Teaching the Core – Exemplar Lesson Preparation Guide, Mathematics

Thank you for participating in the Teaching the Core exemplar video project. We appreciate your important contribution to creating these valuable professional development resources for teachers across the country. The Teaching the Core exemplar video project is focused on capturing lessons that are exemplars of the Common Core State Standards in practice. In order to support you in planning for this lesson we have developed the following lesson preparation guide. When planning your lesson for video capture please follow the steps outlined below.

Step 1: Complete the below demographic information.

School Name: Lighthouse Community Charter School	Teacher Name: Lauren Hofmayer
Date: 6/2/14 and 6/3/14	Period / Time (e.g. 8:45-9:30): 10:15-11:05 and 9:00-9:50
Room Number: S124	Grade Level: 3
Demographics of the class (e.g., % ELL, % SPED, other relevant):	

Step 2: Determine the standard(s) to be addressed in this lesson.

For the purposes of this project, we are prioritizing the standards in the chart below. For K-8, lessons should target the grade level cluster(s), grade level content standard(s) or part(s) thereof as outlined in the table below. These priorities represent a subset of the major work[1] of the grade for K-8. For high school, reference the Widely Applicable Prerequisites[2] for a list of domains and clusters to focus on with the concepts listed in the table below as the top priority.

Gr	First Priority	Close Second
K	K.CC	K.OA
1	1.NBT	1.OA
2	2.OA.A, 2.OA.B	2.NBT
3	**3.OA (Excluding 3.OA.9)**	3.NF, 3.MD.C
4	4.NF, 4.NBT.B	4OA.A
5	5.NF, 5.NBT.B	5.MD.C
6	6.RP.A, 6.EE, 6.NS.1 (showing in particular how it arises from 5.NF.7)	6.NS.C
7	7.RP.A, 7.NS.A	7.EE.3
8	8.EE.B, 8.EE.C, 8.F.A	8.F.B, 8.SP.3 (supporting cluster)
HS	● Variety of modeling tasks. ● Multi-step quantitative problems with lots of units and rates ● Applications leading to 2 simultaneous linear equations in two variables ● Applications of linear, quadratic , and exponential functions ● Seeing and using structure practice with symbolic manipulation ● "Thinking like a mathematician" (e.g., making a conjecture, checking consistency, generalizing)	If the lesson targets geometry in HS: the lesson should be focused on using algebra to solve measurement problems and/or the use of coordinate geometry

[1] www.achievethecore.org/focus

[2] www.achievethecore.org/prerequisites

	● Working with y=mx + b	

a. Note the cluster(s), standard(s) or parts thereof addressed in this lesson.

3.OA.B.5 Apply properties of operations as strategies to multiply and divide. ***Examples: If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known. (Commutative property of multiplication.) 3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30. (Associative property of multiplication.) Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56. (Distributive property.)***

b. Note the aspect(s) of rigor called for by the standard(s) being addressed in this lesson: Conceptual Understanding, Procedural Skill and Fluency, and/or Application.

Conceptual Understanding and Application
Students will need a strong conceptual understanding of the associative property so they can apply it on the second day.

(Reminder: the aspect(s) of rigor called for by the standard(s) being addressed should also be the aspect(s) of rigor targeted in this lesson)

Step 3: Plan the Lesson

Lesson 1. Procedural Fluency (drawing arrays) and conceptual understanding Apply properties of operations as strategies to multiply and divide. *Examples: If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known. (Commutative property of multiplication.) 3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30. (Associative property of multiplication.) Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56. (Distributive property.)*

Lesson Steps	Anticipated Student Responses	T responses, prompts, talk moves; language supports
Introducing (15 minutes) 1. Invite students to the carpet and introduce a problem where 3 numbers are multiplied together (3x5x2). Put 3x5x2 on post-its so we can move the digits around. 2. Remind students about drawing arrays to help us understand what multiplication means. Ask students: How many different ways can we move the numbers around into different orders, because we know that we can multiply numbers in any order. 3. After students have figured out all of the different ways, T models solving this problem drawing one array to represent (3x5)x2 = 30 Show students that we can use parentheses to show what we are going to do first. **T**: I am going to draw 3 groups of 5 because the parentheses tell me to do that part first. Then I am going to draw 3 groups of 5 two times. Now I am going to count up my total and I have 30. Now I am going to need your help to solve the next problem. You said another way to put these numbers in order is to group the 5 and 2 together first. So 3x(5x2). Take a moment to think about how you would draw this. Now turn and talk to a partner about how you would solve this. I am going to invite someone up to show us. Ss turn and talk, then student comes up and draws the arrays. T: Now you said there was a 3rd way, but I am going to let you go and try some of these on your own (T just writes the 3rd way on organizer)	That looks hard! I don't know how to do that! Cool! 2. Students might discover the first two ways, but struggle to see the third way. Students may have trouble drawing the arrays in organized rows.	2. Are there any other ways we can move the numbers around? Are there any other ways to group the numbers? 3. Remember to say aloud to yourself: _____ groups of ____ when you are drawing your array to make sure you are really showing what the equation means. Remember that an array has **equal** groups, so there need to be the same number in each row.
Exploring / Extending (30 minutes) Students will work independently or in partnerships to draw arrays to represent multiplying 3 numbers in different orders. a. 2x3x4 b. 2x6x3 c. 4x5x4 d. 7x3x5 Early finishers can create and solve their own problems using	Students may have difficulty drawing accurate arrays.	Remind students to think of ___ groups of ____ when they draw each array

