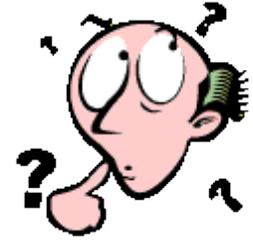


CONSTRUCTING TASK: Developing Meaning by using Story Problems: Result Unknown

Approximately 3 days



STANDARDS FOR MATHEMATICAL CONTENT

MCC.1.OA.1. Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

The goal for this lesson is to expose students to real world problems, using the level of understanding (concrete, representational, or abstract) that each student needs. (see CRA Table on page 15) Addition and subtraction can be divided into four categories: join problems, separate problems, part-whole problems, and compare problems (see Table 1 on page 8). Within these four types of problems, most educators focus on addition and subtract when the result is unknown, this leads to the understanding that addition is “put together” and subtraction means to “take away”. This is a major misconception and limits the students’ understanding. One way to prevent development of this misunderstanding is to provide problem based story problems in which the students are attempting to solve not only for the result but also the change, and the initial.

Students should not complete a multitude of problems within one class period, rather they should work in depth with as few as one problem that they can know and understand completely. Students do not need to know the names of the different types of problems but they should have experience in solving all of the different types. This lesson should not be looked at to be completed in one session, these questions should be readdressed throughout this unit and continue throughout the mathematics curriculum across the year and grade levels.

ESSENTIAL QUESTIONS

- What happens when we join two quantities or take one from another?
- How can we find the total when we join two quantities?
- How can we find what is left when we take one quantity from another?
- What happens when we change the order of numbers when we add (or subtract)? Why?

MATERIALS

- Paper
- Various Manipulatives (examples: counters, based ten blocks, arithmetic rack, etc.)
- Pencils
- Crayons
- Types of Problems (cut out)
- Fill the Tree Game
- Dice
- Small counters

GROUPING

Flexible Grouping (based on student needs) Depending on the story problem, this task could be solved with students working as a whole-class, small groups, or independently.

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Part I

The teacher will tell a story similar to the one suggested and engage in conversation about the questions provided. Continue questioning as needed until the students can answer the questions and understand what is happening in the story.

Five friends are playing outside, five more join them.

- Will that make more or less friends playing together? How do you know?
- What can you do to figure out the total number of friends playing outside now?

Later on, 3 friends had to go inside for lunch.

- How many did that leave playing outside?
- Are there more students inside or outside now? How do you know?
- What did you do to figure it out?
- How was that different from what we did at the beginning of the story, in other words, how did the “actions” for solving or thinking about the problem change?
- How could we use a number line to model the actions in this story?”

Part II

Sample problems have been provided. Copy the problems, cut them out to give to students and/or flexible groups. Each set can be done within small groups or within centers/work stations. The sample word problems are designed to give a conceptual understanding of addition and subtraction of two numbers. Students should explore these problems using the CRA model. Refer to the CRA table on page 15 for explanation and questioning.

- C- Concrete: Using Manipulatives (acting out)
- R- Representational: Drawing Pictures
- A- Abstract: Creating Number Sentences

“In the classroom, this approach is a facilitating framework for students to create meaningful connections between concrete, representational, and abstract levels of thinking and understanding. Students’ learning starts out with visual, tangible, and kinesthetic experiences to establish basic understanding, and then students are able to extend their knowledge through pictorial representations (drawings, diagrams, or sketches) and then finally are able to move to the abstract level of thinking, where students are exclusively using mathematical symbols to represent and model problems.” *Hauser, Jane. Concrete-representational-abstract instructional approach.*

Suggestion for lesson pacing:

- Day one- Students will solve problems within small groups
- Day two- Students will solve problems within partners
- Day three- Students will solve problems independently

The problems listed below are examples from the four types of addition/subtraction problems. The numbers and topics of each problem can be adjusted based on the interest and ability of your students. All four types of problems should be focused in a variety of ways.

