

CCSS Fraction Module 6: Number Line Use with Fractions

Facilitator's Notes

Goal:

To develop a working knowledge of the role of number line use in developing student number sense with rational numbers

Distribute to Participants:

- North Carolina Department of Public Instruction's: *Use of Number Lines in CCSS*
<http://www.dpi.state.nc.us/docs/acre/standards/common-core-tools/organizers/math/number-lines.pdf>

Supplementary Materials:

- [Personal Action Plan Template](#) handout
 - An optional template that can be distributed to each participant to facilitate personal reflection and planning with respect to fraction instruction based on the CCSS. It can be used as a supplementary closing activity for each of the six CCSS Fraction Modules. There are two versions of the template.
 - Follow-Up Template – to be used after each subsequent module completed by a participants

Directions:

1. Ask participants to individually read the introduction to *Use of Number Lines in CCSS*.
2. Direct participants to engage in small group discussions reviewing the key points of the article and to make connections with their present use of the number line in their classrooms.
3. Invite participants to independently turn to their grade level section of the document and to carefully read through the standards and examples for number line use.
4. Arrange participants into grade level groups to debrief the key ideas from their section. Conversation should place a particular emphasis on how number line use with whole numbers connects to number line use with fractions.
5. Encourage grade levels to share out some "Ah Ha's" and some "Oh No's" from their discussion.
6. Divide participants into two groups, irrespective of grade level. Each group will be looking more carefully at a specific progression on understanding.

Group A:

- a. Ask participants to focus on the following progression of standards and to look specifically at the connection between composing/decomposing whole numbers and composing/decomposing fractions on a number line. [1.OA.2, 3.NBT.2, 3.NF.2, 4.NF.4, 5.NF.4, 5.NF.7]
- b. Encourage participants to individually try the illustrative examples contained in the document as well as creating and working through similar problems using the number line model.
- c. Ask participants to create sub-groups and to conduct a discussion focusing on the progression of understanding of number line use. Challenge groups to consider how they can use this knowledge to provide support for struggling learners.
- d. Instruct groups to create a poster, to be shared with the whole group that highlights the major ideas of the progression and their suggestions for assisting struggling learners.

Group B:

- a. Ask participants to focus on the following progression of standards and to look specifically at the use of a number line to help students develop a better understanding of the numerical value of fractions. [3.NF.2, 4.NBT.3, 4.NF.2, 4.NF.6, 5.NF.2]
 - b. Encourage participants to individually try the illustrative examples contained in the document as well as creating and working through similar problems using the number line model.
 - c. Ask participants to create sub-groups and to conduct a discussion focusing on the progression of understanding of number line use. Challenge groups to consider how they can use this knowledge to provide support for struggling learners.
 - d. Instruct groups to create a poster, to be shared with the whole group that highlights the major ideas of the progression and their suggestions for assisting struggling learners.
7. Reconvene the large group and provide time for each small group to share their thoughts and posters.
 8. Close by asking each participant to share one way they will use the number line to support fraction instruction in their classroom.

Activities and Tools to Extend Your Study:

1. *Teaching Fractions According to the Common Core Standards* by H. Wu :

<http://math.berkeley.edu/~wu/CCSS-Fractions.pdf>

- a. Distribute Wu's article to participants.
- b. Direct participants to page 3 and ask them to follow along as you read the this statement:
"The shift of emphasis from multiple models of a fraction in the initial stage to an almost exclusive model of a fraction as a point on the number line can be done gradually and gracefully beginning somewhere in grade 4. This shift is implicit in the Common Core Standards. Once a fraction is firmly established as a number, then more sophisticated interpretations of a fraction (which, in mathematical context, simply mean 'theorems') begin to emerge."
- c. Instruct participants to silently re-read these three sentences. After providing them several minutes to process the passage, ask participants to turn and talk to a neighbor about their reaction to this shift to the number line as "an almost exclusive model" for fractions.
- d. Solicit pairs to share key ideas, concerns, and questions with the larger group.
- e. Direct participants to read their grade level section in H. Wu's article. Ask participants to pay careful attention to the use of number line as a visual model for developing understanding. Direct participants to be ready to share out:
 - i. How this use of the number line connects to the models they are presently using
 - ii. How this use of the number line differs from their current practice
- f. Close by encouraging participants to share out one way that they will strive to incorporate more number line use into their fraction instruction.

2. **Number Line Use in the Progressions Document:**

- a. Distribute the Progressions Document for **3-5 Number and Operations – Fractions**
http://commoncoretools.files.wordpress.com/2011/08/ccss_progression_nf_35_2011_08_12.pdf to participants.
- b. Divide participants into small grade level groups to read through their grade level section, paying careful attention to references to the use of the number line as a visual model. Each grade level will have a specific focus:

- i. Grade 3: Representation and Equivalence
 - ii. Grade 4: Equivalence and Addition/Subtraction
 - iii. Grade 5: Multiplication
- c. Ask grade level groups to share out examples of how the number line can be used as a visual model for building understanding specific to their focus topic(s).
- d. Close by asking participants to share one new idea they will incorporate into their instruction..

3. Practice Tasks for Number Line Use with Fractions:

Tasks are taken from the Illustrative Math Project website <http://illustrativemathematics.org/>

- a. Ask participants to select a task for their grade level from those listed below.
- b. Direct participants to independently solve the task using a number line as their visual model.
- c. Separate participants into grade level groups and encourage them to share their solutions, questions, and strategies using the number line.
- d. Close the session by soliciting groups to model one of their solution strategies to the group at large.

Practice Tasks

- 3.NF.1, 3.NF.2: Comparing sums of fractions.
 - <http://illustrativemathematics.org/illustrations/831>
- 3.NF.2 Locating Fractions Greater than One on the Number Line
 - <http://illustrativemathematics.org/illustrations/173>
- 3.NF.2 Which is Closer to 1?
 - <http://illustrativemathematics.org/illustrations/172>
- 3.NF.3: Ordering Fractions
 - <http://illustrativemathematics.org/illustrations/460>
- 4.NF.1 Visual Fraction Equivalence
 - <http://illustrativemathematics.org/illustrations/743>
- 4.NF.4 Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers
 - <http://illustrativemathematics.org/illustrations/13>
- 5.NF.3 and 5.MD.1 Converting Fractions of a Unit into a Smaller Unit
 - <http://illustrativemathematics.org/illustrations/293>
- 5.NF.5 Interpret multiplication as scaling (resizing)
 - <http://illustrativemathematics.org/illustrations/150>
 - <http://illustrativemathematics.org/illustrations/143>
 - <http://illustrativemathematics.org/illustrations/22>
- 5.NF.6 Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.
 - <http://illustrativemathematics.org/illustrations/295>
 - <http://illustrativemathematics.org/illustrations/296>
 - <http://illustrativemathematics.org/illustrations/294>
- 5.NF.7 Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions
 - <http://illustrativemathematics.org/illustrations/12>