Then and Now: Disease and Technology Through the Ages

Course
World Health Research

Unit I
Then & Now: Disease & Technology Through the Ages

Essential Question
How does chronology lead to understanding of historical relationships between disease and technology?

TEKS
130.209(c) 1B

Prior Student Learning
World History

Estimated time
Lecture/PPT I: 45 min.

Lecture/PPT II: 45 min.

Rationale
Disease drives technology and both continue to evolve and change societies since prehistoric times.

Objectives
Upon completion of this lesson, the student will be able to:

- Identify therapeutic techniques used by primitive people
- List and discuss ancient herbs used for healing
- Compare medical practices during the Dark Ages to that of primitive people
- Identify major medical discoveries, inventions, and scientific achievements, of the 17th – 20th centuries and assess their impact on societies
- Discuss biomedical breakthroughs of the late 20th and 21st centuries

Engage
Many of you are here today because penicillin saved your life, or the life of one of your parents or grandparents. Penicillin's ability to cure people of many once-fatal bacterial infections has saved so many lives that it is easy to understand why it was once called a "miracle drug".

http://herbarium.usu.edu/fungi/funfacts/penicillin.htm

Note: In lieu of the *Then and Now* lesson plans and instructional multimedia presentations below, the students can view PBS *A Science Odyssey – Matters of Life and Death*

Key Points

PART I (Instructional Multimedia Presentation #1 accompanies this lesson)

A. Prehistoric animals
   1. Long before humans were on earth, there was disease.
      a. arthritis – seen at joints of prehistoric animal bones
         i. since animals often retreated to caves to die, this is where many bony remains were found
         ii. lipping (bony overgrowth) seen in joints of excavated bones.
         iii. Arthritic bones were so common in dinosaurs and prehistoric bears that archeologists began to refer to it as “cave gout”.
      b. Skeletal fractures - some healed with little deformity, others show effects of infection (osteomyelitis)

c. Extensive calluses (bone "scars" associated with healing fractures)

B. Neanderthal man
   1. bone reconstruction revealed a stooped, round-shouldered skeleton with a curved spine and bent knees
   2. early speculation by anthropologists was that this was a gorilla-type man—the missing link
   3. scientists now think Neanderthal man was suffering from disfiguring arthritis

C. Primitive people
   1. nomads who were hunters and gatherers
   2. believed illness was caused by invasion of evil spirits and supernatural forces
   3. diseases/conditions that prehistoric man suffered from:
      a. tuberculosis and parasitic infections
      b. under calcified bones (osteoporosis)
      c. caries (decayed teeth)
      d. pyorrhea (eroded teeth from discharge of pus from inflamed gums)
      e. skeletal fractures
   4. health issues for prehistoric women:
      1. had much shorter lifespan than men due to difficult childbirth
      2. weakened immune systems
         a. birthing and nursing children
         b. malnourishment since best food was for men and boys because they were/would be leaders, hunters, and warriors
   5. therapeutic techniques used by primitive healers/shaman
      1. praying
      2. chanting
      3. hallucinogenic trances – a means of communication with the spirit world
         a. typically the shaman will go into a trance with help of hallucinogenic plants
   6. Therapeutic tools of primitive people
      1. facial and body paints to scare away evil spirits
      2. wood splints to stabilize and protect injuries
      3. casts from hardened hide for bone fractures
      4. bone needles threaded with strip of animal tendon to sew lacerations
   7. Prehistoric medicinal herbs
      1. foxglove plant
         a. treatment for failing heart
         b. strengthens and slows heart (more efficient ejection)
         c. drug from foxglove plant is digitalis
      2. birch fungus

a. treatment that stops bleeding and acts as a disinfectant
b. can be used as a laxative when ingested