Join Problems:

When joining two quantities, three different amounts are used: the initial amount, the change amount, and the result amount (or whole). (VDW)

Example: The other day I saw 5 dogs chasing a ball in the park. Then, three more dogs came and joined them playing ball. How many dogs were playing in the park? $5+3=$ _____

Separate Problems:

Within separate problems, your initial amount is the whole. This differs from a joining problem because within a joining problem your result is your whole. (VDW)

Example: Jack has 11 lizards in a cage. 4 escape. How many are left? $11-4=$ _____

Part-Part-Whole is the combining of two quantities to create a whole. The combination can take place physically, or it can be asked to be completed mentally.

Example: Jessica has 7 nickels and 3 dimes. How many coins does Jessica have all together? $7+3=$ _____

Comparing Problems:

Comparing problems do not focus on the operation, but rather the relationship between two quantities. This relationship can be stated or it can be implied by using terms of greater than or less than. (VDW)

Example: Sarah has 7 dogs. Katie has 12 dogs. How many more dogs does Katie have than Sarah? $12-7=$ ____ or $7+$ ____ $=12$

Part III

Students will play “Fill the Tree” with a partner. Each group will need one game board, different color chips or counters for each player and a pair of 6-sided dice. Each player will determine the color chips or counters they will be. Player one will roll the dice, find the sum, and cover the sum with a chip or counter. Player two will repeat the process. Players will take turns until the board is covered. The player to cover the last spot wins. If a sum is already covered the player loses that turn.

FORMATIVE ASSESSMENT QUESTIONS

See included within the CRA table on page 15 of this unit.

DIFFERENTIATION

Extension:

- Allow students to work with numbers larger than 20 without regrouping.
- Ask students to create and solve their own story problems.

Note: Students typically create addition problems. Check students’ problems to make sure they are creating subtraction problems too.

Intervention

- Allow students to work through the stages at a pace that is appropriate to their developmental level. This will provide students with the remediation they need to understand the concept of comparing numbers. Continue to allow them to work with manipulatives as much as needed. At times, partner them with students who are very articulate about their mathematical thinking so they can hear (through conversations) how these students have made sense of the problems.

Join: Result Unknown

The other day I saw 6 dogs chasing a ball in the park. Then, seven more dogs came and joined them playing ball. How many dogs were playing in the park?
 $6+7=$ _____

There were three people swinging on the swings. One more person joined them. How many children are on the swings? $3+1=$ _____

Separate: Result Unknown

There were thirteen chattering monkeys. Five fell asleep. How many monkeys are still chattering? $13-5=$ _____

Pete has 20 mice in a cage. 12 escape. How many are left? $20-12=$ _____

There were eight bunnies at the pet store. Three went home with a new family. How many bunnies were still at the pet store?
 $8-3=$ _____

Today at lunch I had twelve chicken nuggets on my tray. I ate seven of my chicken nuggets. How many did I not eat? $12-7=$ _____

Sarah and Katie had 15 gumballs. Sarah ate 6 of the gumballs. How many are left for Katie? $15-6=$ _____

Part-Part-Whole: Whole Unknown

Tony has 8 pennies and 5 dimes.
How many coins does Tony have
all together? $8+5=$ _____

Cecil has 10 baseball cards and
Anthony has 8 baseball cards.
The boys put all their baseball
cards into one box. How many
baseball cards will be in their
box? $10+8=$ _____

Compare: Difference Unknown

One litter has eleven kittens.
Another litter has six kittens.
How many more kittens does the
first litter have? $11-6=$ _____ or
 $6+$ _____= 11

Pete has 9 mice. Max has 13
mice. How many more mice
does Max have than Pete? $13-$
 $9=$ _____ or $9+$ _____= 13

In my bag of candy, I have
thirteen yellow candies and eight
red candies. How many more red
candies do I have than yellow
candies? $13-8=$ _____ or $8+$ _____= 13

I picked some flowers for my
mother. I gave her twenty
daisies and fifteen roses. How
many more daisies did I give
her than roses? $20-15=$ _____ or
 $15+$ _____= 20



Fill the Tree

Materials: game board, different color chips or counters for each player, pair of 6-sided dice.

Number of Players: Two - both players will use one game board

Directions: Each player will determine the color chips or counters they will be. Player one will roll the dice, find the sum, and cover the sum with a chip or counter. Player two will repeat the process. Players will take turns until the board is covered. The player to cover the last spot wins. If a sum is already covered the player loses that turn.

