# Cultivating Students' Mathematical Identity Through Probability and Statistics

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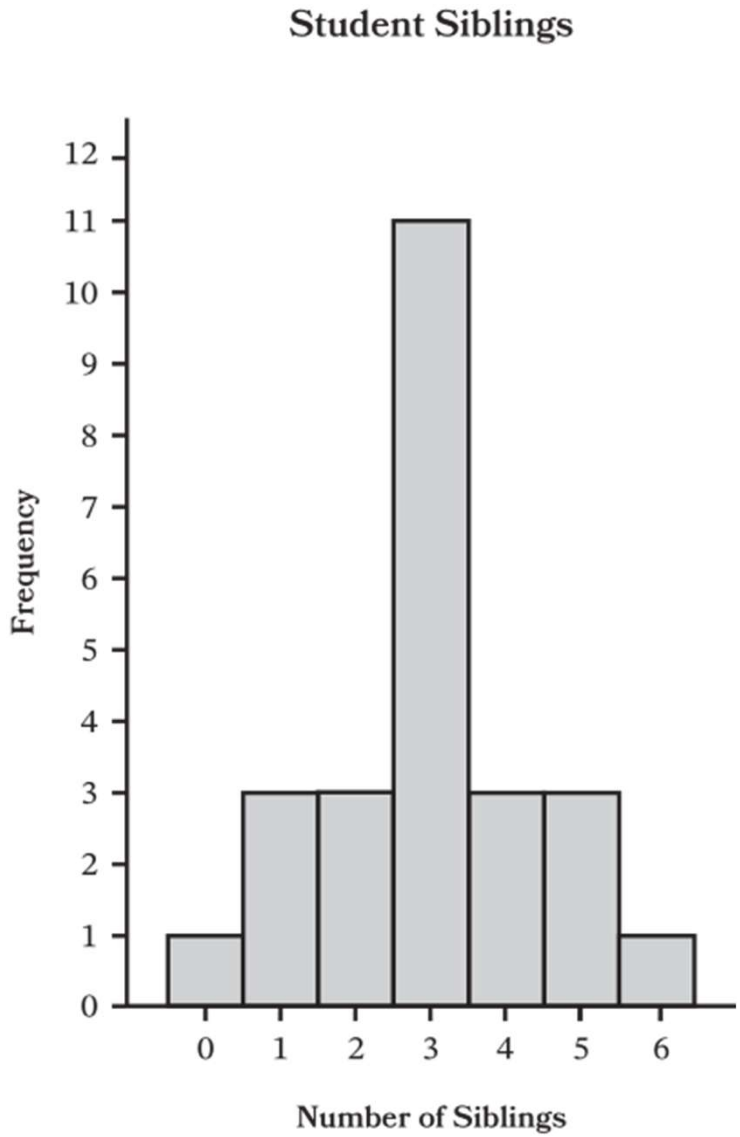
*Great Minds*

# Does this sound familiar?

- Standardized testing is only a couple of weeks away.
- There is one final chapter in the textbook to teach: statistics.
- What **must** be done so that students can answer questions about this histogram?



# Goals

- Define mathematical identity and explain its importance for student success.
- Brainstorm anchoring phenomena that are relevant to students and their communities.
- Explain the importance of statistical questions in developing students' statistical literacy and mathematical identity.
- Create statistical questions that will engage students.

# What is Mathematical Identity?

# Identity is

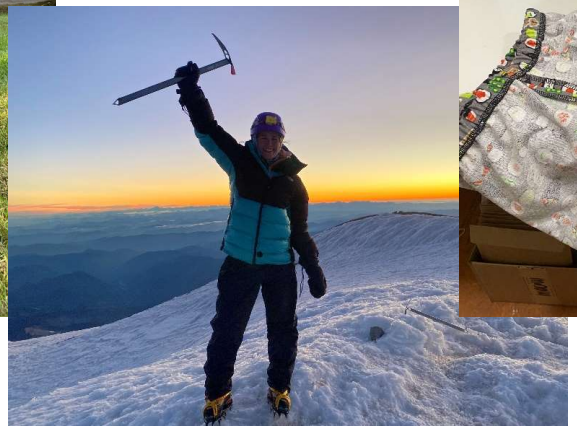
- our sense of who we are as individuals and as members of social groups,
- our sense of how others may perceive and label us, and
- developed through interactions and encounters with people and institutions.[1]


1. Facing History & Ourselves, "Exploring."

# Identity

- What are your beliefs about yourself as a learner or doer of that role or skill?
- What are your beliefs about how others perceive you as a learner or doer of that role or skill?
- What are your beliefs about the abilities one needs for that role or skill?