3. peek-a-boo plant ("toothache plant")
   a. treatment of toothaches and oral infections
   b. chewed leaves or flower head, numbs tongue and mouth
4. bark of cinchona tree
   a. treatment for malaria
   b. used to help relieve malaria's fever and muscle spasms
   c. drug from cinchona bark is quinine
5. opium poppy
   a. treatment for relief of severe pain
   b. allowed ancient surgeons to perform prolonged surgical procedures
   c. highly addictive
   d. drug from opium poppy is morphine
6. belladonna plant (also known as "deadly nightshade plant")
   a. treatment for spastic colon and gastric ulcers
   b. also used for bradycardia
   c. ancient women used it to dilate eyes because they thought it made them look beautiful
   d. drug from belladonna plant is atropine

8. Examples of "good medicine" during primitive times
   1. frightening or cajoling evil spirits out of its victim then casting the offending spirit to a vermin or insect and stomping on it
   2. trepanation (drilling hole in head) was used to treat headaches and odd behavior; it was thought to release evil spirits
   3. sucking and vomiting
      a. healer blew tobacco smoke over patient then gulped in large amounts of smoke until he/she became nauseated
      b. once nauseated, healer would begin sucking on patient's chest (to remove evil spirit)
      c. healer would then vomit to purge the evil, then buy the vomit
9. Besides healing, healers and shamans were also responsible for warding off all potential catastrophes such as:
   1. bad weather
   2. unyielding crops
   3. unsuccessful hunts
   4. enemy warriors

D. Earliest ancient civilizations – did not move around like prehistoric people; built societies
   1. The Egyptians (3150 BC)
      a. first to keep accurate written health records
      b. medical practice included bloodletting, monthly purging, making prosthetic devices, embalming
      c. surgeons in ancient Egypt were both priests and doctors who

blended ritual with medicine

2. Ancient India (3300 BC)
   a. detected diabetes by smelling and tasting urine for sweetness
   b. practiced surgical procedures such as hernia repairs, amputations, C-sections, cosmetic surgery to nose, earlobes and harelips
3. Ancient China (15 Century BC)
   a. illness was still seen as a violation of a god
   b. male doctors didn't directly examine women
   c. ivory dolls were used by doctors to diagnose woman (they would point to the area of discomfort or pain)
   d. also used acupuncture to treat ailments (believed that the needles stimulated energy points throughout the body, relieving obstructions, enabling the body to heal)
   e. used a variety of herbs to treat diseases, which were thought to throw away the evil intruders of the body
      i. ginseng – reduces stress
      ii. rhubarb – enhances body strength
      iii. licorice – relieves muscle spasms
      iv. ginger – treats diarrhea
      v. peony – regulates blood
      vi. salvia – relieves pain of inflammation

PART II (Instructional Multimedia Presentation #2 accompanies this lesson)

E. Ancient secondary societies
   1. Ancient Greece
      a. the first to study the cause of disease
         i. looked for natural explanations, not just divine ones
         ii. made discoveries in science, math, and astronomy
      b. Hippocrates was one of the most famous of the ancient Greek physicians
         i. based his knowledge of anatomy on observation of the external body since human dissection was taboo during this time
         ii. responsible for writing the first known oath of medical ethics: The Hippocratic Oath
         iii. later became known as the "Father of Modern Medicine"
      c. Greek **balance theory** – theory held that the human body was filled with four basic substances called humors, which are in balance when the person is healthy
         i. four humors:
            -black bile
            -yellow bile
            -blood
            -phlegm
         ii. these humors were connected with the four elements:
            -earth

-fire
-air
-water

iii. they were also related to the four seasons:
-autumn
-winter
-spring
-summer

iv. humors, elements, and seasons were all linked to the human body; an imbalance in any of these caused illness

2. Ancient Rome
   a. learned about disease and cleanliness from the Greeks
   b. This period marks the beginning of public health and sanitation.
      i. developed sanitation system of aqueducts to bring clean water to cities and sewers to carry off waste
      ii. built public baths with filtering systems
   c. aqueducts
      i. collected water from several natural springs, which were located far away from cities
      ii. water was chosen according to many factors: position of its springs, purity of its water, its taste, alleged medical properties due to mineral salts
      iii. gravity moved water towards cities (aqueduct acted as a continuous slope)
   d. sewers
      i. underground sewers were covered by stones
      ii. waste flushed from toilets flowed through central channel into the main sewage system into a nearby stream away from the city
   e. bath and spas (not just for bathing)
      i. a place to meet friends, relax, gamble, play games
      ii. public baths were cheap to enter, so both rich and poor could afford to go often
      iii. men and women bathed in separate facilities
      iv. some baths had libraries and restaurants

