GE 7- SCIENCE, TECHNOLOGY, AND SOCIETY HANDOUT

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UNIT I. GENERAL CONCEPTS AND HISTORICAL ANTECEDENTS OF SCIENCE AND TECHNOLOGY

Overview

Science and technology are connected in society, people began to deal with science and technology since ancient times. They used and experienced science and technology in the community since then, starting from old ages until now in the modern ages. Reflected on the historical development and the progress in science and technology too. The science and technology that evolved in society were based on their needs and demands, hence, Science and technology shaped society. This unit will help the student understands the factors of how science and technology changed over time. Moreover, students will become aware of some basic terminologies included in this unit, they will learn the different factors that affect the science and technological advancements in the Philippines and to the other countries.

CONTENT

Introduction to Science and Technology

Science includes the systematic study of the structure and behavior of the physical and natural world through observation and experiment, meanwhile, **technology** is the application of scientific knowledge for practical purposes (*Oxford Reference*).

Historical Antecedents of Science and Technology in The World

People believed that science and technology began in ancient times up to the present. Progress in science and technology exist over time as reflected in its historical advancement as shown as follows [Ang, R., Cruz, J., et al. (2018)]:

ANCIENT AGE

The Three–Age System Under the Ancient Age

1. Stone Ages
2. Bronze Ages
3. Iron Ages

The "Three–Age System"

A System of classifying ancient ages based on tool developmental stages.

The person behind this "Three–Age System" is named Christian Jurgensen Thomsen

1. Stone Ages

These are the Substantial Event During the Stone Age:

- Period of weapons made of stone, wood, bone, or other materials aside from metals.
- Shown cultural evolution of tools from chipped to polished stones

According to John Lubbock, The Two (2) Divisions of the Stone Age Are:

- Paleolithic Periods
- Neolithic Periods

Paleolithic Periods

- Central Event During Palaeolithic Periods:
- Began Approximately 2 Mya and Ended Between 40,000 – 10,000 years. ago
- Longest Phase of Human History
- People Live in Small Bands
- Used Tools Made of Stones, Flints, Bones, And Even Antlers
- Humans were hunter-gatherers
- The successive divisions of Palaeolithic periods are: Lower, Middle, and Upper Palaeolithic Periods

These are the Cultural Features of the Lower Palaeolithic Periods:

- Marked the Age of Human Evolution
- Had Development of Simple Tools Like Stone Chopper
- Tools Used in Food Hunting/Gathering/Cutting Edge

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- Australopithecus which unearthed from Olduvai Gorge, Tanzania
- 100,000 – 500,000 years old stone tools made by Homo Erectus (Discovered in various places like Africa, Europe, and European Sites)

These are the Cultural Features of the Middle Palaeolithic Periods:

- Early Human Ancestor, Called Neanderthal Man
- Existed 40,000 – 100,000 Yrs. Ago
- Cavemen Existed
- Evidence of Painting the Dead Before Burial Practiced During This Period

These are the Cultural Features of the Upper Palaeolithic Periods:

The period was known for communal hunting, extensive fishing, cloth sewing, sculpture, painting, and making personal ornaments out of bone, horn, and ivory.

- Manmade dwellings called pit houses
- Arts arose
- Had to have highly refined weapons like flint, obsidian projectile points, and blades
- Variety of cultures of homo sapiens group (ex. Cro-Magnon man, Grimaldi man)

These are the cultural features of the Mesolithic periods:

- People began to learn to fish along rivers and lake shores
- Make pottery and use the bow
- In the gradual transition from food hunting to agriculture they used tools called microliths

These are the cultural features of the Neolithic periods:

- Wide domestication of plants and animals
- Used stone tools and pottery and weaving in numerous settled villages
- Had cultural and technological development in agriculture

2. Bronze Ages

- During 3000 BC – 1200 BC
- The period is marked by the introduction of metal tools in these cultures.
- Tools and weapons were already made with copper and bronze
- Metal extractions were achieved from ore (a process known as smelting)
- Alloys of metals exist
- Large early trading centers existed
- Bronze used to make tools and weapons
- Farm tools and weapons were being made
- New metal was expensive to make

3. Iron Ages

- 1500 BC – 450 A.D
- Articles made of iron.

