

History of Medicine

Innovations in Obstetrics and Pediatrics

Teacher's Guide

Grade Level: 9–12

Curriculum Focus: Life Science

Lesson Duration: Three class periods

Program Description

Travel back in time to witness some of the most important moments in the history of obstetrics and pediatrics. See one of the earliest documented successful caesarian sections, use of forceps, development of the first vaccine and discovery of pasteurization. Examine major shifts in the social history of childbirth, namely the shift in practitioner from female midwives schooled in herbs to male doctors eager to apply the scientific method to the emerging field of obstetrics.

Onscreen Questions

Part 1, “The First Breath,” “Battling Childbed Fever,” and “Nurturing Growth”

- How have childbirth practices changed over the last few centuries?
- What ethical questions do advances in medical technology raise?

Part 2, “The Road to Vaccines” and “From Stethoscope to X-ray”

- How can the World Health Organization and other international groups eradicate disease?
 - How have advanced technologies helped in the diagnosis and treatment of illness?
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Lesson Plan

Student Objectives

- Relate the important contributions of the innovators and scientists highlighted in the video, including the two Nobel Prize winners Robert Koch and Selman Waksman.
- Describe the purpose of the Nobel Prize in Physiology or Medicine.
- Recommend who might or should have been awarded this honor if the prize had been given before 1901. Defend your choice with information.
- Research and present information about other winners of the Nobel Prize in Physiology or Medicine, describing their contributions.

Materials

- *History of Medicine: Innovations in Obstetrics and Pediatrics* video
- Computer with Internet access

Procedures

1. After watching the video, ask students to name some of the innovations in medicine in the 19th and 20th centuries. Provide the following list of names on the board. As a class, review the significant contributions of each person:
 - Friedrich Osiander: Based obstetrical procedures on solid science and used new instruments such as forceps.
 - Ignaz Semmelweis: Discovered that hand washing could prevent the spread of disease in a hospital.
 - Adolf Windaus: Discovered the connection between a lack of vitamin D and rickets.
 - Edward Jenner: Discovered the first vaccination for smallpox.
 - Louis Pasteur: Discovered the first vaccination for rabies and that heating milk destroyed harmful bacteria.
 - René-Théophile Laënnec: Invented the stethoscope.
 - Robert Koch: Discovered that tuberculosis was caused by a bacterium and introduced new scientific standards for researching infectious diseases.
 - Selman Waksman: Discovered an antibiotic that cures tuberculosis.
 - Wilhelm Conrad Röntgen: Discovered X-ray and produced the first X-ray image of a human.
2. Next, ask students to identify the two people from the list who were awarded the Nobel Prize in Physiology or Medicine. (*Robert Koch in 1905 and Selman Waksman in 1952*) Explain that the Nobel Prize was established by the Swedish inventor, Alfred Nobel, and it is the first international award given yearly since 1901 for achievements in physics, chemistry, physiology or medicine, literature, and peace. In 1968, another prize in economic sciences was instituted. Have students read an excerpt from Nobel's will in which he describes the purpose of the prize:
 - Excerpt from the Will of Alfred Nobel
<http://nobelprize.org/nobel/alfred-nobel/biographical/will/index.html>
3. According to the will, who should be awarded Nobel Prizes? ("*...those who, during the preceding year, shall have conferred the greatest benefit on mankind.*") Who should be awarded the Nobel Prize in medicine? ("*...the person who shall have made the most important discovery within the domain of physiology or medicine.*")
4. Explain that the Nobel Prize was first awarded in 1901. Ask students to review the list of people featured in the video. With the exception of Adolf Windaus, the other individuals made their

significant contributions before 1901. Ask students to consider who might or should have won the Nobel Prize if had been awarded during the 19th century. Have a few volunteers share and defend their choices.