F. Dark Ages (AD 400-800) to High Middle Ages (AD 800-1400)
   a. “Dark Ages” was a term used by European historian in the 18th century to designate the period in Western Europe after the fall of the Western Roman Empire.
   b. the Huns conquered the Roman Empire
   c. during this time, church began to dominate practice of science and medicine and the study of medical science all but stopped
   d. instead of medical intervention, the church held fast to belief of “healing through Christ”

e. treatment for ill during this time: prayer, exorcism saintly relics, superstition
f. terrible outbreak of epidemics occurred during this period:
    i. bubonic plague (black death – responsible for death of 60 million people)
    ii. smallpox
    iii. syphilis
    iv. diphtheria
    v. tuberculosis

G. The Renaissance period (AD 1350 – 1650)
a. period which marked the rebirth of learning
b. building of universities and medical school
c. there was a search for new ideas rather than the unquestioning acceptance of disease as the will of God)
d. acceptance of dissection for purpose of anatomical study
e. development of printing press and publishing of books, which allowed more access to knowledge

H. Sixteenth and seventeenth centuries
a. Leonardo da Vinci (1452 – 1519)
    i. Italian artist, scientist, engineer
    ii. Studied anatomy of body by dissection of human corpses
b. Anton van Leeuwenhoek (1632 – 1723)
    i. Dutchman who invented the microscope
    ii. his early microscope was a lens mounted in a tiny hole of a brass plate
    iii. he held the plate to the light to see his specimen
    iv. discovered tiny moving microorganisms that he referred to as “animacules”

I. Eighteenth century
a. Edward Jenner (1749 – 1823)
    i. English country doctor
    ii. observed that the milkmaids who caught less serious cowpox generally did not catch smallpox
    iii. led him to discover technique of vaccination when he deliberately infected a small boy with cowpox
    iv. he coined the word “vaccination” for cow (*vacca* means cow in Latin)
    v. this word was later adopted by Louis Pasteur for immunization against any disease
b. Rene Laennec (1781 – 1826)
    i. French physician who invented the cylinder stethoscope
    ii. originally made from paper, although later made from a hallow wooden tube

iii. before the cylinder stethoscope, doctors put their ear directly to a patient's body
iv. he is hailed as the "Father of Thoracic Medicine"

J. Nineteenth century
   a. James Blundell (1790 – 1877)
      i. performed the first successful human blood transfusion from a husband to his wife by means of a syringe
      ii. he performed 10 transfusions; only half were successful since blood typing had not been developed
      iii. in the 1870's, doctors began using milk from cows, goats, and humans as a blood substitute
      iv. replaced with saline solution in the 1880's
   b. William Morton (1819 – 1868)
      i. dentist who developed anesthesia techniques that made surgery painless
      ii. he developed an ether inhaler
      iii. before anesthesia, operations were limited to amputations and the removal of external growths
      iv. alcohol or opium were used to alleviate the pain
   c. Florence Nightingale (1820 – 1910)
      i. pioneer of nursing
      ii. she reformed hospital sanitation methods and campaigned to improve health standards
      iii. was awarded the Royal Red Cross in 1883 in recognition of her pioneer work in nursing
   d. Louis Pasteur (1822 – 1895)
      i. "Father of Bacteriology"
      ii. much of his research was in the field of brewing and cheese production
      iii. with his microscope, he showed that by heating foods, harmful bacteria was prevented from growing; hence the term "Pasteurization"
      iv. Pasteur also developed several vaccines including ones against anthrax and rabies
   e. Sir Joseph Lister
      i. discovered that carbolic acid killed germs
      ii. used as an aseptic in surgery
      iii. the mouthwash *Listerine* was named after Joseph Lister
   f. Wilhelm Roentgen (1845 – 1923)
      i. German physicist who discovered x-rays
      ii. his first medical x-ray was of his wife's hand

K. Biomedical firsts of the 20th century:
   a. EKG Machines
   b. Respirators

c. MRI/CT scans
d. Laser surgery
e. Organ transplants
f. Open-heart surgery
g. Pacemakers

Activity: 35 – 45 min.

