California State University **Chico**

School of Education

SSP LESSON PLAN TEMPLATE

WHO	Who is Learning?

TEACHER: Kamille Delgardo (CT Emily Abshier)   **DATE:** 13 November 2025

CONTENT AREA: Integrated Math I

GRADE LEVEL(S): 9-11

INQUIRY-BASED LESSON TITLE: Why can't studies determine cause and effect?

NUMBER OF ELD STUDENTS:

Numerous reclassified native Spanish speakers.
One English Learner in a Structured English Immersion Program
Levels (As of 2022):

- Oral: 3 out of 4
- Written: 2 out of 4
- Listening: somewhat/moderately
- Speaking: well developed

NUMBER OF IEP and/or 504 STUDENTS:

504 - 4
IEP - 4

STUDENTS' ASSETS:

This is a very rowdy and talkative class. This could be an asset for this lesson as pairs and teams stretch their creative thinking to determine lurking variables in associations and create their own spurious correlations.

STUDENTS' LEARNING NEEDS:

Students may have trouble coming up with possible lurking variables. Encourage them to try and find something that both variables have in common, or to see problems as an "if-then" statement to get started.

We will start the lesson with a reminder about the academic vocabulary we've been using this unit including: correlation, form, direction, strength.

LESSON LENGTH: 50 minutes

WHAT	What are students learning?

CONTENT STANDARD(S) & MATHEMATICAL PRACTICE STANDARD(S):

Content:

Integrated Math I

Number and Quantity - Reason quantitatively and use units to solve problems:

- N-Q.1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Statistics and Probability -

- Summarize, represent, and interpret data on two categorical and quantitative variables:
  - S-ID.6a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear and exponential models.
- Interpret linear models:
  - S-ID.9. Distinguish between correlation and causation.

Practice:

Make sense of problems and persevere in solving them, construct viable arguments and critique the reasoning of others

CONTENT-SPECIFIC LEARNING GOAL(S):

Goals:
- Students will be able to explain why cause and effect cannot be determined from a study that reports an association

Success Criteria:
- Given a reported association, students will be able to identify at least one possible "lurking variable."

ENGLISH LANGUAGE DEVELOPMENT STANDARD(S):

Grades 9-10 Part I: "Interacting in Meaningful Ways" A. Collaborative 1. Exchanging information and ideas with others through oral collaborative discussions on a range of social and academic topics.

ENGLISH LANGUAGE DEVELOPMENT GOAL(S) FOR ELD STUDENTS:

Students will be able to describe how correlation is not causation and what possible lurking variables could exist using the following sentence frame:
Instead of [causation #1 (given)] causing [result (given)], it could be that [lurking variable] is the real cause. [Explanation sentence… (show reasoning).]

Individual Education Plan (IEP) GOAL(S) FOR IEP STUDENTS:

Our ADHD student will self-regulate by taking short breaks outside, as needed. We have moved his seat to be next to the door for easier access.
Students will raise hands to ask appropriate questions or answer questions posed to the class.

ACADEMIC/CONTENT LANGUAGE DEMANDS AND PLANNED SUPPORTS:

Language Demands
Function:
- Describe association vs. causation
- Explain why an association may have lurking variables

Vocabulary:
- Association
- Correlation
- Causation

Discourse:
- Constructing an argument about causation vs. lurking variables.
- Interpreting word problems and graphical representations (scatter plots)

Syntax:
- ___ is associated and not caused by ___ because there might be a lurking variable ___

Supports
Input:
- Model interpreting a study - identifying variables and describing association

Output:
- Exit ticket: describing a lurking variable in a real-life study. Preparing for tomorrow's lesson by thinking about cell phone use.

Interaction Supports:
- Team-based collaborative problem solving

Evidence of Language Use:
- Written and oral reasoning or justification about an association and lurking variables.

WHY	**Why does this lesson matter? (Rationale)**

RELEVANCE:

In order to be contributing members of a democratic society, students should learn how to read and critique a basic study. They should apply critical thinking to data that are presented to them.

PRIOR KNOWLEDGE:

Students have experience reading scatterplots including identifying variables, form, strength, direction, and outliers. They learned about correlation in the previous day's lesson.

HOW	How is Learning Being Facilitated?

CREATE HEALTHY CLASSROOM COMMUNITY:

I will encourage participation from all students by drawing names from my playing card deck at random to make sure everyone has a chance to participate and share.
I will try to select students to share their work as I circulate and see how they're doing.

ACADEMIC LITERACY (Listening, Reading, Writing, Speaking): (Describe how students will interact in this lesson. How are students using language to interact in this lesson? Is there content-specific vocabulary necessary to access the content?)