Subdivided into two (2) smaller groups:

1. Dark (450- 1000 A.D)
2. High middle ages (1000 – 1450 A.D)

These are some of the inventions during Iron Agthe es in the country of China:

1. Papers
2. Seismograph
3. Animal harness
4. Water – power
5. Mechanical clock
6. Wheelbarrow
7. Hydraulic engineering works (waterway control & irrigation)
8. Gun powder
9. Guns
10. Cannons
11. Printing press
12. Magnetic compass

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These are some of the inventions during the Iron Ages in Europe:

1. Magnetic compass
2. Watermill and windmill
3. Lenses with spectacles
4. Gunpowder and cannon
5. Paper and printing
6. Medicine
   - involved magic, faith, charm, prayer, and herbs

- poor hygiene and sanitation in general

The following are some of the inventions during the iron ages in India:

1. Medicine/science/ mathematics
   - information on diseases and drugs.
   - information on astronomical bodies was gathered.
2. know solving square roots and linear equations.
3. metallurgy was developed (material science and engineering that studies the physical and chemical behaviors of metallic elements)

SCIENTIFIC REVOLUTION

Period with great scientific intellectual achievements that led to radical changes in scientific inquiries. Some of these are:

- **Universe Model by Nicholas Copernicus**

Describes the sun as the center of the universe; and that the earth and other planets revolve around it in circles.

- **Law of Planetary Motion by Johannes Kepler** – all planets revolve around the sun in elliptical, not circular, orbits, and the closer planets to the sun move faster than the others.
- **Work of Motion By Galileo Galilei** - involves the discovery of the relations among distance, velocity, and acceleration and the law of inertia using scientific approaches.
- **The law of universal gravitation by Isaac Newton** - states that the particles use a force that is directly proportional to the product of their masses and inversely to the square of the distance between their centers.

INDUSTRIAL REVOLUTION

Some of the highlights during this period are:

- Industrial Revolution (from 1750 to 1895 A.D)
- With complex technological inventions that replaced human and animal forces.
- Covers the complex technological innovations that lead to the substitution of machines and inanimate power for human skills and animal forces.
- Remarkable technological advancement:
- Textile, coal and iron and steel, transportation, communication, lighting, and agriculture.
- Some of the inventions are Radio, telephone, electric telegraph, gas lighting, Bunsen burners, electric light, seed drill, steamships, steamboats, blast furnaces and fly-shuttle and cotton gin, etc.

18th TO 19th CENTURY

The connection between science and technology was very minimal. Science, technology, and industry united at a common ground and cause.

Some of the inventions and inventors are:

- Cell or battery – Alessandro Volta
- Discovery of x-ray – Wilhelm Roentgen
- Mercury thermometer – Daniel Gabriel Fahrenheit
- Atomic theory – John Dalton
- Discovery of electron- Joseph John Thomson
- Discovery of cell – Robert Hooke

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- Introduced binomial nomenclature of classifying species – Carolus Linnaeus
- Discovered cell nucleus – Robert Brown
- Vaccine against rabies – Louis Pasteur

20th CENTURY TO DATE

Some of the highlights during this period are:

- Science and technology had structurally and methodologically changed.
- Many scientific theories were introduced and influenced technological works in this century.
- Physics, biology, astronomy, chemistry, earth science, biotechnology, communication, defense, energy, entertainment, medicine, transportation, information, and computer technology.