5. Now tell students that they will explore the work of winners of the Nobel Prize in Physiology or Medicine. Their assignment is to research one past laureate and present his or her contributions to the class. Their presentation should include the following items:
 - Scientist's name and year prize was awarded
 - Brief summary of the scientist's discovery
 - Explanation of how the scientist's work reflected the issues, problems, or technology of the time period
 - Personal statement about why the person deserved the Nobel Prize
6. Tell students they may choose from the complete list of laureates or from the list below. The links beneath the selected names provide background about the scientist's work.
 - The Nobel Prize in Physiology or Medicine: Laureates
<http://nobelprize.org/medicine/laureates/index.html>
 - Ronald Ross (1902) and Alphonse Laveran (1907), Malaria
<http://nobelprize.org/medicine/educational/malaria/readmore/index.html>
 - Ivan Petrovich Pavlov (1904), Pavlov's Dogs
<http://nobelprize.org/medicine/educational/pavlov/readmore.html>
 - Karl Landsteiner (1930), Blood Groups
<http://nobelprize.org/medicine/educational/landsteiner/readmore.html>
 - Alexander Fleming, Ernst Chain and Howard Florey (1945), Discovery of Penicillin
<http://nobelprize.org/medicine/educational/penicillin/readmore.html>
 - James Watson and Francis Crick (1962), DNA Structure
http://nobelprize.org/medicine/educational/dna_double_helix/readmore.html
 - Roger Sperry (1981), Split Brain
<http://nobelprize.org/medicine/educational/split-brain/background.html>
 - Arvid Carlsson, Paul Greengard, and Eric R. Kandel (2000), Signal Transmission in the Nervous System
<http://nobelprize.org/medicine/educational/synapse/intro.html>
 - Paul Lauterbur and Peter Mansfield (2003), Magnetic Resonance Imaging (MRI)
<http://nobelprize.org/medicine/educational/poster/2003/index.html>
 - Richard Axel and Linda Buck (2004), Olfactory System
<http://nobelprize.org/medicine/educational/poster/2004/index.html>
7. Have students give their class presentations. Keep a running list of the laureates and their discoveries on the board.

8. After the presentations, look at the list of Nobel Prize winners again. What impact have these individuals had on our lives? Looking further ahead into the 21st century, what discoveries might earn future scientists Nobel Prizes in physiology or medicine?

Assessment

Use the following three-point rubric to evaluate students' work during this lesson.

3 points: Students were active in class discussions; identified several innovations in medicine from the 19th and 20th centuries; showed a strong understanding of the Nobel Prize and its purpose; created a complete, engaging presentation about a past Nobel Prize winner, including a clear, compelling description of the individual's work.

2 points: Students participated in class discussions; identified some innovations in medicine from the 19th and 20th centuries; showed a satisfactory understanding of the Nobel Prize and its purpose; created a complete presentation about a past Nobel Prize winner, including a simple description of the individual's work.

1 point: Students did not participate in class discussions; identified few or no innovations in medicine from the 19th and 20th centuries; showed a weak understanding of the Nobel Prize and its purpose; created an incomplete or confusing presentation about a past Nobel Prize winner, including an unclear or incomplete description of the individual's work.

Vocabulary

caesarian section

Definition: The surgical removal of a baby from the mother's womb

Context: The caesarean section became a safer option when doctors learned how to keep the abdominal cavity sterile during the operation.

incubator

Definition: A machine with a compartment that provides a controlled environment to help premature or sick babies develop

Context: Incubators have been in use since the end of the 19th century.

midwife

Definition: Someone who helps deliver babies

Context: By the early 19th century, the job of delivering babies went from female midwives to male doctors.

obstetrics

Definition: The branch of medicine dealing with pregnancy and childbirth.

Context: One of the most dramatic developments in the history of obstetrics is the simple practice of hand washing.

premature

Definition: Born before completing the normal gestation period, usually more than three weeks before due date

Context: With the right medical care, premature infants weighing less than one pound can still survive.

vaccine

Definition: A substance that protects a body against a disease by causing the body's immune system to produce antibodies

Context: The development of vaccines is one of the greatest achievements in medical history.

virus

Definition: A microscopic organism that lives in a cell of another living thing

Context: Today we know that a virus causes smallpox.

Academic Standards

Mid-continent Research for Education and Learning (McREL)

McREL's Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education addresses 14 content areas. To view the standards and benchmarks, visit

<http://www.mcrel.org/compendium/browse.asp>.

