CONSTRUCTING TASK: Ten Flashing Fireflies

Approximately 2-3 Days

STANDARDS FOR MATHEMATICAL CONTENT

MCCK.OA.1 Represent addition and subtraction with objects, fingers, mental images, drawings[1], sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.

MCCK.OA.2 Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.

MCCK.OA.3 Decompose numbers less than or equal to 10 into pairs in more than one way, e.g., by using objects or drawings, and record each decomposition by a drawing or equation (e.g., $5 = 2 + 3$ and $5 = 4 + 1$).

MCCK.OA.4 For any number from 1 to 9, find the number that makes 10 when added to the given number, e.g., by using objects or drawings, and record the answer with a drawing or equation.

MCCK.OA.5 Fluently add and subtract within 5

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

As you tell the addition or subtraction stories, have children act out the stories using a variety of manipulatives to represent the fireflies. Once children are comfortable acting out the stories and demonstrate proficiency with acting them out, model for students how to record matching number sentences. Be sure to refer to the plus sign as "and", the equal sign to "is the same as", and the subtraction sign as "minus". Students should understand the meaning of the symbols and how the symbols connect to the stories.

As you create word problems for your students, base them on people, animals, or objects that you are discussing in other content areas or that the students can connect with for other reasons.

Learning is tied to emotion and if students can connect with the problem, they are more likely to be engaged and therefore, learn through their experience.

ESSENTIAL QUESTIONS

- Does the order of addends change the sum? Give examples to justify your thinking.
- How can I find the total when I put two quantities together?
- What happens when some objects are taken away from a set of objects?
- How can I find what is left over when I take one quantity away from another?
- How can I represent problems using objects, pictures, and numbers?
- How can strategies help use solve problems?
- How do you know when your answer makes sense?
- What happens when I decompose a quantity?
- What happens when I join quantities together?
- What is a pattern and where can you find patterns?
- What is a strategy?
- What is the difference between addition and subtraction?

MATERIALS

- *Ten Flashing Fireflies,* by Philemon Sturges or similar book
- "Ten Flashing Fireflies" work mat
- "Ten Flashing Fireflies" recording sheet
- Flashlights
- 10 centimeter cubes

GROUPING

Whole, Individual, Small group

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION:

Comments
This task can be completed over a period of two to three days. The counting book, *Ten Flashing Fireflies,* by Philemon Sturges or a similar book, will set the stage for establishing the concept of number combinations. Each page of the story will introduce a different combination of 10.

Part I
Read the story to the students and have students act it out. Set the scene by dimming the lights and providing flashlights. Select 10 students and give each student a flashlight to shine on the wall to represent fireflies. Designate a spot on the wall as "the jar" and the rest of the wall is "the night sky".   As students model the story with flashlights, have them share the strategy they are using. As you read the story, have students take turns modeling the bugs with the flashlights.

Part II
After modeling the story with flashlights, gather students to a meeting area and ensure each student has (10) centimeter cubes and the *Ten Flashing Fireflies* work mat. During this *solve and share* session it is important that students respect each other's think time. Choosing problems from the *Ten Flashing Fireflies* problems type chart, ask students to solve and model the problem using their work mat.

Comment: The problem types provided incorporate numbers to 10. Using a different total number of "fireflies" (or cubes) for each problem will increase the problem solving strategies that are required of students. This task can be modified to match part-part-whole for just the number 10 for students to work with specific number relationships.

Part III
Distribute 10 centimeter cubes (or other counting objects) to represent fireflies and *Ten Flashing Fireflies* work mat to each student or small group of students. Begin by reading the first couple of pages of *Ten Flashing Fireflie,s* by Philemon Sturges or similar book to the class. As the story begins, pause at each page and allow students to represent the action using the cubes on the work mat. Allow students the opportunity to discuss the strategies they are using to solve the problem the first couple of pages.

After students have discovered two possible combinations of fireflies in the jar and night sky, present students the *Ten Flashing* Fireflies task sheet: *There are 10 fireflies flying around. How many fireflies could be in the jar, and how many could be in the night sky? Find all of the possible combination of fireflies that could be in the jar or in the night sky. Record and explain your thinking using a table.* Have students work through the task that identifies how many fireflies could be in the jar or in the night sky. Once students have completed the task, finish reading *Ten Flashing Fireflies* so that students can verify their combinations and share the strategies they used to solve the task.

Possible questions that engage students:

- What counting strategies are students using as they separate (or add) information?
- Can students separate objects from a larger set of objects?
- Are students able to explain what happens when some objects are removed from a set of objects? Added to a set of objects?
- Can students explain how to find out what is left when one quantity is removed from another?
- Can students explain patterns as the story develops?

Have students write in their math journal about what was easy and what was difficult for them during today's problem solving. As you read (or listen to what they dictate), take note of *what* they write, not *how* they write it (Burns 2006).

FORMATIVE ASSESSMENT QUESTIONS

- What strategy did you use?
- Did you think of the words "more" or 'less"? How?
- Is there another way you could have solved the problem?
- Were there more in the jar or night sky?
- What would you have to do to make the night sky and jar equal?

