To School and Back: Analyzing Transportation Data

Late Elementary Math

LESSON 1 | It's a Long (or Short) Way Home — 30–40+ minutes

Students compile and analyze data on how they get to school and how far they travel.

Objectives

- Students will be able to identify different transportation options used by peers to travel to school.
- Students will be able to use technology to determine their distance traveled from home to school.
- Students will be able to represent data findings in graph form.
- Students will be able to conjecture reasons behind family decisions about transportation.

LESSON 2 | Does Distance Matter? — 35–45 minutes

Students calculate the measures of central tendency for the various types of transportation used to travel to and from school.

Objectives

- Students will be able to explain the difference between active transportation and passive transportation.
- Students will be able to name at least one benefit of active transportation.
- Students will be able to calculate the mean, median, mode and range of a set of numbers.
- Students will be able to decide whether distance from school has any effect on the mode of transportation used to travel to school.

LESSON 3 | Asking Around — 25–30 minutes

Students create a survey to determine if mode of transportation to and from school is related to age/grade.

Objectives

- Students will be able to formulate questions for a survey to address transportation choices for different age groups.
- Students will be able to make predictions about whether the age of a student influences the student's mode of transportation to school.

LESSON 4 | The Age (Old) Question — 40–50 minutes

Students create pie charts to display and analyze survey and class transportation data.

Objectives

- Students will be able to calculate the mean, median, mode and range of a set of numbers.
- Students will be able to decide whether student age has any effect on the mode of transportation used to travel to school.
- Students will create pie charts using protractors and straight edges to display results from various data sets.

LESSON 5 | Go Green, Save Green — 40–50 minutes

Students will use previous and given data to determine cost savings when students who live less than 1.5 miles from the school walk or bike to and from school instead of riding in a car.

Objectives

- Students will be able to calculate the average, median, and individual distances traveled to and from school on a daily, weekly, and yearly basis.
- Students will be able to determine approximately how much it costs to travel one mile by car based on local gas prices.
- Students will be able to determine approximate possible monetary savings given distance traveled.

LESSON 6 *(Optional)* | Getting the Information Out — 15–60 minutes

Students will compile data to share from previous lessons, in the form of a newsletter, handout or bulletin board.

Objectives

- Students will be able to share their survey results with classmates and their families.
- Students will be able to present their data in a way that encourages viewers to think about their own transportation choices.

LEARNING OBJECTIVES

- Students will be able to explain the difference between active transportation and passive transportation.
- Students will be able to name at least one benefit of active transportation.
- Students will be able to calculate the mean, median, mode and range of a set of numbers.
- Students will be able to decide whether distance from school has any effect on the mode of transportation used to travel to school.

ILLINOIS STATE LEARNING STANDARDS

- 10.A.2b–Using a data set, determine mean, median, mode and range, with and without the use of technology.
- 10.A.2c–Make predictions and decisions based on data and communicate their reasoning.

REQUIRED MATERIALS

- Chart paper with graph from Lesson 1
- "How We Get to School" reproducible (completed in Lesson 1)
- "Does the Mileage Matter?" reproducibles (four pages per student)
- Chart paper, four pieces
- Calculators (optional)

SET-UP

- Next to the graph from Lesson 1, post four pieces of chart paper. Label each piece with one of the transportation choices: Walk, Bike, Bus, Car. Write on each piece:
  – Mean Mileage
  – Median Mileage
  – Mode of Mileage Data
  – Range of Mileage Data

LESSON ACTIVITY

Active Transportation (10 minutes)

Explain that "active transportation" means actively using the energy of one's own body to go from one place to another. Explain that "passive transportation" means using another type of power to go from one place to another.

Have students take out their graphs from Lesson 1. Pointing to the graph and its labels, ask students to identify which forms of transportation listed on the graph are active transportation (biking, walking) and which are passive transportation (car, bus). Have students list other forms of transportation (e.g. plane, train, scooter) and determine if they are active or passive transportation.