# Nonidentity

- What are your beliefs about yourself as a learner or doer of that role or skill?
- What are your beliefs about how others perceive you as a learner or doer of that role or skill?
- What are your beliefs about the abilities one needs for that role or skill?

## Mathematical identity is

- our beliefs about math and the nature of math abilities.
- our beliefs about ourselves as math learners.
- our beliefs about how we are perceived by others as math learners.[2]

2. Regional Educational Laboratory Northwest, "Promoting."

# Anchoring Phenomena

## A good anchoring phenomenon

- builds upon everyday or family experiences;
- is observable to students and has relevant data, images, or text;
- has an audience or stakeholder that is interested in the findings; and
- doesn't have to be explosive or fantastic.[3]

3. Penuel, "Qualities."

# Let's Brainstorm!

- What are students' lived experiences?
- What is happening in students' everyday lives?
- What can students observe in the world around them?

# Statistical Questions

# A statistical question is...

a question that can be answered by collecting data values that can vary.

# Statistical Questions

## Nonexamples

- What is my favorite snack?
- How much stuff is in the recycling can?
- How much money does my teacher make?

## Examples

- What is the most common favorite snack among my classmates?
- How much does the amount of material we recycle vary throughout the year?
- What is the average salary for a teacher in my state?

# No Context

Find the mean.

11, 12, 14, 14, 16, 17

# Context and Statistical Question

Jada wonders, What is the typical number of minutes it takes my friends to get to school? She asks them, and they tell her the following numbers of minutes.

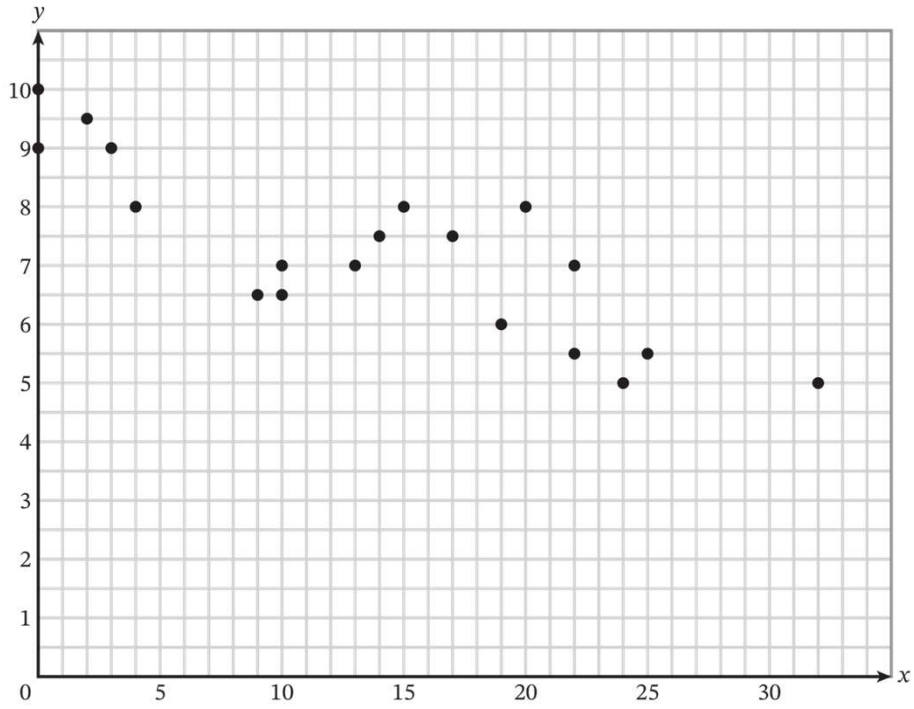
$$11, 12, 14, 14, 16, 17$$

Answer Jada's statistical question by calculating the mean.

