Warm-Up | Analyzing Evidence

Lesson Objectives

By the end of this lesson, you should be able to:

- Identify possible [ ] for inconsistencies in scientific evidence.
- Use [ ] to critique scientific arguments.
- Predict [ ] by analyzing and evaluating data.

Science Practice: Analyze how new [ ] and [ ] affect previous scientific explanations.

Words to Know

Fill in this table as you work through the lesson. You may also use the glossary to help you.

accuracy	the [ ] of measured value to the [ ] value
precision	the closeness of [ ] value to other measured [ ]

© Edgenuity, Inc.

Instruction | Analyzing Evidence

Slide 1

Lesson Question

Slide 2

Data as Evidence

- Data is _____, information, or _____ collected through research and able to be analyzed.
- _____ is data that can be used to answer a question or support a conclusion or judgment.
- Data and evidence are used to form or support a _____ or answer a _____.
- Not all data is evidence – some data is true, but _____.

Poor Measurement

Poor _____ is one factor that affects consistency of evidence.

Proper scientific measurement requires that:

- Instruments _____ the measurement.
- Instruments are in good repair, calibrated, and used _____.
- _____ error is minimized.

© Edgenuity, Inc.

Instruction | Analyzing Evidence

Slide 2

Lack of Accuracy and Precision

Another factor that can affect consistency of evidence is a lack of accuracy and precision.

- [ ]: the closeness of measured value to correct value
- [ ]: the closeness of measured value to other measured values
- [ ]
- Validity

Slide 4

A Flawed Experiment

A third factor that can cause inconsistencies in evidence is a [ ] experiment.

Flawed experiment:

- [ ]
- can't trust [ ]
- [ ] with other tests

© Edgenuity, Inc.

Instruction | Analyzing Evidence

Slide 4

Biased Experimental Design

[ ] is a fourth factor that can cause inconsistencies in evidence.

Bias occurs when:

- sample sizes are too [ ]
- samples are not [ ]
- [ ] are present

Slide 7

The Value of Critiques

Why are [ ] important?

- All [ ] must be critiqued.
- Scientists must [ ] evidence and convince other scientists.
- Constantly checking one another's work leads to [ ] in the final evidence.

Components of a Scientific Argument

A good scientific [ ] has three components:

- [ ]: a conclusion or explanation
- [ ]: data supporting claim
- [ ]: logic that ties claim and evidence together

© Edgenuity, Inc.

Instruction | Analyzing Evidence

Slide 7

A Scientific Argument about High-Fructose Corn Syrup

REAL-WORLD CONNECTION

[ ]: High-fructose corn syrup (HFCS) is the same as table sugar (sucrose).

Ask:

- What is the [ ]?
- Is it [ ]?
- How do you know?
- Do those making a claim have a vested [ ]?

Possible evidence about HFCS:

- Mayo Clinic nutritionist: chemically similar but processed differently; too little [ ] to conclude that HFCS and sucrose are metabolized differently.
- Princeton University study: rats fed HFCS gained significantly more [ ], added more abdominal fat, had higher triglyceride levels than rats fed sucrose.
- M.D. studying sugar addiction and fibromyalgia: HFCS and [ ] are “equally poisonous because of the massive volumes that are added to our diet each year.”

© Edgenuity, Inc.

Instruction | Analyzing Evidence

Slide 7

A Scientific Argument about High-Fructose Corn Syrup: Continued

Commercials use the logic “Sugar is sugar – your body can’t tell the difference.”

- That reasoning does not take into account the fact that the body reacts [ ] to different kinds of sugar.
- Reasoning must take that into account, but [ ] are still being done.
- Of the statements above, only one (the Princeton study) presents solid [ ].
  - The [ ] is another claim – probably unbiased, but not presenting evidence.
  - The [ ] also does not present evidence. Plus, it appears [ ] and does not respond to the actual claim that the two substances are biologically the same.

© Edgenuity, Inc.

