UNIT 1:

NATURE OF SCIENCE AND LAB SAFETY

Topics Covered:

- ❑Observations and Inferences
- ❑Chemistry
- ❑Scientific Method

UNIT OBJECTIVES

- ❑ Know the definition of chemistry and be knowledgeable about specific disciplines of chemistry
- ❑ Understand the nature of the scientific method and distinguish among hypothesis, theory, and law

SCIENTIFIC METHOD

SCIENTIFIC METHOD

A quick refresher course featuring… T-Swift!

SCIENTIFIC METHOD

1. State the problem/question

Should Sean date Taylor Swift?

SCIENTIFIC METHOD

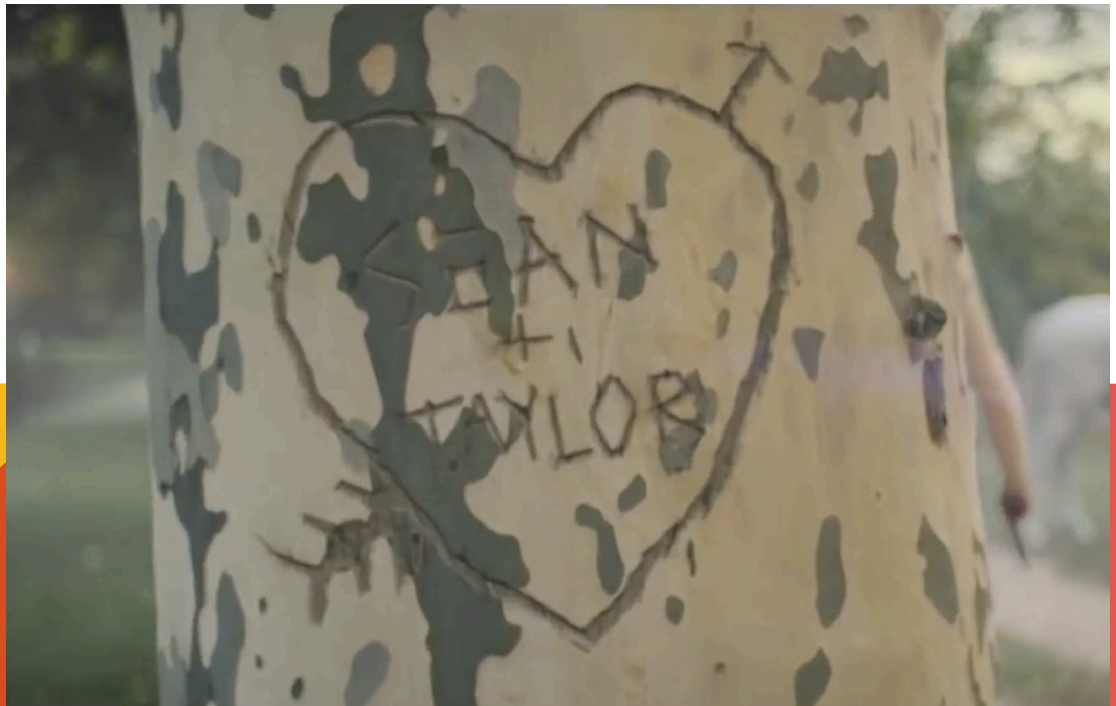
2. Make observations/research

Pros:	Cons:
Pretty Rich $$ ☺ Talented Lives in Nashville	Long list of ex-lovers Reporters May be in a relationship

SCIENTIFIC METHOD

3. Form a hypothesis

If Sean dates T-Swift, then he will be happier



SCIENTIFIC METHOD

4. Experiment

Independent Variable: Dating Taylor (→ What you Δ)

Dependent Variable: Happieness level

Control: Not dating Taylor (↳ What Δ as a result)