Interpret the mean number of minutes in terms of equal shares.

# No Context

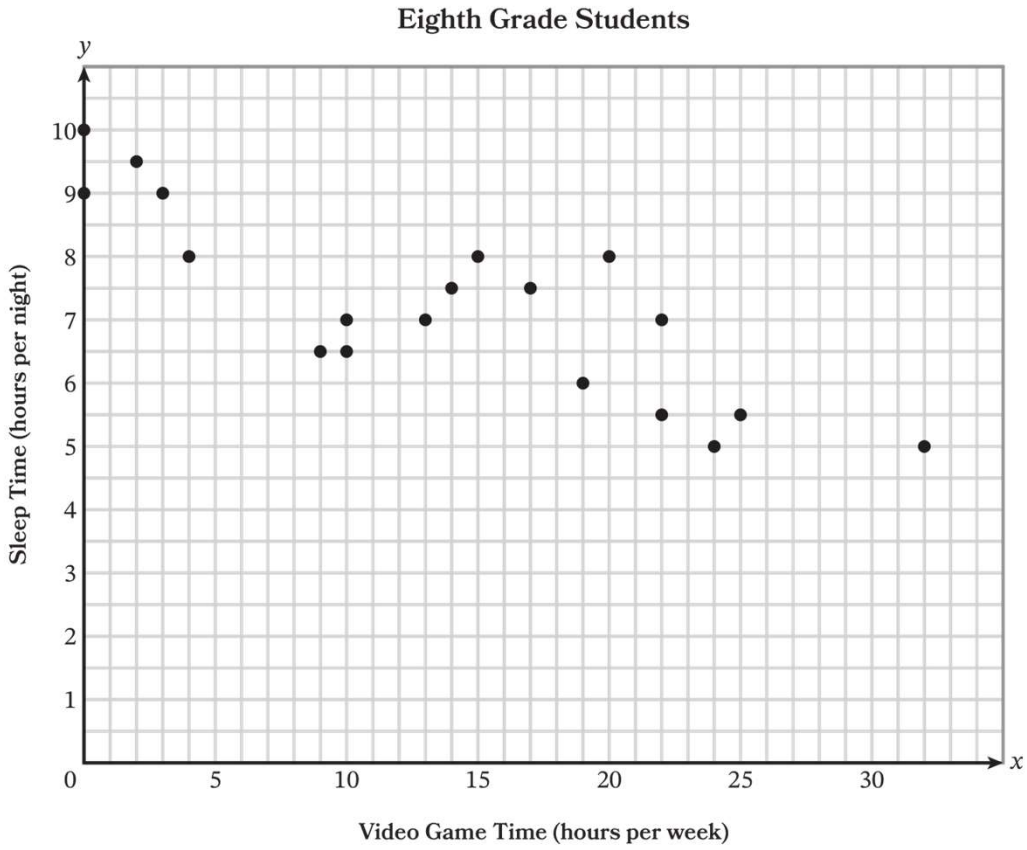
1. Is the pattern of association linear or nonlinear?
2. Is the pattern of association weak or strong?
3. Is the pattern of association positive or negative?