Some of the inventions and inventors are:

- Theory of Relativity – Albert Einstein
- Discovery of Neutron – James Chadwick
- First Walk on The Moon – Neil Armstrong and Buzz Aldrin
- Paper Chromatography – Mikhail Tsvet
- DNA Structure – James Watson & Francis Crick
- Sheep Cloning (named Dolly) – Ian Wilmut
- Discovery of Stratosphere – Leon Philippe Teisserenc De Bort
- Discovery of Earth's Crust and Mantle Boundary – Andrija Mohorovicic
- Continental Drift Theory – Alfred Wegener
- Theory of Seafloor Spreading - Harry Hess
- Biosensors, DNA fingerprinting, gene cloning, synthetic skin, radio, cellular phone, and fiber optics. Tear gas, army tanks, atomic bombs, neon lights, nuclear power plants, solar power, calculator, computer floppy disk, video cassette, Betamax video system, colored tv, laser printer, internet, artificial heart, mammography, pacemaker, test tube baby, x-ray laser, airplane, helicopter, jet engine, and space shuttle, etc.

INFORMATION AGE

Sometimes called the digital age, new media age, or information age. Coupled with the birth of personal computers an era with easy access to any piece of information

The period is characterized by the change from traditional industry to an economy that is founded on the computerization of information. Johannes Gutenberg, in Europe, was a German blacksmith and publisher who introduced "movable type printing" [Ang, R., Cruz, J., et al. (2018)].

The Pre - Gutenberg World

Some of the highlights during this period are:

- The printing press was not yet around
- Information could be processed in a tedious manner
- Books were written and produced by hand
- Made on the surface of clay, wax, papyrus, and parchment
- Books are restricted only to the elite group of people.
- Information was only relayed to others through a word-of-mouth channel.
- Began with the introduction of movable printing.
- Books were initially written in Latin.
- Books contained religious texts of the medieval period.

The Gutenberg Revolution

Some of the highlights during this period are:

- The local languages were used and medical books were also published.

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- Era can be described as the emergence of the Internet and the world wide web.
- Paved the way to the possible uploading and downloading of all forms of media instruments such as video, audio, and images.
- The passing of information is much faster and easier
- People publish or spread information

The Post- Gutenberg World- the rise of the digital age printing presses are not the only tools used in spreading information. Computers, cell phones, digital cameras, and computer printers are now available.

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SCIENCE AND TECHNOLOGY IN THE PHILIPPINES

PRECOLONIAL PERIOD

Some of the highlights during this period are:

- Period before 1521
- Early settlers called modern man (Homo Sapiens)
- They make simple tools and produced seashells ornaments & pottery of various designs.
- Few reliable written materials information available (*early traders and narratives from first Spanish missionaries were the source*s)
- Filipinos made use of boats for coastal trade like the caracao.
- Gradually they learned to manufacture tools made of copper, gold, bronze, and iron.
- Filipino traded beeswax, cotton, pearl, cloth, iron pots, colored glass beads, iron needles, and tin. Meanwhile, Vietnam and China traded porcelains.
- Filipino traded with Borneo, Mallaca, and other Malay Peninsula.
- Cultural and technological influences reached and diffused in the Philippines.
- Filipinos were believers in superstitions.
- They had their writing and measuring systems and counted the years by moons and from one harvest to another.
- -Coastal areas made more sophisticated technology compared to other areas due to their exposure to foreign trade and cultural influences.
- -Filipino were still hunter-gatherers (remote areas)
- -They knew agriculture, raising farm animals, producing wine, vinegar, salt, and bee products & mining.
- Filipino lived in wood, bamboo, or nipa houses with more colorful clothes, self-made jewelry, and even teeth ornamented with gold

SPANISH REGIME

These are some of the highlights during this period:

- Period of birth of modern science and technology in the Philippines.
- Religious orders had great influence.
- They had education and politics.

Politics

- Barangay was headed by Datu *(the lowest level of local government)*
- The tax was imposed and collected
- Compulsory labor services were enforced among the native Filipinos.
- Compulsory sales of local products to the government were implemented,

Education

- Primary education was mainly religious.
- Established with the help of religious orders.
- Higher education is mostly accessible to the elite of the society.
- Higher education was initially offered for the priesthood and clerical positions in the government.

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Agriculture
- Exporter of agricultural products
- In 1887, established Manila (show of agriculture) to promote agricultural development in the country.

