

VIDEO RESOURCE PACKAGE: OBSERVING MATHEMATICS CLASSROOMS

Videos Feature Instructor:

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Standards-in-Action 2.0

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MATHEMATICS CLASSROOM OBSERVATION FOR MELISSA BRAATEN: INTERMEDIATE LEVEL

What follows is an observation of a lesson taught by Melissa Braaten. She serves as an instructor at the Haitian Multi-Service Center for Adult Education, Dorchester, MA. Her ratio and proportion lesson is adapted from the EMPower™ series, Keeping Things in Proportion, and is titled “Mona Lisa, Is That You?” The goal is for the class of students (including some English learners) to use their visual sense and measurements to determine if various reproductions of the painting are in proportion to the original. The lesson includes two parts: a warm-up on fractions and the central session on proportional reproductions. Students sort the Mona Lisa reproductions into those that are in proportion and those that are distorted. They discover that proportional reproductions, when lined up at the origin, create a straight line.

The observation provides examples of what challenging state academic standards in mathematics look like in daily planning and practice for adult basic education and English learner students. The observation tool is designed as a professional development tool for instructors, those who support instructors, and others working to implement standards. It is not designed for use in evaluation.

Core Action 1. Lesson content is rigorous and relevant for the level defined by the state-adopted standards.

Core Action 2. Learning activities are cognitively demanding and maximize opportunities for students to master the lesson content.

Core Action 3. Lesson content productively engages students.

Core Action 4. Lesson content is intentionally sequenced to develop students’ skills and knowledge.

Core Action 5. Students’ levels of understanding are checked throughout the lesson, and instruction is adjusted accordingly.

English Learner Additional Core Action. Lesson activities provide strategic scaffolds to provide English learners access to lesson content.



Core Action 1. Lesson content is rigorous and relevant for the level defined by the state-adopted standards.	Y, N, or N/A
A. Instructor presents a lesson with well-defined standards-based goals that focuses on the major work of the level (MWOTL). ¹	Y
B. Instructor presents a lesson that addresses the Standards for Mathematical Practice that are central to the lesson goals and connected to the targeted content.	Y
C. Instructor, when addressing the MWOTL, intentionally targets one or more aspects of rigor as appropriate for the addressed standard(s). Mark the aspect(s) of rigor the lesson addresses: <ul style="list-style-type: none"> • Conceptual understanding • Procedural skill and fluency • Application 	Y

Evidence observed:

Indicator A:

Two CCR standards are listed in the lesson plan and reflected in the lesson.

- 6.RP.3 Understand ratio concepts and use ratio reasoning to solve problems.
- 7.RP.2 Analyze proportional relationships and use them to solve real-world and mathematical problems.

Melissa addresses ratio reasoning and proportional relationships in the adapted Mona Lisa lesson. In the previous lesson, the students had established the original Mona Lisa painting's ratio (height to width). In activity 2, they use ratio to determine what reproductions of the painting are good (in proportion). In activity 3, students analyze proportional relationships by first looking at all the good reproductions and drawing them on easel paper. Then, they add a star in the upper left corner, and connect them to make a straight line. Students can make the connection that the graph of any proportional situation is a straight line.

¹ MWOTL – Major work of the level (MWOTL) – The most important mathematics in preparing adult learners for success in college, careers, and life. Instructors should learn to identify the topics that are—and are not—major topics for the various standards' levels. When planning instruction, they should focus deeply on the MWOTL rather than racing to cover topics in a mile-wide, inch-deep curriculum. The standards recently adopted by states require educators to significantly narrow and deepen the way time and energy are spent in the math classroom. When educators apply a MWOTL approach to teaching and learning, students can gain strong foundations in critically important areas: conceptual understanding, procedural skill and fluency, and the ability to apply what they learn to solve math problems inside and outside the classroom. Students should spend most of their time on the MWOTL; it should be the major focus of instruction. https://lincs.ed.gov/publications/pdf/ccr/Math_Unit_1_Materials/Math_1_part_mat.pdf



Indicator B:

MP.4 (model with mathematics) is named and reflected in the lesson. Students apply the mathematics they know to solve problems that could arise in everyday life, society, or the workplace. For example, they use proportionality to confirm whether reproductions of the Mona Lisa painting are accurate reproductions.

Indicator C:

The lesson targets two aspects of rigor: conceptual understanding and application. In the warm-up, Melissa checks for understanding of fractions. She asks students to look for as many fractions as they can. At 00:01:57:01, she asks if anyone has any fractions with which to start. When the first student shares their fraction, she asks questions to clarify their understanding and repeats what was said to ensure she understands their reasoning. Through questioning, she ensures that the student (and the class) understands the part and the whole. For example, at 00:05:32:21, a student comes to the whiteboard and explains his reasoning to the class. She continues to ask questions to clarify their understanding. At 00:24:29:02, Melissa passes out seven Mona Lisa reproductions. Then, in pairs, the students apply what they know about proportions to determine if the reproductions are proportionate to the original or look distorted.