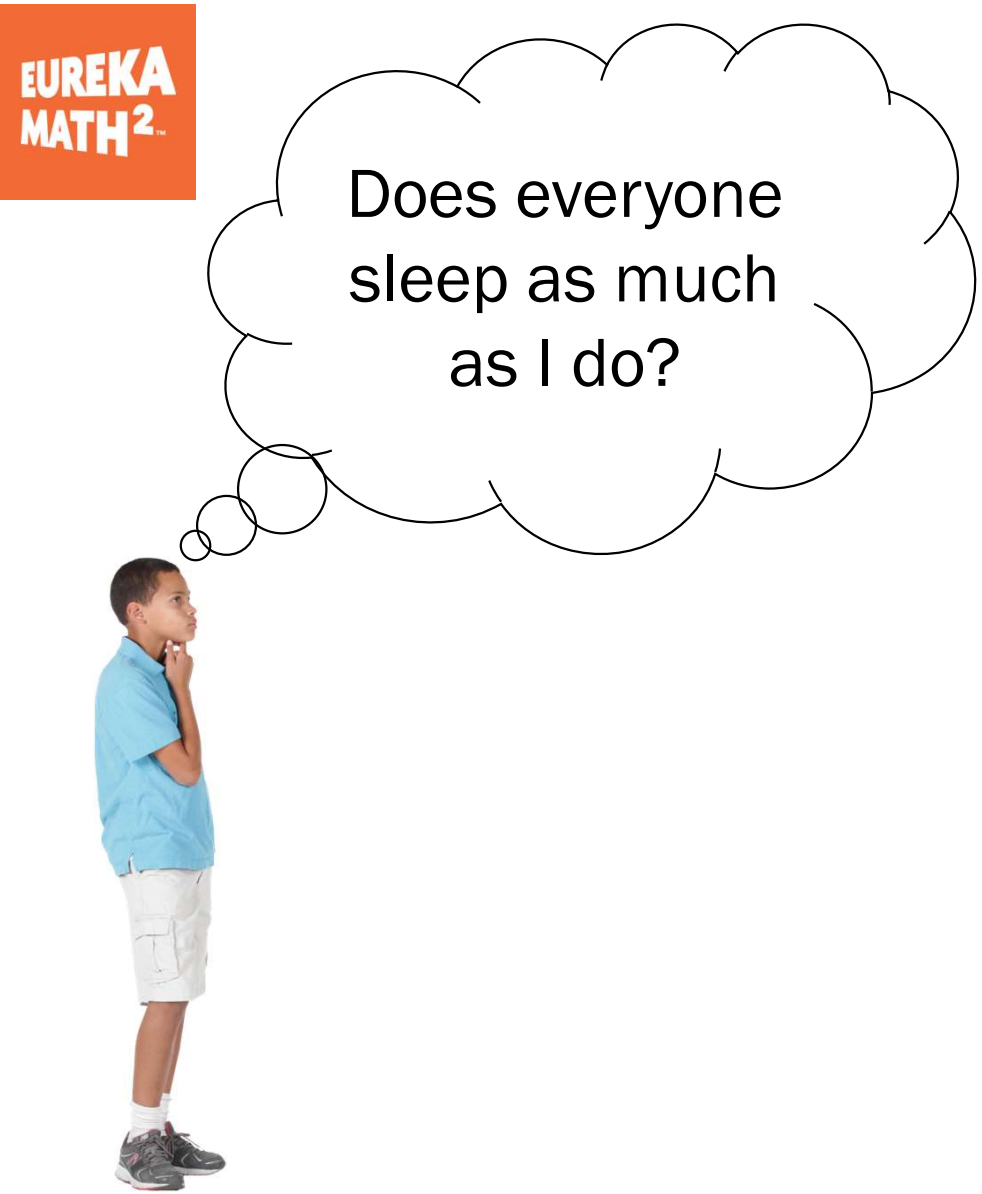


# Context and Statistical Question

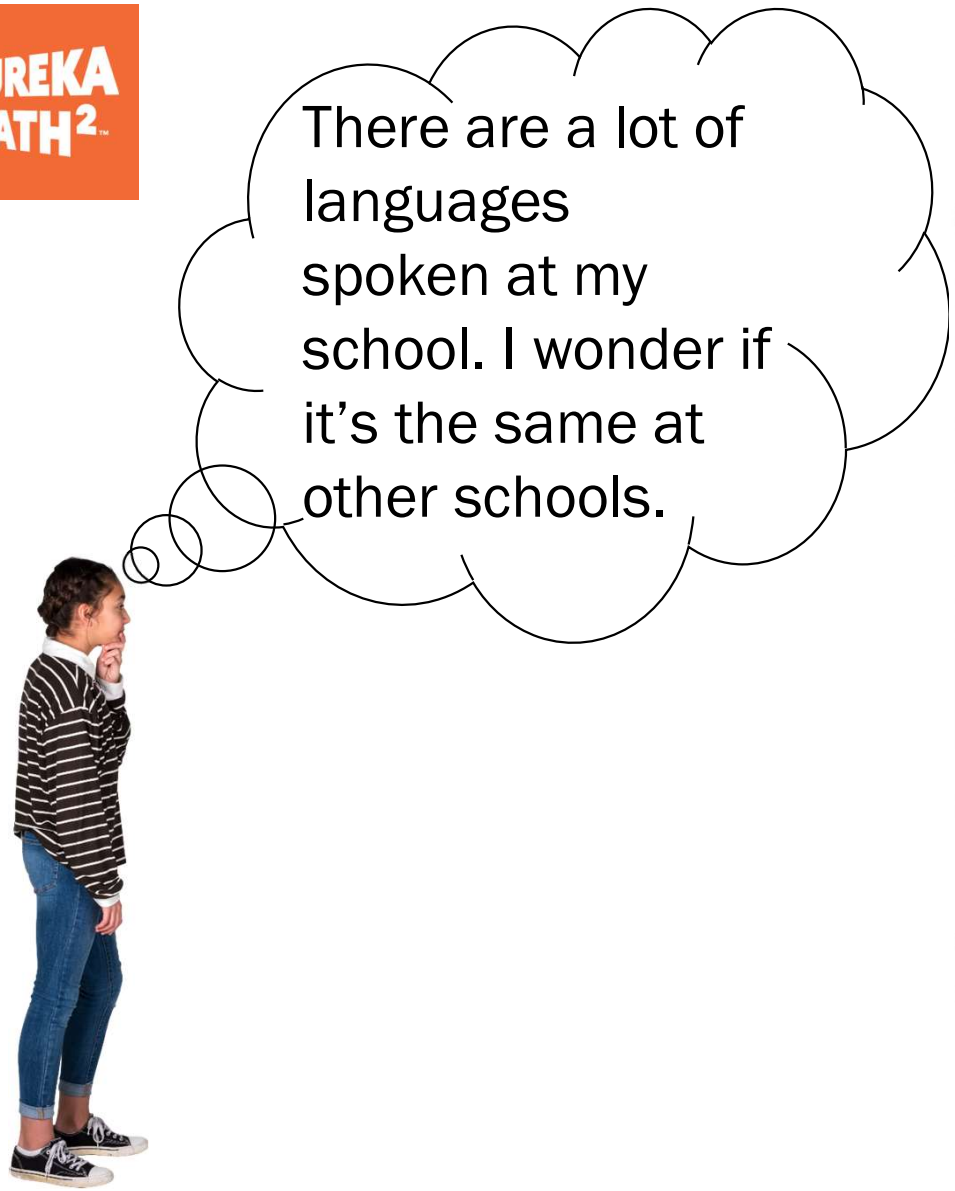
Angel wonders, Is there an association between the amount of time grade 8 students spend playing video games and the amount of sleep they get?

Answer Angel's statistical question by describing the association between the variables in the scatterplot.