Instruction | Analyzing Evidence

Slide 10

Data Analysis—Calculations and Outliers

- Evidence is not usually “raw data” but _____ for clarity
- Summary often includes:
  - mean
  - _____
- Present in _____ or tables
- _____: valid data points or inaccurate measurement?
- Determine _____ before deciding:
  - if _____, can discard it
  - if something _____ in test environment, must include it

Underline the outlier in the data set shown below.

Data set (raw data):

9 10 11 40 10 9 11

Mean with outlier: 100 / 7 = 14.3

Mean without outlier: 60 / 6 = 10

© Edgenuity, Inc.

Instruction | Analyzing Evidence

Slide 12

Graphs for Predicting Trends

- Graphs make it easier to see _____ within data.
- Graphs can be used to make _____.
- _____ can show a continuing trend.

Biological Models to Predict Trends

REAL-WORLD CONNECTION

Predictive models in biology use _____ equations to make _____ based on trends and known evidence.

Examples include:

- models to show cell _____
- _____ to show brain and nerve functions
- _____ models

_____ amount of data and higher _____ data = better _____

© Edgenuity, Inc.

Instruction | Analyzing Evidence

Slide 15

Genetics and Technology: Example

Many people worked on ideas of inheritance.

- In 1910, Thomas Hunt Morgan proposed a _____ theory of inheritance.
- Watson and Crick discovered the structure of DNA in _____.
- How DNA determines construction of proteins, the genetic code, was "cracked" in _____.
- Understanding progressed to recombinant DNA technology, followed in _____ by DNA _____, which is technology for determining the order of bases along a DNA strand. Sequencing made it possible to identify and compare each organism by its DNA sequence.
- The first sequence of human DNA, the human genome, was finished in _____.

Mendel's laws of inheritance are still the _____ of our understanding of genetics. But our knowledge has _____. Mendel had limited _____ and technology. He was not aware of genes, _____, or DNA. Scientists have _____ on his discoveries for the past 150 years.

© Edgenuity, Inc.

Instruction | Analyzing Evidence

Slide 15

Technology and Forensic Science

REAL-WORLD CONNECTION

- _____ is the application or use of science in legal matters.
- DNA analysis is much more specific and _____ than previous methods, such as fingerprinting.
- Labs testing for _____ often guarantee 99.9999% accuracy.

Technology and Cell Theory: Example

Some _____ thoughts about cells:

- Plant cells and animal cells look _____.
- _____ cells are made of several types of fibers.

Through better _____, scientists discovered similarities in cells and determined that _____ are the common building block of all living things.

© Edgenuity, Inc.

Summary | Analyzing Evidence

Lesson Question

What criteria are used to evaluate scientific explanations?

Answer

Slide 2

Review: Causes of Inconsistent Evidence

- _____ is facts collected through research and able to be analyzed.
- _____ is data relevant to answering a specific question.
- Factors leading to _____ evidence:
  - poor _____, such as equipment problems, human error
  - lack of _____ or _____
  - poorly _____ experiment
  - _____ experimental design caused by improper sampling or outliers in data

© Edgenuity, Inc.

Summary | Analyzing Evidence

Slide 2

Review: Critiques of Scientific Arguments

- Scientific [ ] must be critiqued to create confidence about the evidence.
- Components of a good scientific argument include:
  - [ ]
  - [ ]
  - logical [ ] tying evidence to claim
- Learning to [ ] claims and critique evidence makes informed citizens.

Review: Evidence of Trends

- Methods used to predict [ ]:
  - [ ] analysis – calculate mean, range; determine if outliers are present
  - [ ] – look at trends in data and extrapolate to future
  - [ ] – use to study complex systems, such as cells
- All [ ] depend on assumptions/behaviors of factors remaining the same and on the quality of the data.

© Edgenuity, Inc.

Summary | Analyzing Evidence

Slide 2

Review: Technology and Evidence

- Knowledge may be adapted as new _____ leads to new evidence.
  - Example: Mendel's explanation of genetics
- Knowledge may be _____ as new technology leads to new evidence.
  - Example: Early ideas of cells
- _____ may allow for new fields of study.
  - Example: Forensics

Use this space to write any questions or thoughts about this lesson.

© Edgenuity, Inc.