

Correlation of Learning Goals with Summative Assessment

Summary of Assessment:

In this assessment students will be grouped into 5 different groups and given one of the scenarios. (attached documents)

Shark Attacks vs. Ice Cream Sales
Friends vs. Happiness
Pirates vs. Global Temperature
Windmill Speed vs. Wind Strength
Hours Spent Studying vs. Exam Grade

Students will then be given a worksheet with each of the five scenarios (along with data for those scenarios) and asked to create a newscast trying to convince the audience that correlation between the two variables implies that one causes the other. Students will also be given an 'analysis sheet' to complete the following tasks during each newscast presentation:

Learning Goal 1:

Students will be able to differentiate between the definition/consequences of correlation and causation. (Correlation is *necessary* but not *sufficient* for causation)

- a. After the presentation students will be asked after analyzing each group's newscast whether the story is an example of correlation, causation or neither. Students will use the definitions presented in the lesson to explain why they chose their answer.

Learning Goal 2:

Students will be able to identify different causal fallacies (common cause, reverse causation, oversimplified cause, bidirectional causation and coincidence) and apply their knowledge to real-world situations (news articles, scientific studies, peer conclusions, etc...).

- b. If students do not believe that a given newscast is an example of causation, they must identify what fallacy the group committed, explaining their reasoning.

Learning Goal 3:

Students will be able to determine (using the correlation coefficient and randomized experiments) if the relationship within bivariate data is correlated, causal or both.

- c. If students believe the newscast is an example of causation they will use the correlation coefficient and the concept of controlled random experiments to support their decision.
- d. Students should use logic and reasoning.

Leaning Goal 4:

This assessment is to be used after the entire lesson has been taught to assess conceptual mastery.

Students will understand how assuming causation can lead to erroneous conclusions.

e. Students will discuss the newscasts. If they concluded a given newscast was not an example of causation they should discuss why assuming causation leads to illogical associations. If they conclude that the newscast was an example of causation, they will support their decision with logic and reason. For example:

i. Ice Cream Sales Cause Shark Attacks: (Demonstrates correlation, **no causation**)
Students should identify that these two events are not causally related; otherwise, if ice cream sales cause shark attacks, the following are **erroneous conclusions** that would be implied:

1. Shark behavior is influenced by human consumption of ice cream.
2. Ice cream influences people to go into the ocean.
3. Sharks must like ice cream.

*****Discuss common causal variable**

- 1) Both shark attacks and ice cream sales are influenced by warmer weather.

ii. More Friends Make You Happier (Or Happier People Have More Friends):

(Demonstrates correlation, **may demonstrate causation**)

Students may take either stance (that there is or is not causation). For each of these possible answers students should either provide counterexamples that demonstrate no causation, or if the student claims causation they should mention there are other factors to friends/happiness (multiple causes) or bidirectional causation:

1. If a student asserts no causation the following is an erroneous conclusion that may be implied if a causal relationship is assumed:
 - a. Even if someone is rude and impolite, as long as they are happy they will have many friends.

In other words, there are many people who are happy but have few friends and there are people who have many friends but are not happy.

2. If a student asserts causation:
 - a. Even if students assert causation (which is a valid conclusion), the teacher should discuss that there are **multiple causes** for the number of friends someone has or how happy they are (income, self-worth, job satisfaction, how one treats others) and there is also a **bidirectional cause** (more friends → happier & happier → more friends)

Note: the teacher should remind the students that just because one thing may cause another does not mean it is the **only** cause.

iii. Pirates vs. Global Temperature: (Demonstrates correlation, **no causation**)

1. Students should assert there is no causation even though the two categories (pirates and global temperature) are in fact correlated. There

is no reasonable cause between the two categories, otherwise the following **erroneous conclusion** could be made:

- a. The more pirates there are in the world, the warmer the earth will become. (Or the earth will cool in the absence of pirates)

iv. Windmills Cause Wind : (Demonstrates correlation and **(reverse) causation**)

1. If causation is assumed in the order it is presented the following is an **erroneous conclusion** that could be reached:
 - a. If windmills are the cause of the wind, then there should not be any wind where there are no windmills. We obviously know this to be false.

*****Discuss reverse causation**

v. More Studying Makes Better Grades: (Demonstrates correlation and **causation**)

1. While there are most likely multiple causes for increased exam grade, we can safely assume that longer study times is one of the contributing factors. If we were to study for days we could safely assume that no matter who was taking the test (given the same age and circumstances), we would get a better grade on the test than if we were to not study at all.

Remember: To determine causation is very difficult, but one can ask “is it logical to assume that “what else could cause this to happen?” By answering this you may be able to identify additional causes or perhaps the underlying cause (as with summer weather in the case with the shark attack story). If there is a strong correlation and there are no other causes that could attribute to the effect, you *may* have a genuine case of causality.