

Upper Grades- Lesson Topic: Estimating Distances

Unit Description:

In this lesson, students will use a virtual field trip adapted Real World Math (see above technological tools section) and powered by Google Earth. Students will find their school on Google Earth and find schools at different approximate locations, like 1 mile, 10 miles, 100 miles, and 1000 miles. Then, the students will videochat with a school that was found at one of the distances from their school and solve a problem detailing the actual distance in miles, how much gas it would take to get there in a car, and how much it would cost. The students will compare their answers while being able to explain how they got their answer in detail.

The first step in successfully implementing this unit into the classroom is to establish a partnership with a school approximately 10, 100, or 1000 miles from your school. You might have to try different directions and distances to find a school who is willing to participate. The Cooperative Educational Services Agency (CESA 7) and The Center for Interactive Learning and Collaboration (CILC) in the technology tools sections list thousands of different schools in areas both inside and outside the United States that have access to videoconferencing and their contact information, but you can also usually find teacher emails on schools websites. The classrooms listed in these directories are interested in establishing educational partnerships and should be contacted before the beginning of the year to effectively plan for an upcoming unit. Use the sample letter in the resources section for an example of what could be sent as an initial contact to potential cooperating classrooms.

Objectives:

- ① Students will find approximate distances from familiar locations using a virtual ruler and drawing paths on a map.
- ① Students will create a map on grid paper to demonstrate their knowledge of estimation and scale.
- ① Students will use addition, subtraction, multiplication, and division to solve a problem on how to get from one place to another.
- ① Students will explain in detail how they found the answer to a problem and listen to others explain how they solved the same problem.

Standards (California State Content Standards):

CA- California K-12 Academic Content Standards
Subject : Mathematics
Grade : Grade Three
By the end of grade three, students deepen their understanding of place value and their understanding of and skill with addition, subtraction, multiplication, and division of whole numbers. Students estimate, measure, and describe objects in space. They use patterns to help solve problems. They represent number relationships and conduct simple probability experiments.
Area : Measurement and Geometry
Sub-Strand 1.0: Students choose and use appropriate units and measurement tools to quantify the properties of objects:
Standard 1.1: Choose the appropriate tools and units (metric and U.S.) and estimate and measure the length, liquid volume, and weight/mass of given objects.
Standard 1.4: Carry out simple unit conversions within a system of measurement (e.g., centimeters and meters, hours and minutes).
Grade : Grade Four
By the end of grade four, students understand large numbers and addition, subtraction, multiplication, and division of whole numbers. They describe and compare simple fractions and decimals. They understand the properties of, and the relationships between, plane geometric figures. They collect, represent, and analyze data to answer questions.
Area : Number Sense
Sub-Strand 3.0 (Key Standard): Students solve problems involving addition, subtraction, multiplication, and division of whole numbers and understand the relationships among the operations:
Standard 3.1 (Key Standard): Demonstrate an understanding of, and the ability to use, standard algorithms for the addition and subtraction of multidigit numbers.
Standard 3.2 (Key Standard): Demonstrate an understanding of, and the ability to use, standard algorithms for multiplying a multidigit number by a two-digit number and for dividing a multidigit number by a one-digit number; use relationships between them to simplify computations and to

check results.

Standard 3.3 (Key Standard): Solve problems involving multiplication of multidigit numbers by two-digit numbers.

Standard 3.4 (Key Standard): Solve problems involving division of multidigit numbers by one-digit numbers.

Area : Measurement and Geometry

Sub-Strand 2.0 (Key Standard): Students use two-dimensional coordinate grids to represent points and graph lines and simple figures:

Standard 2.1 (Key Standard): Draw the points corresponding to linear relationships on graph paper (e.g., draw 10 points on the graph of the equation $y = 3x$ and connect them by using a straight line).

Grade : Grade Five

By the end of grade five, students increase their facility with the four basic arithmetic operations applied to fractions, decimals, and positive and negative numbers. They know and use common measuring units to determine length and area and know and use formulas to determine the volume of simple geometric figures. Students know the concept of angle measurement and use a protractor and compass to solve problems. They use grids, tables, graphs, and charts to record and analyze data.

Area : Number Sense

Sub-Strand 2.0: Students perform calculations and solve problems involving addition, subtraction, and simple multiplication and division of fractions and decimals:

Standard 2.5: Compute and perform simple multiplication and division of fractions and apply these procedures to solving problems.

Area : Mathematical Reasoning

Sub-Strand 2.0: Students use strategies, skills, and concepts in finding solutions:

Standard 2.1: Use estimation to verify the reasonableness of calculated results.

Standard 2.3: Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.

Standard 2.5: Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.

Standard 2.6: Make precise calculations and check the validity of the results from the context of the problem.

Sample Lesson:

Individual Instruction: For the computer lab portion of this lesson, have students download the “Estimation Lesson” from the Measurement Lessons tab on RealMathWorld.org. Then have the students complete the steps provided by the downloaded lesson on Google Earth. Students will find exact and approximate locations of other elementary schools at 10, 100, 1000, etc. miles from their own school. Then, the teacher will tell students to find the exact distance of a school that is approximately 100 miles away from their own school and then provide the miles per gallon of a particular vehicle (example a Honda Civic that gets 28 miles per

gallon), and the current price of gas per gallon in their town. Students will be asked to use this information to find the price to travel from their school to the school 100 miles away and be able to explain the process they used. Students who are lower achieving in math can do this same problem with a school 10 miles away and whole numbers for the miles per gallon and price per gallon. Some students will have used the same school, but there will likely be a variety of different schools found based on the direction that students chose to “travel” on Google Earth. The teacher should have compiled a list of possible schools and answers beforehand so that answers can be checked for accuracy.

Whole Group Instruction: Using the list of possible schools at an approximate distance of 100 miles away, the teacher should set up a videoconferencing appointment with this school so that the students can collaborate on their answers and share how they find their answers (the other classroom will have completed the same problem from their school). Using StudyRoom (see above technological tools section) have the two classrooms use the interactive whiteboard to show their work (both classroom will be able to see what is appearing on the interactive whiteboard) while also having a smaller image of the videochat on the side of the screen. Only a handful of students will likely have used this exact school to solve their problem, but have the other students follow along and solve the problem on scratch paper or personal whiteboards as the students who did complete this problem explain how they got the answer.

Assessing the Tool:

1. Was the tool simple to use as a teacher? For the students?

2. Did the use of this tool increase student global awareness?

3. What could be done differently to maximize the effectiveness of the tool?

Assessing the Lesson:

1. Did this lesson enhance student multicultural understanding?

2. Did this lesson develop collaborative skills amongst the students?

3. Did this lesson allow students to reach an understanding of the overlying concepts and objectives?