



Information Technology Concepts

Chapter 03 – Science and Technology

Moch Zawaruddin Abdullah, S.ST., M.Kom.
D4 - INFORMATION ENGINEERING

Chapter 03

Science and Technology

3.1 Introduction

Science and technology is an interdisciplinary topic encompassing science, technology, and their interactions:

- » Science is a systemic undertaking that builds and organizes knowledge in clarifications and forecasts of nature and the universe.
- » Technology is to gather methods, procedures, or the achievement of goals, such as scientific analysis, used in the manufacture of products and services.

Science encompasses the systematic study of the physical and natural world's structure and behavior through observation and experiment. Technology is the application of scientific knowledge for practical purposes.

3.2 Knowledge

Knowledge is a variety of symptoms that humans perceive and learn by observation. Knowledge occurs when humans use their intellect to identify particular objects or events that have never been seen or felt before. For example, when someone tastes a new dish or food, he will acquire knowledge of the food's form, flavor, and aroma.

Knowledge is a familiarity, awareness, or understanding of someone or something, such as facts (propositional knowledge), skills (procedural knowledge), or objects (acquaintance knowledge). By most accounts, knowledge can be acquired in many different ways and from many sources, including but not limited to perception, reason, memory, testimony, scientific inquiry, education, and practice. The philosophical study of knowledge is called epistemology.

The term "knowledge" can refer to a theoretical or practical understanding of a subject. It can be implicit (as with valuable skill or expertise) or explicit (as with the theoretical understanding of an issue), formal or informal, systematic or particular.

Knowledge can describe as follow:

- » Facts, information, and skills acquired by a person through experience or education, the theoretical or practical understanding of a subject.
- » Awareness or familiarity gained by experience of a fact or situation
- » The result of "knowing" through the human sense sectors

Knowledge is among the many kinds of cognitive success that epistemology is interested in understanding. Because it has attracted vastly more attention in recent epistemology than any other variety of cognitive success, we devote the present section to considering it in some detail. But the English word “knowledge” lumps together various states that are distinguished in other languages: for instance, the verb “to know” can be translated into French either as “*connaitre*” or as “*savoir*”, and the noun “knowledge” can be translated into Latin as either “*cognitio*” or as “*scientia*.” Exactly how to individuate the various kinds of cognitive success cannot be determined solely by appeal to the lexicon of any particular natural language. The present section provides a brief survey of some of the kinds of cognitive success indicated by the use of “knowledge” in English, but this is not intended to signal that these kinds of cognitive success are all species of some common genus. Neither, however, is it intended to signal that these kinds of cognitive success are not all species of some common genus: at least some philosophers have taken there to be a genus, awareness, of which the various kinds of knowledge are all species, and concerning which these different kinds may all be explained

3.3 Science and Technology

Conscious attempts to investigate, discover, and enhance human understanding of various aspects of reality in human nature. (Prof. Dr. C.A. van Peursen)

Science results from a process of thinking obtained from experience to be the research object, and its truth can be recognized/believed. The intellectual and practical activity encompassing the systematic study of the physical and natural world's structure and behavior through observation and experiment.

Science tries to discover facts and relationships and then tries to create theories that make sense of these facts and relationships. Science is common sense that is regulated and organized, approaches objects or events using observation, which is thorough and critical.

In the Indonesia Dictionary (KBBI), science is knowledge about a systematically organized field according to specific methods that can be used to explain certain symptoms.

What is Technology?

Technology is a human attempt to change the world by creating products that can help people. For example, an airplane was designed to make it easier for humans to travel to distant places quickly. Your smartphone, which was created to make it easier for you to communicate with other people, make it easier to find information via the internet, and so on.

A washing machine is a machine used to wash various clothes without applying any physical effort. With a washing machine, you don't have to rub the clothes with a hand or squeeze them to remove the water from them. The washing machine enables you to wash your clothes automatically without having to supervise its operation.

In the times, science and technology work together, collaborate, it can't be separated. **Science and Technology** is a source of information that can improve human intelligence or knowledge of technology. Science and technology are the very questions that scientists ask that are shaped by the available technology.

“Science encompasses the systematic study of the physical and natural world's structure and behavior through observation and experiment. Technology is the application of scientific knowledge for practical purposes.”