Economy
- Galleon Trade (Manila to Acapulco during 1565-1813)
- Weaving, embroidery, hat making, cigar, & cigarette making
- Water work system
- Banking system
- Rope making
- Stream tramway, electric lights
- Newspaper

Economy
- Due to a lack of support, Philippine native industries did not survive the foreign imported products.

Medicine
- Mostly used herbal plants
- In 1871, schools of pharmacy and medicine were opened at the University of Sto. Tomas
- Leon Ma. Guerrero is known as the Father of Philippine Pharmacy (The First BS Pharmacy graduate, worked extensively on Phil. Medicine Plants).
- Perform biochemical analyses for public health purposes and specimen examination for clinic and medico-legal cases.

AMERICAN REGIME
- The rapid advancement of science & technology in the Philippines

Some of the developments were the following:
- Encouragement and support of the government were seen. Evolved of the extensive public educational system.
- Scholarship grants in science and engineering.
- Organization and establishment of science research agencies.
- Establishment of science-based public services.
- Used English as the medium of instruction.
- Enacted the Private School Act (Act. No. 2076 in 1917)
- In 1901, created the Bureau of Government Laboratories by the Philippine Commission renamed as Bureau of Science.

Bureau of Science
- Served as the primary research institution until the end of World War II.
- 1933, NRCP, established the National Research Council of the Philippine Islands.
- The Philippines remained an exporter to the U.S.A of various crops & raw materials.

Moreover, the following offices were organized in the country and contributed to the development of its scientific researchers:

a. Bureau of Health
b. Bureau of Mines
c. Bureau of Forestry
d. Bureau of Agriculture
e. Weather Bureau
f. Bureau of Coast and Geodetic Survey
g. Bureau of Plant Industry
h. Bureau of Animal Industry

COMMONWEALTH PERIOD

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Some of the momentous events were the following:

- The former Philippine President during this time was Manuel L. Quezon and the Vice-President was Sergio Osmeña.
- Expansion of the public school system.
- Numerous government corporations were formed to perform various functions in the country.
- More Industrial and Scientific research was also performed.
- Foreign trade policies are still controlled by the American government
- In 1941, the Japanese troops came into the country.
- Destruction of various institutions built for the country's science and technological development.
- In 1941 (Dec. 8, 1941), when imperial Japan occupied the Commonwealth of the Philippines.
- From 1941 to 1945 World War II happened.

PERIOD SINCE INDEPENDENCE
Some of the developments were the following:

- In 1946, the Philippines regained its Independence
- Continued support for scientific research and development through education.
- Private universities & colleges were established/ recognized since then supervised by the Department of Education and Culture (DEC).
- Birth and increase various science agencies of the government
- Act of 1958 (R.A 2067), created the NSDB (National Science Development Board). Responsible for making science developmental policies and coordinating the activities of various science institutions.
- In 1982, NSDB reorganized becoming NSTA (National Science and Technology Authority)
- In January 1987, NSTA (National Science and Technology Authority) converted to DOST (Department of Science & Technology)

Department of Science and Technology (DOST):
Before named as:

- Institute of Science (1947)
- Institute of science and technology
- National science development board (1982)
- National science and technology authority
- Department of science and technology (1987)

Now, DOST (Department of science and technology)

Role of the Department of Science and Technology (DOST)

- Plays a role in pursuing the declared state policy of supporting local scientific and technological efforts.
- Developing local capability for technological self-reliance.
- Encouraging greater private sector participation in national research & development.

UNIT II. INTELLECTUAL REVOLUTION THAT DEFINED THE SOCIETY

Overview

In the previous unit, students learned how scientific and technological development affects society. They became familiar with the interactions of science, technology, and society through the antecedents of history. Thus, students fully understood now a glimpse of concepts on STS historical development.
In this unit, students will learn about the development of science and scientific ideas in society. Activities included will allow students to figure out the different intellectual revolutions like Copernican, Darwinian, and Freudian, and other intellectual revolutions that shaped society. Additionally, students will also appreciate the

various contributions of some selected great civilizations found in the world that adds transformation to the science and technology that build significant changes to the heart of the society.