DIFFERENTIATION

Extension
- As students develop proficiency with solving each type of addition and subtraction structure, have them write their own problems for others to solve.
- Exploring number relationships to 20 can also be used to extend this task. The same concept can be used, but students would model part-whole using 20 counting objects.
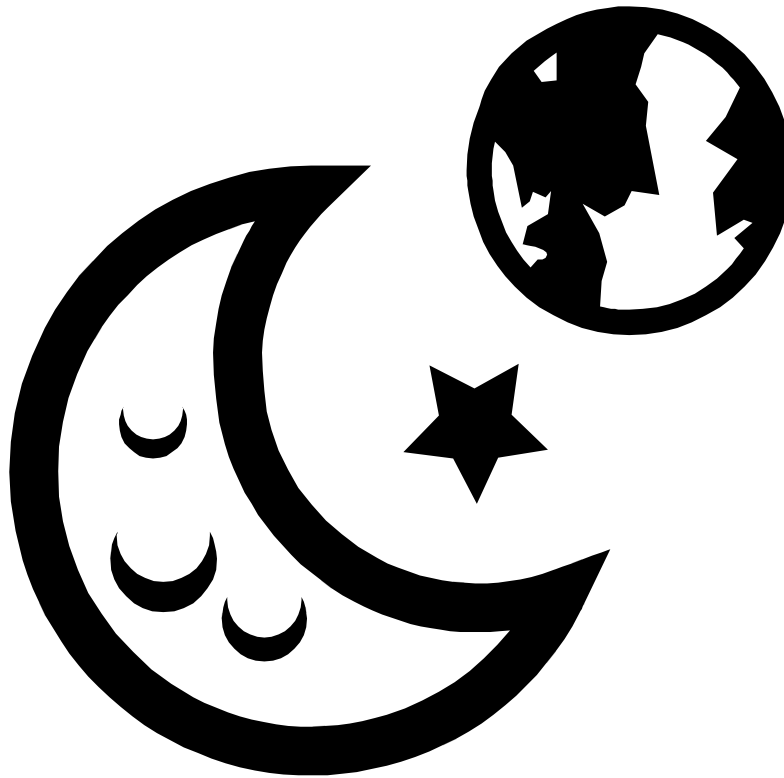
Intervention
- Allow students to work with smaller numbers within 5 so that they can practice using efficient strategies to solve the problems. Counting strategies are efficient at this stage, but will become inefficient and distracting as numbers get larger. As students begin to understand the relationships among numbers, they will begin learning number facts at a recall level (Carpenter et al. 1999).

Ten Flashing Fireflies

There are 10 fireflies flying around. How many fireflies could be in the jar, and how many could be in the night sky? Find all of the possible combinations of fireflies that could be in the jar or in the night sky. Record and explain your thinking using a table.

Ten Flashing Fireflies

In the Night Sky

In the jar

Ten Flashing Fireflies Solve and Share Problems

Join/Combine	3 Fireflies were in the jar. 6 more fireflies flew into the jar. How many fireflies are now in the jar? $3 + 6 = ?$	In the jar there were 5 fireflies. Some more fireflies flew into the jar. There are now 8 fireflies in the jar. How many fireflies flew into the jar? $5 + ? = 8$	There were some fireflies in the jar. 4 more flew into the jar. There are now 7 fireflies in the jar. How many fireflies were in the jar to start? $? + 4 = 7$
Separate/ Decompose	There were 9 fireflies in the jar. 3 fireflies got out of the jar. How many fireflies were left in the jar? $9-3= ?$	There were 6 fireflies in the jar. Some fireflies flew out of the jar. There were 2 fireflies left in the jar. How many fireflies flew out of the jar? $6 - ? = 2$	There were some fireflies in the jar. 7 fireflies flew out of the jar. There were 2 fireflies left in the jar. How many fireflies flew out of the jar? $? – 7 = 2$
	Total Unknown	**Addend Unknown**	**Both Addends Unknown[1]**
Put Together / Take Apart[2]	4 fireflies were in the jar and 4 flireflies were in the night sky. How many fireflies were there? $4 + 4 = ?$	The were 9 fireflies. 3 were in the jar and the rest were in the night sky. How many fireflies were in the night sky? $9 – 3 = ?$	There were 3 fireflies. How many were in the jar and how many were in the night sky? $3 = 0 + 3, 3 = 3 + 0$ $3 = 1 + 2, 3 = 2+ 1$
	Difference Unknown	**Bigger Unknown**	**Smaller Unknown**
Compare[3]	("How many more?" version): 5 fireflies were in the jar. The night sky had 3. How many more fireflies were in the jar? ("How many fewer?" version): 9 fireflies were in the night sky. 3 fireflies were in the jar. How many fewer fireflies are in the jar?	(Version with "more"): There were 6 fireflies in the jar. The night sky had 2 more fireflies than the jar. How many fireflies were in the night sky? (Version with "fewer"): There were 6 fireflies in the jar. The night sky had 3 fewer fireflies than the jar. How many fireflies were in the night sky?	(Version with "more"): The jar had 8 fireflies. The jar had 7 more fireflies than the night sky. How many fireflies were in the night sky? (Version with "fewer"): The jar had 8 fireflies. The jar had 2 fewer fireflies than the night sky. How many fireflies were in the night sky?