Scientists do not deal with truth; they deal with limited and approximate descriptions of reality.

– Fritjof Capra
physicist

The scientist is not a person who gives the right answers, he is one who asks the right questions.

– Claude Levi-Strauss
anthropologist

The mere formulation of a problem is far more essential than its solution, which may be merely a matter of mathematical or experimental skills.

– Albert Einstein
physicist

The beginning of knowledge is the discovery of something we do not understand.

– Frank Herbert
author

Without a hypothesis, our observations are voiceless.

A research hypothesis is a tentative answer to a well-framed question that leads to predictions that can be tested by observation or experimentation.

A research hypothesis must be falsifiable, that is, it must be disprovable.

The null hypothesis (H_0) is a hypothesis of no difference – it is not the opposite of the research hypothesis (H_1).

H_0 is a statistical hypothesis stating that any differences between populations are due to chance, sampling error, or experimental error.

The researcher hopes to reject H_0.

Significance levels (α) and probabilities (*p*-values) are used to statistically reject a null hypothesis (H_0).

The significance level, α, refers to a pre-determined probability chosen by consensus; commonly α = 0.05.

If the calculated *p*-value < α, then the test suggests that the data is inconsistent with H_0, and we may reject H_0.

The *p*-value provides an estimate of how often we would get the obtained result by chance, if in fact H_0 was true.

"The scientist has a lot of experience with ignorance and doubt and uncertainty, and this experience is of very great importance, I think.

When a scientist doesn't know the answer to a problem, he is ignorant.

When he has a hunch as to what the result is, he is uncertain.

And when he is pretty darned sure of what the result is going to be, he is in some doubt.

We have found it of paramount importance that in order to progress we must recognise the ignorance and leave room for doubt.

Scientific knowledge is a body of statements of varying degrees of certainty – some most unsure, some nearly sure, none absolutely certain."

Richard Feynman
Nobel Prize Winner (1918-1988)

http://www.sciencemediacentre.org/wp-content/uploads/2012/09/Uncertainty-2012.pdf

We're going to need confirmation by independent groups. That's the way things work in science. We don't believe things because somebody says they're true; we believe them because different people make the measurements independently and find the same results.

– Marc Kamionkowski
physicist

The Precautionary Principle should be applied when safety is questionable.

When an activity raises threats of harm to human health or the environment, precautionary measures should be taken, even if some cause and effect relationships are not fully established scientifically.

http://www.sehn.org/wing.html

No science is immune to the infection of politics and the corruption of power.

— Jacob Chanowski
author