CONTENT

Intellectual Revolution vs. Scientific Revolution

Frontlearners Module (2019) defined *Intellectual Revolutions* as the historical changes in thoughts, beliefs, and social institutions due to new ideas and principles like Copernican, Darwinian, and Freudian. It may also refer to the historical period when science became more important and influential during the Middle Ages. The intellectual Revolution was also considered a golden age in the history of science because it marked the birth of science as a discipline wherein many scientific ideas and discoveries were developed. Meanwhile, Frontlearners Module (2019) cited that when science and technology are the centers of an intellectual revolution, it can be called then as a *Scientific Revolution.*

Some Intellectuals Who Made Essential Contributions to Science during the Period of Scientific Revolutions:

- Nicholas Copernicus (Copernican) – developed a model of the universe in which everything moved around a single center at unvarying rates. He placed the sun in the center of the universe, and all the planets surrounding or orbiting it. Copernicus' Model of planets orbiting around the sun automatically positioned the planets into a logical sequence [Ang, R., Cruz, J., et al. (2018)].

  Heliocentric Model – adopted to use to prove the idea that the sun is the center of the solar system.

- Charles Darwin (Darwinian) - His theory of evolution by natural selection (process) is instrumental in many fields until now. Content of Darwin's Theory of Evolution. All organisms are related and have descended from a common ancestor. Variation in a population helps different species to survive. The animals that do survive and reproduce are better-adapted organisms (survival of the fittest). A random genetic mutation occurs within an organism's genetic code, to aid survival [Ang, R., Cruz, J., et al. (2018)].

- Sigmund Freud (Freudian) - developed the idea of psychoanalysis that helped in understanding human behavior, especially neurological conditions. Human actions result from the interactions among three parts of the mind: id, ego, and superego [Ang, R., Cruz, J., et al. (2018)].

  - Id – part of the personality that is present at birth; primitive personality existed within the unconscious.
  - Superego - includes the ideas of right and wrong acquired from society and culture. Overpower the urges of the id and tries to make the ego moral, rather than realistic. Composed of people's internalized ideals acquired from parents and society.

  - Ego – less primitive than the Id, partly conscious and unconscious. It facilitates the demands of the Id, superego, and reality. - It prevents people from acting on the basic urges created by the id and works to balance their moral and idealistic standards created by the superego.

Information Revolution

Accompanied the history of mankind and began as early as 3000 BC with Sumerian Pictographs. - Triggers profound changes both in the way of lives and, in a way, perceive the self as human beings [Ang, R., Cruz, J., et.al (2018)].

Milestones of the Information Revolution are:

- In 1455, Johannes Gutenberg's invention on a printing press.

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- In the early 1830s, Charles Babbage worked on Analytical Engine.

- During the 1870s, the Invention of the first telephone.

- During World War II, Alan Turing refined the concept of algorithms and computation using the Turing Machine. He contributed to the Turing test concerning the possibility of developing a conscious and thinking machine in Artificial Intelligence.

Science provided different ancient civilizations with the means to survive and understand the natural and physical world. Help humans to develop various technologies used in everyday tasks. Cited below are some ancient civilization and their significant contributions that defined the society [Ang, R., Cruz, J., et.al (2018)].

Mesoamerican Civilization

- Located in the region and cultural area in the Americas - Contributed greatly to agriculture (as early as 7000 BC)
- The transition from hunter-gatherer tribal groupings to the organization of sedentary agricultural villages.
- The main food sources were beans, corn, & squash (a triad of products known as the "three sisters"; introducing the rotational crops and slash-and-burn aided in retaining the nutrients in the soil.
- Value cacao as an essential crop because it is used as a trade currency and in rituals.
- Cotton plants & rubber trees are used for making culturally significant products like textiles (vibrant colors) and rubber balls (used in performance games) due to ritual significance.
- Created chinampas (plots of mud and soil placed on top layers of thick water vegetation)
- First, to use irrigation techniques.
- The first one is to create a calendar (like a civil calendar or Haab and Tzolkin Calendar).