ACCOMMODATIONS, MODIFICATIONS & UDL CONSIDERATIONS:

- A Spanish version of the textbook is available in print and on Chromebook.
- Mrs. Riley will be pushed in from the resource classroom to assist.
- Captioning will be turned on for YouTube videos about Correlation vs. Causation

CO-TEACHING AND/OR PARAPROFESSIONAL SUPPORT (If applicable)**:**

I will each take the lead on each question. CT Mrs. Abshier, Education Specialist Mrs. Riley, and I will circulate through groups individually after each main lesson.

INFORMAL ASSESSMENT(S):

This lesson will involve a lot of creative thinking. As we circulate ask:
- Is there an association here? How can you tell?
- Is there a causation here? How can you tell?
- What do these two variables have in common that the study didn't measure?
- What else could be causing both of these variables?
- How is that lurking variable related to the study variables?
- How could a further study be done to determine causality?

FORMAL ASSESSMENT(S):

Groups will produce at least one correlation/causation map with variables and links labeled.
Each student will complete an exit ticket that identifies at least one lurking variable and gets them thinking about the positive/negative associations with smartphone use.
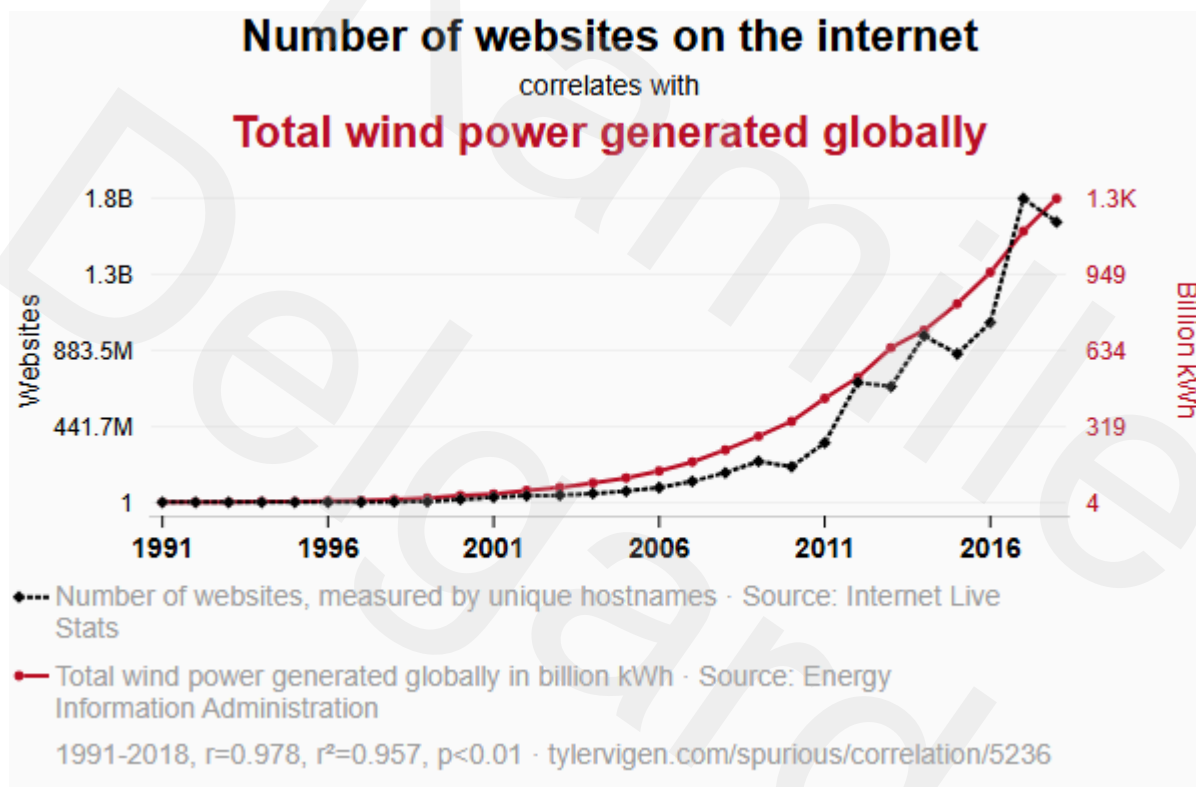
MATERIALS NEEDED:

CPM Textbook

LEARNING ACTIVITY SEQUENCE:

0: We will start by checking the homework from lesson 4.2.2, then we will answer any questions students bring up (UDL 5.3 Promote individual and collective reflection). Ask students to get out math notebooks.

1. **Engaging Introduction**:

Number of websites on the internet
correlates with
Total wind power generated globally

● Number of websites, measured by unique hostnames · Source: Internet Live Stats

● Total wind power generated globally in billion kWh · Source: Energy Information Administration

1991-2018, r=0.978, r²=0.957, p<0.01 · tylervigen.com/spurious/correlation/5236

Introduce the problem with applying causality to a correlation using Spurious Correlations #5236. Ask students about the form, direction, and strength of this graph. Ask students how there could be a causal relationship between these two variables.
Based on this graph can we say there's an association between the number of websites and total wind power generated? Can we say that one causes another?

