Teacher Tune-up

Quick Content Refresher for Busy Professionals

What's the difference between an observation and an inference?

People often draw conclusions from observed facts so rapidly and unconsciously that they don't even realize they've made an inference. And when we mistake inferences for observations, it's harder to gauge accurately the strength of our claims.

Teachers can help students distinguish between observation and inference by reminding them that observations are statements of observed fact (primarily through our five senses), while inferences are interpretations of observed or reported fact. In general, observation is perceptual, while inference is conceptual.

Simple examples can help students make this distinction. Ask your students to think about an absent student. A student's absence from class is an observable fact. But sometimes when a student is absent we tend to infer (perhaps without much data) that the student is sick.

Here is a table that might be helpful:

Context	Observation	Three Inferences
	Juan is not in class right now.	1. Juan is home sick today. 2. Juan's bus is running late. 3. Juan is on a field trip with the debate team.
	Kaytee is sitting in the principal's office.	1. Kaytee is in trouble. 2. Kaytee is getting a big award. 3. The principal needs some advice from Kaytee (ha ha).
	The alarm is ringing.	1. Someone tripped an alarm accidentally. 2. There's a fire. 3. There's a fire drill.

- An inference can be correct or incorrect.
- An inference can be plausible or implausible.
- An inference with little or no evidence is often called a speculation.
- An inference can be supported (or refuted) by gathering more data.

Considering the first example above, if yesterday a student had seen Juan blowing his nose and heard him say that he wasn't feeling well, those observations (data) would support inference #1 above: it would be plausible to think that Juan might be home sick today.

Alternatively, if we looked around the room and saw that several students other than Juan were not in class, and we knew that they all rode the same bus as Juan (and that none of the students who are present ride that bus), that might support inference #2: Juan might well be absent because his bus hasn't arrived yet.

If the school's debate team were away and students had observed that Juan is a debater on the team, then that information would support inference #3: Juan is probably away with the debate team.

Often statements with words like "because" (or statements that can be recast as causal statements) are inferences: "Juan is absent because he is sick," or "Juan is absent because he is away with the debate team." On the other hand, if you find yourself saying "I think Juan is absent because I don't see him here," then the direct sensory evidence that underwrites the claim indicates that you're making an observation, not an inference. The causal version of an observation feels redundant or tautological, as if we were citing a fact as evidence of itself. (Admittedly, the distinction between observation and inference does depend on how well you are observing—did you turn and look behind you for Juan?—and on whether you are prone to hallucinations; observations, though more concrete than inferences, can sometimes also be incorrect.)

For a physical science teacher, the next step is to help students apply the distinction between observation and inference to physical phenomena. For example, we may observe that a puddle of water evaporates quickly. Whether we attribute this to heat, or to low atmospheric humidity, or to wind, or to some combination of these potential causes, is a matter of inference. Such inferences might be supported or modified by making more observations (taking measurements of temperature, humidity, and wind speed, and perhaps comparing rates of evaporation in different circumstances).

Science proceeds by both observation and inference. It proceeds with greater clarity and reliability when we are aware of which is which.