Asian Civilization

- Asia bore 2 of the world's great early civilizations: From India & China
- Birth of the two world's known religions: Hinduism & Buddhism.
- In Hinduism, based on Vedas (4 sacred books; believed written by Aryan People); People believed to be divided into a "caste system"; Priests called
- Brahmans (ranked highest) and the "untouchables" as lowest.
- In Buddhism, praise Buddha (meaning "The Enlightened One") who is in the person of Siddharta Gautama (believed that human greed and selfishness lead to human pain).
- Another religion Confucianism, developed along the Huang Ho riverbank in Northern China, is based on the teaching of Confucius.
- Created the Great Wall of China, built to protect from invasions of "barbarians" from other parts of Asia.

Middle East Civilization

- Considered the home to the "Cradle of Civilization" (seen world's oldest culture and civilization).
- First to practice intensive year-round agriculture and currency-mediated trade as opposed to barter.
- Gave the rest of the world the first writing system.
- Laying the foundation for astronomy and mathematics.
- Created the first generalized government and law codes.
- Invented the clay cylinder seals (on which little pictures of objects could be recorded)
- Early writings evolved from pictures baked on clay tablets.

African Civilization

- According to some historians, Africans were nothing more than savages whose only contributions to the world were farming and slaves.

- Lineage and culture of achievements emerged at least 40,000 years ago in Africa. Some were the following:

- Developed modern concepts in mathematics like the first method of counting.
- People in present-day Zaire and Yoruba (now Nigeria) developed the Numeration system 8,000 years ago.
- In the Yoruba, the system lauded this system because it required much abstract reasoning. African Stonehenge (in present-day Kenya) was constructed around 300 BC a remarkably accurate calendar.
- Meanwhile, the Dogon people of Mali have various astronomical discoveries like Saturn's rings, Jupiter's moon, the spiral structure of the Milky Way, and the orbit of the Sirius Star.
- They built great architectural Monuments along the Nile like the Great Pyramid of Giza, and the Great Sphinx of Giza, and great cities like Zimbabwe & Mozambique (made of massive stone complexes and huge castle-like compounds existed).
- The Empire of Mali boasted impressive cities, including Tumbuktu with grand palaces, mosques & UNIVERSITIES in the 13th century.
- In Medicine, some practices were: the use of plants with salicylic acid for pain, kaolin for diarrhea, and extracts that were confirmed to kill Gram-Positive bacteria.
- Other plants used had anticancer properties, caused abortion, and treated malaria.
- Some medical procedures performed in ancient Africa: Vaccination, autopsy, limb traction, broken bone setting, bullet removal, brain surgery, skin grafting, filling of dental cavities, installation of false teeth, anesthesia, and tissue cauterization.

UNIT III. SCIENCE AND TECHNOLOGY IN NATION BUILDING

Overview

This lesson will discuss the importance of science and technology in building its nation, and how different science-related programs and policies shaped solid science and technology in the country. Part of this unit is the indigenous science and technology that serves as foundations of modern science and technology, Science Education highlighted here to stress some factors that affect the teaching and learning of sciences and technology in the Philippines, mentioned challenges in the different projects and programs of the country leads challenges to act.

CONTENT

SCIENCE AND TECHNOLOGY

Plays an integral part in human development & society because it can put an end to ignorance, improve quality of life, and increase perceptions of a fact or a situation. Gives significant breakthroughs can only be achieved through a strong scientific foundation. Hence, Give various changes in society [Ang, R., Cruz, J., et al. (2018)].

