

UKanTeach K&L Lesson Plan

Author (s): Team Members: KP Preut, Skyler Shaw, and Sydney Pilger	Title of Lesson: Application of Scientific Notation Lesson Source: Scientific Notation Lesson Plan Study.com word problems scientific notation key.notebook (commackschools.org)
Lesson #: 1 Date lesson will be taught: April 20th, 2023	Subject/Grade level: 8th Grade Math
Concepts/Main Idea – <i>explain the concept(s) that will be the focus of this lesson in detail.</i> <ul style="list-style-type: none">- We will explain the definition of scientific notation and its purposes in the mathematical world.<ul style="list-style-type: none">- Scientific notation is a way of expressing numbers that are very large or very small- This is done by placing one digit from 1 to 9 before the decimal place followed by relevant digits after the decimal place. This decimal is then multiplied by 10 to a power that accurately represents the number.<ul style="list-style-type: none">- For example, 5,000,000,000,000 would be expressed as 5×10^{12}	
Common alternative conceptions – <i>Explain the major alternative conceptions or partial understanding that students tend to have about this topic.</i> <ul style="list-style-type: none">- misconception(s):<ul style="list-style-type: none">- Students will likely be able to compute real numbers then convert to scientific notation. However, some may struggle computing numbers already expressed in scientific notation.	

Instructional model and strategies – *The model (e.g., learning cycle, PEOE, ADI, etc.) and the strategies (e.g., concept-mapping, writing -to-learn, etc.) that will be used during the lesson*

Model: 5Es

Strategies: Concept mapping, Think-Pair-Share

Objective/s- Write objectives in SWBAT form...
The Students Will Be Able To:

- Students will be able to express real numbers in scientific notation.
- Students will be able to convert numbers in scientific notation to real numbers.
- Students will be able to solve word problems using the scientific notation format.

Evaluation *Based on your objectives, draft the content of the questions you will ask on your pre- and post-tests; at least 1 question for each objective. Questions do not have to be multiple choice. Your actual pre- and post-tests will be included in the interview paper.*

Diagnostic assessment – This should line up with the learning targets and provide the teachers with the information needed to make instructional decisions *before* the lesson begins. Be sure the assessment will make the students’ thinking visible.

- Students have taken a Pretest on the subject before Lesson.
- Students performed very well and helped form the lesson on more word and word based problems.

Formative assessment(s) – This should line up with the learning targets and provide teachers with the information needed to make instructional decisions *during* the lesson. Be sure to describe the format of the assessment and what it is designed to assess.

- Concept map comparison
 - Teacher will observe how concept maps develop and change over the course of the lesson
- Fist to five after completing the Explain section
 - Check for student confidence on the topic before moving on the the elaborate section

	<p>Summative assessment - This should line up with the learning targets and provide teachers with the information needed to be confident that students understand the content. Be sure to describe the format of the assessment and what it is designed to assess.</p> <ul style="list-style-type: none">● Post test will be given the next class after the class<ul style="list-style-type: none">○ Post Test will include word problems as well as addition and subtraction with scientific notation
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Kansas Science and Math Standards- Include standard, benchmark and indicator where applicable

Math Lessons must include:

1. one Common Core Math Practice Standard (Number and Title of standard)
 - Attend to precision
2. A minimum of one Common Core Math Content Standard (domain, cluster, standard)
 - 8.EE.A4 Expressions and Equations (Work with radicals and integer exponents)
3. one science practice from NGSS
 - S4. Analyze and interpret data

Describe the big ideas found in the standards that you are addressing.

The big ideas in the math standard addressing scientific notation is how to read and write scientific notation. Students will be able to work out problems in decimal and scientific notation, through interviews we found that some students had a harder time when the problem was already in scientific notation. Our lesson will also look at the two different ways they would see scientific notation

Write the essential question that will be used to focus this lesson.

How can scientific notation be used to simplify computing data?

Materials list (BE SPECIFIC about quantities)
for Whole Class:

per Group: One whiteboard (3 total) for doing computations in
the Explore section.

per Student: One piece of paper for every student to make their
concept maps

Advance preparation:

Include handouts at the end of this lesson plan document (blank
page provided to paste a copy of your document). List handouts
in your materials list.

- 9 copies of Elaborate worksheet
- 9 copies of summative assessment.

Accommodations: Include a general
statement and any specific student
needs. Be sure to include struggling
readers.

- Teachers provide verbal and
visual directions on the board.
 - Teacher will be make
themselves available to
read out the problems

Safety: Include a general statement
and any specific safety concerns

- General classroom safety
should be enforced.
 - Students need to be
respectful to one
another.

Describe what the student and the teacher will do during each stage of the lesson. Be sure to describe the learning experiences and the assessments. You also need to discuss any management considerations (e.g., picking up materials, movement of students, etc.)