3.4 Interconnections between Science and Technology

The relationship between science and technology is that science must be in line with technology to be up to date. If the technology is not the line with knowledge, then we are outdated, whereas if expertise is not the line with technology, the information will be slow to obtain.

Science is based on fixed hypotheses or formulas, and technology is the practice or implementation of research-based assumptions. Science explores to know, while technology explores to make something useful from that knowledge.



“Science drives technology by making new technology possible through scientific breakthroughs. Without technology, some science experiments would not be possible.”

For example, in the Biology lab, the research and monitoring process will be complicated without a microscope. We do technology experiments, such as searching for information, designing information systems. Without technology such as laptops/computers, what would happen? We use technology to automate our processes and efficiency, making new technology innovations more useful.

We know it’s a car, but we can drive it if we don’t have that knowledge. Without Alan Turing's science experiment, computer technology would not exist, laptops would not exist.

*“Without science, technology could not proceed. Science is a way of Knowing
Technology is a way of Doing.”*

According to Betz in 1993 about Science, Engineering, and Technology explain that:

- » Science is the discovery & explanation of nature
- » Engineering is the understanding & manipulation of nature for human purposes
- » Technology is the knowledge of the manipulation of nature for human purposes

3.5 The Importance of Science towards Technology

According to Harvey Brooks (1994), Science contributes to technology in six ways:

1. Science is a direct source of new technological ideas; new knowledge serves as a natural source of new technical possibilities.

2. Science as a source of engineering design tools and techniques; source of tools and techniques for more efficient engineering design and a knowledge base for evaluating the feasibility of strategies.
3. Instrumentation, laboratory techniques, analytical methods, research instrumentation, laboratory techniques, and analytical methods are used in research that eventually finds their way into a design or industrial practices, often through intermediate disciplines.
4. Social skills; research as a source for growth and assimilation of new human skills and capabilities eventually useful for technology.
5. Technology assessment; creating a knowledge base that becomes increasingly important in the evaluation of technology in terms of its broader social and environmental impacts.
6. Science as a development strategy source; knowledge base that enables more efficient applied research, development, and refinement of new technologies.

3.6 The Impact of Technology on Science

There are at least two impacts of technology on science (Harvey Brooks, 1994)

1. Technology is a source of new scientific challenges; it provides resources for original research and helps justify the allocation of resources needed to solve the problem quickly and broaden the scientific agenda. Like the 4G internet network technology, a new challenge in creating a cheaper, faster, and more efficient internet network. And finally came the 5G network.
2. Instrumentation and measurement techniques; Technology has played an enormous role in making it possible to measure natural phenomena that were not previously accessible to research. We can predict the weather, climate, disasters using technology. We can observe and expect crime using technology that is connected to cameras / CCTV.

3.7 Science and Technology in Education

We already know examples of technological developments in the usage of renewable energy. Now, what are some examples of science and technology developments in the field of education?

According to (Hamzah B. Uno & Nina Lamatenggo, 2011) (Budiman, 2017), the trend of education in the future follow as:

- a. The distance learning model in an open education development program. As at this time, the teaching and learning process carried out has used a distance learning model with the support of a zoom application and a learning management system (LMS).
- b. Resource sharing between educational institutions has developed into a source of information. It has also happened that university data is managed in a single system so that data for students, lecturers, and institutions can be found easily.
- c. Use of interactive information technology tools. Various ways to do interactive education can be done quickly. Such as using the LMS application, Quizziz, Kahoot as a means of assignments and exams. Such as YouTube as a means of delivering learning videos that can be accessed anytime and anywhere.

There are several roles of science and technology for students

- » online learning media
- » source of knowledge
- » for group discussion
- » information media
- » etc.

There are several positive influences of technology on education

- » The advent of electronic media as a source of information and a hub for education.
- » The creation of new learning strategies that will make it easier for students to learn.
- » The learning method does not have to be face to face (distance learning).
- » Data management device for evaluation (automatic evaluation tests).
- » The need for education facilities can be addressed quickly.

There are several negative influences of technology on education

- » Students are becoming lazy to learn.
- » The event of an unethical infringement.
- » The rise of electronic mass media as a source of information and a knowledge hub that is misused.
- » Misuse of applications for data processing.