factors 2-9		
Summarizing (15 minutes) What did you notice? What did you notice about the answers? Are they the same? Why are they the same? What is different?	They all look different, the answers are all 30, *Important takeaway: no matter how you "associate" or order the factors you get the same answer.*	

Lesson 2. Application Apply properties of operations as strategies to multiply and divide. *Examples: If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known. (Commutative property of multiplication.) 3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30. (Associative property of multiplication.) Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56. (Distributive property.)*

Lesson Steps	Anticipated Student Responses	T responses, prompts, talk moves; language supports
Introducing (15 minutes) 1. Invite students to the carpet and review the work we did yesterday. *T: Yesterday we were drawing arrays and you found out that there were 3 different ways that you could associate (or group) the 3 factors together to multiply.* *Today we are going to do the same thing, but we are going to use a real context. Imagine that your parents are going to pay you 3 dollars a day for 7 days to wash the dishes for 2 weeks.* *How would you figure out how much money you would make?* T writes: **3 dollars x 7 days x 2 weeks** Does anyone have an idea about how they might solve this problem? 3. Could you combine the factors in a different order?	Do I have to draw a picture? Can I draw an array like we did yesterday? Students may not be sure what to write first	You could. Why don't you give it a try and figure it out. No, you can use any strategy that makes sense to you. What does it mean that my dad gave me 2 dollars a day for 3 days? How much money did I make for 3 days? Prompt students to make sense of the problem: use a t-chart use math facts visualize the problem and draw money to show how many times they are being paid that amount *You would probably want to draw a picture to help you understand what the story is saying. 3x7x2. If I imagine what this means, I would draw 3 dollars each day for 7 days. Then I would do that 2 times because I am going to get paid for 2 weeks [T labels*

		Week 1 and Weeks 2). That is one way I could make sense of this. Then I just need to figure out how many $3s I have.
Exploring / Extending (30 minutes) 1. Students will work independently or in partnerships to solve problems where they have to make sense of the word problem and apply the associative property to solve. a. Your parents are going to pay you 4 dollars a day for 3 days to walk the dog for 6 weeks. How much money would you make? b. Your cousin offers to pay you 5 dollars a day for 5 days to babysit his sister for 3 weeks. How much money would you make? c. Your teacher offers the class 3 marbles a day for 5 days for a quarter of the school year (9 weeks). How many marbles could the class earn for making good choices? d. Early finishers can make up their own problem and show how they would solve it.	Students may have trouble getting started Students may not know how to figure out the total for all of the weeks.	Prompt students to focus on 2 factors first. T: Let's think about how much money you are going to make for working for 3 days What does it mean that your parents are paying you 4 dollars a day for 3 days? Now imagine that you are doing that for two weeks. Now for 3 weeks….for 6 weeks Act it out with students if they are getting stuck Draw a picture, make a table, use repeated addition
Summarizing (15 minutes) _____ solved this problem this way. Would we still get the same answer if we combined the factors *this* way? T writes the factors in a different order Give Ss think time, turn and talk (?), then take a volunteer to come up and write it It seems like we got the same answer. We are going to keep working with problems that have 3 factors on another day and see if we keep getting the same answer no matter what order we combine the factors!	Sometimes it was hard to figure out what to draw or start working on a problem	

a. Use the grade-appropriate Instructional Practice Guide (achievethecore.org/math-common-core/instructional-practice) to plan your lesson. An exemplar lesson will meet all of the indicators for Core Action 1 and many, if not all, of the indicators for Core Action 2 and 3. Please write your lesson plan using the lesson plan format with which you are most familiar. Be sure to note:
   - Any materials you will use in the lesson (including multi-media)
   - Where this lesson fits within the context of the larger unit – what was covered before this lesson, and what will be covered after this lesson
   - Any student activities and where in the classroom those activities will take place

b. Reflect on the lesson you have just planned and note which of the Core Action indicators you think this lesson illustrates particularly well.

Core Action 1 A, B, and D -- This lesson is based on CCSS.MATH.CONTENT.3.OA.B.5. At this point in time in the year, the students are familiar with drawing arrays to represent multiplication.

Core Action 1 C -- These lessons intentionally target conceptual understanding of the associative property in Lesson 1 by having students draw arrays and application in Lesson 2 when students are asked to apply their understanding of the associative property to novel story contexts.

Core Action 2 A -- The array model is a representation that is familiar to the students that will help them understand the more complex multiplication problems with 3 factors.

Core Action 2 B - Students will be applying their understanding of multiplication on Day 2 to develop their thinking and understanding of the associative property.

Core Action 2 C, D, and E -- Time is built in for students to work and constructively struggle; the problems will be in order of increasing difficulty to scaffold student understanding.. I will also be able to identify students who need additional support or small group conferring based on the work and conversation from the previous lesson.

Core Action 3 -- The planning of this lesson experience and work I put into facilitating conversations is going to provide all students with the opportunity to demonstrate mathematical practices in the context of the lesson.

c. Tell us anything else you feel is important to know about this lesson that is not captured above or in the lesson plan.

Step 4: Share the Lesson

a. At least 10 days before your lesson is recorded, please share all lesson materials (this completed document, lesson plan, handouts, and text) with [INSERT DISTRICT CONTACT(s)]. [INSERT DISTRICT CONTACT(s)] will review and provide you with feedback on your lesson at least one week before your lesson is recorded.

b. At least three days before your lesson is recorded, email the electronic versions of all lesson materials (this completed document, lesson plan, handouts) to lessonmaterials@teachingthecore.org.

c. The day of the lesson, attach a copy of your lesson plan and any student handouts to this document and give it to the videographer.

d. After the lesson, provide the videographer with samples of student work. If it is not possible to make copies of the student work, the videographer can take a picture. If you are not able to provide student work immediately after the lesson you can also bring samples to your interview.

Step 5: Prepare for Filming

The filmmaker will make every attempt to minimize the disruption to your classroom. In order to support this goal, we ask that you please keep the following in mind as you prepare for the day of the video-taping.

We ask that you:

a. Use black whiteboard markers – they show up better on film. The filmmakers will bring extra black markers in case they are needed.
b. Try to minimize background noise. If you typically play music while students work, please lower the volume or choose not to for this one day.

c. If students are moving in the classroom during the lesson, please let the filmmakers aware of this. Please keep students in the classroom (do not move into the hallway, etc.)
d. You will need to wear a wireless microphone so that your voice is captured clearly on the video. Wear clothing that has a pocket or belt on which to place a transmitter as well a top which will allow a small microphone to clip on easily.
e. Before the video-taping begins, please advise the filmmaker of any students who have not turned in their video release forms and allow the filmmaker to photograph any previously uncollected video release forms

Important information about the filmmaking process:

a. The filmmaker may request to adjust the blinds or classroom lighting.
b. While camera set-up times may vary based on the class size and set-up, it typically takes 20 minutes.
c. A total of 4 cameras will be placed in the classroom. The most common set up will be 2 in the front and 2 in the back of the room. 6 small audio recorders will placed in different locations around the room. Once the class has started, the filmmaker will operate the 2 cameras in the back of the room, leaving the 2 front cameras rolling continuously. This will minimize classroom disruption.

Step 6: Reflect on the Lesson

At some point after your lesson you will be asked to participate in an interview. The goal of this interview is to learn more about the lesson, the decisions you made in planning for it, and your assessment of how it could have been strengthened. The questions below will help you reflect on the lesson and prepare some thoughts for the interview. Please take a few moments to think about your responses to the following questions – note that you do not need to write out answers to these questions; imagine this is a conversation with a fellow teacher about your lesson. However, because a few days may elapse between the lesson and the interview, you may want to jot down a few notes so you do not forget your thoughts.

1. **We want to understand the decisions you made in planning for this lesson and how it fits into the unit and year.**
   a. How does this lesson connect to and build on students' prior skills and knowledge? What was taught before this lesson, and what will come after it? Discuss the sequence of lessons that surround this one lesson.
   b. Talk about the standard(s) or cluster targeted in this lesson. What did you do to make the lesson reflect the full intent of that standard or cluster?
   c. Which of the Core Action indicator(s) do you think this lesson best exemplified? How did you plan for this?
2. **We are interested in how the Shifts required by the CCSS are being incorporated into your classroom.**
   a. Discuss how this lesson illustrates the Shifts required by the CCSS.
   b. How did you teach the content of this lesson prior to the CCSS? What is the same and what is different?
3. **Student engagement is crucial to the work of the CCSS – we want to understand how you ensured that all students had the opportunity to productively engage in the work of the lesson.**
   a. How did the students handle this lesson? Did they understand the mathematics of the lesson? How do you know?
   b. Explain how you differentiated in this lesson. Did all students have opportunities to work on grade-level content? If all students did not have this opportunity, please explain why. Which behaviors from Core Action 3 did the students' best exemplify in this lesson? What actions have you taken as a teacher to make that happen?
   c. Would you like to comment on any of the submitted student work? Was there something that delighted or surprised you with this work?
4. **Great instructors are continuously learning – we want to understand what you celebrated in this lesson and what you would improve upon.**
   a. Reflecting on the lesson, what worked particularly well and what might you do differently?
   b. Were there any surprises or unexpected student behaviors or reactions?