ACTION PROPOSAL

Microorganisms and there possible destructive Pathogenic Path.

Rochelle Glenn

Roosevelt Middle School District of Palm Beach County

Abstract:

This research project will enhance the learning of 8th grade Medical Skills and Services student with knowledge of how pathogen can change, spread and wreak havoc on a community. I will incorporate hands on activities and new lessons to help students relate pathogens to real world situations. This action plan will be a part of a 2-3 weeks module on Infection control. The students will test water & diarrhea (simulated) samples for the presence Cholera. They will use DNA microarray to test for various strands of Cholera. The next activities will have them test a patient with ELISA to see if antibodies are present in a patient to figure out if she has been exposed to Dengue. These are activities that help increase their science knowledge test scores of the students.

Rationale:

The demographics at our school consist of 90% minority students. We are a title one school that tends to be under served. We have limited funds and I want to expose the students to various science techniques in diagnostic testing, patient intake practices and new career opportunities that they may never be exposed to. I want them to understand how pathogens emerge and will affect possible treatments of certain bacterial infections in the future. The two added lessons, "The Dengue Dilemma" and "A Medical Mystery of Epidemic Proportions" will allow me to expose my students to those things. We have a large Haiti population at our school. Many of which still have many family members still living in Haiti. Some of their family members experience the Cholera outbreak first hand. That lesson alone can spark a conversation with their parents. They will practice pipetting prior to those lesson with Pipetting by design lesson from Catalyst. Being able to relate class lessons personally, will leave a lasting impression on those students. My goal is to spark and interest in science for my students.

Description of teaching unit or module(s):

This module will take approximately 3 weeks.

SCIENCE STANDARDS

- 10.01 Distinguish between fact and fallacy about the transmission and treatment of diseases caused by blood borne pathogens.
- 10.02 Identify community resources and services available to the individual with diseases caused by blood borne pathogens.
- 10.03 Identify at risk behaviors which promote the spread of AIDS and the public education necessary to combat the spread of diseases caused by blood borne pathogens.
- 10.04 Apply infection control techniques designed to prevent the spread of diseases to the care of all patients following Centers for Disease Control (CDC) guidelines.

- 12.04 Discuss professionalism and the ethical role and responsibility of the healthcare worker.
- LA.910.2.2.3 The student will organize info to show understanding or relationships among facts, ideas, events
- LA.910.4.2.2 The student will record information and ideas from primary and secondary sources accurately and coherently, noting the validity and reliability of these sources and attributing sources of information.

Expected outcomes:

For the students to have a better understanding of science diagnostic testing, patient intake processes, infection control, bacteria and virus structure and function and emerging pathogens.

Data collection techniques and/or student assessments:

- Pipetting by design- visual assessments while working and end result.
- A medical mystery of Epidemic Proportions- Student packet will be graded.
- Dengue Dilemma- Vocabulary quiz, case report completion, Step to ELISA (Visual check), ELISA results (visual check)
- Posttest will include question from both lesson of Cholera and Dengue.

Use of equipment lockers and/or UF visit (either in the classroom or UF campus:

Pipetting by design locker

Dengue Dilemma ELISA supplies.

CATALySES summer institute elements specifically included (UF connections):

- ✓ Pipetting by Design lesson
- ✓ Dengue Dilemma lesson (up to ELISA)
- ✓ A Medical Mystery of Epidemic Proportions (Science Take) Lesson
- Various pathogen names will be added to my current search project for student research. Names of pathogens taken from the multiple presentations.

How your proposal differs from what you normally teach, new pedagogies; how you previously taught this lesson or topic versus how you plan to teach it under your Action Proposal:

I will add the new lesson into my current module on infection control. The added items hopefully will help the students retain the information. I now have a lesson that multiple students can relate to.

Literature cited:

https://www.sciencedirect.com/science/article/pii/S014067361260436X?via%3Dihub

https://www.ncbi.nlm.nih.gov/pmc/?term=dengue+fever

Budget and budget justification

LESSON PLAN

TITLE: "Microorganisms and there possible destructive Pathogenic Path"

KEY QUESTION(S):

- 1. What are pathogens?
- 2. Identify the cause of infection.
- 3. How can diseases spread in a population?
- 4. What are some preventative measures that can reduce the spread of pathogens?
- 5. How are vaccinations associated with infection control?
- 6. How does infection control play a part in how a disease spreads?
- 7. How does the prevention of diseases in a population change due to social and economic status?

