L1: HISTORICAL ANTECEDENTS IN SCIENCE AND TECHNOLOGY

SCIENCE, TECHNOLOGY, AND OUR SOCIETY

- SCIENCE and TECHNOLOGY have long existed since ancient times. These advances in the history of technology stimulated SOCIETIES to adopt new ways of living and governance.
- Science drives the discovery and understanding of natural phenomena, leading to the development of technology, which makes a society improve and prosper.
- Our society right now is the result of discoveries and technology developed in the past.

HISTORICAL ANTECEDENTS IN SCIENCE AND TECHNOLOGY

- Historical antecedent refers to an event in history that existed or happened before, especially as the cause or origin of something that came later.
- A smartphone cannot exist without the first telephone.
- A high-rise building in the city cannot exist without the invention of the first brick.
- Therefore, it is important to look back at the Science and Technology of our past in order for us to understand and appreciate what we have right now in our modern society.

SCIENCE AND TECHNOLOGY ACROSS TIME

- Ancient Times
- Medieval / Middle Ages
- Modern Age
- Sumerian Civilization
- 4500 – 1900 BCE
- The earliest known civilization
- Located in the southern Mesopotamia
- Relied on Tigris and Euphrates Rivers to develop their civilization

SUN-BAKED BRICKS

- The Sumerians were able to build the first true city called Uruk, and their Ziggurat (temple of God) using "sun baked bricks".
- These bricks were made of mud or clay from the river, which they mixed with reeds for reinforcement.

CUNEIFORM

- It is the earliest known writing system and was originally developed to write the Sumerian language.
- It utilized pictures and triangular symbols which are carved on clay bricks and then left to dry or sun-baked.

IRRIGATION

- The Sumerians created levees (mounds of earth) to hold back the floods from their fields and cut canals to channel river water to the fields.
- This process helped in the mass production of food items through farming.

SAILBOAT

- It is the main mode of transportation through waterways such as rivers and seas.
- Sailboats were used to carry large quantities of products, covering large distances of travel.

WHEEL

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- The first wheels were not made for transportation but for farm work and food processes.
- Farmers were able to mill grains with less effort in less time.

PLOW

- Invented to dig the earth in a faster pace.
- As the plow breaks the ground, the farmer would just drop the seeds and farm work would already be done.
- Farmers were able to mass produce food without taking so much effort and time.

ROADS

- Constructed with the same technology used in making the sunbaked bricks that they laid down on the ground.
- Flow of traffic became faster and more organized, improving transportation and movement in cities.

BABYLONIAN CIVILIZATION

- 1894 – 539 BCE
- Like the Sumerians, the Babylonian civilization emerged near the Tigris and Euphrates Rivers.
- The Babylonians were great builders, engineers, and architects.
- They used the innovations of the Sumerians, added to them, and built an empire.

HANGING GARDENS OF BABYLON

- Structure made up of layers of gardens that contained several species of plants and trees.
- King Nebuchadnezzar II built the gardens for his wife, Queen Amytis.
- No physical evidence has been found to prove the existence of the structure, except in stories of historians and paintings.

CODE OF HAMMURABI

- A collection of 282 rules that established standards for commercial interactions as well as fines and punishment for crimes.
- "An eye for an eye, a tooth for a tooth." Whoever commits an injury should be punished in the same manner as that injury.
- Hammurabi's Code was carved onto a massive, finger-shaped black stone pillar.

EGYPTIAN CIVILIZATION

- 3100 BCE – 332 BCE
- Located in North Africa
- The civilization developed along the Nile River. The river's annual flooding ensured reliable, rich soil for growing crops.

PAPYRUS

- Material similar to thick paper that was used in ancient times as a writing surface. It was made from the pith or reed of the papyrus plant.
- It made writing easier for the world, replacing clay tablets that were very fragile, heavy, and delicate to handle.

INK

- Egyptians invented ink by combining soot with pigments, which was mixed with a binder (gum Arabic) and suspended in water, vegetable oil, or vinegar.
- Ink was invented because Egyptians shifted from engraving to writing in papyrus.

HIEROGLYPHICS

- Egyptian system of writing using symbols that may represent the objects that they depict but usually stand for particular sounds or groups of sounds.

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- Hieroglyphics were carved at the walls of pyramids and other important Egyptians structures.