Engagement: Estimated Time: <u> 5 </u> minutes <u> </u>		
What the teacher does AND how will the teacher direct students: (Directions)	Probing Questions: Critical questions that will connect prior knowledge and create a “Need to know”	Expected Student Responses AND Misconceptions - think like a student to consider student responses INCLUDING misconceptions:
<ul style="list-style-type: none"> ● Teacher will put students into pre-assigned groups <ul style="list-style-type: none"> ○ Three groups of three ● Each student should have a piece of paper. ● Students will work with one another to create their concept maps. <ul style="list-style-type: none"> ○ Everyone should make their own. Group members can have the same map, or individuals can have differences based on their own understanding. ○ Students will be given the terms “scientific notation, decimals, and data” to be included in their concept maps. They also need to come up with three more terms to add to their maps. These terms need to be connected with associative verbs. ● One student from each group will briefly share what they discussed. 	<ul style="list-style-type: none"> - What additional vocab can you add? - What words are you using to connect the terms? - What does it mean if there is a negative in your equation? 	<ul style="list-style-type: none"> - multiply, squared, divide - reduces, groups - That my number will be negative.

Exploration: Estimated Time: _____ 6 minutes _____		
What the teacher does AND what the teacher will direct students to do: (Directions)	Probing Questions: Critical questions that will guide students to a “Common set of Experiences”	Expected Student Responses AND Misconceptions - think like a student to consider student responses <i>INCLUDING</i> misconceptions:
<ul style="list-style-type: none"> ● Students will stay in the groups they were placed in for the Engage section. ● They will be given a large whiteboard to show their work for the practice problem. ● Students will be given a word problem to solve as a group. <ul style="list-style-type: none"> ○ The word problem will include data that has very large numbers. ○ Students will not be directed to solve the problem using a specific method (including scientific notation). ● Students will need to show their boards for the next step, so they will be told to not erase their work. 	<ul style="list-style-type: none"> - How do you handle numbers this large? - Is scientific notation more beneficial for examples this large or detrimental? 	<ul style="list-style-type: none"> - Maybe split the number into smaller ones so they're easier to solve. - Beneficial

Explanation: Estimated Time: <u>4 minutes</u>		
What the teacher does AND what the teacher will direct students to do: (Directions)	Clarifying Questions: Critical questions that will help students “ <i>clarify their understanding</i> ” and introduce information related to the lesson concepts & vocabulary	Expected Student Responses AND Misconceptions - think like a student to consider student responses <i>INCLUDING</i> misconceptions:
<ul style="list-style-type: none"> ● Groups will go to the front of the class with their boards and explain how they found their answers. <ul style="list-style-type: none"> ○ Other students will be directed to ask the presenting group questions about their method. ● All methods are acceptable, however the goal is that a group explains how to compute numbers expressed in scientific notation. <ul style="list-style-type: none"> ○ If none of the groups used this method, the teacher will explain the method. ● Teacher will do a fist to five to check for students' understanding and confidence with the content. 	<ul style="list-style-type: none"> - How do the vocab words that you've chosen help explain the process of scientific notation? 	<ul style="list-style-type: none"> - They help express each step of writing scientific notation

Elaboration: Estimated Time: <u>8 minutes</u>		
What the teacher does AND what the teacher will direct students to do: (Directions)	Probing Questions: Critical questions that will help students “ <i>extend or apply</i> ” their newly acquired concepts/skills in <i>new situations</i>	Expected Student Responses AND Misconceptions - think like a student to consider student responses <i>INCLUDING</i> misconceptions:

<ul style="list-style-type: none"> ● Students will return to their groups and will be given a worksheet to complete. <ul style="list-style-type: none"> ○ This worksheet will be word problems that require the use of scientific notation. <ul style="list-style-type: none"> ■ For this worksheet, students will be required to compute numbers that are expressed in scientific notation. ● The teacher will circulate to make sure groups are using the required method. ● When the groups are finished working on the problem, each group will share their answers. <ul style="list-style-type: none"> ○ If each group got the same answer, move on to the next activity. ○ If groups got different answers, go over the methods used and clear up any misconceptions. ● Next, students will pair up with a student they have not worked with that day. <ul style="list-style-type: none"> ○ Students will need the concept maps they created earlier. ○ Students will work together in a Think-Pair-Share to describe any changes they 	<ul style="list-style-type: none"> - What changes in your process of computing equations when using scientific notation? - How would you now go about solving equations with larger numbers? 	<ul style="list-style-type: none"> - You have to keep in mind the exponents and pemdas - The same way maybe
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<p>would make to their concept map.</p> <ul style="list-style-type: none"> ■ They need to add at least one more term and create a justification for any changes or why they kept their map otherwise unchanged. ○ Students will briefly tell the class what changes they made. 		
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<p>Evaluation: Estimated Time: _____ 7 minutes _____ Critical questions that ask students to demonstrate their understanding of the lesson’s performance objectives.</p>
<p>Formative Assessment(s): <i>In addition to the pre- and post-test, how will you determine students’ learning within this lesson: (observations, student responses/elaborations, white boards, student questions, etc.)?</i></p> <ul style="list-style-type: none"> ● Concept map comparison <ul style="list-style-type: none"> ○ Teacher will observe how concept maps develop and change over the course of the lesson ● Fist to five after completing the Explain section <ul style="list-style-type: none"> ○ Check for student confidence on the topic before moving on the the elaborate section ● Observing student work throughout the lesson <ul style="list-style-type: none"> ○ When they are working with whiteboards and on the worksheet, teachers will observe their work and check for mistakes and misconceptions. ● Students reporting their answers to the whole class <ul style="list-style-type: none"> ○ If there are differences in answers, we can go over them
<p>Summative Assessment: <i>Provide a copy of the key to the post-test in the interview paper.</i></p>