# CHAPTER 1: INTRODUCTION TO SCIENCE, TECHNOLOGY AND SOCIETY

**CHAPTER OUTLINE**

1. S & T: Definitions and Assumptions
2. Face to Face with S & T
3. S & T Fused Together
4. Where Science and Technology is taking the Society
5. STS Approach

https://studieren.univie.ac.at/en/degree-programmes/master programmes/science-technology-society-master/

*"Science knows no country, because knowledge belongs to humanity, and is the torch which illuminates the world."*

\- *Louis Pasteur*

Learning Outcomes: At the end of this chapter, the students should be able to:

1. define science, technology and society;
2. distinguish the relationships of science, technology and society; and
3. develop a deeper interest in the field of science, technology, and society.

**SITUATION**

**Task 1 (For All Classes).** After reading the news items below, answer the questions that follow. Send your work to your respective GEC 17 Google classrooms (Classes A and B) and in a short bond paper for Class C following the format:

Name: _____ Course and Year: _____

News 1:

At least 137 people were killed and 5,000 wounded in a massive explosion that shook Beirut on Tuesday, according to Lebanon's health minister. Hundreds have been reported missing, raising fears that the death toll will rise, the health minister said Wednesday. More than 300,000 people have been displaced from their homes. Authorities declared Beirut a "disaster city" and imposed a two-week state of emergency. It's still unclear what exactly caused the explosion. Lebanon's prime minister said an investigation would focus on an estimated 2,750 metric tons of the explosive ammonium nitrate stored at a warehouse.

News 2:

Bataan Nuclear Power Plant, the only nuclear power plant in the country began in 1976 in Morong, Bataan, four years into the Martial Law period under then President Ferdinand Marcos. The Bataan Nuclear Power Plant (BNPP) cost a total of $2.3 Billion USD, and was expected to generate 621 MW of power, but the project was shelved despite having reached near-completion due to the discovery, by an independent inquiry by the Puno Commission, of structural defects in the plant that made it unfit for commercial operation. Following the fall of Marcos's dictatorship in 1986, issues of corruption surrounding the project also gave newly elected President Cory Aquino more reason not to push through with the plant's operation. Months later, the plant was ultimately closed in the wake of the Chernobyl nuclear disaster

News 3:

Stopping life support so natural death can come is a normal part of health care. We all have the right to refuse medical interventions even if it is likely to lead to death. As the great late bioethicist Paul Ramsey put it when he led the movement in to obtain that right, not forcing tubes and drugs into an unwilling person is to treat the "patient as a person."

Moreover, in the 1976 Karen Ann Quinlan case, New Jersey's Supreme Court ruled that removing a respirator at the request of an unconscious patient's parents is not killing. It is notable that after her respirator was removed, Quinlan lived another ten years.

Write your observations on the above news items:

1. What characteristics do these news items have in common?

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_____
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2. Write down some disadvantages of science and technology that were presented in the news.

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3. Would you allow Euthanasia or mercy killing of a dying loved one?

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4. Are science and technology really important and indispensable factors in our everyday life? Explain.

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## SCIENCE AND TECHNOLOGY: DEFINITIONS AND ASSUMPTIONS

Science and technology are dynamic processes engaged in by man to satisfy two-basic needs- the thirst for knowledge and the material requirements for human survival and prosperity. Science and technology had been around even before the words biology, physics, chemistry, engineering, and agriculture were coined.

*Science* is the description, understanding, and prediction of phenomena through the use and generation of verifiable theories, laws, and principles. Research and development are usual activities associated with science as a process. Research and development involve the acquisition of new knowledge and the utilization of such knowledge to devise new or improved products and processes. (Seludo-Ballena, Bernal, Paquiz, Ramos and Viet, 2004). The Oxford Dictionary meanwhile defines science as the intellectual and practical activity encompassing the systematic study of the structure and behavior of the physical and natural world through observation and experiment.

According to McGinn (1991) Science has four meanings:

1. **As a Knowledge**: the organized, well-founded body of knowledge of natural phenomena.
2. **As a Field of Systematic Inquiry into Nature**: the particular field or domain or systematic inquiry in which such knowledge is sought.
3. **As a Form of Human Cultural Activity**: a distinct form of human activity in which such knowledge is sought.
4. **As a Total Societal Enterprise**: the summation of knowledge, people, skills, organization, facilities techniques, physical resources, methods and technology, which is devoted to the study and understanding of the natural world.