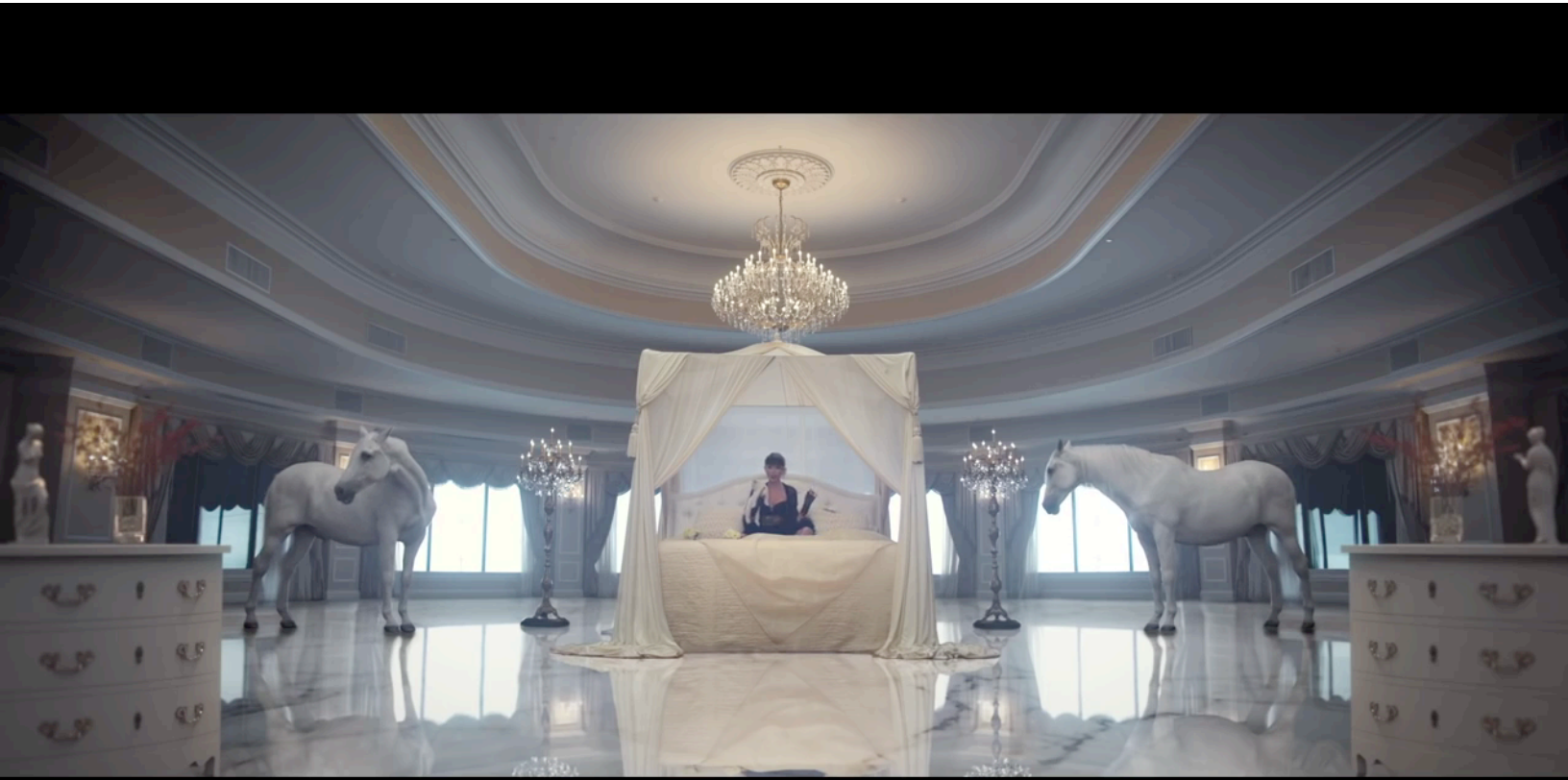
Constants: Personalities

SCIENTIFIC METHOD

5. Collect and analyze data

- Measure his happiness from the control. (No date with Taylor)
- Measure his happiness during the experiment (Date with Taylor)
- Compare happiness.

