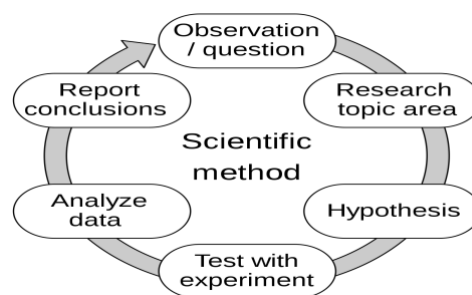


scientific method The engineering design process

The Scientific method is a process with the help of which scientists try to investigate, verify, or construct an accurate and reliable version of any natural phenomena. They are done by creating an objective framework for the purpose of scientific inquiry and analysing the results scientifically to come to a conclusion that either supports or contradicts the observation made at the beginning.

Steps of Scientific method



Steps of the scientific method

The scientific method uses a series of steps to establish facts or create knowledge. The overall process is well established, but the specifics of each step may change depending on what is being examined and who is performing it. The scientific method can only answer questions that can be proven or disproven through testing.

Make an observation or ask a question. The first step is to observe something that you would like to learn about or ask a question that you would like answered. These can be specific or general.

Gather background information. This involves doing research into what is already known about the topic. This can also involve finding if anyone has already asked the same question.

Create a hypothesis. A hypothesis is an explanation for the observation or question. If proven later, it can become a fact.

Create a prediction and perform a test. Create a testable prediction based on the hypothesis. The test should establish a noticeable change that can be measured or observed using empirical analysis.

Analyze the results and draw a conclusion. Use the metrics established before the test see if the results match the prediction.

Share the conclusion or decide what question to ask next: Document the results of your experiment. By sharing the results with others, you also increase the total body of knowledge available.

Using the scientific method in technology and computers

The scientific method is incredibly valuable in technology and related fields. It is obviously used in research and development, but it is also useful in day-to-day operations. Because almost everything can be quantified, testing hypotheses can be easy.

Most modern computer systems are complicated and difficult to troubleshoot. Using the scientific method of hypothesis and testing can greatly simplify the process of tracking down errors and it can help find areas of improvement. It can also help when you evaluate new technologies before implementation.

The engineering design process

The **engineering design process** is a common series of steps that engineers use in creating functional products and processes. The process is highly iterative - parts of the process often need to be repeated many times before another can be entered - though the part(s) that get iterated and the number of such cycles in any given project may vary.

It is a decision making process (often iterative) in which the basic sciences, mathematics, and engineering sciences are applied to convert resources optimally to meet a stated

objective. Among the fundamental elements of the design process are the establishment of objectives and criteria, synthesis, analysis, construction, testing and evaluation.

Common stages of the engineering design process-

It's important to understand that there are various framings/articulations of the engineering design process. Different terminology employed may have varying degrees of overlap, which affects what steps get stated explicitly or deemed "high level" versus subordinate in any given model. This, of course, applies as much to any particular example steps/sequences given here.

One example framing of the engineering design process delineates the following stages: *research, conceptualization, feasibility assessment, establishing design requirements, preliminary design, detailed design, production planning and tool design, and production*. Others, noting that "different authors (in both research literature and in textbooks) define different phases of the design process with varying activities occurring within them," have suggested more simplified/generalized models - such as *problem definition, conceptual design, preliminary design, detailed design, and design communication*. Another summary of the process, from European engineering design literature, includes *clarification of the task, conceptual design, embodiment design, detail design*.

Comparison with the scientific method

Engineering is formulating a problem that can be solved through design. Science is formulating a question that can be solved through investigation. The engineering design process bears some similarity to the scientific method. Both processes begin with existing knowledge, and gradually become more specific in the search for *knowledge* (in the case of "pure" or basic science) or a *solution* (in the case of "applied" science, such as engineering). The key difference between the engineering process and the scientific process is that the engineering process focuses on design, creativity and innovation while the scientific process emphasizes Discovery (observation).