
NANYANG
GIRLS' HIGH

What Science Is Not

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What Science is Not

One

- Science is not a process that can solve all kinds of problems and questions.
- The realm of science is limited strictly to solving problems about the *natural world*.
- Science is not properly equipped to handle the supernatural realm, nor the realm of values and ethics.

What Science is Not

Two

- Science is not a process that can ignore rules.

- Science must follow certain rules, otherwise, it's not science (just as netball is not netball if the players do not follow the rules of netball).

What Science is Not

Three

- Science is not a process that seeks the truth or facts.

- The goal of science is to come as close to understanding the reality of the natural world as we can.

- Truth and facts can mean different things to different people.

What Science is Not

Four

- Science is not a process that attempts to prove things.

- The process of science, when properly applied, actually attempts to disprove ideas (tentative explanations) a process called *testing,* or *challenging.*

- If the idea survives testing, then it is stronger, and more likely to be an accurate explanation.

What Science is Not

Four

- Supernatural causes can never be disproved (because in a supernatural world, anything would be possible) hence they cannot be part of any scientific explanation (whether they exist or not).

What Science is Not

Five

- Science is not a process that can produce all kinds of explanations.
- Only natural explanations can be used.
- Scientific explanations must be potentially disprovable, but supernatural explanations can never be disproved (supernatural causes, by definition, do not predictably follow the laws of nature).

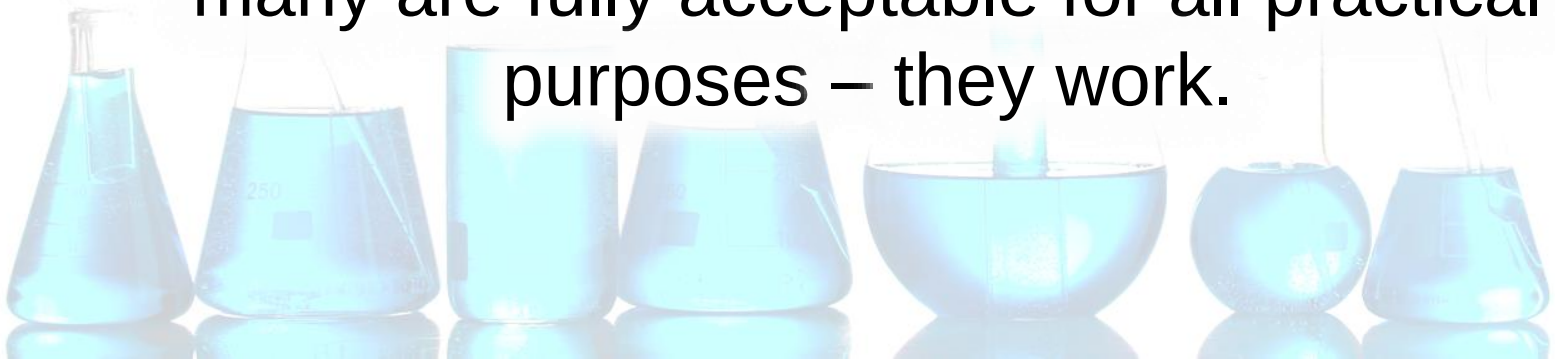
What Science is Not

Six

- Science is not a process that produces certainties, or absolute facts.

- Science is a process that can only produce *possible* to highly *probable* explanations for natural phenomena.

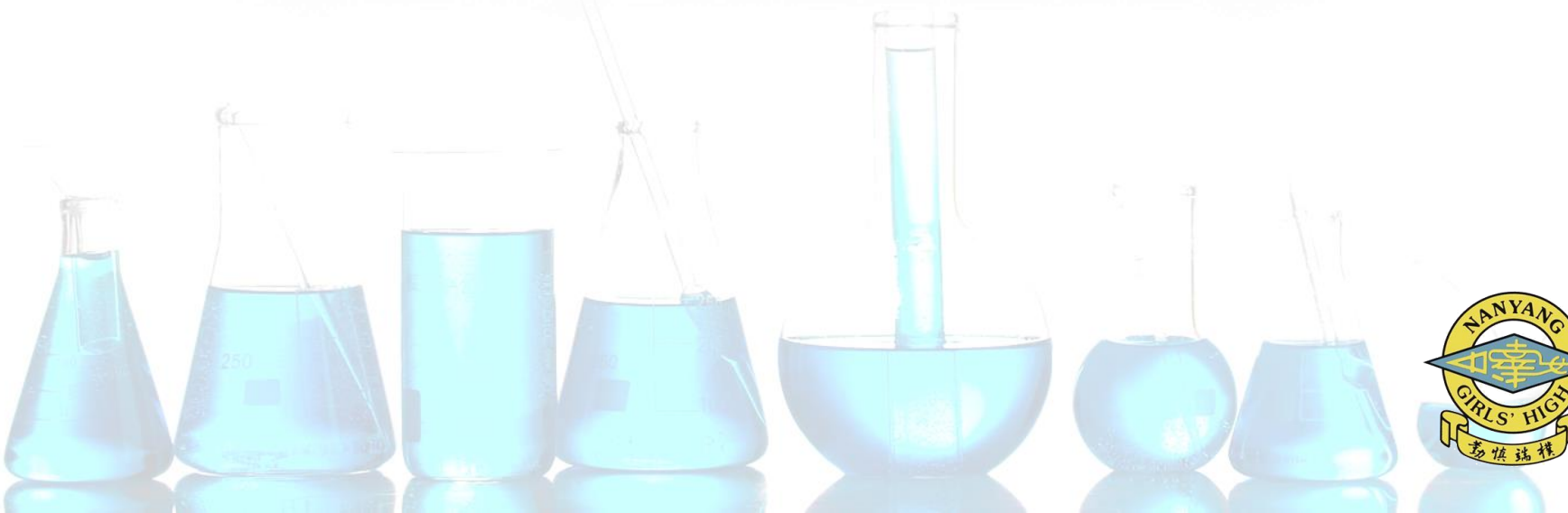
- These are never absolute certainties, but many are fully acceptable for all practical purposes – they work.