SCIENTIFIC METHOD



SCIENTIFIC METHOD

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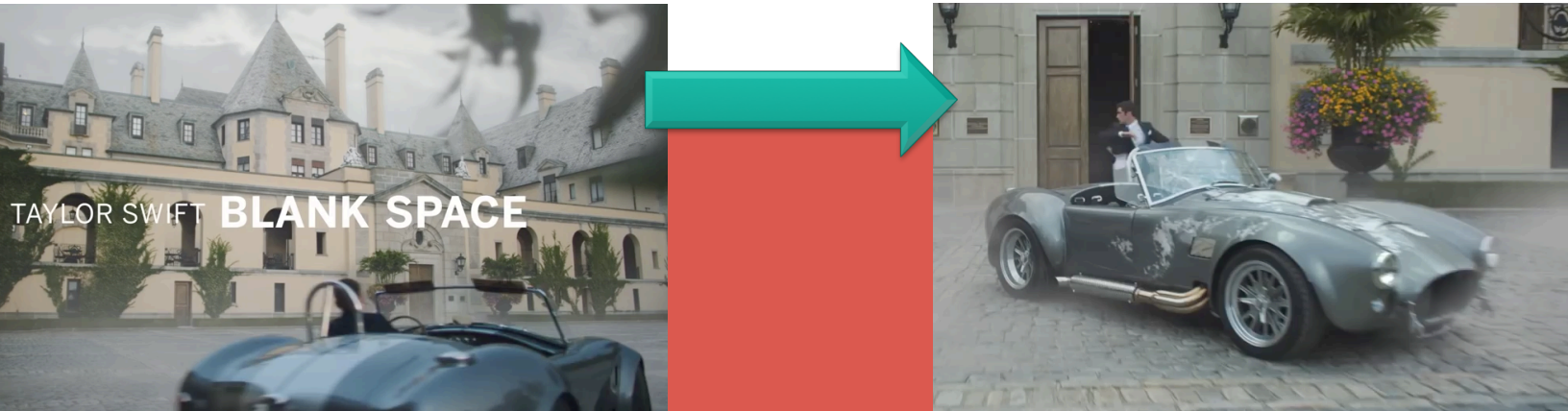


SCIENTIFIC METHOD

6. Form your conclusion

My hypothesis was refuted, Sean was not happier dating Taylor.