COSMETICS

- Used for both health and aesthetic reasons.
- Egyptians wore Kohl around the eyes to prevent and even cure eye diseases.
- Kohl was created by mixing soot or malachite with mineral galena (Lead sulfide).
- They also believed that wearing make-up protects them from evil and that beauty was a sign of holiness.

WIG

- Wigs were worn to protect the shaved heads of the wealthy Egyptians from sunlight. They shaved their head to prevent lice.
- Wigs were composed of various materials such as human hair, sheep wool, plant fibers, and horsehair.

GREEK CIVILIZATION

- 1100 BCE – 146 BCE
- Archipelago in the southeastern part of the Europe
- Known as the birthplace of western philosophy
- Greek civilization flourished along the Aegean Sea. The sea provided means of transportation, trade, and communication, connecting various city-states and islands.

WATER MILL

- They were commonly used in agricultural processes like milling of grains which was a necessary form of food processing during that time.

ROMAN CIVILIZATION

- 753 BCE – 476 CE
- The civilization grew from a small town on the Tiber River in central Italy into a vast empire that ultimately embraced England, most of continental Europe, most of Asia, Northern Africa, and the islands of the Mediterranean.
- The empire was perceived to be the strongest political and social entity in the west.

AQUEDUCT

- Romans constructed waterways throughout their empire to bring water from outside sources into cities and towns.
- Aqueduct water supplied public baths, latrines, fountains, and private households.
- Chinese Civilization
- 2070 BCE – present
- Located in Eastern Asia
- Chinese civilization is considered to be the oldest civilization in Asia, if not the world.
- The Huang He (Yellow River) Valley is the birthplace of Chinese civilization.
- SILK PRODUCTION
- One of the things that connected Far East China to the world is silk.
- Chinese were the ones who developed the technology to harvest silk from silkworm cocoon and process it to produce paper and clothing.
- TEA PRODUCTION
- It was developed when an unknown Chinese inventor created a machine that was able to shred tea leaves into strips.
- This machine used wheel-based mechanism with sharp edges attached to a wooden ceramic pot.

GREAT WALL OF CHINA

- Chinese leaders instituted wall-building projects to protect the land from

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northern, nomadic invaders, resulting to the Great Wall.

- One surviving section of such an ancient wall, in the Shandong province, is made of hard-packed soil called "rammed earth".

GUNPOWDER

- During the Tang Dynasty, around 850 A.D., an alchemist mixed 75 parts saltpeter (potassium nitrate) with 15 parts charcoal and 10 parts sulfur. The aim of this mixture is to produce the elixir of life that would render their emperor immortal.
- It did explode with a flash and a bang when exposed to an open flame. It was not the elixir of life that they were expecting.

WOOD BLOCK PRINTING

- One of the world's first printing technologies
- Used paper, ink, and wood for printing
- An engraver would carve letters in relief on a block of wood. The block was then used to print texts and images.

MEDIEVAL/ MIDDLE AGES

- 5th - 15th century CE
- Period in European history after the collapse of Roman civilization.
- Wars were prevalent during this time. As such, great technology was needed in the fields of weaponry, mass food production, and health.

GUTENBERG PRINTING PRESS

- Johann Gutenberg designed and built the first known mechanized printing press in Europe, allowing the mass production of books.
- He utilized wooden machines that extracted juices from fruits, attached to them a movable metal impression of the letters, and pressed firmly the cast metal into the piece of paper.

MODERN AGE

- 1500 AD – Present
- Wide span of time marked in part by technological innovations, urbanization, scientific discoveries, and globalization.
- Began with early Europe
- Ideas of modern age spread because of European expedition and contact with the rest of the world.

MICROSCOPE

- After the invention of eyeglasses in earlier years, Zacharias Janssen was able to develop the first compound microscope in 1595.
- This helped us view and understand microorganisms that cause diseases, providing improvement in the medical field.

SPYGLASS

- Hans Lippershey was credited with the invention of the spyglass in 1608.
- The spyglass was used to view incoming ships in the port.

TELESCOPE

- In 1609, Galileo learned of the spyglass and began to experiment with telescope-making, grinding and polishing his own lenses.
- His telescope allowed him to see with a magnification of eight or nine times, making it possible to see that the Moon had mountains and that Jupiter had satellites.