2. **Learning Activities**:

4-82. A dietician studying the benefits of eating spinach surveyed a large sample of individuals. She recorded the amount of spinach they ate and their physical strength. The dietician found the spinach eaters to be much stronger than the non-spinach eaters. The next day the newspaper headline was, *"Popeye was right! Eating spinach makes you stronger!"*

    a. Do you agree with the newspaper? Do you agree that if you eat more spinach, you will grow stronger muscles and increase your strength?

    b. The dietician correctly found an association. What could explain this association other than spinach makes you stronger?

Have students popcorn read each sentence of the problem.
Ask students thumbs up/thumbs down whether they agree with question A. Ask at least one thumbs up and one thumbs down why they think so or not.
Ask students what could cause the association (or "correlation")? Have them talk to a partner for a minute then ask if anyone found anything else.

4-83. A **lurking variable** is a hidden variable that was not part of the study. The size of the fire in problem 4-81, and the amount people work out in problem 4-82, are lurking variables.

A medical study found a strong link between the number of hours high school students wear a helmet and the number of concussions (head injuries). However, it is unlikely that wearing helmets causes head injuries. Can you think of a **lurking variable** that might explain this association?
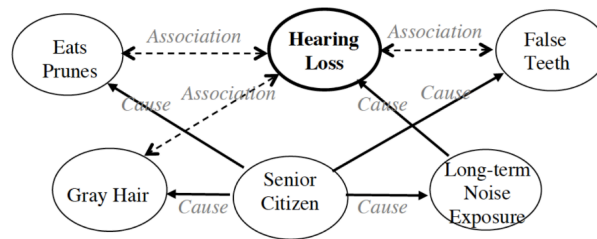
Play the video Correlation vs. Causality: The Debunked Link Between Ice Cream and Polio | Freakonomics as an introduction to correlation, causation, and lurking variables.
Ask students what the study variables were and what they had in common. The common variable they didn't measure was time of year: summertime. Polio rates and ice cream consumption rates both went up in the summertime.
This is called a lurking variable.
Read the second part of the question and have students discuss with a partner for no more than a minute what could be a lurking variable in this scenario. Have students share.

4-84. A web of associated variables like the one shown below can get complex and be difficult to unravel. Consider a medical study focused on hearing loss. It may associate variables like eating prunes to hearing loss as strongly as it associates an actual cause like long-term noise exposure to hearing loss.

Here are some newspaper headlines from actual observational studies. Each of them found an association. Some even imply a cause and effect relationship.

Determine at least one plausible lurking variable that could explain the actual cause.

a. "Calcium in Diet May Cut Risk for Some Cancers, Study Finds"

b. "Study: Family Time Declines as Web Use Booms"

c. "Chocolate is Linked to Depression"

d. "Study: Kids Who Were Spanked Have Lower IQs"

e. "Lack of Health Insurance Kills 45,000 a Year"

Introduce the problem.
Have students take a moment to look at the cause/association map. Give them the sentence frame to work with: There is an <u>association</u> between hearing loss and eating prunes, but the <u>lurking variable</u> is that being a senior citizen <u>causes</u> eating prunes, and long-term noise exposure over a lifetime <u>causes</u> hearing loss.
Ask one or two students to describe two points on the map using these academic terms.
Have students work in groups for a few minutes to determine lurking variables for A-E. They should draw at least one cause/association map labeling the variables, lurking variables, and arrows including direction.
Have groups share their findings.

4-85. Come up with your own original news headlines. The first sentence should contain a reasonable link between two variables. The second statement should be a clear misinterpretation of the link. Two examples are given below.

1st Statement: Facial Tissue Linked to Colds and Flu.
2nd Statement: Surgeon General Calls for a Shift to Paper Towels!

1st Statement: Bathing Suits Tied to Sunburn.
2nd Statement: Doctors Recommend: Swim Naked!

We may or may not get to this problem. Have groups come up with their own sensational headlines that describe a spurious correlation. Encourage funny headlines.
If students are struggling to start, have them list broad variables (like "families") and specific variables ("parents," "children," "car seats") then link them ("Car seats linked to having children!").
For each headline ask them for a lurking variable.

3. **Learning Closure:**

Hot off the presses data from <u>a study published last month</u>: Less cellphone use during the day (cell phone bans) is associated with fewer absences and higher test scores. Administer <u>exit ticket</u>: What could be a lurking variable?
How do you feel about school with Durham's cell phone ban?

REFLECTION

ASSESSMENT RESULTS: (Summarize formal assessment data by describing trends that highlight student learning and identify areas to target for improvement. Did students meet the learning goal(s)? What data supports this? What do students need to learn or practice? What data supports this?)

LESSON OBSERVATION FOCUS:

Demonstration of student thinking.