The Philippine Science & Technology Agenda:

- National Integrated Basic Research Agenda (NIBRA) – a program led by DOST. Focus on basic principles of research. Water security, Food & Nutrition Security, Health Sufficiency, Clean Energy, Sustainable Community & Inclusive Nation-Building.
- Health Research and Development Agenda
- Agricultural Aquatic & Natural Resources
- Industry, Energy & Emerging Technology
- Disaster Risk Reduction & Climate Change Adaptation

Agencies responsible for the Implementation of Harmonized Research & Development Agenda 2017 -2022:

1. DOST – Department of Science & Technology
2. NRCP – National Research Council of the Philippines
3. PCHRD - Philippine Council for Health Research & Development
4. PCIEERD – Philippine Council for Industry, Energy and Emerging Technology Research & Development.

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5. PHIVOLCS – Philippine Institute of Volcanology and Seismology
6. PAGASA – Philippine Atmospheric Geophysical and Astronomical Services Administration
7. PCAARRD – Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development.

Some Government Policies About Science and Technology

1. Republic Act 10055 – Known as the Philippine Technology Transfer Act of 2009.
   - aims to provide and support intellectual property resulting from research and development funded by the government.
2. Republic Act 2067 **-** known as the Science Act of 1958
   - focuses on the integration, coordination, and intensification of S & T research and development.

Some Major S & T Development Programs in the Philippines:

- Balik Scientist Program (By DOST) – Launched to motivate the well-trained overseas Filipino experts to come home to the Philippines and shared their expertise for the development of the country.
- Cara-Vita Organic fertilizer
- Project NOAH (Nationwide Operational Assessment of Hazard) - developed a more accurate and responsive disaster prevention and mitigation system
- Electric Train Project 2015 (ERT)
- DREAM (Disaster Risk and Exposure Assessment for Mitigation Program) – Three-Dimensional (3D) Mapping Program to effectively and accurately measure critical flood elevation and depth.

Science Education

It deals with the teaching & learning of science thus helping the public develop science literacy. Hence, important in the promotion and development of S&T in the country

Moreover, science is one of the subjects taught in elementary up to tertiary education. It was seen in the various field shown in the following:

Science Subject:

- Taught in Elementary & Secondary under the K to 12 Program supervised by the Department of Education (DepEd)
- Taught in Tertiary implemented and supervised by CHED or Commission on Higher Education (Created under RA 7722 in 1994)

In grade levels, there is a sequence of domains or strands per quarter that Caters to the need of the student. To promote science education: Science Schools established in the Philippines like Philippine Science High School System or PSHSS prepared by DOST. It has 16 campuses nationwide and was initiated by the Department of Education (DepEd).

Some Problems in Science Education Seen in the Philippines:

- Lack of Science Education Facilities
- Teacher qualification and preparedness (Factors in the teaching & learning Science)

Hence:

Need for continuous Capability Enhancement programs. Build Laboratories, Purchase Teaching Materials.

Selected Indigenous Science and Technologies

Indigenous Science is a product of indigenous knowledge perfected by man through life experiences. It uses process skills like (observing, comparing, measuring, problem-solving, communicating, inferring, & predicting). Additionally, guided by culture and community values composed of traditional knowledge and valued by people and communities. Hence, develop Science and Technology that gave birth to Science and Technology as a field and discipline.

Some the Example of Indigenous Science are:

- The use of herbal medicine
- Building irrigation system
- Making wines and juices from fruits
- Traditional health habit practices
- Knowledge of preserving foods. Etc.

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Indigenous technologies are a product or process resulting from the continuous pursuit of indigenous science. Samples are Yoyo, Patis or fish sauce, a medical Incubator, and Banana Catsup.

INFLUENCES ON THE DEVELOPMENT OF SCIENCE AND TECHNOLOGY IN THE PHILIPPINES

- Internal Influences: Survival, Culture, Economic Activities
- External Influences: Foreign Colonizer, Trades with Foreign Countries, International Economic Demands

Note: Indigenous science is one of the foundations of modern science.

UNIT IV. HUMAN FLOURISHING

Overview

In previous units, students learned the introduction and the historical antecedents of science and technology that shaped the society including the different science-related programs and policies that help in building the nation.

Now, students will be ready to understand the different philosophical perspectives on how people will prosper in life through science and technology. The lesson emphasizes the value of having happy and prosperous life to achieve human flourishing. At the end of the unit, a general awareness and understanding of human flouring will be attained.