NEWTON'S IDEAS

- Isaac Newton helped define the laws of gravity and planetary motion,

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co-founded calculus and explained the laws of light and color.
- He made groundbreaking discoveries while isolated during the Great Plague of London.

EINSTEIN'S EQUATION

- Albert Einstein was a famous scientist that had profound impact on quantum theory to nuclear power and the atom bomb.
- He came up also with the famous equation \bm{\text{E}=\text{mc}^2}.
- His famous equation explains the energy released in an atomic bomb but doesn't explain how to build one.

PASTEURIZATION

- Louis Pasteur, a French biologist, microbiologist, and chemist, invented pasteurization, the process of heating dairy products to kill the harmful bacteria that allow them to spoil faster.

PETROLEUM REFINERY

- Samuel M. Kier was able to discover kerosene by refining petroleum through distillation.
- Kerosene was used to provide lighting and heat to homes.
- The development of kerosene established the petroleum refinery industry.

TELEPHONE

- Alexander Graham Bell developed the world's first working telephone, receiving a patent on the 1876.
- The voice vibrations in the mouthpiece moved a diaphragm connected to an electromagnet, creating electrical signals. These signals traveled through wires to the earpiece, where they were converted back into sound.

CALCULATOR

- The first handheld calculator was a 1967 prototype called Cal Tech, whose development was led by Jack Kilby.
- Provided a faster way to compute equations.
- Why study the historical antecedents?
- Without the historical antecedents mentioned, our society right now will not reach its current state of development.
- We could say that we are "standing on the shoulders of giants".
- It means "using the understanding gained by major thinkers who have gone before in order to make intellectual progress".

L2: HISTORICAL ANTECEDENTS IN SCIENCE AND TECHNOLOGY

INTELLECTUAL REVOLUTION

- The term "Intellectual Revolution" was used to refer to Greek speculation about the "nature" in the period before Socrates.
- First, the world is a natural whole (supernatural forces do not make things happen).
- Second, there is a natural 'order' (there are 'laws of nature' that are observable).
- Intellectual Revolution
- People were committed to scholarly life during the period of Intellectual revolution.
- Commitment to learning scientific knowledge led to the death or condemnation of some scholars.
- Religious institutions condemned the scholars to preserve their faith, religion, and theologian views.
- In spite of all the challenges the scholars experienced, their ideas and theories led to a CHANGE or REVOLUTION on how people understand the world around them.
- People understood the world without relying too much on religion and faith...

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THREE NOTABLE SCIENTIST THAT CONTRIBUTED IN THE INTELLECTUAL REVOLUTION

- Nicolaus Copernicus: 1473-1543
- Charles Darwin: 1809-1882
- Sigmund Freud: 1856-1939
- NICOLAUS COPERNICUS
- HELIOCENTRIC THEORY
- What People Believed in the Past
- For nearly 1,000 years, Aristotle's view of a stationary Earth at the center of a revolving universe dominated natural philosophy.
- A geocentric worldview became ingrained in Christian theology, making it a doctrine of religion as much as natural philosophy.

OBSERVATION OF THE NIGHT SKY

- Astronomers such as Ptolemy didn't have modern technology (telescope) to observe space. They used their own observations during the night and mapped out planetary movement, along with the Sun and stars.
- Ptolemy accepted Aristotle's idea that the Sun and the planets revolve around a spherical Earth, a geocentric view.

PTOLEMAIC MODEL

- Claudius Ptolemy (100 CE - 170 CE) was an Egyptian astronomer, mathematician and geographer.
- He developed the geocentric model of the universe now known as the Ptolemaic system.
- The Earth is the center of the universe. Planets and stars move around the Earth.
- Ptolemy argued that the Earth was a sphere at the center of the universe, from the observation that half the stars were above the horizon and half were below the horizon at any time.
- The stars were all at distance from the center of the universe.

THE BASIC ELEMENTS OF PTOLEMAIC ASTRONOMY

- A planet has an epicycle and a deferent
- Epicycles are small circular orbits that move along much larger circular orbits called deferent.
- Ptolemy proposed that planets move in epicycles because of his observation of planets appearing to move backward in circles.
- This is now known as retrograde motion, wherein the planets as viewed from Earth appear to move backward in its orbit.
- Geocentric model was adopted and supported by the Catholic Church as it aligned with the religious belief in a stationary Earth at the center of the universe.

