How Hypothesizing, Predicting, and Interpreting Differ

Hypothesizing

Answers the question

Why *. . . ?* (E.g., Why does the sweater keep me warm?)

A hypothesis proposes an explanation (based on observation, evidence, and past experience) of events or phenomena. (A hypothesis may or may not be correct.)

EXAMPLE: Sweaters and other warm things keep me warm because they make heat.

Predicting

Answers the question

What will happen in this particular instance if *. . . ?* (E.g., What will happen if I put a thermometer in my sweater and let it sit there for several hours?)

A prediction takes experience into account and is often based on a hypothesis.

EXAMPLE: If I put a thermometer in my sweater and leave it there for several hours, it will show an increase in temperature.

Interpreting

Answers the question

What do my data tell me? (E.g., What does the fact that the temperature did not go up after several hours tell me?)

An interpretation is a conclusion based on analysis and assessment of the data.

EXAMPLE: The fact that the temperature did not go up after several hours tells me that either there was a flaw in my experiment or sweaters don't make heat.

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A hypothesis is a tentative explanation of an event or phenomenon.

A hypothesis is not necessarily correct, but it should be reasonable in terms of available evidence and science concepts. In addition, a hypothesis is testable—there must be a way to prove it wrong.

Some people refer to a hypothesis as an "educated guess." Although that's technically correct, using the word guess tends to confuse people about how much knowledge and evidence is required to form a good hypothesis.

A prediction is based on knowledge about what has happened before, a pattern of evidence, or a hypothesis. When a prediction is based on a hypothesis, it can serve as a test of that hypothesis.

In general, a prediction refers to a particular case. A hypothesis is a proposed explanation that can be applied to a broad range of cases.

Interpreting can get confused with hypothesizing since sometimes interpretations lead to tentative explanations.

Interpreting is distinguished by the assessment of data, checking for reliability, and looking for patterns or other meaning. Interpreting may involve organizing, analyzing, and synthesizing data using statistical analysis, tables, graphs, and diagrams.

In general, interpreting involves finding a pattern or other meaning in a collection of data.

Although interpreting data may result in a set of facts that lead to a hypothesis, it is not the formation of a hypothesis.

“The” Scientific Method?

Use caution when referring to the scientific method. It may be better to refer to *a* scientific method rather than *the* scientific method in order not to imply that there is one, fixed method.

Be aware that even though scientists may refer to the term scientific method, they use this term to generalize the systematic process of doing science, not a rigid, fixed set of steps all scientists follow.

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(http://static.nsta.org/pdfs/BookBeat201208DoingScience.pdf)

Scientific inquiry is more complex than popular conceptions would have it. It is, for instance, a more subtle and demanding process than the naive idea of "making a great many careful observations and then organizing them." It is far more flexible than the rigid sequence of steps commonly depicted in textbooks as "the scientific method."

American Association for the Advancement of Science (https://www.aaas.org/),
(http://www.project2061.org/publications/bsl/online/index.php?chapter=1)

In most scientific investigations, a hypothesis is actually preceded by a question. A good deal of investigation into that question is usually necessary before the investigator has enough experience and information to produce a tentative answer or explanation—a hypothesis rather than a guess. Once one has a hypothesis, the scientific method provides a way to test that hypothesis. But even then, the path to a conclusion is rarely very linear. Investigations meant to test hypotheses often involve revisions in planning, looking at a variety of predictions, challenging assumptions, puzzling over interpretations and more, done in no particular order.

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Experiment vs. Investigation

All experiments are investigations, but not all investigations are experiments.

Experimentation is a process in which scientists control conditions in order to test their hypotheses. An experiment is a type of investigation that involves testing cause-and-effect relationships between variables—manipulated (independent) and responding (dependent).

Astronomy, field studies in nature, and paleontology are some of the examples of areas of science in which it would be difficult or unfeasible to manipulate and control experimental conditions. In these types of investigations, scientists rely on a wide range of naturally occurring observations to make inferences about organisms, objects, events, or processes. For example, the link between smoking and lung cancer was actually established through correlational research designs as opposed to classic experiments.

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