*Technology* is the use of scientific knowledge and/or empirical knowhow for the production, improvement, and distribution of goods and services, as well as the satisfaction of other material needs, On the other hand, it is more related to economic activity. The actual use of technology in the production process points out the potentials as well as the problems associated with a particular technology. In short, it is the application of understanding of natural laws to the solution of practical problems.

In the book The Nature of Technology: What it is and how it evolves, W. Brian Arthur (2009) defined technology in three ways:

1. Technology is a “means to fulfill a human purpose” in that a method or any material may be utilized to serve a human purpose.
2. Technology is an assemblage of practices and components
3. Technology is a collection of devices and engineering practices available to culture.

*Society* is a group of persons joined together for a common purpose or by a common interest. They come to learn and perform behavior expected of them.

Sociologists place societies in three broad categories: Pre-Industrial Society: Food production, which is carried out through the use of human and animal labor, is the main economic activity. Industrial societies: The increased efficiency of production of the industrial revolution produced an even greater surplus than before. Now the surplus was not just agricultural goods, but also manufactured goods. Post-industrial societies: Societies dominated by information, services, and high technology more than the production of goods are known as Post-industrial Societies.

## FACE TO FACE WITH SCIENCE AND TECHNOLOGY

Some may think that science is very easy to define and might say that it is just it is. But philosophers are said to be in argument about the definition of science for decades already because it has a wide coverage of human dealings. Science can be taken as the investigation of the physical world in which experiments are rendered in order to explain matters of concern. To have a face to face with science, it would be best to explore its wide coverage by identifying its common characteristics. Four common characteristics that categorize something as science include:

1. Focuses on the Natural World

It is through science that we understand the natural world. Its main concern is the physical world. It studies animals, plants, rocks, man, and all other kinds of matter. Science is not concerned with supernatural world which cannot be tested and is not governed by the laws of the natural world. This is a continuous study of the physical world to look for evidences that could prove something. The goal is to see how something works and see the components that make up the area being studied. Findings can change after time depending on the new evidences that may arise but all scientific idea is said to be reliable because before it could get scientific acceptance, first it has to be supported with a number of evidences.

2. Goes Through Experiments

Science subjects any matter of study to experimentation. Something has to be tested and should arrive at a number of consistent observations so it could be taken as true. Anything that cannot be subjected to experimentation and could not give any observable data cannot be regarded as science.

3. Relies on Evidence

As science requires experimentations and observations, it is only right that it would look for evidences that will support the truthfulness of something. For something to be really regarded as science, it should be tested not only by one group as that can be taken of as a bias. Evidences that are relevant to the matter being studied are what scientists are looking for to confirm something to be of science.

4. Passes Through the Scientific Community

Science requires a number of consistent evidences for it not to be biased, it has to go through different groups of people who would qualify the idea. In finding different evidences, a scientist would likely check on different angles concerning the matter of study and would therefore work with people of different expertise. Scientific experimentations and processes change over time as the society takes place, as communication and technology advances, and as further discoveries and understandings are achieved by science.

As scientists have been arguing as to the definition of science, the same is true with technology. Martin Heidegger strongly opposes the view that technology is “a means to an end” or “a human activity.” These two approaches, which Heidegger calls, respectively, the “instrumental” and “anthropological” definitions, are indeed “correct”, but do not go deep enough; as he says, they are not yet “true.” Unquestionably, Heidegger points out, technological objects are means for ends, and are built and operated by human beings, but the essence of technology is something else entirely. Just as the essence of a tree is not itself a tree, Heidegger points out, so the essence of technology is not anything technological. These claims of Heidegger is further discussed in Chapter 6.

## SCIENCE AND TECHNOLOGY FUSED TOGETHER

Brooks (1994) highlighted six relationships between science and technology

1. New knowledge which serves as a direct source of ideas for new technological possibilities;
   e.g. discovery of uranium fission-atomic bomb, X-Rays, LASER, explorations in Bell Lab leading to invention of the transistor

2. Source of tools and techniques for more efficient engineering design and a knowledge base for evaluation of feasibility of designs.
   e.g. prototyping, theoretical prediction, modeling, and simulation of large systems, often accompanied by measurement and empirical testing of subsystems and components.

3. Research instrumentation, lab techniques, and analytical methods used in research that eventually find their way into design and industrial practices
   e.g. the scanning electron microscope (SEMI, ion implantation, synchrotron radiation sources, phase-shifted lithography, high vacuum technology, industrial cryogenics, superconducting magnets (originally developed for cloud chamber observations in particle physics, then commercialized for 'magnetic resonance imaging' (MRI) in medicine)

4. Practice of research as a source for development and assimilation of new human skills and capabilities eventually useful for technology
   e.g. research specialization among scientists

5. Creation of a knowledge base that becomes increasingly important in the assessment of technology in terms of its wider social and environmental impacts
   e.g. manufacture of a new chemical may involve disposal of wastes which require knowledge of the groundwater hydrology of the manufacturing site.