Core Action 2. Learning activities are cognitively demanding and maximize opportunities for students to master the lesson content.	Y, N, or N/A
A. Instructor presents high-quality questions and tasks to prompt students to discuss their developing thoughts and elaborate on and justify their responses.	Y
B. Instructor consistently uses explanation, modeling, or examples to make the mathematics of the lesson explicit.	Y
C. Instructor provides students with opportunities to work with and practice level-specific problems and exercises.	Y

Evidence observed:

Indicator A:

Melissa presents high-quality questions and tasks. When providing answers to questions and tasks, Melissa often asks probing questions to encourage students to elaborate on their thinking. During the warm-up, she asks students to describe the fractions they see. As she writes them on the board, she poses additional questions to ensure that they understand the “part” and the “whole.” Her manner in asking questions prompts deep discussion [00:01:57:01]. In the warm-up, Melissa asks students to look for as many fractions as they can. This question is open-ended and allows for a variety of responses. Then, during the discussion, Melissa calls on various students to share their fractions and asks them to describe them. For example, she does this at 00:01:59:19, 00:04:12:11, and 00:04:40:14.

During activity 2, she asks students to sort seven reproductions to determine which are proportional and which are distorted. Then, at 00:25:48:16, she asks the class to give her one they think is a good reproduction (proportional). Next, the class gives her the letters identifying the images they think are proportional. Then, students look at the ones that the class thinks are distorted. Finally, she asks the class to use numbers to check and see if they are right. This task leads to a class discussion about what it means to be “in proportion” (equal ratios).

Indicator B:

During activity 2, after students determine the reproductions they think are good (proportional) and those that they think are bad (distorted). Melissa has the students use numbers to see if they are right. Then, she builds off their example to further discuss what it means to be in proportion [00:28:56:23]. As Melissa walks around and talks to groups, she uses a Mona Lisa reproduction to help explain why some of the images are proportional [00:32:14:06]. She also asks questions to clarify understanding. During activity 3, Melissa uses distorted images to show that they don’t line up with the proportional images or fall on a straight line [00:59:06:16]. She uses this to connect proportional relationships and a straight line.



Indicator C:

The problems and activities presented in the Mona Lisa lesson are appropriate for Intermediate (GLE 5-8) students. The lesson source is from a book part of the EMPower series. These books were designed for adult education programs. Students work individually and in groups and are engaged throughout the lesson. They feel comfortable sharing their thinking and engaging in the activities.



Core Action 3. Lesson content productively engages students.	Y, N, or N/A
A. Students participate actively in sustained class discussions and activities where they build on each other's observations and insights.	Y
B. Students have varied opportunities to apply what they are learning in authentic adult-oriented contexts.	Y
C. Most students display persistence with tasks and problems.	Y

Evidence observed:

Indicator A:

Students consistently participate in class discussions. Melissa asks students to provide answers and explain their thinking throughout the class period. Melissa also prompts deeper thinking through her questions. For example, at 00:54:08:21, she asks students what they notice about the rectangles they drew and the stars they made. Students feel comfortable sharing their thinking. Every student participates in the discussion at some point during the class period. Students also participate actively when they work in smaller groups. For example, at 00:31:29:16, they work in pairs and discuss their reasoning with each other.

Indicator B:

Students apply what they have learned about proportions to an authentic context involving reproductions of the Mona Lisa. First, they must determine which reproductions are good (proportional). Then, these concepts can be further explored when thinking about a scale drawing or model (although these terms weren't yet introduced).

Indicator C:

Students remain engaged, persistent, and supportive of each other's learning as they work throughout the class. Melissa consistently moves around the room to check on student progress and provide support. For example, at 01:04:11:20, one of the groups feels comfortable asking Melissa questions to help clarify their thinking. They continue talking through the problem with the teacher until they understand it.



Core Action 4. Lesson content is intentionally sequenced to develop students' skills and knowledge.	Y, N, or N/A
A. Instructor explicitly relates new mathematical concepts to previous lessons or students' prior knowledge.	Y
B. Instructor delivers concepts in a way that builds on their logical connections to each other.	Y
C. Instructor ends the class by: <ul style="list-style-type: none">• Reviewing lesson objectives;• Summarizing student learning with references to student work and discussion; and• Previewing the next class session and explaining how it will build on today's activities.	N

Evidence observed:

Indicator A:

Melissa makes connections between mathematical concepts throughout the lesson. There is an example of this in the warm-up [00:10:31:03]. She recalls a pattern that has come up consistently.