COPERNICAN MODEL

- In 1515, a Polish priest named Nicolaus Copernicus (1473-1543) proposed the heliocentric model, that the Earth was a planet like Venus or Saturn, and that all planets circled the Sun.
- The Sun is the center of the universe.
- Earth's rotation caused daily motion from east to west, making the night sky appear to move.
- Afraid of criticism because of his scientific shortcomings with his theories, Copernicus did not publish his theory until 1543, shortly before his death.
- De revolutionibus orbium coelestium (On the Revolutions of the Heavenly Spheres) was the book published by Copernicus.

COPERNICAN REVOLUTION

- The Copernican revolution caused the paradigm shift of how the earth and sun were placed in the universe.
- It is the idea that rejected Ptolemy's geocentric model (earth is the center of the universe) and introduced the

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heliocentric model (Sun is the center of the universe, having earth revolving around it).

- The theory gathered few followers, and for a time, some of those who did give credence to the idea faced charges of heresy (belief that goes against religious teachings).
- Italian scientist Giordano Bruno was burned at the stake for teaching, among other heretical ideas, Copernicus' heliocentric view of the Universe.

LEAVING A LEGACY

- Nicolaus Copernicus died on May 24, 1543 in what is now Frombork, Poland.
- He died the year his major work was published, saving him from the outrage of some religious leaders who later condemned his heliocentric view of the universe as heresy.
- It was not until the early 17th century that Galileo developed and popularized the Copernican theory with the use of the telescope.
- Galileo's study resulted in a trial and conviction for heresy.
- Following Isaac Newton's work in planetary motion in the late 17th century, acceptance of the Copernican theory spread rapidly in non-Catholic countries.
- By the late 18th century, the Copernican view of the solar system was almost universally accepted.

PROBLEMS WITH COPERNICAN MODEL

- Copernicus' heliocentric theory has its problems:
- First, the planets do not move in exact circles around the Sun, they move in oval paths called ellipses.
- Another important point is this idea of a center. The sun is not the center of the universe, but it is the center of the solar system.
- Lastly, retrograde motion is not caused by epicycles, but an optical illusion created by our planet's revolution around the sun, along with other planets.

CHARLES DARWIN THEORY OF REVOLUTION

DARWANIAN REVOLUTION

- The Darwinian Revolution refers to the impact of Charles Darwin's theory of evolution by natural selection to our understanding of the origin and diversity of species.
- It was considered to be one of the most controversial intellectual revolutions of its time because it provided a different idea about the "theory of Creation".
- Charles Darwin (1809-1882) was an English naturalist whose scientific theory of evolution by natural selection became the foundation of modern evolutionary studies.

HISTORY OF DARWIN'S STUDIES

- Charles Darwin had an intense curiosity about the natural world due to his training in medical science.
- In 1831, Darwin joined a 5-year voyage through the HMS Beagle on the Galapagos Islands upon the recommendation of his professors.
- He particularly liked and observed the different tortoise species on different islands of Galapagos.
- He realized that the tortoises had traits that allowed them to live in their particular environments.
- Darwin also studied different species of finches on different islands.
- Like the different shells of each tortoise species, Darwin noticed differences in beak structure of each species of finches, relating it to the environment and diet of the finch living on a particular island.

EVOLUTION THROUGH NATURAL SELECTION

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- Darwin believed that finches had a common ancestor.
- This common ancestor produced a variety of offsprings with different beak types.
- Not all variety will survive, only those who are fit with the environment they live in.
- This is called Natural Selection.
- Gray warbler finches with small beaks are adapted to catching insects and will survive on an island with large insect population.
- The Common cactus finch has a pointed beak adapted to feed on cactus, surviving on islands with large cactus population.
- Large ground finches that do not rely on insects have large beaks used to crush seeds and eat it.
- By studying the adaptations and similarities between different species, Darwin proposed that all organisms, including human beings, share a common ancestry and a product of natural selection.
- Variations between organisms resulted because of their differences in environment.

DARWINIAN REVOLUTION

- In 1859, he published his book "The Origin of Species" which presented his theory of evolution with overwhelming evidence.
- Many religious people did not like the theory because it conflicted with their beliefs about creation.
- Scientists argued about the theory; some agreed with it, while others needed more proof.
- Over time, people accepted the theory due to evidences presented.