Activity
I. Create a *Then and Now* Timeline

Assessment
Successful completion of ☑CheckPoint tests.

☑CheckPoint© Test – The instructional multimedia presentation includes a short quiz known as a ☑CheckPoint test. After every 5 to 8 slides, there will be several questions testing the students' knowledge over the previously viewed slides. There should be no note-taking during these multimedia presentations. This is an exercise in *active listening*. Students are expected to practice dynamic listening then write the answers to the ☑CheckPoint questions as they appear during the presentation.

Materials
Instructional Multimedia Presentation *Disease and Technology Through the Ages* Part I
Instructional Multimedia Presentation *Disease and Technology Through the Ages* Part II

Key to ☑CheckPoint test #1
Key to ☑CheckPoint test #2

Medical Timeline Activity Instructions

Accommodations for Learning Differences

Online activity: 5 min.

For reinforcement, the student will participate in the interactive online activity *Doctor Over Time*

National and State Education Standards
National Health Science Cluster Standards
HLC08.02
Health care workers will understand accepted ethical practices with respect to cultural, social, and ethnic differences within the health care environment.

They will perform quality health care delivery.

TEKS
130.209 (c) 1B discuss history of diseases and the evolution of medical technology over time.

Texas College and Career Readiness Standards
English Language Arts
III. B. Develop effective speaking styles for both group and one on one situations.

Science Standards
IV. A. 1. Recognize how scientific discoveries are connected to technological innovations.
IV. C. 1. Understand the historical development of major theories in science.
IV. C. 1. Recognize the role of people in important contributions to scientific knowledge.

Social Studies Standards
Interrelated Disciplines and Skills
I. B. 2. Identify and evaluate sources and patterns of change and continuity across time and place.

Cross-Disciplinary Standards
I. E. 1. Work independently.
I. E. 2. Work collaboratively.

II. A. 8. Connect reading to historical and current events and personal interest.
II. E. 1. Use technology to gather information.

Then and Now: Timeline Activity

INSTRUCTIONS:
Each student will choose, or be assigned one of the following periods in medical history and make a drawing, which depicts an assigned period of medical history. Their drawing must include title, date, and short description. Each drawing will be placed in order and taped together in one BIG horizontal timeline.

MATERIALS:
- blank paper for each student
- pencil
- colored pencils or markers

Students may need time to look up their medical period on the computer before the activity to get drawing ideas.

1.	Primitive people (superstitions and illness)
2.	Primitive people therapeutic healing techniques: chanting, wood splints, sewing lacerations, trepanation, etc.
3.	Ancient herbal medicine
4.	Ancient Egyptian medicine
5.	Ancient Indian medicine
6.	Ancient Chinese “diagnostic dolls”
7.	Ancient Chinese herb pharmacy
8.	Ancient Greece: Hippocrates
9.	Ancient Greek: Balance Theory
10.	Ancient Rome: aqueducts/baths
11.	Medicine in the Dark Ages
12.	Renaissance medicine
13.	Leonardo da Vinci’s contributions to medicine
14.	Anton van Leeuwenhoek
15.	Edward Jenner
16.	Rene Laennec
17.	James Blundell
18.	William Morton
19.	Florence Nightingale
20.	Louis Pasteur
21.	Sir Joseph Lister
22.	Wilhelm Roentgen
23.	Dr. Walter Reed
24.	Frederick Banting
25.	Sir Alexander Fleming
26.	Open heart surgery
27.	Organ transplants or any other 20^{th}/21^{st} century technology you can think of

KEY CheckPoint Test
Then and Now: Disease and Technology Through the Ages
Part I

1. What existed long before humans were on earth?
   a. Java bear
   b. disease
   c. evil spirits
   d. herpes

2. Prehistoric arthritis was so common that archeologists referred to it as:
   a. bear fever
   b. bony calluses
   c. cave gout
   d. field fasciitis

