EQuIP Review Feedback

Lesson/Unit Name: Module 1 – Integer Exponents and Scientific Notation
Content Area: Mathematics
Grade Level: 8

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.	The 13 lessons contained in this unit focus on 8.EE.1, 8.EE.3, and 8.EE.4. The lessons emphasize 8.EE.1: Know and apply the properties of integer exponents to generate equivalent numerical expressions. Throughout the series of lessons, these standards are developed so that students are able to use the properties and apply them to generate equivalent expressions. The Standards for Mathematical Practice are laid out at the beginning of the unit with examples for how students will engage in these practices. Specific examples of how students will be using these mathematical practices are described throughout the module. While the Standards for Mathematical Practice are evident, it is not always clear that they are developed to the depth expected by the Common Core State Standards for Mathematics. The Standards for Mathematical Practice are the heart of mathematical thinking and students need opportunity to problem solve on a regular basis. Many of the lessons rely on the teacher demonstrating an example and the students practicing with similar problems. Conceptual understanding is developed by beginning with students' prior knowledge and reasoning about how these ideas might be used with exponents. While the focus is on procedures, these procedures are based on conceptual understandings. For example, page 8 demonstrates how repeated multiplication can be represented as an exponent. Throughout the lessons, there are multiple opportunities for students to practice mathematical procedures.
Rating: **3 – Meets most to all of the criteria in the dimension**	

Dimension II – Key Shifts the CCSS

The lesson/unit reflects evidence of key shifts that are reflected in the CCSS: ✓ **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	Focus: Working with expressions and equations is a primary focus of grade 8 and considered critical content. This unit provides an in-depth treatment of the content. The opportunity to extend beyond the grade level is available but not required. Because this is a unit rather than an individual lesson, there is the opportunity to reach the intended depth of the standard. Coherence: The lessons provide foundational standards from previous grade levels and connect previous learning to the current lesson. Students build upon their foundation with exponents as they make conjectures about how zero and negative exponents of a number should be defined and prove the properties of integer exponents. (8.EE.1) These properties are codified into three Laws of Exponents. They make sense out of very large and very small numbers, using the number line model to guide their understanding of the relationship of those numbers to each other (8.EE.3). This is an example of coherence within the domain. For example, exponents are introduced by connecting to repeated addition and the rules

within or across clusters, domains and learning progressions. ✓ **Rigor:** Requires students to engage with and demonstrate challenging mathematics with appropriate balance among the following: – **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.	for repeated addition. Lessons begin with simpler ideas and build to more complex ideas, such as learning to work with positive exponents before introducing negative exponents. Application: Within Topic A, the lessons provide limited opportunities for application, such as in the closure section on page 11 and the problem with a bouncing ball on page 25. More exploratory activities that include context and application might make the lessons more engaging for students. There are more opportunities for application within Topic B. Through these application situations, students have the opportunity to further develop their conceptual understanding. Conceptual understanding: The lessons allow for well-developed conceptual understanding. Students develop laws of exponents through a logical sequence and Socratic discussions help build understanding. Students discuss the idea of 0 power, which is purely conceptual. This is an excellent example of developing understanding. Procedural skill and fluency: Most of the lessons build towards procedural skill through conceptual understanding. The unit provides sprints and fluency activities that provide opportunities for students to practice the skills developed in the lessons. The content standards addressed in this unit are not standards for which fluency is an major expectation for this grade level.
Rating: **3 – Meets most to all of the criteria in the dimension**	

Dimension III – Instructional Supports

The lesson/unit is responsive to varied student learning needs: ✓ 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. – 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.	The overall layout of the unit is easy to follow. The overview provides a strong sense of the unit before beginning to look at the specifics of each lesson. The inclusion of how the Standards for Mathematical Practice are being used will be beneficial for teachers. Additional commentary where these are pointed out within lessons about these practices would be helpful. After some conversation with students, formal rules and definitions are developed. Throughout the lessons, when there is an important property, these are noted. The use of vocabulary might be strengthened, but what is included is well-developed. The Socratic discussions are a powerful tool to use in the classroom. You might consider including a protocol so teachers implement the discussions as designed. It would also be important to provide a description for how the Sprints are to be used with students. Student outcomes are clearly noted. Sample responses are included. "Note to Teacher", "Scaffolding", and additional teacher supports provided in the lessons will be appreciated by teachers and provide for consistency in the implementation of lessons. Teachers will have a sense of the "thinking" behind the selected problems. We appreciate the emphasis on closure and an exit ticket so that lessons do not end abruptly. One minor error at the top of page 16: 5^2 x 5^4 should equal 5^6 rather than 5^8.

