Calculating Time Spent on Different Modes (for 3rd & 4th graders)

Problem Description

Sam's family (2 adults and 2 kids) is having a family reunion in Disneyland. About how long will it take Sam's family from (city, state pulled at random from a hat or app) to arrive at Disneyland in Anaheim, California if they traveled by _____.

- Also discuss which is most direct route
- Personal vehicles will need to stop for bathroom/food breaks vs trains
- May encounter other obstacles more likely to slow vehicles (poor weather, fatigue of driver, road blockages, congestion, etc.)
- 7 suggested originating cities for students to do the calculations
  - Albuquerque, NM
  - Portland, OR
  - Seattle, WA
  - Salt Lake City, UT
  - Phoenix, AZ
  - Denver, CO
  - Helena, MT

U.S. Map Showing Origin and Destination Cities

3rd & 4th Grades Activity

Calculation Table

Team (city, state):	 **Electric Car (sedan)**	 **Bus**	 **High Speed Rail**	 **Passenger plane**
	Average miles per charge: 250	Average miles per tank: 500	Average miles per trip:	Average miles per trip:
Average Number of Passengers	4	50	150	100
Miles to Anaheim, CA using mode of transit 				
Average speed	60mph	70mph	150mph	575mph
Direct carbon output	190 grams of CO_2 per mile	2,680 grams of CO_2 per mile	10 grams of CO_2 per mile	900 grams of CO_2 per mile
Carbon output per Sam's family member	55,147.5 g CO_2 or 55 kg CO_2 per mile			
Estimated total travel time				

How to Solve the Problems

Miles to Disneyland in Anaheim, CA using mode of transit

Research how far your assigned city is from Anaheim, CA. You can use Google Maps to calculate the distance from the originating city to the destination.

Carbon output per Sam's family member

$$\frac{(Carbon\ output\ of\ transportation\ mode\ x\ miles\ traveled)}{Average\ number\ of\ passengers} = Carbon\ output\ per\ passenger\ per\ mile$$

For example,

$$Seattle\ to\ Anaheim\ by\ Electric\ Car = \frac{(190\ g\ x\ 1161\ mile)}{4} = 55,147.5\ g\ CO\ 2\ per\ mile\ per\ passenger\ OR\ 55\ kg\ CO\ 2\ per\ mile\ per\ passenger$$

To determine which transportation option is the most efficient, look for the ***lowest number of carbon output per passenger per mile***.

Further Discussion

What if the bus, train or plane was mostly empty? What if the bus, train or plane carried the same amount of people? Then which would be more efficient?