LEAVING A LEGACY (DARWIN)

- Darwin's theory of evolution helped in explaining the world around us like never before.
- Darwin laid out concepts that allowed humans to understand our own existence without the need of supernaturalism.
- Darwin died on April 19, 1882, at the age of 73 due to heart failure.
- No high-level Church pronouncement has ever attacked head-on the theory of evolution as applied to non-human species.
- Although a bishop of the church did excommunicate Gregorio Chil y Naranjo in 1878 for his scientific work defending Darwin.

PROBLEMS WITH DARWIN'S THEORY

- We all know that racism creates a society where people don't trust and respect each other, leading to extreme cases such as prejudice and violence.
- Social Darwinists portrayed non-European races as less evolved, reinforcing harmful stereotypes and justifying practices such as slavery and imperialism. Although Darwin himself rejected these applications of his theory, the views associated with Social Darwinism resonated with prevailing racist attitudes of the time.
- Racism should not be advocated to maintain peace in society.

SIGMUND FREUD

FREUDAN REVOLUTION

- In the past, the field of psychology was classified under philosophy and was considered more an art rather than a science.
- In the later 19th century, Sigmund Freud was able to change people's perception of psychology with his revolutionary theory of psychoanalysis.
- Sigmund Freud (1856-1939) was an Austrian neurologist and the Father of psychoanalysis.
- Psychoanalysis is a clinical method for evaluating and treating problems originating from conflicts in the mind.

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- Some of the problems treated by psychoanalysis include: depression, generalized anxiety, and sexual problems.

FREUD PSYCHOANALYSIS

- Freud's Psychoanalysis Theory can be understood by analyzing its foundational components:
- Psychosexual Development Theory
- Theory of Personality
- Psychoanalysis (Definition & Theories)
- Definition: Psychoanalysis is a therapeutic approach and theory of mind developed by Sigmund Freud that emphasizes the role of the unconscious in shaping behavior, thoughts, and feelings. It seeks to uncover repressed memories, desires, and traumas through techniques like free association and dream analysis.
- Theories: Psychosexual Theory: Individuals progress through five sexual stages. Conflicts at each stage can have lasting impacts on personality and behavior.
-

FREUD'S PSYCHOSEXUAL STAGES

- Oral stage: Birth to 1 year - Erogenous zone: Mouth
- Anal stage: 1 to 3 year - Erogenous zone: Bowel and Bladder control
- Phallic stage: 3 to 6 year - Erogenous zone: Genitals
- Latent stage: 6 to puberty - libids inactive
- Genital stage: Puberty to death - maturing sexual interest

FREUD'S THEORY OF PERSONALITY

- Definition: Freud's Theory of Personality posits that human behavior is the result of the interactions among three component parts of the mind: the id, ego, and superego. The id operates on the pleasure principle, the ego mediates between the id and reality by acting on the reality principle, and the superego represents our brain's morality.

COMPONENTS:

- Id: The id operates on instinctual drives and the pleasure principle.
- Ego: The ego mediates between desires and reality, seeking practicality.
- Superego: The superego enforces moral standards and acts as the conscience.

FREUD'S COMPONENT OF HUMAN MIND

- Id - unconscious part of mind:
- This part of mind seeks to bring us pleasure
- Primitive part of our personality that includes pleasure-seeking drives, aggression, and sexual drives
- Ego - Conscious part of mind (Rational Self):
- Decides what action to take for positive means and what to do based on what is believed is the right thing to do.
- Aware of reality
- Superego - unconscious part of mind:
- Ethical component of the personality
- Provides the moral standards by which the ego operates.
- Acts as our conscience.
- The ID and the SUPEREGO are in constant conflict.
- Your drive tells you to do one thing, while society tells you to do something else.
- In the end, your EGO decides what action to take.
- If you don't resolve this conflict between ID and SUPEREGO, you may experience unhappiness or mental distress.

LEAVING A LEGANCY (FREUD)

- Freud's psychoanalytic theory, with its emphasis on the unconscious mind, has

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fundamentally altered our perception of human behavior.

