The Mysterious I.D. Vide in Newton's Nemesis, No. 1

Lesson Plan – For Whole Classrooms & Small Groups

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This lesson uses the first issue of *The Mysterious I.D. Vide in Newton's Nemesis* to introduce what it means to multiply a whole number by a unit fraction, to encourage students to reflect on their learning process, and to recognize that making mistakes and struggling means they are learning.

Learning Outcomes

After completing this lesson, students will:

- Understand that the expression "1/3 of 12" is equivalent to "1/3 x 12".
- Recognize that making mistakes is a natural part of the learning process.

Common Core Standards
- CCSS.MATH.CONTENT.5.NF.B.4.A
- CCSS.MATH.CONTENT.5.NF.B.4.B
- CCSS.MATH.CONTENT.5.NF.B.5.B

Materials: Enough copies of *The Mysterious I.D. Vide in Newton's Nemesis* for each child or each pair of children; flashlight (optional); paper or math journals, markers or writing tools, large chart paper or white boards; manipulatives to model fraction and whole number operations (e.g. fraction strips, bars, or Cuisineaire rods)

Prerequisite knowledge: Modeling whole number division and multiplication; conceptual understand of a fraction; defining addition, subtraction, multiplication and division as "mathematical operations".

Launch:

Show the class the cover of the comic book and ask, "What do you think this story is about?" Allow the students to make suggestions and conjectures about the plot and the characters, then tell the class that they will each receive a copy of the book to read quietly at their desks. Instruct the children not to write in the books. When finished, students should respond to the writing prompt (s) that will be on the board either in their math journals or on paper.

Silent Reading & Writing Response: 15-20 minutes.

While the students are reading, choose one or both of the following prompts to write on the board.

1. Find in the story where Theo is feeling bad about making mistakes. We know making mistakes is part of learning, and like his mother said, it makes you brain grow! Write a letter to Theo that might encourage him.

2. On pages 16-17, Theo explained to Leah how ½ was the same as dividing by 2 and 1/3 was dividing by 3. Make up two story problems that Theo can use to explain dividing by 4 is the same ¼. Draw pictures he can use with the story problems.

After all of the class has finished reading, bring them back to whole group and allow those who didn't have time to finish their writing to complete it at home.

Whole Class Reading: 15-20 minutes

"Now that you have read the story, let's have some fun and read it together." Assign each of the characters to a class member or a group that take turns reading the characters. The characters include:

- The Narrator (Some teachers may want to take this role)
- Ms. I.D. Vide (Some teachers may want to take this role)
- Theo
- Quint
- Ben
- Theo's Mother
- Leah
- Mrs. Jones
- Sound effects (the rest of the class!)*
  [*Note: You may want to give the class a visual cue, such as a thumbs up or raising your hand, so the class can do the sound effects in unison.]

There are a couple of fun moments that are options:

OPTION 1: During the beginning of the reading, momentarily stop the class when they reach Theo's flashback (on page 2) turn down the lights and give the flashlight to the character playing Quint. Turn the lights up when the class says "SCREEECH!" (at the top of page 5).

OPTION 2: When Ms. Vide raps, invite the class to have a contest or a "Rap Off" to see who can make up the best rhythm for the rap.

Stop the class reading after Theo's mother explains that it's normal to make mistakes (end of page 15) and ask students if they've ever felt bad about making mistakes or when they struggled to answer a question, then ask them to share their stories. Encourage classmates to listen with empathy and respond with encouragement. Students should learn that rather than laughing at someone who struggles to something (physically or mentally) we should say things such as, "That's okay, you can do it!" or "Can I help?" If you used writing prompt 1, allow students who have written letters to Theo to share (and for those who did not get a chance to finish to complete their letters as homework).

[Possible stopping point for Day 1: Recap the next day before continuing]

Continue reading until Theo is ready to share his candy (bottom of page 17). Stop the class and say,

> "There's something I'm not sure I understand. Theo explained that dividing 12 by three is the same as 1/3 of 12. I know I can write 12 divided by three as a mathematical phrase. [Write on the board "12 ÷ 3"] And I can write 12 divided by three is the same as four as a mathematical equation. [Write on the board 12 ÷ 3 = 4] Then Theo said, 1/3 of 12 is the same as four. Do we all think that's true? Why? Can someone explain? Can we use drawings or blocks to explain?"

> [Note: This will assess if students have the prerequisite understanding of the fraction 1/3 as 1 part out of 3].

> After students have justified that 1/3 of 12 is 4 the teacher should continue, "Okay, 1/3 of 12 is 4. Let's go back to our mathematical expressions we have. We can write 12 ÷ 3 = 4 when we mean 12 divided by three is the same as four. But, how would I write a mathematical expression that means 1/3 of 12? And 1/3 of 12 is the same as 4?"

> Divide the class into groups to explore this question. You may need to review that it must be one of the operations they know, and with the whole class demonstrate how to model addition, subtraction, multiplication and division with arrays and areas. Then write "1/3 _____ 12 = 4" on the board and ask the groups to determine which operation should go on the blank.

Student Group Work: 15-20 minutes

> Students may first want to model whole number expressions to recall the meaning of addition, subtraction, multiplication and division. After the group has come to consensus on the answer they should justify why each operation is or is not the operation associated with 1/3 of 12. Allow groups to struggle and also not come to an answer. Expect some to pose answers such as, "We think it's either multiplication or division," and only be able to rule out some operations. They may report on all four operations. Give each group a large piece of chart paper that they may use to explain their reasoning to the whole group.

Math Congress (Whole Group): 15-20 minutes

Student groups should share their reasoning that allowed them to reject the conjecture that the operation was addition or subtraction and confirm the conjecture that it is multiplication. Students may not arrive at that conclusion immediately, but by holding a "math congress" (Fosnot & Dolk, 2002) in which the students come to consensus on the logic of the explanations, students in the class can develop a sense of ownership in correctly determining what operation 1/3 of 12 is. The concept of fraction division may be left as an "open question," or one that will be explored in the next unit. Since the class has determined that 1/3 of 12 is 1/3 x 12, make note of the fact that 12 x 3 results in a number larger than 12, but 12 x 1/3 results in smaller number smaller than 12.

<u>Closing Activity (Whole Group)</u>: 15 minutes

After finishing the math congress, complete the reading of Theo's nightmare (pages 18-20). After reading the nightmare scene, ask the class, "Why do you think Theo's head is growing?" Students might note that it's the witch's spell, or that she's making his brain grow (just like his mother said it would). Make sure the students notice that the witch is sending fractions to make his brain grow. Then pose the question, "If the witch's spell was a mathematical operation, would multiplying the size of Theo's head by a fraction make it grow?" This question will hopefully require the students to reflect on the last discussion that multiplying by unit fractions would cause his head to shrink, so what could it be?

[Optional extension] Ask the students to journal about what they think might happen next!

REFERENCES

Fosnot, C., & Dolk, M. (2002). *Young mathematicians at work: Constructing fractions, decimals, and percents*. Portsmouth, NH: Heinemann.

Literacy and Numeracy Secretariat of the Ontario (September 2010). *Communication in the mathematics classroom, Capacity Building Series,* Ontario, Canada: Ministry of Education.