Look at the list of active transportation choices and ask students to list some of their benefits (e.g., exercise, no pollution, avoid traffic delays, fun). Ask students to dig deeper into some larger benefits as well:

- "How would the environment around our school change if everyone traveled here using active transportation?" (Fewer cars, more people talking/connecting, less traffic.)
- "How would using more active transportation affect your safety around the school building?" (Reducing the number of cars could make walking and bike riding safer. You could note that parents driving students to school account for an estimated 15% to 30% of morning traffic.)

- "What are some benefits of active transportation?" (Save money, exercise, see more of the community, no/low environmental impact.)
- "To stay healthy, kids should be physically active for at least one hour each day. How would using active transportation as a way to get to school help students achieve this goal?"

Predict (2 minutes)

Remind students of their conversation from Lesson 1 about factors that affect family decisions on how to get students to and from school. Ask students to predict in what ways, if any, the distance from a student's home to the school influences the choice of transportation for that student.

Measures of Central Tendency and Range (13–23 minutes)

Lead a guided practice to find the mean, median, mode and range of mileage for students who walk to school. Record the findings on the chart paper labeled "Walk."

Pass out the reproducible "Does the Mileage Matter?" Divide the class into three groups—Car, Bike or Bus. Ask students in each group to work in pairs to determine the mean, median, mode and range of the students' mileage for that type of transportation, using the data listed in the graphs from Lesson 1. Depending on class size, you also could have students work in pairs, in small groups or at stations to find the answers for all categories.

Give students a chance to confer and check their math together with others who computed the same data. When groups have reached a consensus, have a representative from each group come forward and record the findings on the posted chart paper (or announce their findings to the class).

Have students use all the distances listed on their graphs to compute the average distance that students travel to school. Once the average has been found, have students line up with their data cards in ascending order to find the median distance traveled. Have students enter the average and median distances for all students to get to school on their "How We Get to School" sheets. (This information will be used in Lesson 5). While standing, students also may determine the mode and range of the data.)

As a class or while students are working, compute the mean and median distances traveled by students who use active transportation (biking and walking) and by students who use passive transportation (car and bus).

Analyze the Data (10 minutes)

Use the data compiled by the class to answer and discuss the following questions:

1. Look at the mean and median distances computed for the total class population. Ask if any individual student's distance traveled is above one of these numbers but below the other. Discuss why this is possible, based on what median and mean represent.
2. What form of transportation is used most often by the students who, on average, live farthest from the school? What form of transportation is used most often by the students who, on average, live closest to the school?

3. When we compare the average distance traveled by students who use active transportation and those who use passive transportation, do we find that distance strongly influences choice of transportation to school? (Discuss the factors, including distance, that make it easier for students living nearby to use active transportation to travel to school.)
4. How do our class numbers compare with the distances that Illinois law considers reasonable for students to walk or bike to school? (Remind students that Illinois state law requires public schools to provide bus transportation to all students who live 1.5 or more miles from school.)
5. Do you think this data is constant throughout the year, or do you think that it would differ from season to season? Why?

Encourage students to challenge themselves and their families to find ways to use active transportation more often. Discuss the benefits to society if more people use active transportation, and brainstorm ideas on how students and their families may increase their use of active transportation options.

EXTENDING THE LESSON

Print out the 10-day forecast from www.weather.com.

Using the already gathered data as a reference point, have students use the weather forecast to predict which days will bring out the most and fewest active transportation users.

Each day, take a hand-raising survey to tally how many students used active vs. passive transportation, and note the actual weather conditions for that day. After 10 days, revisit the students' predictions. Compare the weather forecast with actual weather conditions, and compare students' predictions to actual transportation use.

HOME CONNECTION

Have students talk with their families about how society might benefit if more people used active transportation more often. Ask family members to help calculate how much money they spend each week on passive transportation (gas or bus/train fares). How much would the family save if they used active transportation for some of those trips? Students also may share their ideas from the class brainstorm on how they and their families could use active transportation more often.

ADDITIONAL RESOURCES

Read more about school bus policies across the country, including "hazard busing" in Illinois. In Illinois, 15% of school bus riders live less than 1.5 miles from school; buses are provided because it is deemed too dangerous for those students to walk or bike to school.

http://www.saferoutespartnership.org/schoolbuscuts
http://www.cnt.org/repository/Hazard-Busing-Report.pdf