This lesson plan addresses the following national standards:

- Science – Nature of Science: Understands the nature of scientific knowledge; Understands the nature of scientific inquiry
- Technology: Understands the relationships among science, technology, society, and the individual
- World History – An Age of Revolutions, 1750-1914: Understands patterns of global change in the era of Western military and economic dominance from 1800 to 1914
- World History – A Half-Century of Crisis and Achievement, 1900-1945: Understands the search for peace and stability throughout the world in the 1920s and 1930s
- World History – The 20th Century Since 1945: Promises and Paradoxes: Understands the search for community, stability, and peace in an interdependent world

National Academy of Sciences

The National Academy of Sciences provides guidelines for teaching science in grades K–12 to promote scientific literacy. To view the standards, visit this Web site:

<http://books.nap.edu/html/nses/html/overview.html#content>.

This lesson plan addresses the following national standards:

- Science and Technology
 - Science in Personal and Social Perspectives
 - History and Nature of Science
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Support Materials

Develop custom worksheets, educational puzzles, online quizzes, and more with the free teaching tools offered on the Discoveryschool.com Web site. Create and print support materials, or save them to a Custom Classroom account for future use. To learn more, visit

- <http://school.discovery.com/teachingtools/teachingtools.html>
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DVD Content

This program is available in an interactive DVD format. The following information and activities are specific to the DVD version.

How To Use the DVD

The DVD starting screen has the following options:

Play Video – This plays the video from start to finish. There are no programmed stops, except by using a remote control. With a computer, depending on the particular software player, a pause button is included with the other video controls.

Video Index – Here the video is divided into sections indicated by video thumbnail icons; brief descriptions are noted for each one. Watching all parts in sequence is similar to watching the video from start to finish. Brief descriptions and total running times are noted for each part. To play a particular segment, press Enter on the remote for TV playback; on a computer, click once to highlight a thumbnail and read the accompanying text description and click again to start the video.

Curriculum Units – These are specially edited video segments pulled from different sections of the video (see below). These nonlinear segments align with key ideas in the unit of instruction. They include onscreen pre- and post-viewing questions, reproduced below in this Teacher's Guide. Total

running times for these segments are noted. To play a particular segment, press Enter on the TV remote or click once on the Curriculum Unit title on a computer.

Standards Link—Selecting this option displays a single screen that lists the national academic standards the video addresses.

Teacher Resources—This screen gives the technical support number and Web site address.

Video Index

I. The First Breath (6 min.)

For many centuries women gave birth with the help of traditional midwives. But that practice changed when obstetrics became a science. Learn about the 19th-century changes in obstetrics.

II. Battling Childbed Fever (5 min.)

Puerperal fever once took the lives of many women. Investigate this illness and discover why the practice of hand washing was introduced in obstetric clinics.

III. Nurturing Growth (10 min.)

Watch premature triplets as they struggle through their first weeks of life with the aid of modern medicine. Learn about the importance of vitamin D to a baby's health.

IV. The Road to Vaccines (12 min.)

The discovery of vaccines changed medicine. Learn about Edward Jenner's work with the smallpox vaccine and Louis Pasteur's important contributions to the medical community and the world.

V. From Stethoscope to X-ray (12 min.)

The production of antibiotics and the invention of X-ray technology marked two major milestones in the history of modern medicine. See how these two innovations came to be.

CURRICULUM UNITS

1. The Practice of Caesarian Section

Pre-viewing question

Q: What do you know about midwives?

A: Answers will vary.

Post-viewing question

Q: What is a Caesarian section and when is this procedure performed?

A: A Caesarian section, also known as a C-section, is the surgical removal of a child from its mother's womb. The procedure is usually performed when birth canal is too narrow or another condition threatens the mother's or baby's life.

2. Changes in 19th-Century Obstetrics

Pre-viewing question

Q: What professions or occupations have traditionally been dominated by women?

A: Answers will vary.

Post-viewing question

Q: How did the practice of obstetrics change during the 19th century?

A: By the early 19th century the process of delivering babies was becoming the work of male doctors rather than female midwives. Doctors began to rely on scientific evidence and fact and made use of medical interventions, including using forceps, a newly developed instrument. They did not adhere to traditional superstitions, herbs, and other traditional practices of midwifery.