3. Early speculation of Neanderthal man's skeletal remains was that he:
   a. had arthritis
   b. had a broken back
   c. was an aberrant primate
   d. was the "missing link"

4. The most common reason women had a shorter life span than men was that they…?
   a. were killed while gathering food
   b. didn't eat as well as men
   c. died in childbirth

5. Archeological evidence revealed that ancients had osteoporosis.
   a. true
   b. false

6. Name one way that primitive people treated wounds.
   wood splints, casts from hardened hide, bone needles to sew lacerations

7. Birch fungus was used to: (mark all that apply)
   a. scare away evil spirits
   b. disinfect a wound
   c. stop bleeding
   d. thin blood

MATCHING

8. strengthens and slows heartbeat **b.** a. quinine

9. numbs oral lesions or tooth pain **d.** b. digitalis

10. used to treat bradycardia & dilate eyes **c.**

11. treatment for malaria **a.**

12. treatment for severe pain **e.**

c. belladonna

d. peek-a-boo plant

e. morphine

13. Briefly describe the practice used to treat headaches/peculiar behavior.
trepanation; drilling hole in skull

14. Other than the treatment above, give an example of "good medicine"
-frightening or flattering evil spirits out of victim then casting it to an insect & stomping on it
-sucking and vomiting

15. Name one medical practice of Ancient Egyptians.
bloodletting, purging, making prosthetic devices, embalming

16. How did Ancient Indians check for diabetes?
smelled & tasted urine for sweetness

17. Name one surgical procedure used by the Ancient Indians.
hernia repairs, amputations, c-sections, cosmetic surgery

18. How did Ancient Chinese doctors diagnose women?
had them point to area of pain or discomfort on an ivory female doll

19. Which of the following practices was commonly used in Ancient China?
a. water therapy
b. acupuncture
c. feverfew herb extract
d. sucking and vomiting

20. Name one herb used by the Ancient Chinese.
ginseng, rhubarb, licorice, ginger, peony, salvia

KEY CheckPoint Test
Then and Now: Disease and Technology Through the Ages
Part II

1. How many elements were involved in the "balance theory"?
   four

2. What was the 1st code of medical ethics called?
   Hippocratic Oath

3. Name one of the body's humors.
   yellow bile, black bile, blood, phlegm

4. Imbalance of the humors resulted in:
   a. bad weather
   b. some type of illness
   c. a depletion of blood
   d. environmental disasters

5. The Romans learned about disease and hygiene from…
   the Greeks

6. Roman aqueducts carried:
   a. clean water to cities
   b. sewage away from cities

7. Only rich people could afford the Roman baths.
   a. true
   b. false

8. Who conquered the Roman Empire?
   a. Greeks
   b. Mesopotamians
   c. Germans
   d. Huns

9. Why did the study of medicine come to a stop during the Dark Ages?
   pervasive belief was "healing through Christ"

10. Approximately how many deaths was the Bubonic plague responsible for?
    a. six thousand
    b. six million
    c. sixty million

11. What does the word "Renaissance" mean?

a. rebirth
b. academia
c. new ideas
d. scholar

12. Leonardo da Vinci is known as:
    a. an engineer
    b. an artist
    c. a scientist
    d. all

13. What is the name Leeuwenhoek used to describe microorganisms?
    a. microbes
    b. organelles
    c. animacules
    d. pathogens

14. The word *vaccination* is derived from a Latin word, which means…?
    cow

15. Laennec's first stethoscope was made of:
    a. paper
    b. wood
    c. copper
    d. hardened rawhide

16. Before Laennec's stethoscope, how did physicians listen to heart and lung sounds?
    put their ear directly to patient's body

MATCHING

17. reformed hospitals; pioneered nursing **b.**
18. successful blood transfusions **d.**
19. developed anesthesia techniques **a.**

a. Morton
b. Nightingale
c. Snow
d. Blundell

MATCHING

20. developed rabies vaccine **c.**
21. discovered x-rays **d.**
22. used carbolic acid to kill germs **a.**

a. Lister
b. Laennec
c. Pasture
d. Roentgen