- He proposed that our actions are not always governed by our conscious thoughts but are often driven by unconscious desires and experiences.
- Sigmund Freud died due to a lethal dose of morphine administered at his request by his friend and physician Max Schur.
- Freud had been suffering agonizing pain caused by an inoperable cancerous tumor in his eye socket and cheek. He died in the United Kingdom in 1939.
- The Catholic Church had been critical of Freud's theories, as they conflicted with the teachings of the Church on human nature, sin, and morality.
- On the other hand, Freud considered God as a fantasy, based on the infantile need for a dominant father figure.

PROBLEMS WITH FREUD'S THEORY

- Freud's ideas, despite being intriguing and appealing to common sense, lack substantial scientific evidence.
- There is no scientific evidence to support the Oedipus complex (boys lusting after their mothers and hating their fathers).
- There is no proof of the existence of the id, ego, or superego, or their purported control over the human psyche, despite the continued use of these terms.

L3: HISTORICAL DEVELOPMENTS OF SCIENCE AND TECHNOLOGY IN THE PHILIPPINES

History of Science and Technology in the Philippines

- The history of science and technology in the Philippines reflects a blend of indigenous knowledge, colonial influences, and the country's pursuit of scientific and technological advancements in the modern era.
- Looking back in time allows us to understand how our society became what it is at present because of the innovations done in the past.
- Philippine history is often divided into three time periods: Pre-colonial or Pre-Hispanic, Colonial, and Post Colonial or Contemporary.
- The Colonial Period is further subdivided into:
- Spanish Colonization
- American Colonization
- Japanese Occupation.
- Each period in Philippine History tells a unique story on how Science, Technology, and the Philippine Society work together to get to where we are right now.

PRE - COLONIAL PHILIPPINES

- Long before the Spaniards came to the Philippines, Filipinos had a civilization of their own.
- The recorded history of the Pre-Colonial Philippines between 900 and 1565 begins with the creation of the Laguna Copperplate Inscription in 900 and ends with the beginning of Spanish colonization in 1565.
- The Laguna Copperplate Inscription is an official acquittance (debt relief) certificate inscribed onto a copper plate in the Shaka year 822 (Gregorian A.D. 900).
- It is the earliest known calendar-dated document found within the Philippine Islands, marking the start of recorded history in the country.
- To understand the development of Science and Technology in Pre-colonial Philippines, we shall focus on the following aspects: Language, Agriculture and Trade, Medicine, Arts and Crafts, Engineering, and Clothing.

PRE - COLONIAL PHILIPPINES: LANGUAGE

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- The Austronesian languages were spoken in the pre-colonial Philippines.
- Austronesian refers to a family of languages spoken in an area extending from Madagascar in the west to the Pacific islands in the east.
- Early settlers in the Philippine archipelago have their own method of writing which they used sharp-pointed tools, leaves, bamboo trunk and skin.
- Baybayin is one of the precolonial writing systems used by early Filipinos in the Tagalog Region.
- It comes from the Tagalog root word baybay, which means "to spell."

PRE - COLONIAL PHILIPPINES: AGRICULTURE AND TRADE

- Farming: Main source of livelihood: rice, coconuts, sugar cane, cotton, abaca, bananas, oranges, and many species of fruits and vegetables.
- Two ways of Farming: Terracing and Kaingin.
- Kaingin: In forested areas, crops were grown on swidden (slash-and-burn) fields known as kaingin. Kaingin system involved clearing forested areas for planting through slash and burn method, then moving to a new area after a few seasons.
- Terracing: In mountain areas, farming was practiced through Terracing. Terraced fields were constructed on the slopes of mountains, particularly in the Cordillera region of Luzon. Banaue rice terraces, in the mountains of north-central Luzon, Philippines, were created more than 2,000 years ago by the Ifugao people (Igorot).
- Precolonial Philippines also relied on animals: Primary domesticated animals like pigs were raised for meat and other uses. Carabao (Water Buffalo) was an essential animal used for plowing fields and transportation. Coastal and riverine communities relied heavily on fishing.
- Barter Trade: Agricultural products were bartered within and between communities, in exchange for other materials needed. Early Filipinos traded agricultural products with the Chinese in exchange for metal pots, silk, porcelain, glass, beads, pearls, tortoise shells, and stoneware jars.