Indicator B:

In the warm-up, Melissa reviews fractions and clarifies the understanding of part, whole, and equivalent fractions. When she summarizes the lesson, she connects equivalent fractions and equal ratios, setting the stage for their discussion about proportions [00:10:31:03]. She then moves to activity 2, where she has them discover that the reproductions proportional to the original Mona Lisa painting have the same ratios. Finally, in activity 3, they trace the reproductions on easel paper to discover that proportional relationships are linear. These are all logical connections that build on each other.

Indicator C:

At 01:07:19:19, Melissa summarizes what they did throughout the class. During activity 2, they determined that the reproductions were proportional because the ratios were equal. For example, they discovered they would fall on the same line if the reproductions were proportional. Melissa did a summary at the end of the class but also summarized each activity throughout the class. She did this at 00:29:40:13 when describing why certain reproductions were good. Although she did summarize student learning throughout, she didn't review the lesson objectives or preview the next class session with the class.



Core Action 5. Students' levels of understanding are checked throughout the lesson, and instruction is adjusted accordingly.	Y, N, or N/A
A. Instructor consistently uses informal yet deliberate methods to provide students with prompt, specific feedback to correct misunderstandings and reinforce learning.	Y
B. Instructor consistently provides strategic supports and scaffolds to students who need them.	Y
C. Instructor provides opportunities for students to evaluate and reflect on their own learning.	Y

Evidence observed:

Indicator A:

Melissa provides prompt specific feedback during the discussions. She consistently asks students to explain their thinking. In doing that, she identifies misunderstandings. For example, at 01:04:43:22, Melissa recognizes that one student needs help understanding the concepts. She addresses the whole group and then works specifically with them until they feel comfortable with the concepts.

Indicator B:

Melissa walks around throughout the class period to check on students. She works individually with students to provide further explanation and support. For example, at 00:32:10:04, Melissa works directly with a pair of students. She uses one of the more miniature reproductions to help students understand why a reproduction is distorted. She also has them look at a good reproduction and apply what she showed them.

Indicator C:

Students are not required to evaluate or reflect on their learning at the end of the lesson. However, they are often encouraged to evaluate and reflect on their learning throughout the lesson.



English Learner Additional Core Action. Lesson activities provide strategic scaffolds to provide English learners access to lesson content.	Y, N, or N/A
A. Instructor draws on students' funds of knowledge about the topic and content of the lesson and provides opportunities for peer-sharing.	Y
B. Instructor uses revoicing to model correct mathematical language, to help students put their thoughts into words, and to clarify their responses.	Y
C. Students have varied opportunities to demonstrate their understanding of the lesson's core content and its vocabulary.	Y

Evidence observed:

Indicator A:

When Melissa transitions to the Mona Lisa lesson, she first talks about how someone can change the way a picture looks. She references Word and PowerPoint—something students could have used to change the size of pictures they took. Melissa uses a picture of Kamala Harris and shows different ways it can be enlarged, but the image doesn't look the same [00:13:37:06]. She calls it “distorted” and shares the definition. Then, she writes the word on the smartboard. The word “distorted” comes up frequently throughout the lesson.

Indicator B:

During the warm-up, Melissa asks students to share the fractions they found. More specifically, she asks them to describe it. She does this with a student describing the purple-shaded region [00:02:02:00]. She repeats what he says, writes it down, and clarifies with him what portion is the “part” and the “whole.” She asks follow-up questions to make sure she understands what he is saying and that he understands what a fraction is. She does this again at 00:04:16:16.

Indicator C:

During the warm-up, students first work on their own to identify fractions. They then share as a group. Some students share what they got, and she writes them on the smartboard [00:01:57:07]. One student goes to the smartboard to share what they got [00:05:33:21]. Doing so allows students different ways to demonstrate their understanding. She has students work in pairs during the lesson and then share as a group. They can demonstrate their understanding with their peers and the larger group.



LESSON PLAN FOR MATHEMATICS

*Lesson from EMPower as Adapted by Melissa Braaten
Haitian Multi-Service Center • Massachusetts*

Lesson from EMPower:

Mona Lisa, Is That You?

Unit:

Ratio and Proportion

Materials:

- Easel paper outline of the Mona Lisa painting
- Rulers and Yardsticks
- Markers
- Copies of Mona Lisa Student Sheet
- Sets of Mona Lisa reproductions (one set per group of 2-3 students)

Level:

Beginner GLE 2-4

Time Frame:

Approximately a 1.5-hour class¹

Students Will Be Able to:

- Use visual sense and measurements to determine if various reproductions are in proportion to the original.
- Recognize that equivalent ratios can be graphed as a straight line.

