Fractions as Numbers: Eliciting Student Thinking Through Questioning Techniques

Crystal Vesperman
Indiana University

Julie Amador
University of Idaho

NSF Program Discovery Research K–12 Grant # 0732143

Overview of Presentation

1. Questioning Literature
2. Fraction Scenarios
3. Classroom Application

QUESTIONING LITERATURE

Questioning

- Questioning encourages students to elaborate on their ideas
- Types of questions (Franke et al., 2009; Moyer & Milewicz, 2002):
  - General Questions
  - Specific Questions
  - Problem Posing
  - Probing Sequences of Questions
  - Leading Questions
  - Checklisting
  - Instructing Rather than Questioning

Types of Questions

- General Questions
  - Why do you think that?
- Specific Questions
  - What do you mean when you say half of ten?
- Probing Sequences of Questions
  - How can you show me what 1/3 looks like? Is there another way to represent 1/3? If someone asked you to combine 1/3 and 1/3 what would you tell them?

- Leading Questions
  - Don't you think that ½ plus ½ is a whole?
- Checklisting [No follow up questions]
  - What is half of ten? What is half of twelve?
- Instructing Rather than Questioning
  - When you combine ½ and ½ you get one whole. Why is that the sum?

- When in proper context, preservice teachers are able to develop the ability to competently question students
- Implies that practicing teachers can also develop this ability
- The ability to develop effective questioning practices is something that can be learned (Weiland, Hudson, & Amador, 2014)
- Being aware of question types and knowing how to question improves practice

FRACTION SCENARIOS

Scenario 1

Teacher: Can you put these fractions in order from smallest to largest: 1/4, 1/3, and 1/5?

Student: Sure…umm.. [pauses] 1/3 then, uh, 1/4, and then 1/5.

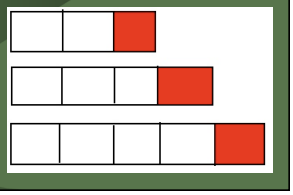
Teacher: Can you draw that for me to show me how you got that?

Student: Sure! (draws picture below)

What misconception does this highlight?

What questions would you ask at this point?

(CCSS.MATH.CONTENT.3.NF.A.1)



Scenario 2

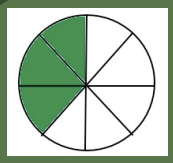
Teacher: Can you look at the picture and tell me what fraction of the circle is filled in?

Student: One…two…three… (writes down three and then puts a line under the number). Umm… one, two, three, four five! (writes five underneath the three) Three-fifths!

What misconception does this highlight?

What questions would you ask at this point?

(CCSS.MATH.CONTENT.3.NF.A.3.D)



Scenario 3

First, try to answer the problem that is given to the student:

If the given figure (see lower right) is 9//7, what is the whole?

Then, think about what you think the student will choose as his solution?

What types of questions did the teacher ask?

What questions would you ask at this point?

(CCSS.MATH.CONTENT 3.NF.1, 4. NF.3

MP.2. Reason Abstractly and Quantitatively)

Scenario 4

The problem:

This is 10/6 of the whole, what does the whole look like?

Then, think about what you think the student will choose as his solution?

What types of questions did the teacher ask?

What questions would you have asked?

(CCSS.MATH.CONTENT 3.NF.1, 4. NF.3

MP.2. Reason Abstractly and Quantitatively)

Scenario 5

The problem:
If this is 10/7, what is the whole?

What types of questions did the teacher ask?
What questions would you have asked?

(CCSS.MATH.CONTENT 3.NF.1, 4. NF.3
MP.2. Reason Abstractly and Quantitatively)

- 1) Look at the Questions
- 2) Label the questions by question type
  - **General Questions**
  - **Specific Questions**
  - **Problem Posing**
  - **Probing Sequences of Questions**
  - **Leading Questions**
  - **Checklisting**
  - **Instructing Rather than Questioning**
- 3) Reword/Add questions you deem appropriate

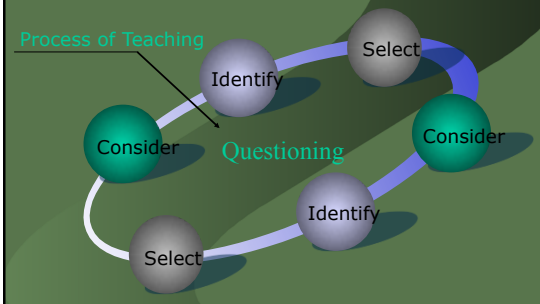
- General Questions
  - Why do you think that?
- Specific Questions
  - What do you mean when you say half of ten?
- Probing Sequences of Questions
  - How can you show me what 1/3 looks like? Is there another way to represent 1/3? If someone asked you to combine 1/3 and 1/3 what would you tell them?
- Leading Questions
  - Don't you think that ½ plus ½ is a whole?
- Checklisting [No follow up questions]
  - What is half of ten? What is half of twelve?
- Instructing Rather than Questioning
  - When you combine ½ and ½ you get one whole. Why is that the sum?

CLASSROOM APPLICATION

Progress Diagram

Consider	Identify	Reflect
Consider the frequency of your questioning -Do you question often? -What do you questions tell you? -What do you glean about content from you questions?	Identify the types of questions you ask To do this: Audio Record a segment of your teaching. Listen to your questioning. Write down five questions you asked.	Reflect on your questions. Consider the question type, consider your instructional purpose. Consider whether or not you need to restructure the types of questions you ask.

Application



Thank You

QUESTIONS?

Crystal Vesperman cmvesper@indiana.edu
Julie Amador jamador@uidaho.edu

2014 NCTM ANNUAL MEETING & EXPOSITION
April 9–12 • New Orleans

Rate this presentation on the conference app!
www.nctm.org/confapp

Download available presentation handouts from the Online Planner! **www.nctm.org/planner**

Join the conversation! Tweet us using the hashtag **#NCTMNOLA**

NCTM | NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS