

Lesson/Unit Name: Rating Rate Plans

Content Area: Mathematics

Grade Level: 6

Overall Rating:

E/I

Exemplar if Improved

Dimension I – Alignment to the Depth of the CCSS

The lesson/unit aligns with the letter and spirit of the CCSS:

- ✓ Targets a set of grade-level CCSS mathematics standard(s) to the full depth of the standards for teaching and learning.
- ☐ Standards for Mathematical Practice that are central to the lesson are identified, handled in a grade-appropriate way, and well connected to the content being addressed.
- ✓ Presents a balance of mathematical procedures and deeper conceptual understanding inherent in the CCSS.

This "Poster Problem" lesson is designed to address 6.EE.1, 6.EE.2a, and 6.EE.2c. It addresses 6.EE.2c to the full depth by having students evaluate several different expressions involving variables. Students do evaluate expressions that involve exponents, so they do get some experience leading to 6.EE.1, but it is not sufficient to achieve mastery. Students don't have an opportunity to write expressions from a context or verbal description, as called for in 6.EE.2a. A suggestion would be to allow students opportunities to write some of the expressions themselves to better target 6.EE.1 and 6.EE.2a to the full depth. For example, when the different rate plans are presented in the beginning of the lesson, an effective strategy would be to have the students work in groups to write the expressions for the different rate plans. Also, in section 5, "Strategic Teacher-Led Discussion" the idea of dependent and independent variables is discussed. In addition, several of the poster problems show the rate plans represented through tables and graphs. These ideas are not addressed in the CCSS until 6.EE.9 and it is unclear whether it is the intent of this lesson to address those standards or if these concepts are simply ones that advanced students may develop as they work on this problem. A suggestion is to include clear guidance for teachers as to whether students should be able to represent the cell phone rate plans as tables or graphs or if this is something that may result as students develop their thinking and make connections to concepts they have learned in the past. One would not expect students to have learned about dependent and independent variable and the graphing of such prior to learning about writing and evaluating expressions.

The lesson materials do not mention the Standards for Mathematical Practice. It would be helpful for teachers if there was a discussion of the Standards for Mathematical Practice included with the lesson. The discussion should include a description of which Standards for Mathematical Practice students will be engaging in, and suggestions to the teacher about how to elicit and develop these practices within the lesson. Students who engage in this task fully will have the opportunity to engage in several of the Standards for Mathematical Practice. In the lesson, students are asked to evaluate three rate plans, and present their findings. In order to do this successfully, they will have to Make Sense of Problems and Persevere in Solving them, because how to determine what is best and how to display has to be determined by students. Students also get to Reason Abstractly and Quantitatively by considering how the various terms and variables in the different rate plan expressions relate to the final cost of the bill. Students get to Construct Viable Arguments and Critique the Reasoning of Others when they determine which rate plan is best and when they get to comment on other students' posters. Students Model with Mathematics by examining a real-world scenario that has been represented in a mathematical formula for calculating cost for any number

	<p>of talk minutes or texts. Finally, students Look for And Make Use of Structure when they determine how the various fees and charges get represented in a variable expression.</p> <p>In the lesson, students are wrestling with the concept of variable and constant, while also getting practice in using variables and constants in algebraic expressions. Through the teacher-led discussions, students will have to consider the meaning of variable and constant, as well as consider ways to represent the presented scenarios.</p>
<p>Rating: 2 – Meets many of the criteria in the dimension</p>	

Dimension II – Key Shifts the CCSS

<p><i>The lesson/unit reflects evidence of key shifts that are reflected in the CCSS:</i></p> <ul style="list-style-type: none"> ✓ Focus: Lessons and units targeting the major work of the grade provide an especially in-depth treatment, with especially high expectations. Lessons and units targeting supporting work of the grade have visible connection to the major work of the grade and are sufficiently brief. Lessons and units do not hold students responsible for material from later grades. ✓ Coherence: The content develops through reasoning about the new concepts on the basis of previous understandings. Where appropriate, provides opportunities for students to connect knowledge and skills within or across clusters, domains and learning progressions. ✓ Rigor: Requires students to engage with and demonstrate challenging mathematics with appropriate balance among the following: <ul style="list-style-type: none"> – Application: Provides opportunities for students to independently apply mathematical concepts in real-world situations and solve challenging problems with persistence, choosing and applying an appropriate model or strategy to new situations. – Conceptual Understanding: Develops students’ conceptual understanding through tasks, brief problems, questions, multiple representations and opportunities for students to write and speak about their understanding. – Procedural Skill and Fluency: Expects, supports and provides guidelines for procedural skill and fluency with core calculations and mathematical procedures (when called for in the standards for the grade) to be performed quickly and accurately. 	<p>This "Poster Problem" lesson allows students to explore some different algebraic expressions and evaluate them for different variable values. The standards addressed, 6.EE.1, 6.EE.2a, and 6.EE.2c are considered major work of the grade, and this lesson provides a significant opportunity to move students' understanding of these standards.</p> <p>While the standards being addressed clearly build off of some earlier standards, and lead to future standards, a description of that trajectory is not included with this lesson. It would be better if there was a clearer connection spelled out in either the activity or the teacher notes to help students connect to prior work and lay the groundwork for future work with variables and expressions. The developer may want to consider adding in a pre-assessment to help teachers identify the prior knowledge students come in with.</p> <p>All aspects of rigor are apparent in this lesson. The problem is couched in an engaging and realistic real-world scenario, which motivates the need to use and understand expressions involving variables. Conceptual understanding of variables and expressions is developed through comparing several plans and choosing different values to substitute in for the variables. Successful completion of this lesson will allow students to practice the skill of evaluating an expression several times.</p>
<p>Rating: 3 – Meets most to all of the criteria in the dimension</p>	

Dimension III – Instructional Supports

<p><i>The lesson/unit is responsive to varied student learning needs:</i></p> <ul style="list-style-type: none"> ✓ Includes clear and sufficient guidance to support teaching and learning of the targeted standards, including, when appropriate, the use of technology and media. ❑ Uses and encourages precise and accurate mathematics, academic language, terminology and concrete or abstract representations (e.g., pictures, symbols, expressions, equations, graphics, models) in the discipline. ✓ Engages students in productive struggle through relevant, thought-provoking questions, problems and tasks that stimulate interest and elicit mathematical thinking. ✓ Addresses instructional expectations and is easy to understand and use. ❑ Provides appropriate level and type of scaffolding, differentiation, intervention and support for a broad range of learners. <ul style="list-style-type: none"> – Supports diverse cultural and linguistic backgrounds, interests and styles. – Provides extra supports for students working below grade level. – Provides extensions for students with high interest or working above grade level. <p><u><i>A unit or longer lesson should:</i></u></p> <ul style="list-style-type: none"> ❑ Recommend and facilitate a mix of instructional approaches for a variety of learners such as using multiple representations (e.g., including models, using a range of questions, checking for understanding, flexible grouping, pair-share). ❑ Gradually remove supports, requiring students to demonstrate their mathematical understanding independently. ❑ Demonstrate an effective sequence and a progression of learning where the concepts or skills advance and deepen over time. ❑ Expect, support and provide guidelines for procedural skill and fluency with core calculations and mathematical procedures (when called for in the standards for the grade) to be performed quickly and accurately. 	<p>The structure of the "Poster Problem" lesson allows teachers and students to go through a progression to develop learning of the targeted standards. The suggestions for teacher questions, sample posters, and the level descriptors help teachers facilitate student learning. The teacher tune-ups, which are linked from the document, provide relevant background content for teachers. Some guidance to teachers for how to move students from one level to the next is needed. Teachers who use this lesson may not know what to do to move a students from, say, level 2 to level 3.</p> <p>The use of precise mathematics and academic language is not as strong as it could be. If this lesson were used as a launch into a unit on 6.EE standards, the terms variable, constant, and variable (or algebraic) expression should be explicitly introduced and the lesson notes and student pages should encourage the correct use of those terms. While it is suggested that students may use multiple representations in their posters, the materials themselves only have a symbolic representation of the scenarios. It is unclear whether it is expected that students will use other representations (such as tables or graphs) in their posters, or whether it's completely optional. If it is expected then more vocabulary (independent, dependent) and support to students will be needed to ensure they get to the multiple representations.</p> <p>The scenarios are engaging and complex, and it is not obvious from the materials and teacher instructions to students what the best way to answer the question would be. Deciding how to explore the different plans, and what information to display and deciding which plan is best will allow students to engage in productive struggle. Page 2 asks students to consider how realistic certain numbers are and page 4 includes an opportunity for students "discover" the effect of the exponent in the expression. The discussion after the poster problem is designed to elicit student understanding.</p> <p>The format of the "Poster Problem" lesson is clearly laid out, and the steps for implementing the lesson are clear and easy to follow. Both a novice and experienced teacher should be able to implement the lesson with the provided materials. Handouts and slides to use with the lesson are also provided. One suggestion for improvement would be to provide some guidance about what the teacher should be doing while students are working on their posters. It is unclear what sort of support, involvement, student guidance, or intervention the teacher should anticipate having to give.</p> <p>The problem posed in this lesson is quite open-ended, has many points of entry, and has many levels at which it could be addressed, which makes it suitable for a wide range of learners. However, specific guidance about how to support struggling and advanced learners as well as English-language learners is not included in the lesson. It would be helpful to have some suggestions for how to adjust this problem for different learners.</p>
<p>Rating: 2 – Meets many of the criteria in the dimension</p>	

Dimension IV – Assessment

<p><i>The lesson/unit regularly assesses whether students are mastering standards-based content and skills:</i></p>	<p>Because this "Poster Problem" is just a single lesson, it may be that a summative assessment at this point is not necessary. Formative assessment about what the students learned from creating and discussing</p>
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<ul style="list-style-type: none"> ✓ Is designed to elicit direct, observable evidence of the degree to which a student can independently demonstrate the targeted CCSS. ✓ Assesses student proficiency using methods that are accessible and unbiased, including the use of grade-level language in student prompts. ☐ Includes aligned rubrics, answer keys and scoring guidelines that provide sufficient guidance for interpreting student performance. <p><u>A unit or longer lesson should:</u></p> <ul style="list-style-type: none"> ☐ Use varied modes of curriculum-embedded assessments that may include pre-, formative, summative and self-assessment measures. 	<p>the posters can be done with the "Same Concept in a New Context" activity. In this activity, students will have the opportunity to independently demonstrate their understanding of the targeted standards (6.EE.2c, 6.EE.1, and, to a lesser extent, 6.EE.2a).</p> <p>The activity's context may pose a challenge for some students if they are not familiar with the idea of a food truck or with the names or types of Indian cuisine. Teachers may want to spend a few minutes making sure students understand those ideas before allowing students to tackle this activity independently. The questions asked in the prompt are not biased and do use appropriate language levels.</p> <p>The lesson provides answer keys for all problems, some sample posters, and a description of 5 learning levels to assist the teacher in assessing current student understanding. However, further guidance on evaluating the posters (perhaps samples of each level) and what the expectation is for the posters is needed.</p>
<p>Rating: 2 – Meets many of the criteria in the dimension</p>	

Summary Comments

The "Poster Problem" lesson is a rich, open-ended, and engaging method to allow students to explore and gain proficiency with the targeted 6.EE standards. It would serve well at the beginning of or during a larger unit on expressions. The instructions for using the lesson in the classroom are clear and there is sufficient guidance on most portions to support teachers who want to use this lesson with their students.

This lesson would be improved if there were some discussion of the Standards for Mathematical Practice included with the lesson materials. The lesson itself provides opportunity for students to engage in the Standards for Mathematical Practice, and a discussion of this will help teachers know how to facilitate the lesson so that students are developing their use of the Standards for Mathematical Practice.

Because teachers are likely to have both struggling and advanced learners, as well as English-language learners in their classroom, this lesson would be improved by attending to those populations in the lesson notes. The open-ended and collaborative nature of the lesson allows for these populations to access the lesson, and a discussion of teacher moves or decisions that would help support these learners would make the lesson stronger overall. Finally, the inclusion of tables and graphs in the sample posters and Strategic Teacher-Led discussion needs to be clarified, because these representations, which relate to 6.EE.9, may not come up spontaneously. Other suggested teacher moves and student activities may need to be included if all students are expected to develop tables and graphs as part of the poster.

Rating Scales

Rating Scale for Dimensions I, II, III, IV:

3: Meets most to all of the criteria in the dimension

2: Meets many of the criteria in the dimension

1: Meets some of the criteria in the dimension

0: Does not meet the criteria in the dimension

Overall Rating for the Lesson/Unit:

E: Exemplar – Aligned and meets most to all of the criteria in dimensions II, III, IV (**total 11 – 12**)

E/I: Exemplar *if* Improved – Aligned and needs some improvement in one or more dimensions (**total 8 – 10**)

R: Revision Needed – Aligned partially and needs significant revision in one or more dimensions (**total 3 – 7**)

N: Not Ready to Review – Not aligned and does not meet criteria (**total 0 – 2**)

Rating Descriptors

Descriptors for Dimensions I, II, III, IV:

3: **Exemplifies CCSS Quality** - meets the standard described by criteria in the dimension, as explained in criterion-based observations.

2: **Approaching CCSS Quality** - meets many criteria but will benefit from revision in others, as suggested in criterion-based observations.

1: **Developing toward CCSS Quality** - needs significant revision, as suggested in criterion-based observations.

0: **Not representing CCSS Quality** - does not address the criteria in the dimension.

Descriptor for Overall Ratings:

E: Exemplifies CCSS Quality – Aligned and exemplifies the quality standard and exemplifies most of the criteria across Dimensions II, III, IV of the rubric.

E/I: Approaching CCSS Quality – Aligned and exemplifies the quality standard in some dimensions but will benefit from some revision in others.

R: Developing toward CCSS Quality – Aligned partially and approaches the quality standard in some dimensions and needs significant revision in others.

N: Not representing CCSS Quality – Not aligned and does not address criteria.