College and Career Readiness Standards for Adult Education Addressed:

- 6.RP.3 Understand ratio concepts and use ratio reasoning to solve problems.
- 7.RP.2 Analyze proportional relationships and use them to solve real-world and mathematical problems.
- MP.4 Model with Mathematic

¹ Note: The lesson's time frame is 1.5 hours. The taping runs for a little over an hour. While you will observe students working independently and in small groups, not all student work time is reflected in the video.



How does this lesson connect to previous lessons?

In previous lessons in this unit, students explored equivalent ratios with drawings and the Property of Equal Ratios. This lesson follows and builds on a lesson in which students were given a small, 3” by 2” reproduction of the Mona Lisa. They were told that the actual painting is 30” tall and had to use proportional reasoning to find the width of the actual painting (20”). Students then created an actual size (30” x 20”) outline on easel paper. This outline is used for the following lesson.

How does this lesson connect to future lessons?

The next few lessons will look at graphing ratios on a coordinate grid and solidifying the connection between equal ratios and a straight line. These lessons will progressively lay the groundwork for a later understanding of rates and slope in linear algebra.

Warm-Up (20 minutes): Fraction Talks [Timestamp: 00:00:36:18]

- Show students a “Fraction Talks” image (available for download from mathforlove.com/lesson/fraction-talks/).
- Ask students to write down any fractions that they see. After a few minutes of wait time, ask volunteers to share their fractions and to show, on the image, how they see that fraction. Push students to find different ways of breaking the whole into equal parts, to create equivalent fractions.
- Remind students that fractions are part/whole ratios and that the same pattern they saw with Property of Equal Ratios works for fractions.

Review Previous Class (10 minutes): [Timestamp: 00:13:13:00]

- Review, with student input, how in the previous class they created the actual size outlines from the small reproduction. Highlight how to see the 3:2 height-to-width ratio in both the small (3” x 2”) and large (30” by 20”) rectangles.
- Draw students’ attention to where the factor of 10 shows up. (The large painting is three groups of 10” tall and two groups of 10” wide. The large painting is also ten times the height and ten times the width of the small reproduction.)

Lesson Activities:

Activity 1 (30 minutes): Adapted from EMPower: Mona Lisa, Is That You?

[Timestamp: 00:24:18:13]

- Give each student a copy of Activity 2 and each group (2-3 people) a set of Mona Lisa reproductions.
- Define the word “distorted” with an example. (Resizing a photo on a digital slide)
- Instruct groups to sort the Mona Lisa reproductions into Good Reproductions (in proportion) and Bad Reproductions (distorted) just by sight to begin with.
- Debrief to see if groups agree on the good and bad reproductions.



- Ask: How could we use measurements to see if they are in proportion?
- Check in with groups as they measure the dimensions of each reproduction. Ask how they could use the numbers to see if it matches the original ratio, established in the previous lesson: height to width, 3:2.
- Debrief both in proportion and distorted examples on the board, highlighting how the Property of Equal Ratios can be seen.

Activity 2 (30 minutes): Adapted from EMPower: Lining Up the Reproductions
[Timestamp: 00:48:38:09]

- Using the same easel paper, ask groups to draw their actual-sized Mona Lisa. This demonstrates how to line up each good reproduction in the corner of the large outline and to trace around each one.
- Then, model for students how to draw a star in the upper left corner of each traced rectangle, including the large outline.
- Ask: What do you notice?
- Students establish that corners make a straight line. After, ask them to put distorted reproductions in the corner for comparison to see that they do not fall on the line.
- Instruct students to draw another rectangle “in proportion” to the good reproductions.
- Ask: How do you know?

Closing Discussion (5 minutes): [Timestamp: 01:03:59:07]

- Ask students how they can tell if two ratios are equivalent.
- Make sure to connect back to the Property of Equal Ratios. Highlight that they now have a new way to test for equal ratios, called the straight-line test.

Assessment:

- Assess if students can create another rectangle in proportion to the good reproductions and explain how they know it is in proportion. Look for whether they identify the fact that it falls on the line and the dimension measurements as ways of testing for proportionality.
- Students complete weekly homework that consists of exit ticket prompts used as formative assessments of skills and conceptual understanding.

Note: “Mona Lisa, Is that You?” material is adapted from the EMPower™series titled Keeping Things in Proportion. © 2016 TERC. Used with permission. This material may not be otherwise copied or distributed without written permission from the Adult Numeracy Center at TERC: adultnumeracy@terc.edu. The full version of Lesson 5 from EMPower Keeping Things in Proportion: Reasoning with Ratios is included as a separate document with this Resource Package.