CONTENT

HUMAN FLOURISHING

Key concepts:

Human being - Homo sapiens with superior mental development; and can articulate speech and upright stance

HUMAN, ACCORDING TO ARISTOTLE:

- Rational animal; because man can think and use reason consistently
- Made up of a material body and a spiritual soul
- A man is destined to live in the physical world, as he is part of it together with other living organisms.
- Science and technology can be used to satisfy man's material world.

CHARACTERISTICS OF HUMANS THAT EVOLVED OVER TIME

- Walking Upright
- Use of different tools
- Domestication of Animals
- Changes in the human body
- Complexity of the brain

As humans evolved, the brain size tripled and became the largest and most complex of any living primate. The evolution of the human brain focused on selective pressures of the physical environment (climate, diet, food availability) and social environment (group size, parental care). Man used language and symbols to communicate.

People communicated with each other using languages, symbols, and sounds. Modern humans used colors, printing presses, sounds, and language to communicate. Communication tools helped humans survive changes in the environment. As the famous passage that "No man is an island, entire of itself. Every man is a piece of the continent, a part of the main", hence, man is sociable longing for companions [Ang, R., Cruz, J., et al. (2018)].

SOCIETY

- Society derived from the French word "societe"; came from the Latin word "SOCIETAS" meaning a friendly association with others.

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- defined as an organization or aggregate of people living together with common interests or purpose or activity
- A group of people share commonness.
  SOCIETIES HAVE THE FOLLOWING IMPORTANCE:
- Support for each other
  The support given by society can be of physical, emotional, financial, or medical form. A system is implemented for the protection of society, the leader is selected, and social hierarchies and social codes are established.
- Formation of social groups.
  Giving rise to strong social bonds that result in long-lasting relationships, becomes the foundation of the government and building blocks of all nations.
- Formation of a culture.
  Culture - defines as the pattern of human activity in a society. Society also set the standard of good and evil.
- Regulation of policies and standards
  Regulates the distribution of public facilities to individuals; thus, gives central regulating authority.
- Achieving a common goal
  Serve as a strong support system in life. Forms a collective movement to work together for what would benefit all of them.

HUMAN FLOURISHING

Defined as an effort to achieve self-actualization and fulfillment within the context of a large community of individuals, each with the right to pursue his or her efforts.

- Long life existential journey of hopes and achievements, regrets, losses, illness, suffering, and coping.
- Human Prosperity or Happiness

Attaining the balance of intellectual virtues and virtues of characters through habit formation *(Eudaimonia).*

- It is a Greek word commonly translated as happiness or welfare.
- “Human flourishing or prosperity"

Eudaimonia - For Aristotle, the end of human life is to flourish, to live well, and to have a good life. All actions should aim at this end.

ARISTOTLE

- 384 -322 B.C, a pupil at Plato’s Academy for almost 20 years.
- Greek philosopher
- His father was a doctor and scientist.
- He used his senses.
- Believed in human purpose.
- Believed in the discipline of logic as a "science". Believed that everything in nature has the potentiality of realizing or achieving a specific form.

WELL-BEING THEORY

- By Martin E.P. Seligman
- Stated that human flourishing is not only focused on the happiness of individuals alone but also on psychological well-being.
- Human flourishing rests in five (5) pillars, denoted by the handy mnemonic PERMA.
- **P** stands for positive emotion. Emotion is an affective state of consciousness.
- **E** stands for Engagement. “Engaged life; being fully engaged means doing everything with enthusiasm.

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- **R** stands for Relationship. Accomplishments shared with other people. Additionally, other people are the best antidote to the downs of life and the single most reliable up. Human evolution could also be related to positive relationships with other people; other people are also part of the environment where humans adapt.
- **M** stands for Meaning. A meaningful life is based on a man's value or worth.
- **A** stand for Accomplishment. Something successful, or that is achieved after a lot of work or effort. Achieving life is dedicated to accomplishment for the sake of accomplishment.

- **END -**