiplication symbols (\times and $/$) drawn on cardstock and laminated
- 1 piece of string to represent the equal sign
- 8 minus signs drawn on green cardstock and laminated
- 8 plus signs drawn on red cardstock and laminated
- Sentence strips for division.

Content Taught

Teach the skills needed to solve Algebraic expressions using concrete objects.

Teaching Procedures

1. Introduce the lesson on the topic of solving algebraic expressions.
2. Model the lesson:
 - a) Step 1: Show the students a concrete representation of $5 - 2x - 6$ using manipulative objects. This would appear in the following order: 5 toothpicks, a minus sign, one coefficient marker, an X, a minus symbol, 6 toothpicks.
 - b) Step 2: Model for students how to manipulate the objects in order to create the final answer.
 - c) Step 3: Model these steps using the manipulative objects
 1. $5 - 2x - 6$ (combine your 5 and -6)
 2. $-2x - 1$
3. Guide students through procedures:
 - a) Give the students a problem to solve using the manipulative. (e.g. $10 - 3x - 2$)
 - b) Assist the students in solving the problem.
 - c) Together go through the problem using the manipulative.

1. $10 - 3x - 2$ (combine 10 and -2)

2. $-3x + 8$

4. Independent Practice:

- a) Give the students problems for independent practice.
- b) If the students get fewer than 5 correct, give more guided practice.
- c) After guided practice, give students more problems for independent practice.
- d) If the students still get less than 5 correct, repeat the lesson for that student.

Evaluation

Independent practice problems were used to assess the students learning.

Lesson Plan Based on:

Cease-Cook, J.J. (2013). The effects of concrete-representational-abstract sequence of instruction on solving equations using inverse operations with high school students with mild intellectual disability. (Unpublished doctoral dissertation). University of North Carolina at Charlotte, Charlotte, NC.

Witzel, B. S. (2005). Using cra to teach algebra to students with math difficulties in inclusive settings. *Learning Disabilities: A Contemporary Journal*, 3(2), 49-60

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