MATHEMATICS CLASSROOM OBSERVATION FOR MELISSA BRAATEN: BEGINNER LEVEL

What follows is an observation of a lesson taught by Melissa Braaten. She serves as an instructor at the Haitian Multi-Service Center for Adult Education, Dorchester, MA. Her number sense lesson is adapted from BeCALM Part 1: Number Sense and is titled “How Much Money Is in the Jar?” The goal is for the class of students (including some English learners) to look strategically for numbers that, when paired, produce “friendly” numbers to make addition easier. The lesson includes two parts: a warm-up on two-digit subtraction and the central session teaching students to reorder and group numbers when adding. Students work toward understanding the commutative and associative properties of addition, although these components are not named.

The observation provides examples of what challenging state academic standards in mathematics look like in daily planning and practice for adult basic education and English learner students. The observation tool is designed as a professional development tool for instructors, those who support instructors, and others working to implement standards. It is not designed for use in evaluation.

Core Action 1. Lesson content is rigorous and relevant for the level defined by the state-adopted standards.

Core Action 2. Learning activities are cognitively demanding and maximize opportunities for students to master the lesson content.

Core Action 3. Lesson content productively engages students.

Core Action 4. Lesson content is intentionally sequenced to develop students’ skills and knowledge.

Core Action 5. Students’ levels of understanding are checked throughout the lesson, and instruction is adjusted accordingly.

English Learner Additional Core Action. Lesson activities provide strategic scaffolds to provide English learners access to lesson content.



Core Action 1. Lesson content is rigorous and relevant for the level defined by the state-adopted standards.	Y, N, or N/A
A. Instructor presents a lesson with well-defined standards-based goals that focuses on the major work of the level (MWOTL). ²	Y
B. Instructor presents a lesson that addresses the Standards for Mathematical Practice that are central to the lesson goals and connected to the targeted content.	Y
C. Instructor, when addressing the MWOTL, intentionally targets one or more aspects of rigor as appropriate for the addressed standard(s). Mark the aspect(s) of rigor the lesson addresses: <ul style="list-style-type: none"> • Conceptual understanding • Procedural skill and fluency • Application 	Y

Evidence observed:

Indicator A:

Three CCR standards are listed in the lesson plan and reflected in the lesson.

- 2.NBT.6 Add up to four two-digit numbers using strategies based on place value and properties of operations.
- 2.NBT.7 Add and subtract within 1000, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method. Understand that in adding or subtracting three-digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones; and sometimes it is necessary to compose or decompose tens or hundreds.
- 2.NBT.9 Explain why addition and subtraction strategies work, using place value and the properties of operations.

In the warm-up, Melissa asks students to find multiple ways to solve four related two-digit subtraction problems. The students use various strategies to solve the problem and explain their

² MWOTL – Major work of the level (MWOTL) – The most important mathematics in preparing adult learners for success in college, careers, and life. Instructors should learn to identify the topics that are—and are not—major topics for the various standards’ levels. When planning instruction, they should focus deeply on the MWOTL rather than racing to cover topics in a mile-wide, inch-deep curriculum. The standards recently adopted by states require educators to significantly narrow and deepen the way time and energy are spent in the math classroom. When educators apply a MWOTL approach to teaching and learning, students can gain strong foundations in critically important areas: conceptual understanding, procedural skill and fluency, and the ability to apply what they learn to solve math problems inside and outside the classroom. Students should spend most of their time on the MWOTL; it should be the major focus of instruction. https://lincs.ed.gov/publications/pdf/ccr/Math_Unit_1_Materials/Math_1_part_mat.pdf



reasoning. Melissa also connects the problems to addition as a way to check students' answers. In the lesson, Melissa gives students amounts of money and asks them to find the total amount in the jar, which involves two-digit addition. Students are encouraged to look for pairs that total \$1 to make it easier to find the total amount of money in the jar. At 00:58:15:12, Melissa asks students why she can jump around in an expression and add numbers that are not in order. She also discusses grouping different numbers together and getting the same answer. They are examples of the associate and commutative properties (properties of operations). Melissa doesn't name these properties but has students explain them in their own words.

Indicator B:

MP.7 (look for and make use of structure) is named and reflected in the lesson. When students count the amount of money in the jar, she encourages them to find pairs totaling \$1. They begin to see that finding these pairs makes it easier to count the amount of money in the jar. This is because they can just count the dollar amounts once they find all the pairs. These tasks also connect to the commutative and associative properties. Students notice that the order in which they add doesn't matter: they can group numbers together and still get the same answer. In the warm-up, Melissa has students solve related two-digit subtraction problems to see the connection when subtracting a similar problem. Specifically, they see when one number was changed by one and how that changed the answer.

