ELEMENTARY MATH STANDARDS CASE STUDY

4th Grade Mathematics Standard for Number and Operations - Fractions

What are the students learning?

Grade level standard: 4. NF.1. Explain why a fraction *a/b* is equivalent to a fraction *(n x a)/(n x b)* by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.

Example Learning Progression Elementary Math

WA-AIM Access Points			Teacher adjusted	Grade Level Standard
Less Complex	**Intermediate**	**More Complex**	**Further Complexity**	**Grade Level Standard**
Student will identify real-world objects that represent one-half or one whole.	Student will identify models of one-half and one-fourth.	Student will identify or create models that are equivalent to one-half (2/4, 3/6, 4/8, 5/10).	Using tangible fraction models, explain why a fraction a/b is equivalent to a fraction (n x a)/(n x b).	4. NF.1. Explain why a fraction a/b is equivalent to a fraction (n x a)/(n x b) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.

Educator adapts instruction to meet the needs of students and deepen learning toward grade level standard

How could I teach this standard in general education to all students?

- **Use Visual Representation Tools** - Support opportunities to customize the display of information. To help students understand equivalent fractions, you could incorporate visual fraction models, such as pie charts, number lines, or area models. Allow students to choose the model that resonates with them most. For instance, some students might prefer using colored paper to create fraction circles, while others could benefit from digital tools that visualize fractions (e.g., National Library of Virtual Manipulatives). This customization can help them better perceive and understand the concept of equivalence.
- **Interactive Group Activities** - Foster collaboration, interdependence, and collective learning. Organize hands-on group activities where students work together to create equivalent

fractions using manipulatives like fraction bars or blocks. Encourage them to explain their reasoning to each other, reinforcing their understanding through collaboration. For example, one group could explore how 1/2 and 2/4 are equivalent by using blocks to create two different models, discussing how the number and size of the parts differ but the whole remains constant.

- **Diverse Methods of Assessment -** Use multiple media for communication. To assess understanding of equivalent fractions, provide students with various options for demonstrating their learning. Some might choose to create a video explaining the concept, while others could write a story that incorporates equivalent fractions or draw a comic strip. This variety allows students to express their understanding in a way that feels authentic and comfortable to them.

How could I measure understanding of the standard for students with significant cognitive disabilities?

Start with how you measure student understanding for all students and adapt from there. For example, if students are taking a test with various tasks and fractions represented, educators may consider simplifying the tasks according to the fractions represented in the Access Points (one-half and one-fourth, for example.

Further Complexity towards the Grade-Level Standard

In some cases, students may need very little scaffolding to be successful with a standard, even when they take the alternate assessment. If a student needs scaffolding, consider ensuring they have access to needed accommodations and support when student understanding is measured. For example, given the following questions, they may benefit from sentence stems and word banks.

Use a visual fraction model (such as a drawing of fraction bars or circles) to show that 4/5 is equivalent to 8/10. Explain how the number and size of the parts change but the overall value stays the same.

Since I *(multiplied)* **both the numerator and denominator of 4/5 by** *(2)* **to get 8/10, the fractions are** *(equivalent)*. **The size of the individual pieces** *(changed)*, **but the overall fraction represents the** *(same)* **amount.**

Word bank: multiplied, divided, added, subtracted, changed, same, different

Marcus says that 2/6 is equivalent to 4/12. Show whether he is correct using multiplication and explain your reasoning.

2/6 and 4/12 are/are not (circle one) equivalent fractions because_____
_____.

Further scaffolds could include limiting the fractions that a student would be assessed on to 1/2 and 1/4 for example, but the problems would be the same for all students.

If the student requires additional scaffolding, consider the More Complex Access Point.

More Complex (WA-AIM Access Point)

To assess the student's demonstration of the More Complex Access Point standard: Student will

identify or create models that are equivalent to one-half (2/4, 3/6, 4/8, 5/10).

How does measuring understanding of the grade level standard look like for all students? Have this be your starting point and adapt from there, if needed. For example, if students are taking a multiple-choice test with various fractions represented, educators may consider simplifying the assessment according to the fractions represented in the Access Points (one-half and one-fourth, for example).

Teachers might use multiple representations of fraction models (area, bar, and set models), however, these need to be explicitly and systematically taught.

In this Access Point, students may identify or create fraction models that are equivalent to one-half. Any of the ideas presented in the Less Complex Access Point could be used with any fractional model type to meet this portion of the More Complex Access Point[2].

To challenge students further to create fraction models that are equivalent to one-half, educators might:

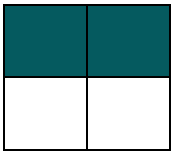
A. Use an area model representing 2/4 and have the student color in 1/2 of the fractional parts.
B. Use a set model and give the student 8 dual-colored counters, and ask the student to show 1/2 (or 4/8).

If the student requires additional scaffolds beyond the More Complex Access Point, consider using the Intermediate Access Point.

Intermediate (WA-AIM Access Point)

Student will identify models of one-half and one-fourth. To assess the intermediate Access Point, an educator could use fraction models such as area models, set models, and length models representing one-half and one-fourth.