3. Deadly Puerperal Fever

Pre-viewing question

Q: What deadly diseases or illnesses do you know of?

A: Answers will vary.

Post-viewing question

Q: What were the symptoms of puerperal fever?

A: Puerperal fever symptoms started with the body shaking, followed by a high temperature and agonizing abdominal pain.

4. Solving the Mystery of Puerperal Fever

Pre-viewing question

Q: How does scientific observation help solve medical mysteries?

A: Answers will vary.

Post-viewing question

Q: How did Ignaz Semmelweis solve the mystery of puerperal fever?

A: Dr. Semmelweis stumbled on the solution to the mystery of puerperal fever when his colleague developed the same infection as new mothers. After cutting himself with a scalpel in the pathology lab, the man died. Dr. Semmelweis concluded that the doctors working on cadavers were passing septic poison to the new mothers. He urged doctors to wash their hands before examining the mothers. Some doctors complained about the practice, but Semmelweis could show that it spared the lives of many women.

5. Incubators for Premies

Pre-viewing question

Q: What is an incubator?

A: Answers will vary.

Post-viewing question

Q: How does an incubator help premature babies?

A: Incubators provide a temperature-controlled environment that allows premature babies to continue developing outside the womb.

6. Delivering Premature Triplets

Pre-viewing question

Q: What does it mean to be born prematurely?

A: Answers will vary.

Post-viewing question

Q: When is it safe for a premature baby to leave the hospital?

A: A premature baby usually leaves the hospital once it has a stable heartbeat and body weight, and its internal organs reach the maturity of a full-term baby.

7. Rickets

Pre-viewing question

Q: Why is a healthful diet necessary?

A: Answers will vary.

Post-viewing question

Q: What is rickets and how is it connected to diet?

A: Rickets is a bone disease caused by a deficiency of vitamin D or calcium; symptoms include bent or deformed bones. Sufficient doses of vitamin D and calcium in the diet protect against the disease.

8. The Smallpox Vaccine

Pre-viewing question

Q: Which diseases are often prevented by vaccines?

A: Answers will vary.

Post-viewing question

Q: How did the smallpox vaccine come about?

A: Edward Jenner created the smallpox vaccine in 1796 after learning of cowpox patients who did not get smallpox. Suspecting a link, Jenner infected a young boy with cowpox. Weeks after the boy recovered, Jenner infected him with smallpox. When the boy remained healthy, Jenner had evidence that cowpox infection provided immunity from smallpox.

9. Louis Pasteur

Pre-viewing question

Q: Who has made important contributions to modern medicine?

A: Answers will vary.

Post-viewing question

Q: What did Louis Pasteur discover in his experiments with alcohol?

A: In looking through the microscope, Pasteur discovered that yeast bacteria could ferment beetroot juice to form alcohol, and vinegar bacteria would render it undrinkable. Pasteur could prove that germs from the air spread throughout the fermenting liquid. He also discovered that he could prevent milk from spoiling by heating it to kill any bacteria; the process now known as pasteurization.

10. Treating Tuberculosis

Pre-viewing question

Q: What do you know about tuberculosis?

A: Answers will vary.

Post-viewing question

Q: How was tuberculosis in children treated in the 19th century?

A: During the 19th century, tuberculosis patients were sent to sanitariums where they received rest, good food, fresh air, and daily exercise to promote deep breathing. Doctors shone sunlamps when natural sunlight wasn't available.

11. New Standards for Scientific Research

Pre-viewing question

Q: What are the rules for conducting school science experiments?

A: Answers will vary.

Post-viewing question

Q: What were Robert Koch's contributions to medicine?

A: Dr. Robert Koch discovered that tuberculosis was an infectious disease caused by a pathogen, not an illness of malnutrition. He introduced scientific standards for researching infectious diseases. According to Koch, to prove that a pathogen causes disease, a scientist must identify and isolate it, breed a pure culture in a petri dish, and be able to repeat the same clinical results in animal experiments.

12. A Cure for Tuberculosis

Pre-viewing question

Q: What are medical uses of X-ray machines?

A: Answers will vary.

Post-viewing question

Q: How have humans benefited from antibiotics and X-ray technology?

A: Answers will vary.