Indicator C:

The lesson targets two aspects of rigor: conceptual understanding and application. In the warm-up, Melissa checks that students understand the subtraction of two-digit numbers. She asks students to find multiple ways to solve four related two-digit subtraction problems. She makes it a point to walk around and check understanding for individual students. For example, she does this with a student at 00:01:35:23 and 00:02:01:14. Starting at 00:04:31:02, she asks students to share their solutions and strategies. She asks clarifying questions throughout to assess their conceptual understanding. Students also apply what they know about two-digit addition in the "How Much Money Is in the Jar?" lesson. Students are given envelopes with money amounts and asked to find the total amount in the jar [00:25:54:06].



Core Action 2. Learning activities are cognitively demanding and maximize opportunities for students to master the lesson content.	Y, N, or N/A
A. Instructor presents high-quality questions and tasks to prompt students to discuss their developing thoughts and elaborate on and justify their responses.	Y
B. Instructor consistently uses explanation, modeling, or examples to make the mathematics of the lesson explicit.	Y
C. Instructor provides students with opportunities to work with and practice level-specific problems and exercises.	Y

Evidence observed:

Indicator A:

Melissa presents questions and tasks that are high-quality. When providing answers to questions and tasks, Melissa often asks additional probing questions to prompt students to discuss and elaborate on their thinking.

During the warm-up at 00:05:59:23, a student provides her answer to a subtraction problem by giving an addition problem. Melissa asks a question to get her to elaborate on her thinking. After the student explains her thinking, another student still has questions. The initial student explains her reasoning with the help of a third student. Later in the warm-up, Melissa walks around and sees a different strategy used that hadn't yet been discussed. She recreates the image on the whiteboard and then has the student explain how to solve the subtraction problem using the recreated picture [00:13:00:06]. In the warm-up, Melissa asks students to solve four related two-digit subtraction problems and find more than one way to solve them. This question allows her to explore the different strategies for solving subtraction problems. During the discussion, Melissa called on various students to share their solutions and the strategies they used. For example, she does this at 00:04:38:07, when the student uses the standard algorithm for subtraction. Then, at 00:11:08:10, she uses a visual version and connects it to the standard algorithm for subtraction.

During activity 2, Melissa gives students envelopes with money amounts and asks them to find the total amount in the jar. She encourages them to use amounts that total \$1. Most students work in pairs, which encourages them to talk to each other and explain their reasoning. Note this example at 00:28:27:16.

Indicator B:

During the warm-up, Melissa uses multiple models to explain the solution to the subtraction problems. She uses the standard algorithm for subtraction [00:04:38:07], a visual model (with dots) [00:11:53:10], the 100s chart [00:19:37:04], addition [00:09:40:09], and a number line [00:16:04:06].



Note, however, that she doesn't use an actual number line. Using an actual number line would have provided better support for students' conceptual understanding. During the lesson, Melissa walks around the class to attend to students who need help understanding how to group the numbers. She does this with a student [00:35:38:18] when she uses an example and then offers them coins to make it more straightforward.

Indicator C:

The problems and activities presented in the "How Much Money Is in the Jar?" lesson are appropriate for Beginner (GLE 2-4) students. The lesson source is from the BeCALM (Beginning Curriculum for Adults Learning Math) series. These books were designed for adult learners who need beginner-level math instruction. The students work individually and in groups and appear engaged throughout the lesson. They feel comfortable sharing their thinking and engaging in the activities.



Core Action 3. Lesson content productively engages students.	Y, N, or N/A
A. Students participate actively in sustained class discussions and activities where they build on each other's observations and insights.	Y
B. Students have varied opportunities to apply what they are learning in authentic adult-oriented contexts.	Y
C. Most students display persistence with tasks and problems.	Y

Evidence observed:

Indicator A:

Students participate actively in discussions throughout the class. Melissa asks students to build on each other's observations and insights and explain their thinking to one another. For example, at 00:06:27:09, one student shares her solution, and another student asks a question for clarification. Both students explain their thinking to one another and the class. Melissa designs activities so that students can have a class discussion while sharing their solutions. She also designs activities so that they can discuss with each other in small groups.

Indicator B:

Students apply what they have learned about multi-digit addition to an authentic context involving adding sums in a money jar. First, Melissa asks them to find pairs that equal \$1 to make the calculations easier.

Indicator C:

Students are persistent and supportive of each other's learning when they attend to the activities. Melissa constantly moves around the room to check on student pairs to provide support. For example, at 00:35:38:18, she works with one group to help them find two numbers that equal \$1. She uses coins to help with understanding, and the students appear to feel comfortable engaging and asking questions to clarify their thinking.