SCIENCE SUBJECT: Medical Skills and Services

m

GRADE AND ABILITY LEVEL: 8th Grade Medical Skills and Services

SCIENCE CONCEPTS:

- 10.01 Distinguish between fact and fallacy about the transmission and treatment of diseases caused by blood borne pathogens.
- 10.02 Identify community resources and services available to the individual with diseases caused by blood borne pathogens.
- 10.03 Identify at risk behaviors which promote the spread of AIDS and the public education necessary to combat the spread of diseases caused by blood borne pathogens.
- 10.04 Apply infection control techniques designed to prevent the spread of diseases to the care of all patients following Centers for Disease Control (CDC) guidelines.
- 12.04 Discuss professionalism and the ethical role and responsibility of the healthcare worker.
- LA.910.2.2.3 The student will organize info to show understanding or relationships among facts, ideas, events
- LA.910.4.2.2 The student will record information and ideas from primary and secondary sources accurately and coherently, noting the validity and reliability of these sources and attributing sources of information.

OVERALL TIME ESTIMATE: Module will take approximately 3-4 weeks. Time varies based on student comprehension.

LEARNING STYLES: Visual, auditory, and or kinesthetic.

VOCABULARY:

• Acute

• Aerobic

AgaroseAirbourne Precautions

- o Anaeroic
- Antibody
- Antigen
- o Antisepsis
- Asepsis
- Biohazadous
- Causative Agent
- **CDC**
- o cDNA
- Chain of Infection
- $\circ \quad \text{Communicable Disease}$
- $\circ \quad \text{Contact precaustions} \quad$
- Contaminated
- Dengue
- $\circ \quad \text{Direct contact} \\$
- Disinfection
- Droplet Precautions
- o ELISA
- Endemic
- Endogenous
- Epidemiology
- Exogenous
- o Flora
- o Fungi

- o Gel electrophoresis
- Indirect Contact
- o Infectious Disease
- Isolation
- Material Saftey Data Sheet
- Microoganisim
- \circ Mode of Transmission
- o Nonpathogen
- Nosocomial
- \circ Opportunistic
- Pathogen
- o PCR
- $\circ \quad \text{Portal of Entry} \\$
- Portal of Exit
- o PPE
- o Protozoa
- o Reservoir
- o Richettsiae
- o Spores
- Standard Precautions
- o Sterile
- \circ Sterilization
- $\circ \quad \text{Susceptible Host} \\$

LESSONS SUMMARY: In this module students will learn about the structure, function of bacteria and virus, followed by the chain of infection. Then infection prevention process in a clinical setting. Students will do individual research on a pathogen they have been assigned (see attached infection control project). We will then move on to a lesson on a medical mystery of epidemic proportions-Cholera outbreak in Haiti. This assignment reinforces the information learned about pathogens and infection control practices. They will proceed to do the Dengue Dilemma assignment (3-4 days) Day 1-What ails you? Day 2- Steps of and ELISA. Day 3 – Testing for Dengue Antibodies.

STUDENT LEARNING OBJECTIVES WITH STANDARDS:

The student will be able to...

- Know the difference between a bacteria and virus.
- To understand how bacteria and virus infects a host.
- Different diseases that are caused by bacteria and virus.
- Understand the chain of infection.
- Learn how to break the chain by using infection control practices in the clinical setting.
- Learn about disease transmission in Cholera and Dengue.

MATERIALS:

- Computer with Internet access
- Handouts provided by teacher

BACKGROUND INFORMATION:

Infection control is a huge part to controlling the spread of pathogens. Throughout this module lesson student will learn how to have a better understanding of science diagnostic testing, patient intake processes, infection control, bacteria and virus structure and function and emerging pathogens.

ADVANCE PREPARATION:

Pipetting by design items needed:

MATERIALS:

• (1) Multicolor Food Coloring Package (Red, Blue, Yellow, Green)

Needed For Each Student Pair:

- (2) 10mL aliquots of Colored Water (Color of water needed is dependent upon which protocol each group is using)
 - A- DNA: Red and Blue water
 - B- GATC: Blue and Green water
 - C- Gator: Green and Brown water
 - D- UF: Orange and Blue water
 - E- Virus : Purple and Red water
 - F Atom; Red, Orange and Blue water
 - G Flask; Blue, Orange and Red water
 - H DNA Strand; Blue and Red water
 - I Insect; Green and Blue water
 - J PCR; Green, Orange and Blue water

Dengue Dilemma

MATERIALS:

LESSON 1:

- Copies of the case report per student
- o Copies of the epidemiological log per student

LESSON 2 :

- Steps of an ELISA cards, cut (laminate for repeated use)
- Steps of an ELISA student worksheet, per student pair (laminate for repeated use)

LESSON 3:

If performing the authentic ELISA, this curriculum recommends BioRad. Other companies also have classroom-friendly ELISAs, but the instructions provided here are specific to BioRad.

