

Title: Emerging and Re-emerging infectious diseases

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Abstract: Infectious diseases have been a major issue in the human population for centuries. They have adversely impacted our society nationally as well as globally. Millions of dollars have been spent year after year to explore and scrutinize pathogens in order to better protect ourselves from them. Although the human race as well as nature are still impacted by pathogens, scientists through their continuous hard work on research has come up with many biotechnology techniques that have improved and even made possible to view pathogens at a much earlier time which makes it possible to save more lives as well as plants. Unfortunately, a vast majority of people around the world have very little understanding about biotechnology. Some even believe that biotechnology affects them in adverse ways. This project will help educate high school students on how scientists are using biotechnology to sequence DNA, studying viruses and other pathogens in a much closer way. Consequently, scientists have been able to manufacture medications that combat diseases that were death sentences in the past as well as more knowledge for the public in order to protect ourselves from these pathogens. All these progressive steps have increased the survival rate for humans as well as for animals and plants.

Rationale: The purpose of this project is primarily to introduce students to various emerging and re-emerging infectious diseases. The unit that deals with Bacteria, Viruses, Fungi and Protists will provide the opportunity for students to learn about various types of pathogens on how they can affect their health as well as their ability to adversely impact the population nationally and globally. Students will have a brief review of the general characteristics of each of these pathogens and the techniques used to detect and diagnose them. Furthermore, students will get familiar with the methods and techniques scientists are using on the quest for better understanding and cures for these pathogens.

Students will have the opportunity through the activities that will take place during these modules to be exposed to the skills that higher level scientists use in their laboratory to explore pathogens. By exposing the students to the field of infectious diseases as well as the biotechnology skills behind it, it is my objective to not only educate them on how to protect themselves as well as their surroundings, it is also my hope to gently guide and trigger their interest into something that can lead them into a career in the future.

Description of teaching unit or module(s), including expected outcomes

This project will cover the entire unit that covers Bacteria, Viruses, Fungi and Protists and will last approximately 32 days. Each module will start with a pretest to assess student prior knowledge or strength regarding each topic related to the pathogens. Next, there will be lecture sessions to introduce and explain the concept of the pathogens. Each lecture will describe, explain and compare the important points and answer every essential question from the chapter. The lectures will also include a demo and class discussion where students will be able to ask questions about anything that is unclear and give input about the topic being discussed. Various videos will be viewed throughout the chapter. Work

sheets from a work book will be provided after each lecture. Each assignments and labs will be modeled before being assigned to the students. Some of the assignments are guided reading materials that students can use to read through the chapter. The assignments will allow students to compare contrast, differentiate, draw conclusion and use their analogy and essay skills. Formal assessment, bell work/mini assessments, vocabulary quizzes, lab assignments will be used at the end of each module to assess the level of learning that the students acquired.

Module 1: Bacteria

This section will cover bacterial infections. Students will be introduced to physical features that are used to classify and explain how prokaryotes reproduce. Students will also learn ways in which bacteria cause illness and ways that humans defend against them. Students will view a video on food borne illness which will focus on various bacterial food borne illness and the precautions that should be followed to prevent infections. A video on bacterial sexual transmitted diseases will also be viewed. Each video will include a worksheet to be completed simultaneously with the video. Online activities such as, gizmo, Hands-on activities will give the students the opportunity to put in practice and visualize the concepts they have learn during the lectures and assignments. The hands-on activity Outbreak from University of Florida ICORE program, which focuses on cholera emerging in Port-au-Prince, Haiti, will be completed during that module. Other laboratory activities that possibly will take place during this unit are: The Right Prescription for bacteria during which students will learn how scientists test the effectiveness of an antibiotic against particular bacteria, and Battling germ with disinfectant which has for purpose to allow students to explore the various pathogens that are on them and around their environment as well as the methods that they can use to protect themselves. After successfully completing this module, students will demonstrate understanding of the relationships of structure, function, and reproduction of selected plants, animals, and microorganisms. Students will also be able to describe ways in which bacteria cause illness and identify ways that humans defend against them.

Module2: Viruses

This section will cover viral infection. Students will learn the structure and how viruses reproduce. They will also learn how viruses cause disease, and how human defend against them. The life cycle of a retrovirus will be explained in other for students to understand how the HIV viruses function and infect its hosts. The CD title Viral Outbreak the Science of Emerging Diseases as well as AIDS Evolution of an Epidemic will be viewed during this module. Online activities which include animated and virtual lab will be used in the lesson plan. Students will perform the laboratory experiment title ELISA which focuses on the testing of HV virus (equipment for this lab activity will be checked out from the locker of University of Florida ICORE program). Also, the laboratory experiments title Detecting TSWV using an immunostrip and Verification of PCR using gel electrophoresis will be completed (Equipment for this lab activity will be checked out from the locker of University of Florida ICORE program). At the end of the module students will be able to describe the structure and reproduction of viruses; explain how viruses cause disease and explain how human defend against viral diseases. Students will also be able to describe the life cycle of a retrovirus

Module 3 Vector born diseases

There will be no laboratory activities for the vector born diseases module. However, after learning about vector born diseases a CD title Integrated Pest Management for Mosquito Control will be viewed attach with a work sheet that will be complete simultaneously with the movie. Students will be conducting a project which will give them the opportunity to practice their research skills. Students will be divided in various group and each group will be assign with a particular vector born disease which they will have to do research on and present to the class at an appointed time. Thus, students will have an opportunity to teach and learn from each other.

Last but not least a video related to the benefits that biotechnology contribute to the science community will be view to strength or emphasize on the importance of the biotechnology skills that will be applied to the laboratory activities.

