

TOK Knowledge Framework – Experimental Sciences / Natural Sciences

Scope and Application

Seek to discover natural laws of nature – regularities in the natural world.
System of knowledge based on observation.
Community of scientist dispersed geographically and largely independent in culture
Interest in producing generalized statements, principals or scientific laws about the natural world.
Most of these laws are causal: If A happens, then B happens as a result.
Prediction is important, but so is understanding of the underlying reasons, causes, principals.
Importance of objectivity.
The scientific method (s)
Empiricism and experiment.

Concepts and Language

Theory	Model
Individuals	Knowledge Communities
Predictability	
Empiricism	
Mathematical language and knowledge is essential	
Ambiguity is bad	
Precision is good	
Strict rational and reasoning.	
Falsification	Correlation
Scientific revolutions	Paradigm shifts
Mathematics	Equations
Nomenclature	

Historical Development

Development of the scientific method
The development and use of empiricism

Clashes between empiricism and faith

Development of scientific instruments and the knowledge skills and know how to develop methods to make scientific instruments

Several important shifts in our thinking in the development of the natural sciences.

The development of nomenclature system – Linneus, (Beaufort -wind, Howard - clouds)
Periodic table – Mendeleev

The development of accuracy.

The importance of thought experiments.

Experimental Sciences / Natural Sciences

Methodology

Induction/ Deduction
Measurement involves interaction with the world, but this interaction can sometimes change the aspect of the world we are observing. – Schroedinger's cat.
Quantum.
Models are important.
Classification is important.
Hypothesis – induction/ deduction – observation – reason.

The problem of induction.

Links to personal knowledge

We get a view of ourselves as material entities behaving according to universal laws

Is there a way in which the natural sciences allow us to consider ourselves as rational, free agents with desires and the ability to choose.

Individuals have contributed to the advancement in science in often revolutionary ways – Newton, Einstein, Darwin (“standing on the shoulder of giants”)

The use of imagination, intuition and emotion in creating hypothesis

Knowledge Questions

How reliable is science?
Why does scientific knowledge change over time?
How can we know cause and effect relationships given that one can only observe correlation?
How can we build an understanding of the world independent of the human act of measuring it?
How can we decide if one method or model or theory is better than another?