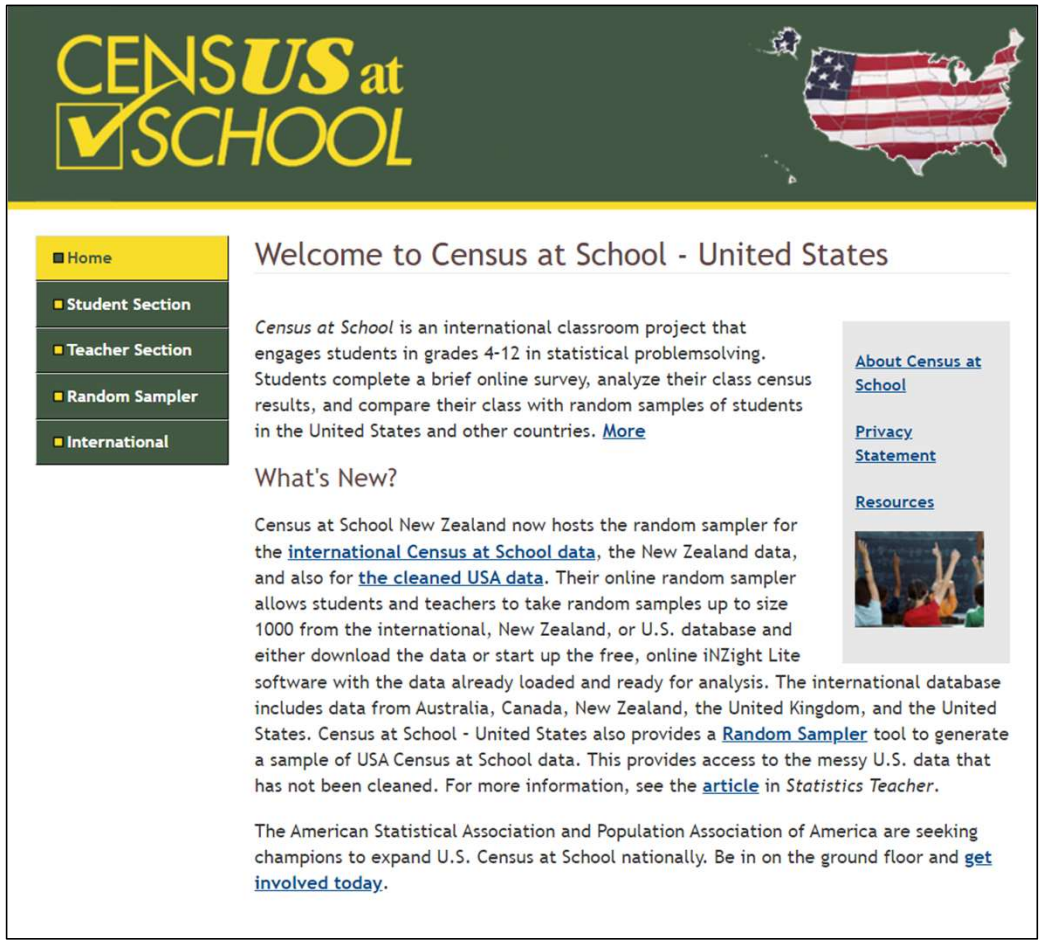

How many hours of sleep do my classmates typically get on a school night?




How does the number of languages spoken by students at my school compare to the number of languages spoken by students at other schools?


Is there an association between the price of a pair of shoes and the customer rating they receive?

# Census at School




4. American Statistical Association, "Census."

# Census at School

- Grade 6:
  - Examine class data by using class registrations
- Grade 7:
  - Examine nationwide data by using the Random Sampler
  - Examine international data by using Census at School - New Zealand
- Grade 8:
  - Examine bivariate class, nationwide, or international data

# Let's Create a Problem

Data:

- Sample of 28 middle school students from Colorado

Variables:

- Number of Languages Spoken
- Number of Occupants in Home
- Favorite Season
- Allergies

# Grade 6: Number of Languages Spoken

- Learning:
  - Univariate data
  - Shape of data distributions
  - Measures of center and spread

- Statistical questions:
  - What is the typical number of languages spoken by these students?
  - How much does the number of languages spoken vary?

# Grade 7: Number of Occupants in Home

- Learning:
  - Random sampling
  - Sample statistics vs. population characteristics

- Statistical Questions:
  - What is the typical number of occupants in a middle school student's home?
  - Is this sample representative of all middle school students' homes?

# Grade 8: Favorite Season and Allergies

- Learning:
  - Bivariate data
  - Scatterplots (numerical data)
  - Two-Way tables (categorical data)

- Statistical Questions:
  - Is there an association between these students' favorite season and whether they have allergies?
  - Does knowing someone's favorite season help me predict whether they have allergies?

# Cultivating Mathematical Identity

# Questions?

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