A unit or longer lesson should: ❒ 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.	Another minor error on page 16: In the box labeled "Scaffolding", there appears to be a phrase missing at the end. It should say "requires use of parentheses". On page 23, the exit ticket asks students to simplify the numerical expression. Rather than writing 5^(3+2) or 5^5, it might be interpreted that simplest form would be 3125. It might be helpful to include a note to teachers that defines what you mean by "simplify" or "simplest form". These terms are used frequently throughout the lessons. On question 2 of the assessment from page 64, students are asked to "Use properties of exponents to prove the following identity". Consider including "identity" in the list of "Familiar Terms and Symbols" on page 5 so teachers are aware that students will need to know this term. Opportunities for productive struggle are limited. Many of the lessons are teacher-directed and follow an "I do, we do, you do" model. Some of the problem set examples could be used to engage students in productive struggle. Providing more opportunities for students to engage in inquiry will allow for productive struggle. See page 33 as examples of opportunities for productive struggle. However, it might be more powerful if there were a context given. Perhaps include more balance between inquiry and teacher-directed activities. The lessons provide some ways to scaffold the lesson - suggestions for teachers are provided in boxes to the side within the lesson. The pacing of the lessons is fast - especially for Topic B. Consider including suggestions for how teachers might accommodate all students. For English Language Learners, more development of the vocabulary and examples might need to be provided. The context for some of the application problems might also need to be adjusted. Students with Disabilities and other diverse learners might need additional support with the lessons. Suggestions for how these students might be supported would be beneficial.
Rating: **2 – Meets many of the criteria in the dimension**	

Dimension IV – Assessment

The lesson/unit regularly assesses whether students are mastering standards-based content and skills: ❒ 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. *A unit or longer lesson should:* ✓ Use varied modes of curriculum-embedded assessments that may include pre-, formative, summative and self-assessment measures.	There are concerns with two of the three items on the Mid-Module Assessment. In problem 1, the social media problem does not require the use of exponents to be solved. The problem works for exponents in this particular situation because the base is 3 and the base is tripling. If, for example, we started with 4 million rather than 3 million, exponents would not be able to be used. In problem 2, students are asked in the first part to write an expression as the product of unique primes. I could not find any examples within the lessons where students had experience writing expressions as the product of unique primes. Additionally, students might not be familiar with what they are to do with "identity". While "identity" is used frequently within the lessons, it is typically used as a note to the teacher and might not be used in discussions with students. While the lessons, particularly in Topic A, contain few examples of contextual problems, both the Mid-Module Assessment and the End-of-Module Assessment are comprised of all contextual

	problems. This appears to be a mismatch between what the students have been learning and how they are going to be assessed. Including more contextual problems within the lessons might alleviate this concern if the desire is to base the assessment on contextual problems. Examples of formative assessment are used through the Socratic discussions and exit tickets. These can be used to plan and adjust instruction for the subsequent lesson. Rubrics and alignment of the assessments to the standards is helpful. Teachers will appreciate these tools that help them understand the expectations of the unit and will help provide consistency in scoring. There is no evidence of a self-assessment for students.
Rating: **2 – Meets many of the criteria in the dimension**	

Summary Comments

Overall, this is a strong series of lessons that could be effective in helping students learn the "know and apply the properties of integer exponents to generate equivalent numerical expressions." The overall flow and approach is conducive to student understanding for most students and ease of educator use. Areas for improvement include the infusion of more context and productive struggle during the lessons. While the Standards for Mathematical Practice are evident within the lessons, these sometimes appear to be included only at the surface level. Allowing more opportunity for productive struggle should serve to help students find more success on the summative assessment and in their future work as they apply their understanding of integer exponents.

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.