PRE - COLONIAL PHILIPPINES: MEDICINE

- Albularyo: general practitioners, often using herbal remedies and spiritual rituals to address a variety of ailments.
- Manghuhilot: specialize in musculoskeletal issues, employing massage and manipulation techniques for healing.
- Babaylan: These were priestly figures, often women, mediating with the spirit world and possessing knowledge of various healing practices.
- Herbal Remedies: Indigenous knowledge included the use of various plants and herbs to treat illnesses. Commonly used plants included ginger, garlic, betel leaves, and guava leaves. Remedies were prepared as decoctions (soup), poultices (topical application), or teas.

PRE - COLONIAL PHILIPPINES: ARTS AND CRAFT

- Pottery: Pots were made from locally sourced clay.
- Storage Jars (Tapayan) were particularly famous when it comes to pre-colonial Filipino pottery.
- Large jars were used for storing water, grains, and fermented foods.
- Burial jars were also used to store the bones of the deceased, placed after initial decomposition.
- The Manunggul Jar is a Neolithic burial jar from the Tabon Caves in Palawan, Philippines. It dates back to 890-710 B.C. and features two figures on the lid representing the journey of the soul to the afterlife.

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- On occasions, some clan forces would form alliances to attack more powerful opponents. Conventional weaponry during the pre-colonial era includes: Kris and Kampilan, Blowgun or Sumpit, and Canon or Lantaka.
- Balangay and Karakoa: The balangay is a boat that was used for cargo and trading. Karakoa, a special type of balangay, were large outrigger warships from the Philippines, used by native Filipinos, notably the Kapampangans and the Visayans, during seasonal sea raids.

PRE - COLONIAL PHILIPPINES: ENGINEERING

- Bahay Kubo: Houses in pre-colonial times were built to suit the tropical climate. It is made of wood, bamboo, and nipa palm; it was built on stilts and can be entered through ladders that can be drawn upward. Others, such as the Badjaos, built their houses in bodies of water.

PRE - COLONIAL PHILIPPINES: CLOTHES

- Precolonial Filipinos used a variety of materials for clothing, including abaca cotton, silk, and pineapple fibers.
- Precolonial Filipinos used natural materials that were woven and used to create garments like bahag, malong, baro at saya, and barong Tagalog.
- Gold was readily available throughout the Philippine archipelago, and gold items were valued as symbols of power and markers of elite status.
- Both men and women wore multiple ornaments of gold to display their status in the society.

END OF PRE - COLONIAL PHILIPPINES

- The precolonial period in the Philippines came to an end with the arrival of Miguel Lopez de Legazpi's expedition in the Philippines in 1565.
- This marked the beginning of Spanish colonization and the introduction of Western influence in the region, changing the landscape of Science and Technology in the Philippines.

COLONIAL PHILIPPINES

- Colonial History in the Philippines can be divided into:
- Spanish rule (1565–1898)
- American rule (1898–1946)
- Japanese occupation (1941–1945)
- Colonial Philippines: Spanish Period
- The history of the Philippines from 1565 to 1898 is known as the Spanish colonial period, during which the Philippine Islands were ruled as the Captaincy General of the Philippines within the Spanish Empire.
- The Captaincy General of the Philippines was an administrative district administrated by a governor-general.
- To understand the development of Science and Technology in Spanish Colonial Philippines, we shall focus on the following aspects:
- Spanish:

GALLEON TRADE

- Introduction of Formal Education and Scientific Institutions
- Construction of Infrastructure
- Development of Modern Transportation
- Galleon Trade
- Facilitated the exchange of culture, ideas, and technology between the Philippines and Mexico.
- Products as well as knowledge from foreign countries like Mexico were able to reach our country.
- Friars on-board the Galleon Trade shared their beliefs and knowledge to the Filipinos, improving the pool of knowledge in the Philippines.
- Introduction of Formal Education and Scientific Institutions
- Spaniards brought established of formal educational systems managed by friars.

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- Friars established parochial schools linked with churches to teach catechism.
- Scientific institutions like UST laid the foundation for the development of scientific knowledge and technological advancements by offering science and medical courses.
- Construction of Infrastructure
- Spanish colonial authorities invested in infrastructure development, constructing bridges, roads, and buildings that contributed to the advancement of engineering and architectural practices.
- Church constructions were given importance to facilitate the spread of Catholicism.
- Spanish Colonial Philippines: Churches and Architecture
- In general, the majority of Philippine colonial churches were constructed of adobe, coral stone, or brick.
- Others used egg whites in the mortar to make churches durable.
- Development of Modern Transportation
- The Manila-Dagupan Railroad opened on November 24, 1892.
- It was the first railroad in the Philippines. Beginning construction in 1888, and it covered a distance of 195 kilometers from Manila to Dagupan in Pangasinan.