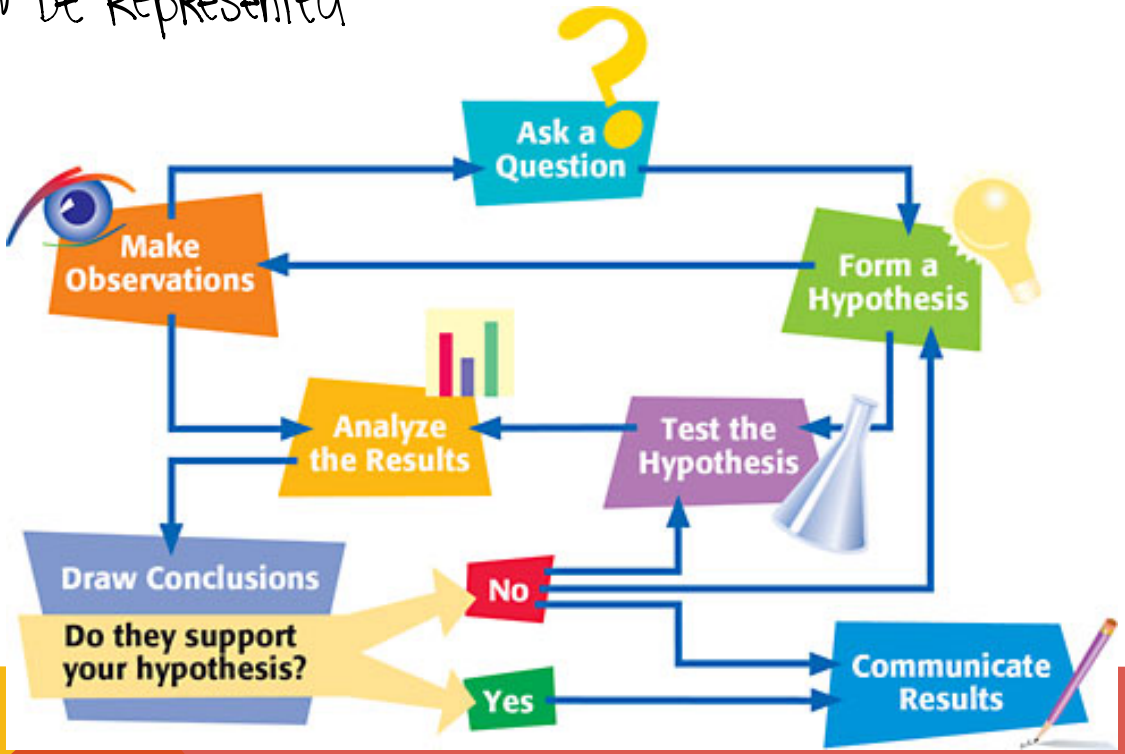
SCIENTIFIC METHOD

7. Repeat experiment

Bring in a new guy & start again

SCIENTIFIC METHOD

*the scientific method does not have to go in this order, & not every step needs to be represented



SCIENTIFIC METHOD

Scientific Hypothesis: Tentative explanation that can be tested & is based on observation(s)

What is a Hypothesis?

Directions: Put an X next to the statements that describe a hypothesis.

- ✓ A. A tentative explanation.
- ✓ B. A statement that can be tested.
- _____ C. An educated guess.
- _____ D. An investigative question.
- _____ E. A prediction about the outcome of an investigation.
- _____ F. A question asked at the beginning of an investigation.
- ✓ G. A statement that may lead to a prediction.
- _____ H. Included as part of all scientific investigations.
- _____ I. Used to prove whether some is true.
- _____ J. Eventually becomes a theory, then a law.
- ✓ K. May guide an investigation.
- ✓ L. Used to decide what data to pay attention to and seek.
- ✓ M. Partly developed from imagination and creativity.
- _____ N. **MUST** be in the form of "if…then…"

SCIENTIFIC METHOD

Question: Will giving my teacher chocolate reduce the amount of homework I have?

Independent Variable: The variable you are changing
x-axis

Dependent Variable: The variable you measuring.
y-axis

SCIENTIFIC METHOD

Question: Will giving my teacher chocolate reduce the amount of homework I have?

Hypothesis: If I give Ms. Shomshor chocolate, then I will have no homework

SCIENTIFIC METHOD

Question: If I study will I get a better grade in chemistry?

Independent Variable: The variable you are Ding.

Dependent Variable: The variable you measuring.

SCIENTIFIC METHOD

Question: If I study will I get a better grade in chemistry?

Hypothesis: If I studying every night then I will result in earning an A in chemistry.

SCIENTIFIC METHOD

Scientific Theory: Evidence-based explanations based on related observations of phenomena or events

Examples: Big Bang Theory
Atomic Structure
General Relativity

What is a Theory?

A 'theory' in science has a different meaning than the 'theories' we talk about in everyday life.
Directions: Put an X next to the statements that describe a theory.

✓ A. Theories include observations.

B. Theories are "hunches" scientists have.

C. Theories can include personal beliefs or opinions.

✓ D. Theories have been tested many times.

E. Theories are incomplete, temporary ideas.

F. A theory never changes.

✓ G. Theories are inferred explanations, strongly supported by evidence.

H. A scientific law has been proven and a theory has not.

✓ I. Theories are used to make predictions.

J. Laws are more important to science than theories.

K. A hypothesis is upgraded to a theory, then a law.

SCIENTIFIC METHOD

Scientific Law: Based on repeated experimental observation that describe an aspect of the physical universe

Examples: Cosmic Expansion ($v = H \cdot d$)
Universal Law of Gravitation ($F = G\frac{m_1 m_2}{r^2}$)
Newton's Law of Motion ($F = ma$)

What is a Law?

A 'law' in science has a different meaning than the 'laws' we talk about in everyday life.
Directions: Put an X next to the statements that describe a law.

_____ A. Laws are theories that have 'graduated', and once were a hypothesis.

✓ B. A law can be framed as an equation.

_____ C. Laws are explanations of a physical event.

✓ D. Laws are descriptions of a physical event.

_____ E. Laws are more important to science than theories.

_____ F. A scientific law has been proven and a theory has not.

_____ G. A law never changes.