Core Action 4. Lesson content is intentionally sequenced to develop students' skills and knowledge.	Y, N, or N/A
A. Instructor explicitly relates new mathematical concepts to previous lessons or students' prior knowledge.	Y
B. Instructor delivers concepts in a way that builds on their logical connections to each other.	Y
C. Instructor ends the class by: <ul style="list-style-type: none">• Reviewing lesson objectives;• Summarizing student learning with references to student work and discussion; and• Previewing the next class session and explaining how it will build on today's activities.	N

Evidence observed:

Indicator A:

Melissa connects new mathematical concepts to what students already know. For example, in the warm-up, she uses addition to check the answers to the subtraction problems [00:05:17:23]. In the Money Jar lesson, she uses actual money to help students understand the concepts [00:35:38:18].

Indicator B:

The warm-up doesn't explicitly connect to the Money Jar lesson but serves as a review of the subtraction of two-digit numbers. However, within the warm-up, Melissa does connect the different subtraction strategies and shows the connection between addition and subtraction. She also shows how the different subtraction problems relate to one another [00:23:47:00].

In the Money Jar lesson, students find pairs of numbers that equal \$1, so they can easily add the numbers in the Money jar. At the end of the class, she does a problem like the Money Jar activity [00:52:41:05]. It is an expression with eight different amounts of money, so they must group different numbers to find numbers that equal \$1. This task connects with what they did previously and allows them to use the properties of addition. By the end of the class, they can explain these properties in their own words.

Indicator C:

At 00:52:41:05, Melissa does a problem like the Money Jar activity. She has an expression with eight different amounts of money. She checks their understanding of the last activity by having them group numbers together that make \$1 and then count the amount. In this activity, she has them describe the commutative and associative properties in their own words. While Melissa doesn't review the lesson objectives or preview the next class session with students, she does these during the follow-up interview.



Core Action 5. Students' levels of understanding are checked throughout the lesson, and instruction is adjusted accordingly.	Y, N, or N/A
A. Instructor consistently uses informal yet deliberate methods to provide students with prompt, specific feedback to correct misunderstandings and reinforce learning.	Y
B. Instructor consistently provides strategic supports and scaffolds to students who need them.	Y
C. Instructor provides opportunities for students to evaluate and reflect on their own learning.	Y

Evidence observed:

Indicator A:

Melissa provides prompt specific feedback during the discussions. She consistently asks students to explain their thinking. In doing that, she identifies misunderstandings. For example, at 00:07:34:04, Melissa asks a student to explain their thinking as she writes it on the board. There appears to be a misconception, so she goes to his desk to have him further explain his thinking. She acknowledges that it is different from another answer and uses addition to have him check his answer. She also does this as she is walking around talking to groups. If someone is having trouble with a concept, she works with them directly to help correct misunderstandings [00:28:44:04].

Indicator B:

Melissa consistently checks on students as they work. Then, she works directly with students who need it by providing additional explanation and support. For example, at 00:35:31:15, Melissa works directly with a pair of students and uses the money to help them understand the concepts. Then, she brings out actual coins that they can count.

Indicator C:

Students are not required to evaluate or reflect on their learning at the end of the lesson. However, they are often encouraged to evaluate and reflect on their learning throughout the lesson.



English Learner Additional Core Action. Lesson activities provide strategic scaffolds to provide English learners access to lesson content.	Y, N, or N/A
A. Instructor draws on students' funds of knowledge about the topic and content of the lesson and provides opportunities for peer-sharing.	Y
B. Instructor uses revoicing to model correct mathematical language, to help students put their thoughts into words, and to clarify their responses.	Y
C. Students have varied opportunities to demonstrate their understanding of the lesson's core content and its vocabulary.	Y

Evidence observed:

Indicator A:

The Money Jar activity draws on students' funds of knowledge about money. Melissa also uses coins to help students determine what amounts equal \$1. For example, she does this at 00:35:31:10. She also uses dimes to help them think about it in terms of 10s. There is another example she draws on students' funds of knowledge at 00:51:08:13 when talking about counting a group of coins.

Indicator B:

At 00:58:13:23, Melissa is wrapping up the last activity. She asks the students why they are allowed to skip around and don't have to go in order. As the students answer, she repeats what they say and writes it on the board. She is getting them to define the Commutative Property of Addition but doesn't name the term. She also references something that a student said previously about being able to add groups of numbers. She summarizes this and writes that on the board, which defines the Associative Property of Addition, although she doesn't name the property.

Indicator C:

Throughout the lesson, Melissa offers varied opportunities for students to demonstrate understanding. In the beginning warm-up, she has them work on a set of related subtraction problems and asks them to solve it in two different ways. After giving them time to work independently, she has them share their different solutions. Multiple students have the opportunity to share, and they showcase various methods. Doing so allows them to demonstrate their understanding. She also asks prompting questions about their solutions [00:05:34:07]. In addition, she has students work in pairs during the Money Jar activity to talk through the solutions in their groups. While they work, she walks around to check students' understanding. She brings them together again and has them report as a larger group.