6. Knowledge base that enables more efficient strategies of applied research, development, and refinement of new technologies.
   e.g. The accumulated stock of existing scientific (and technological) knowledge helps to avoid blind alleys and hence wasteful development expenditures.

## WHERE SCIENCE AND TECHNOLOGY IS TAKING THE SOCIETY

For the past centuries, science and technology has marked a great progress in the society. Man has benefitted much from the advances made with land, water, air and animals. Machines and tools have made living so much easier. Communication and transportation, infrastructures, and agriculture have become more convenient. But science and technology in itself would not exist without the society. It is the society that allows for the discoveries and inventions to take place. It is the society that decides how S&T is to be utilized. And yet, society needs science and technology in order to continue on. National progress now relies so much on science and technology in the area of industry, health care, national security, and environmental protection.

In as much as science and technology is taking the society towards progress and development, the risks and dangers that come with it should be taken lightly and accepted blindly. Everyone should have keen eyes and observe closely where science and technology is taking the society. After taking this course in STS, you should be a guardian of society, not only to make them aware of how science and technology is shaping the society but how they can partake in keeping the balance between the benefits and dangers of S&T.

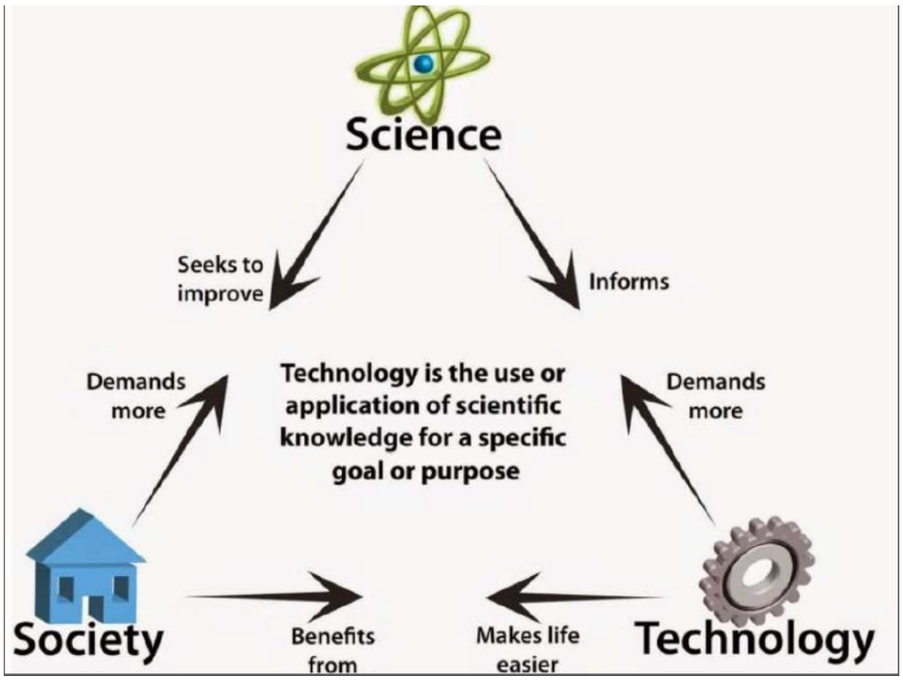


Fig. 1. Interactions of Science, Technology and Society

**STS APPROACH**

In response to the growing importance of S&T in the contemporary society and the increasing recognition of that importance, the last two decades have witnessed the birth and growth of a new academic field: Science, Technology, and Society (STS). STS does not refer to the kinds of preparatory studies or advanced work in various technical fields pursued by aspiring or practicing scientists and engineers. Rather, it refers to the study about science and technology. More precisely, STS refers to the study of science and technology in society- that is, the study of the ways in which technical and social phenomena interact and influence each other.

STS also encompasses the internal study of science and technology. Internal refers to studies of phenomena such as the general nature and interrelationship of science and technology, the social structures and reward systems of the professions of science and engineering, and social aspects of everyday scientific and technological activity.

Besides their increasing social importance and the growing recognition of that importance, the phenomena of science and technology in society are studied by scholars because they are interesting and complex sociocultural phenomena.

