LESSON MAKER PRO

Hidden Factors

Look beyond an association to find what else may matter.

HIGH SCHOOL · S.IR.2.2

S.IR.2.2 "Identify potential lurking variables which may explain an association between two variables."

NAME _____ **DATE** _____

THE BIG IDEA

When two things are associated, one does not necessarily cause the other. A lurking variable is a third factor that may affect both. Comparing rates within groups that share a possible lurking variable can help you check the association.

WORKED EXAMPLE

In a survey, 12 of 16 students who bring lunch eat fruit, compared with 8 of 16 students who buy lunch. What factor might help explain the difference?

1. For students who bring lunch, 12/16 = 75% eat fruit.
2. For students who buy lunch, 8/16 = 50% eat fruit.
3. Having fruit available at home could make a student more likely to bring lunch and eat fruit.

Answer: Fruit availability at home is a possible lurking variable. The rates do not show that bringing lunch causes students to eat fruit.

PRACTICE 6 problems

1 Students on school sports teams tend to own more athletic shoes than other students. Name a possible lurking variable and explain how it could affect both.

ANSWER _____

2 In a survey, 14 of 20 students who attend tutoring pass a course, compared with 11 of 20 who do not attend tutoring. Find both pass rates. Then name a possible lurking variable.

ANSWER _____

3 A survey reports fewer headaches overall among students who bring a water bottle to school. Find the headache rates for bottle users and nonusers within each sleep group. What factor could help explain the overall association?

STUDENTS REPORTING HEADACHES

Sleep on school nights	Bottle: headaches/total	No bottle: headaches/total
7+ hours	2/20	1/10
Less than 7 hours	3/10	9/30

ANSWER _____

4 Students who listen to music while studying tend to score higher on quizzes. Name a possible lurking variable and explain how it could affect both.

ANSWER _____

5 In a survey, 21 of 35 chess club members earn an A in math, compared with 14 of 35 nonmembers. Find both rates. Then name a possible lurking variable.

ANSWER _____

6 Students who work more hours at paid jobs tend to sleep less on school nights. Which is a more plausible lurking variable: family financial need or favorite color? Explain how it could affect both.

ANSWER _____

APPLY IT Show your work

1 A student newspaper says that using a study playlist helps students pass quizzes. Compare pass rates for playlist users and nonusers within each study-time group. Do these data show that playlists cause higher pass rates?

STUDENTS PASSING QUIZZES

Daily study time	Playlist: passed/total	No playlist: passed/total
2+ hours	18/20	9/10
Less than 2 hours	2/10	6/30

ANSWER _____

2 At a gaming club, 24 of 30 players who use a paid practice app win their next match, compared with 18 of 30 players who do not use it. Find the difference in win rates in percentage points. Identify a possible lurking variable and explain how it could affect both app use and winning.

WORK SPACE

ANSWER _____

CHALLENGE One step up

A driving school says students who take its optional road-safety class pass the driving test more often. Find the overall pass rate for each group, then compare rates within each prior-practice group. How could prior practice explain the surprising result?

STUDENTS PASSING A DRIVING TEST

Prior driving practice	Took class: passed/total	Did not take class: passed/total
More practice	18/20	10/10
Less practice	1/10	6/30

WORK SPACE AND ANSWER

Hidden Factors

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Students on school sports teams tend to own more athletic shoes than other students. Name a possible lurking variable and explain how it could affect both.	**Interest in sports could make students more likely to join a team and buy athletic shoes.**
2	In a survey, 14 of 20 students who attend tutoring pass a course, compared with 11 of 20 who do not attend tutoring. Find both pass rates. Then name a possible lurking variable.	**The pass rates are 70% with tutoring and 55% without tutoring. Family support is a possible lurking variable because it could affect both tutoring attendance and course performance.**
3	A survey reports fewer headaches overall among students who bring a water bottle to school. Find the headache rates for bottle users and nonusers within each sleep group. What factor could help explain the overall association?	**With 7+ hours of sleep, both rates are 10%. With less than 7 hours, both rates are 30%. Sleep duration could help explain the overall association.**
4	Students who listen to music while studying tend to score higher on quizzes. Name a possible lurking variable and explain how it could affect both.	**Time spent studying could affect both. Students who study longer may be more likely to listen to music while studying and to score higher.**
5	In a survey, 21 of 35 chess club members earn an A in math, compared with 14 of 35 nonmembers. Find both rates. Then name a possible lurking variable.	**The rates are 60% for members and 40% for nonmembers. Prior math achievement could affect both joining chess club and earning an A.**
6	Students who work more hours at paid jobs tend to sleep less on school nights. Which is a more plausible lurking variable: family financial need or favorite color? Explain how it could affect both.	**Family financial need is more plausible. It could lead a student to work more hours, while financial stress could make sleep more difficult.**

PART 2 · APPLY IT

1. **In the 2+ hours group, both pass rates are 90%. In the less than 2 hours group, both are 20%. The data do not show that playlists cause higher pass rates; study time could explain the overall association.** Divide passed by total in each table cell. The rates match within each study-time group, so study time is a possible lurking variable.
2. **The win rates are 80% and 60%, a difference of 20 percentage points. Prior gaming experience could make a player more likely to buy the app and win a match.** Compute 24/30 = 80% and 18/30 = 60%, then subtract. Prior experience is one plausible factor affecting both variables.

CHALLENGE

Overall, 19/30, or 63 1/3%, of class takers passed, compared with 16/40, or 40%, of non-takers. Within the more-practice group, the rates are 90% with the class and 100% without it. Within the less-practice group, they are 10% with the class and 20% without it. Class takers were more likely to have had more prior practice, which could explain their higher overall pass rate.

Accept other plausible lurking variables when the explanation shows how the factor could affect both measured variables. The observational results do not establish cause and effect.