LESSON PLAN FOR MATHEMATICS

BeCALM Part 1: Number Sense as Adapted by Melissa Braaten
Haitian Multi-Service Center • Massachusetts

Lesson from BeCALM:

How Much Money Is in the Jar?

Unit:

Number Sense

Materials:

- Copies of “How Much Money is In the Jar?” text
- Optional: Cut up sets of money amounts in envelopes

Level:

Beginner GLE 2-4

Time Frame:

Approximately a 1.5-hour class¹

Students Will Be Able to:

- Find pairs of numbers that add together to make friendly numbers like \$1, \$10, or \$100.
- Reorder and group numbers when adding to make addition easier.

College and Career Readiness Standards for Adult Education Addressed:

- 2.NBT.6 Add up to four two-digit numbers using strategies based on place value and properties of operations.
- 2.NBT.7 Add and subtract within 1000, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method. Understand that in adding or subtracting three-digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones; and sometimes it is necessary to compose or decompose tens or hundreds.
- 2.NBT.9 Explain why addition and subtraction strategies work, using place value and the properties of operations.
- MP.7 Look for and make use of structure.

¹ Note: The lesson’s time frame is 1.5 hours. The taping runs for a little over an hour. While you will observe students working independently and in small groups, not all student work time is reflected.



How does this lesson connect to previous lessons?

Previous lessons in this unit had students exploring properties of addition, including the Commutative Property and the Associative Property of Addition. Students have also been working with strategies for estimation, including rounding.

This is the first lesson where students have explicitly been asked to look strategically for numbers that pair together to make friendly numbers.

How does this lesson connect to future lessons?

In this lesson, students are looking for amounts that group together to make \$1. After this lesson, students will repeat similar activities looking for amounts that make \$10 or \$100. Students will also build familiarity/automaticity with these pairs through targeted games and activities in upcoming lessons.

Warm-Up (30 minutes): Subtraction Number Talk [Timestamp: 00:00:35:23]

- Show students four related two-digit subtraction problems and ask them to find more than one way to solve each one. Encourage mental math but allow paper as needed (paper and pencil is a useful resource for students with working memory difficulties).
- After a few minutes of think time, ask for student volunteers to explain how they solved one of the problems. Try to get two different strategies for each problem. If students describe strategies that have come up before, name them (for example, adding up). Reproduce student visuals/work on the board.

Activity (45 minutes): Adapted from BeCALM Part 1: Number Sense: How Much Money Is in the Jar? [Timestamp: 00:25:54:08]

- Have students work in pairs. Give out worksheets or envelopes with money amounts. Explain that students need to find the total amount of money in the jar. Encourage them to look for pairs of amounts that make \$1 and to match them together.
- If students do not have enough familiarity with combinations that make \$1 to recognize them, you can provide additional support with play money. For example, give a student ten dimes and ask them to group the dimes into two groups. Make a list of different pairs, such as 10 + 90, 20 + 80, etc. Have them refer to the list to help them match the amounts in the jar. Future classes should involve activities and games with these number pairs to increase familiarity and automaticity.
- Debrief the pairs that students found and the total amount of money in the jar.
- Next, turn students' attention to the long addition problem that contains similar pairs of numbers. Encourage them to look for pairs that make \$1 to make the addition easier.
- Debrief this equation, annotating or color coding to show the pairs that make \$1.
- Repeat with the next jar and equation, as time allows.



Closing Discussion (5 minutes): [Timestamp: 00:58:13:00]

- Ask students: What does this activity show about addition?
- (We can look for groups that add to make friendly numbers to make adding long lists of numbers easier.)
- What else have we learned about addition in past lessons?
- (We can add numbers in any order or group them and add up the subtotals.)

Assessment:

- See if students can apply what they did with the jar (or the cut-up amounts) to the long equation.
- Students have weekly homework that consists of exit ticket prompts, used as formative assessment.

Note: “How Much Money Is in the Jar?” is material adapted from BeCALM Part 1 Number Sense © SABES Mathematics and Adult Numeracy Curriculum & Instruction PD Center. Created with funding from the Adult and Community Learning Services division of the Massachusetts Department of Elementary and Secondary Education, which is managed by TERC, inc. Used with permission. This material may not be otherwise copied or distributed without written permission from the Adult Numeracy Center at TERC. adultnumeracy@terc.edu. Lesson materials can be found here: BeCALM Part 1 Number Sense: Remote-Ready Curriculum for Beginning Math Students (GLE 2–4) | SABES