Area model



Set model

Length model

[2] see National Center on Intensive Intervention's video Teaching Fractions Using Manipulatives

Various activities to assess the student could include:

A. From a choice of 3 or 4, ask them to touch the object that shows _____ (one-half or one-fourth).
B. When presented with an object, ask, is this one-half or one-fourth? (they may even be given a one-half card and one-fourth card to use to communicate)
C. Given a variety of models, some halves and some fourths, ask the student, "please hand me one-half." Repeat with the models you have.

If the student continues to require additional scaffolding given the Intermediate Access Point, consider the Less Complex Access Point.

Less Complex (WA-AIM Access Point)

The Less Complex Access Point for this standard is to "Student will identify real-world objects that represent one-half or one whole."

To most meaningfully measure student learning for this Access Point aligned to the standard, students with significant cognitive disabilities can demonstrate their understanding using real-world objects. Any easily divided object can be used (for example, paper, flower, leaf, apple, orange, pizza, cookie) in wholes or cut into halves.

Various activities to assess the student could include:

A. From a choice of 3 or 4, ask them to touch the object that shows _____ (one-half or one whole).
B. When presented with an object, ask, is this one-half or one-whole? (they may even be given a one-half card and one whole card to use to communicate)
C. Given a variety of models, some halves and some fourths, ask the student, "please hand me one-half." Repeat with the models you have.

With all these examples, providing instruction before measuring student learning is important. Once the measurement has begun, you can decide whether to provide corrections or not, but remain consistent throughout, and ensure that you record data on their first response before you provide any prompts.

Reducing Barriers for Learners who have Significant Cognitive Disabilities in Large Group Lessons

Make reducing barriers an ongoing practice embedded in the instructional process - take a few minutes to think about your process! Is there a barrier related to:

- **Interest or engagement?** Think about how to incorporate the student's lived experiences, culture, and interests in your mathematical models and problems.
- **Background knowledge?** Think about how to highlight key mathematical ideas (e.g., equivalence) and define key vocabulary (e.g., wholes, halves, equivalent).
- **Showing what they know?** Think about having options for how they use learning tools (e.g., graphic organizers) and technology to communicate.

For example, one possible barrier is if there is no flexibility in how the content is represented (e.g., the content is represented using only paper models or manipulatives and the student has little or no use of their hands).

Ideas to reduce this barrier could include classroom educators supporting students to:

- Count the parts of fractions or decimals using a step-by-step process which progresses through numbers; the student scans an array of possible options and uses a switch to select the number to identify the numerator
- Use computer representation of fractions that can be manipulated with a switch
- Place fraction representations on a slant board or eye gaze board
- Create a grid on a large surface on the floor so that the student can walk over or ride over in wheelchair

Use these Inclusive Strategies to help reduce barriers[3].

[3] The Inclusive Big Ideas were adapted from resources created by the NCSC Project , a federal grant from the US Department of Education (PR/Award #: H373X100002), However, the contents do not necessarily represent the policy of the US Department of Education and no assumption of endorsement by the Federal government should be made.

Expanded Learning Progression for Elementary Math

	WA-AIM Access Points			Teacher adjusted	Grade Level Standard
	Less Complex	**Intermediate**	**More Complex**	**Further Complexity**	**Grade Level Standard**
Student Skill	Student will identify real-world objects that represent one-half or one whole.	Student will identify models of one-half and one-fourth.	Student will identify or create models that are equivalent to one-half (2/4, 3/6, 4/8, 5/10).	Using tangible fraction models, explain why a fraction a/b is equivalent to a fraction (n x a)/(n x b).	4. NF.1. Explain why a fraction a/b is equivalent to a fraction (n x a)/(n x b) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.
Complexity Details	• Real-world objects representing fractions one-half or one whole	• Fractional models one-half and one-fourth	• Fractional models equivalent to one-half	• Fractional models of various sizes • Structured mathematical discourse	• Fractional models of various sizes • Mathematical discourse
Success Criteria Ex:	• Matches fractions (one half and one whole) to appropriate real-world objects	• Matches fractions (one half and one fourth) to appropriate real-world objects	• Identifies and creates fractions equivalent to one-half	• Uses tangible models to explain equivalent fractions in terms of the number and size of fractional parts	• Uses visual models to explain equivalent fractions in terms of the number and size of fractional parts • Generates equivalent fractions independently
Instructional Strategy Examples	Visual Supports • Real-world objects (one-half or one-whole) Scaffolds • Pre-made fraction cards with picture support Technology • Virtual manipulatives	Visual Supports • Fraction cards Scaffolds • Receptive or expressive identification of fractions Technology • Virtual manipulatives	Visual Supports • Examples/ non-examples of fraction models equivalent to one-half Scaffolds • Simpler fractions, moving to more complex • Prompting and fading Technology • AAC with math vocabulary	Visual Supports • Tangible or visual fraction models Scaffolds • Explicit instruction in various fractional models • Structured mathematical justifications • Simplified fractions Technology • Virtual manipulatives	Visual Supports • Visual fraction models • Visual vocabulary cards Scaffolds • Explicit instruction in various fractional models (area, set, length models) • Modeling of mathematical justifications Technology • Virtual manipulatives • Math modeling software