After successfully completing this unit, students will demonstrate understanding of the structure of the pathogens discussed throughout the chapter. They will also be able to explain how they function and their ability to adversely affect them and their environments. Students will have an understanding of biotechnology and its usefulness in research as well as having a certain degree on performing micropipetting, PCR DNA fingerprinting as well as ELISA techniques.

Literature cited

- Bio-Rad <http://www.bio-rad.com>
- Fisher Scientific <http://www.fishersci.com/>
- Bio-Rad, Inc. ELISA Immune Explorer
- Bio-Rad, Inc. ELISA Antibody Test
- Marco Salemi. 2011 June 20. The Origin of HIV-1 in Chimpanzee
- Klosterman M, Sadler T, Barko T, Bokor J, Brown J, Echevarri JF, Mandell T. 2011. Mission Biotech Teacher Guide. University of Florida College of Education

Budget and budget justification

ELISA Immuno Explorer Kits Colorimetric Kit /reagents	will loan from CPET equipment locker \$353.19 (96 test kit)
Adjustable micropipettes (S66800)	\$190.25 each (will loan from CPET equipment locker)
Pipette tips	will loan from CPET equipment locker
Tomato spotted wilt virus kits	will loan from CPET equipment locker

Science Lesson Plan- (Anatomy and Physiology Honors and Biology Honors)

Pierre-Louis

Lesson Planning

Benchmark/ Standard:

Chapter 12 or 17 The Lymphatic and Immune System and Resistance to Disease

Sunshine State Standards

- F.1.4.1 Knows that the body processes involve specific biochemical reactions governed by biochemical principles
- F.14.2 Knows that body structures are uniquely designed and adapted for their function
- F.14.3 Knows that membranes are sites for chemical synthesis and essential energy conversions
- F.14.4 Understands that biological systems obey the same laws of conservation as physical systems
- F.14.5 Knows that complex interactions among the different kinds of molecules in the cell cause distinct cycles of activity governed by proteins
- F.14.6 Knows that separate parts of the body communicate with each other using electrical and/or chemical signals
- F.14.7 Knows that organisms respond to internal and external stimuli
- F.1.4.8 Knows that cell behavior can be affected by molecules from other parts of the organism or even from other organisms

BENCHMARK #6: *After successfully completing this course, the student will demonstrate understanding of the relationships of structure, function, and reproduction of selected plants, animals, and microorganisms.*

BENCHMARK #7: *After successfully completing this course, the student will demonstrate understanding of the factors which affect the behavior of organisms.*

Essential Questions:

- What is lymphatic tissue?
- How are interstitial fluid and lymph similar, and how do they differ?
- What are the roles of thymus and lymph nodes in immunity?
- what are the functions of the spleen and tonsils?
- How does the immune system work?
- How do bacteria and viruses cause diseases in the human body?
- How can human defend against bacterial and viral diseases?
 - How do vaccines and antibiotics work to prevent disease?
- What causes HIV and how does it affect the immune system?
- With the wealth of drug research available, why is AIDS still devastating populations across the world

Materials and Resources:

- Various videos on the lymphatic system, bacteria and viruses will be used to throughout the chapters.
- Students will have the opportunity to do online research and presentation on various diseases related to viruses and bacteria.
- Activities and labs (cholera emerging in Port-au-Prince, Haiti , Detecting TSWV using an immunostrip and Verification of PCR using gel electrophoresis from the ICORE program)
- Work sheets from a work book will be provided after each lecture
- Lecture power point (the Lymphatic System, Review of bacteria and viruses)

Lesson Delivery

Explicit Instruction: *How will I deliver this lesson to help my students answer the essential questions?*

Teacher will write the essential question on the board

Lecture: Will describe, explain and compare every important point and answer every question from the chapter. Each lecture also includes, online cadaver as demo and class discussion where students can ask question about anything that is unclear and give input about topic being discuss.

Lesson Agenda:

Day One: Lecture about the Immune system (describe structure and function)

Day Two: Lecture: Review about bacteria and viruses; how the human body is affected by them as well as how the body defend and protect itself.

Day three: Modeled Instruction

Day four: Guided Instruction (labs)

Day five: Quiz/Assessment

Modeled Instruction:

Each assignments and projects will be modeled before being assigned to the students.

- Students will learn the functions of the lymphatic and immune system
- Students will describe the general location of the lymphatic organs, vessels and lymph nodes.
- Students will Briefly evaluate how environment and personal health are interrelated.
- Students will be able to describe two ways in which bacteria cause illness; identify ways that humans defend against bacterial and viral diseases
- Student will discuss what causes AIDS and how HIV affects the immune system.
- Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.
 - Student will discuss methods used to treat HIV/AIDS.
 - Reverse transcriptase inhibitors
 - Protease inhibitors
 - Combination drug therapy
 - Student will evaluate reasons for increases in infection rate.
 - Student will evaluate the following reasons for increases in infection rate.
 - Rapid mutation rate of the virus.
 - Geographic variations of viral strains
 - How do vaccines and antibiotics work to prevent disease?

Guided Practice:

Each assignment is guided reading materials that students can use to guide through the chapter. Each assignment will allow students to compare contrast and use their analogy and essay skills.

Independent Practice:

Each assignment will required students to work on their own for each assignment will be given to students after explanation and class discussion have take place. Thus, students should feel comfortable working on the assignment.

Assessment:

- Mini-assessment/bell work after each lecture and class discussion.
 - Vocabulary quiz
 - Formal assessment at the end of the chapter. Assessment will include multiple choices
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