What Science is Not

Six

- With new information, tools, or approaches, earlier findings (theories, or even facts) can be replaced by more accurate findings.



What Science is Not

Seven

- Science is not a process that can always be relied upon due to its total objectivity and internal self-correction.

- Science can be done poorly, just like any other human endeavour. We are all fallible, some of us make fewer mistakes than others, some observe better than others, but we are still subjective in the end.

What Science is Not

Eight

- Science is not a process that is always properly used.

- Unfortunately, science is all too frequently misused. Because it works so well, there are those who apply the name of science to their efforts to *prove* their favourite cause, even if the rules of science were not followed. Such causes are properly labelled *pseudosciences.*

What Science is Not

Eight

- In addition, some legitimate scientists have been known to do fraudulent work in order to support their ideas and / or gain more money to conduct their research. Such work is usually exposed sooner or later due to the work of other scientists.

What Science is Not

Nine

- Science is not a process that is free from values, opinions or bias.

- Scientists are people, and although they follow certain rules and try to be as objective as possible, both in their observations and their interpretations, their biases (conscious or unconscious) are still there.

What Science is Not

Ten

- Science is not a process in which the product (understanding) is based on faith or belief.
- The product of science (probable explanations for natural phenomena) are always based on observations which are carefully analysed and tested.

What Science is Not

Ten

- The high confidence we have in science comes from the many successful applications to real-life problems (for example in medicine, space exploration, chemistry and technology).

What Science is Not

Eleven

- Science is not a process in which one solution is as good as another, or is simply a matter of opinion.

- In science, there is a rigorous analysis and fair-test comparison of alternative explanations, using discriminate criteria, for example, confirmation by multiple independent lines of evidence, leading to one *best* solution.

What Science is Not

Twelve

- Scientific Theories are not *tentative ideas* or *hunches.*

- The word *theory* is often used this way in everyday conversation, but a theory in science technically refers to a highly probable, well-tested and comprehensive *natural* explanation for a *natural* phenomenon, based on many critical observations.

Modern science is based on several underlying assumptions…

Assumptions

1. The world is real. The physical universe exists, whether we can sense it or not.

2. Humans can accurately perceive and understand the physical universe. Such understanding is possible.

Assumptions

3. Natural processes are sufficient to explain the natural world. Non-natural processes are unnecessary.

4. Nature operates the same way everywhere in the universe, and at all times, except when we have contrary evidence.

Modern science has its limitations…

Limitations of Science

1. Observations are confined to the biological limits of our senses, even with technological enhancement.

2. The mental processing of our sensory information is unconsciously influenced by previous experiences, which may result in inaccurate or biased perceptions of the world.

Limitations of Science

3. It is impossible to know if we have observed every possible aspect of a phenomenon, have thought of every possible alternative explanation, or controlled for every possible variable.

4. Scientific knowledge is necessarily contingent knowledge rather than absolute knowledge. It is based only on the available evidence which must be assessed, not on indisputable *proof.* The history of science is filled with examples of scientific knowledge changing over time.

Limitations of Science

5. Science must follow certain rules, such as:

a) Scientific explanations must be based on careful observations and the testing of hypotheses.

b) It must be possible to disprove a hypothesis.

c) Scientific solutions cannot be based merely on personal opinion, judgement or belief.

d) The *best* hypothesis, out of the choices, must be one which fits several explicit criteria.

Limitations of Science

6. Science, as for any human endeavor, can be done poorly.

7. Science can be misused.

Limitations of Science

- Given so many limitations and uncertainties, why is science still so useful?
- Because it is the most reliable knowledge we have about the natural world, meaning, most of the time…

It Works!

Presentation on
The Nature of Science – What Science Is Not

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