Teacher Tune-up

Quick Content Refresher for Busy Professionals

In science, what do we mean by claim, theory, and law?

Claim

The term "claim" doesn't have a neat, tidy definition. But in general, students must learn that when they put forward an idea as true (or likely), they need to have evidence to show why they think what they think. The evidence should be prepared systematically and presented in a way that communicates clearly to people who were not connected with the initial experiment, observation, or data collection.

Frequently in science activities students are asked to gather data that serves as evidence. These exercises are helpful, but teachers should remind students not to lose perspective in their haste to back up claims. For example, students (like all of us) can sometimes "jump" to conclusions without exploring relevant alternatives. The disciplinary tradition of science includes discussion, skepticism, retesting, and refinement of hypotheses.

Evidence for a claim does not always come from students' own hands-on work. Students' research can provide important backup for claims, especially when multiple reliable sources agree.

Students' personal experience can sometimes also provide relevant evidence to support a claim. For example, if a student lives in an apartment building and sees many happy, playful dogs coming and going for walks, it might be fair to claim that it's possible for dogs to thrive in apartment buildings.

In this video, Professor Catherine Snow contrasts how the term claim is used in language arts, social studies, and science.

Theory

Theory is an important word in science. A theory incorporates many tributary hypotheses and claims into a broader, more comprehensive explanation of why and how something works the way it does. Theories are more weighty than hypotheses and are supported by the careful work of numerous scientists. They are well established, but are not immune to challenge. For example, there used to be a theory that the sun was the sole source of all energy for life on Earth. When scientists found communities of living things that got their energy from hot-water vents deep in the ocean far from any sunlight, they had to modify this theory. The modification or overthrow of a scientific theory signals a major shift in our thinking.

Law

Laws in science are not explanations; they simply tell what happens in certain situations. For example, Newton's law of universal gravitation is widely accepted and has been tested and retested. A mountain of measurements and calculations testifies that, indeed, the force of gravitational attraction between two bodies is equal to the product of their masses divided by the square of the distance between them, multiplied by a proportionality constant.

As with theories, scientific laws are well-established, but can be challenged by new evidence. But it's a really big deal when that happens. For example, Einsteinian relativity recasts gravity not as a force, but as a distortion of space-time. Newton's law of universal gravitation remains an indispensable approximation for most purposes, but no longer enjoys pride of place as an absolute.