STS as an approach means starting with students, their questions, using resources available to work for their resolution, and wherever possible, advancing to the stage of taking actual actions individually and in groups to resolve actual issues. STS approach is expected to increase general interest and understanding of science. It is also expected to fill a critical void in the traditional curriculum. Harms and Yager (1993) further derive four main purposes of the STS approach, namely:

1. Preparing students to use science for improving their own lives and as a corollary to be able to better understand and cope with an increasingly technological society.
2. Enabling students as they progress through life to deal with STS issues in a responsible manner.
3. Identifying a body of knowledge that would enable them to deal with STS issues.
4. Acquiring knowledge and understanding about career opportunities in the

field. Enabling the students plan for their careers by comprehending the possible job opportunities available in their job market.

## SUGGESTED READINGS AND REFERENCES


1. Agsalud, Priscilla Signey. (2012). *Science, Technology and Society*. Great Books Publishing

2. Bautista, D., N. Bruce, J. Marasigan-Dungo, C. Garcia, J. Imson, R. Labog, F. Salazar, J. Lee-Santos. (2018). *Science, Technology and Society.* Maxcor Publishing House Inc

3. Ballena, N., R. Bernal, L. Paquiz, R. Ramos and L. Viet. (2004). *Science, Technology and Society*. Trinitas Publishing

ACTIVITY 1

**THE PARADOX OF OUR TIME**

Direction: Read the essay below and compose a reflection paper (maximum of 300 words) focusing on three (3) paradoxes that you have personally experienced in your life and in relation to STS. For Classes A and B submit your work in your respective Google classrooms. For Class C, write your reflection in a short bond paper.

The Paradox of Our Time
Dr. Bob Moorehead

The paradox of our time in history is that
we have taller buildings but shorter tempers;
wider freeways, but narrower viewpoints.
We spend more, but have less;
we buy more but enjoy less.

We have bigger houses and smaller families,
more conveniences, but less time;
we have more degrees, but less sense;
more knowledge, but less judgement;
more experts, yet more problems,
more medicine, but less wellness.

We drink too much, smoke too much,
spend too recklessly, laugh too little,
drive too fast, get too angry,
stay up too late, get up too tired,
read too little, watch TV too much, and pray too seldom.

We have multiplied our possessions, but reduced our values.
We talk too much, love too seldom, and hate too often.
We've learned how to make a living, but not a life,
we've added years to life not life to years.

We've been all the way to the moon and back, but have
trouble crossing the street to meet a new neighbor.
We conquered outer space but not inner space.
We've done larger things, but not better things.

We've cleaned up the air, but polluted the soul.
We've conquered the atom, but not our prejudice.
We write more, but learn less.
We plan more, but accomplish less.
We've learned to rush, but not to wait.

We build more computers to hold more information to
produce more copies than ever, but we communicate
less and less.

These are the times of fast foods and slow digestion;
big men and small character;
steep profits and shallow relationships.
These are the days of two incomes but more divorce,
fancier houses but broken homes.

These are days of quick trips, disposable diapers,
throw-away morality, one-night stands,
overweight bodies, and pills that do everything
from cheer to quiet, to kill.

It is a time when there is much in the show window and
nothing in the stockroom. A time when technology
can bring this letter to you, and a time when you can choose
either to share this insight, or to just hit delete.

Remember, spend some time with your loved ones,
because they are not going to be around forever.

Remember, say a kind word to someone who looks up
to you in awe, because that little person soon
will grow up and leave your side.

Remember, to give a warm hug to the one next to you,
because that is the only treasure you can give with
your heart and it doesn't cost a cent.

Remember, to say "I Love you" to your partner and
your loved ones, but most of all mean it.
A kiss and an embrace will mend hurt when it comes
from deep inside of you.

Give time to Love, give time to speak, give time to
share the precious thoughts in your mind.

## RUBRICS ON REFLECTION PAPER

| Reflection Paper Rubric | Exceeds Standards 10 points | Meets Standards 7 points | Unsatisfactory 1-3 points | Score |
|---|---|---|---|---|
| Organization | Well-organized, well written, easy to read and understand. | Well-organized but “flow” could be improved. | Organization lacking and difficult or impossible to follow. | |
| Reflection | Shows strong evidence of reasoned reflection and depth. | Shows evidence of reasoned reflection. | Lacks reflection and depth. | |
| Grammar and Spelling | No errors. | 1-2 minor errors | Lacks basic proofreading or contains major errors. | |
| TOTAL | | | | /30 |