ELISA test (BioRad's Biotechnology Explorer ELISA Immuno Explorer Kit Catalog #166-2400EDU Protocol III — Antibody test. All necessary consumables are included in the BioRad kit.)

OR

If performing the simulated ELISA, you will need the materials listed below:

• Fluorescent ink pen

- 12-well microplate strips
- Assorted 1.5 or 2.0ml microfuge tubes
- o Microfuge racks
- o Disposable transfer pipets
- o P200
- Disposable tips, 20-200ul
- o Clear or white unscented soap
- $\circ\quad \text{Cups or small beakers}$
- o UV lights

A Medical Mystery of Epidemic Proportions

Materials: Science take out kits (A medical Mystery of Epidemic Proportions)



PROCEDURE AND DISCUSSION QUESTIONS WITH TIME ESTIMATES: (All assignments below are attached to the end of the lesson plan. The amount of time may vary based on your students.

- Day 1-> Students will learn proper pipetting procedures and will practice with <u>Pipetting by</u> <u>Design</u>.
- Days 2-6 -> Dengue Dilemma
- Days 7-10 -> <u>A Medical Mystery of Epidemic Proportions</u> Lab activity.

ASSESSMENT SUGGESTIONS:

I would recommend having the students work in groups. Group size will vary based on how many students you have in your class. I will have no more than 4 students per group. Ideally, I would have them work in pairs. You can grades students on final results or how ever you see fit to grade them. I would recommend some sort of formative assessment during the activities and a final summative assessment after everything has been completed and reviewed.

Microorganisms possible destructive Pathogenic Pathway



By Rochelle Glenn Roosevelt Middle School Palm Beach County



Introduction to Bacteria

The Good, the Bad and the Ugly...





VIRUSES





Assessment on notes. Research project given.



A Medical Mystery of Epidemic Proportions Science Take out lesson





O1 Vibrio cholerae genes spotted on the microarray:

Gene 1 – Cholera toxin gene Gene 2 – Catalase enzyme gene Gene 3 – DNA polymerase gene Gene 4 – Flagella gene Gene 5 – O1 Antigen gene Gene 6 – Pilus gene (attachment to intestine)



Pipetting by Design



The Dengue Dilemma

Day 1Day 2Lesson 1Lesson 2What Ails You?Steps of an ELISA(45 minutes)(45 minutes)

Lesson 3 Testing for Dengue Antibodies (45 minutes)

Day 3

The Investigation Begins - Case Report

EPIDEMIOLOGICAL REPORT

N

Patient Case #: _____ Gender: 🗆 Male 🗆 Female Age: _____

forme address:		Recent tra	web		
DATE SYMP	томя	SAMPLE SOURCE	TEST PERFORMED	RESULT	DIAGNOSIS
Chils Prever Headache Joint/muncle pain Light-heade d Other:	Malaise Nausea-Vomiting Pain bahind eyes Rah Swelling				
Chills Fever Headache Joint/muscle pain Light-heade d Other:	Moloise Nouseal-vomiting Pain behind eyes Redn Swelling				
Chills Forver Joint/wurcle pain Ughtheade d Other:	Malaise Nausea-Vomiting Pain behind eyes Rash Swelling				
Recovered					
Draw or affix image of ELISA b			w or affix image of POR/g	el electrophonesis on back	

🕵 Steps of an ELİSA

A common test used to detect if a patient has been exposed to a virus such as HIV, Dengue, or West Nile is called an ELISA [Enzyme Linked ImmunoSorbant Assay]. This test takes advantage of the interactions between antigens and antibodies. Often compared to a lock and key, an antigen/antibody interaction is very specific. ELISA tests usually take place in plastic plates containing wells, or depressions.

Match the statements and images below to sequence the steps of an ELISA test.



Student ELİSA Procedure



Power point presentations on pathogen assigned



Assessment on Cholera and Dengue