AMERICAN COLONIAL PHILIPPINES

- The American colonial period in the Philippines began in 1898 with the outbreak of the Spanish-American War.
- When the Spanish-American War ended in December 1898, Spain sold the entire Philippine archipelago to the United States for $20 million via Treaty of Paris.
- To understand the development of Science and Technology in American Colonial Philippines, we shall focus on the following aspects:
- American:
- Upgrading of Railway System
- Establishment of Public School System
- Introduction of Modern Educational Systems and Institutions
- Improvement of Public Health
- Upgrading of Railway System
- The Manila-Dagupan Railway became Manila Railroad Company.
- The main line of the Manila Railroad Company extended from Manila to Legazpi in the Bicol region.
- Renamed into the Philippine National Railways (PNR) in 1964.
- Establishment of Public School System
- In 1901, the U.S. colonial government in the Philippines established a free, secular school system with English as the only language of instruction.
- The Philippine Commission recruited several hundred American educators called "Thomasites" to teach in and administer the colonial school system.
- Introduction of Modern Educational Systems and Institutions
- The Americans established schools and universities to promote scientific learning and knowledge:
- 1901: Philippine Normal University (PNU)
- 1901: Technological University of the Philippines (TUP)
- 1904: Polytechnic University of the Philippines (PUP)
- 1908: University of the Philippines (UP)
- Improvement of Public Health
- Philippine General Hospital, the largest and most prominent public hospital in the Philippines, began operations in 1910.
- It served as a teaching hospital for the University of the Philippines College of Medicine.
- UP College of Medicine provided medical education and training to Filipino students that will eventually serve the country.

JAPANESE PERIOD

- The Japanese presence in the Philippines is more appropriately referred to as

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"occupation" because it was rather "short" when compared to the Spaniards or even the Americans who were here for decades and centuries.
- Due to their short presence in the Philippines, the Japanese didn't have any significant contribution to science and technology in the country.
- If anything, their presence only brought destruction.

POST COLONIAL PHILIPPINES

- The United States formally recognized and granted Philippine Independence in 1946 under the Treaty of Manila between the governments of the United States (U.S. Ambassador Paul V. McNutt) and the Republic of the Philippines (Pres. Manuel Roxas).
- This ended Philippine Colonial History.
- To understand the development of Science and Technology in American Colonial Philippines, we shall focus on the following aspects:

Post-War Jeeps

- Establishment of Government Agencies
- Increasing Number of Filipino Scientists
- After World War II, American troops left several Willys Jeep in the country, which Filipinos modified and turned into bus-like vehicles that can transport passengers.
- Jeeps have been used as a mode of transportation in the Philippines since the 1950s.

Establishment of Government Agencies

- Creation of the National Science Development Board (NSDB) in 1958 during the administration of President Carlos P. Garcia.
- The agency formulates and implements policies, plans, and programs for the development of science and technology capabilities and the promotion of scientific and technological activities.
- NSDB later became the Department of Science and Technology (DOST) in 1987.
- Construction of the Philippine Nuclear Research Institute (PNRI) in 1958 facilities for research in nuclear science and technology.
- The International Rice Research Institute (IRRI) was established in 1960, leading to the development of high-yielding rice varieties.
- Increasing Number of Filipino Scientists
- Filipino scientists were encouraged to invent after the war through increased support and funding from the government and other organizations.
- This support allowed them to conduct research, develop solutions, and make exciting discoveries.

L4: SCIENCE, TECHNOLOGY, AND NATION BUILDING-HISTORICAL CONTEXT

- Recap of PH History
- Philippine History can be divided into:
- Pre-colonial / Pre-Hispanic
- Colonial – Spanish, American, Japanese
- Post Colonial / Post War

PRE - COLONIAL PHILIPPINES:

- Recorded history started with the Laguna Copperplate Inscription
- People had an established culture, tradition, and practices before the Spaniards came
- Agricultural methods like kaingin and terracing
- Expertise in weaving, pottery, metalwork, and boat-making
- Traditional medicine based on herbal remedies and rituals

COLONIAL PERIOD:

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