Read your way through it!

A prospective way to increase student understanding of content knowledge through reading news articles.

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Action Research Proposal Template 2018

Abstract:

Can reading articles on up to date information help students "buy" into content area knowledge? As a science teacher I wanted to do my part in helping English/reading teachers by incorporating a reading skill into my classroom while also teaching my subject area content. Normally I teach cell types solely by lecture and activity but I was very curious to see if incorporation of a news article pertaining to emerging pathogens would help increase the student "buy" into the content. Starting with a pretest and having a control group I will collect the unit test data and compare results from pretest to unit test to see if there were any significant gains made to the class using the article as an additional supplement. The attached lesson plan will lay out a more detailed classroom approach.

Rationale:

In my county reading has become an enormous deficiency over the years resulting in large groups of students needing intensive reading classes. As a science teacher I wanted to do my part in helping English/reading teachers by incorporating a reading skill into my classroom. I am hoping by incorporating reading into my curriculum I can prove that this technique is extremely beneficial to students. If students can read our content then they shouldn't have an problems learning our content.

Question:

How will reading a news article about bacteria and antibiotic resistance help students understand the structures and functions of prokaryotic cells? How will reintroducing antibiotic resistance help students bring up previous knowledge and help with content area

Intervention:

Reading components seem to be extremely helpful to my students using this observation I wanted to test this hypothesis. I am going to include questions throughout the article to help keep students focused and thinking about bacteria.

Normally I teach prokaryotic cells in a lecture/activity style which seems to do okay but I really think it might help students "buy" into the different types of cells if they know what is going on in the world with this little microbe.

I will then revisit another article (Part 2) when students get to the immune system unit. Comparing the data again will help get a clear picture of any gains.

Bacteria are ever changing single celled prokaryotes (no nucleus) that live but inside and outside of living organisms. These little guys can be harmful and are the cause to many epidemics throughout history such as Justinian Plague, Bubonic Plague, Cholera, Modern Plague and so on. But sometimes bacteria are helpful such as those found growing in your intestines and on your skin.

Bacteria can be classified by their shape such as spherical, rod, and spiral with lots of variations within each group. Bacteria have some similarities and differences to eukaryotic (animal) cells. Some of their structures include a cell wall, plasma membrane, cytoplasm, DNA, ribosomes, flagellum, and pili. Most bacteria obtain energy by eating organic carbon while other bacteria are autotrophic (make their own food) and some are even chemotrophs.

Bacteria live everywhere (soil, water, plants, animals, radioactive waste, artic, hot springs, in the earth's crust, even deep in the ocean). Bacteria can be anaerobic (grow without oxygen) and aerobic (grow in the presence of oxygen). Some bacteria are even considered extremophiles (living in conditions considered too extreme for most life forms).

Bacteria are asexual reproducers usually reproducing though binary fission but scientists have found they can also transfer their genetic information to other bacteria through processes known as conjugation, transformation, and transduction. Some bacteria can also produce spores when they are low on resources and these spores have a high rate of survival.

Bacteria can be useful in many ways (creating cheese, digestion, nitrogen fixation, breaking down other organic compounds, and so on) but other can be very harmful. One of the major concerns scientists are focused on is resistance. This is when bacteria become impervious to medication or traditional methods used to rid the organisms of the bacteria.

Data Collection and Analysis:

One class will be taught the material without the reading article (in a traditional manner) while the other class will be given the article assignment. I will then use the unit test as a data comparison between the two classes. This procedure will be used again in the immune system unit (semester 2).

Connections to CATALySES Summer Institute:

In CATALySES we spent some time learning about different types of bacteria, bacteria resistance, the response our immune systems have, etc. This lesson will help incorporate aspect of the lectures and materials we learned throughout the program while still giving this a spin to help struggling readers.

Literature Cited:

https://www.medicalnewstoday.com/articles/157973.php

(Part 1) https://www.sciencenewsforstudents.org/article/superbugs-silent-health-emergency

(Part 2) https://www.sciencenewsforstudents.org/article/war-superbugs

http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.460.2956&rep=rep1&type=pdf

https://files.eric.ed.gov/fulltext/EJ1008596.pdf *Seventh grade specific but the text seems to be universal.

Lesson Plan Format

Title:

Read your way through it! A prospective way to increase student “buy in” of bacteria structures and functions.

Key Questions:

What is bacteria? How does it affect plants and animals? What are scientists doing to combat these super bugs?

Science Subject:

Biology

Grade and Ability Levels:

9 - 10, Regular

Science Concept:

Cell Types, Structures, and Functions

Immune System

Overall Time Estimate:

4. 50 minute periods

Learning Styles:

Visual and Auditory

Vocabulary:

antibiotic A germ-killing substance prescribed as a medicine (or sometimes as a feed additive to promote the growth of livestock). It does not work against viruses.

bacterium (plural for **bacteria**) A single-celled organism forming one of the three domains of life. These dwell nearly everywhere on Earth, from the bottom of the sea to inside animals.

boils A skin infection that starts as a hard, red, painful lump. Eventually, it gets bigger, softens and fills with pus. A common source of these is a bacterium known as *Staphylococcus aureus.*

bioengineer A researcher who applies technology for the beneficial manipulation of living things. Bioengineers use the principles of biology and the techniques of engineering to design organisms or products that can mimic, replace or augment the chemical or physical processes present in existing organisms. This field includes researchers who genetically modify organisms, including microbes. It also includes researchers who design medical devices such as artificial hearts and artificial limbs.

cholera A bacterial disease that infects the small intestine, causing sever diarrhea, vomiting and dehydration. It is spread by germs from feces that contaminate water or food.

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DNA (short for deoxyribonucleic acid) A long, spiral-shaped molecule inside most living cells that carries genetic instructions. In all living things, from plants and animals to microbes, these instructions tell cells which molecules to make.

gene A segment of DNA that codes, or holds instructions, for producing a protein. Offspring inherit genes from their parents. Genes influence how an organism looks and behaves.

germ Any one-celled microorganism, such as a bacterium, fungal species or virus particle. Some germs cause disease. Others can promote the health of higher-order organisms, including birds and mammals. The health effects of most germs, however, remain unknown.

gonorrhea A serious disease that can infect the genitals, rectum and throat. This sexually transmitted disease is very common, especially among people between the ages of 15 and 24. Untreated, it can cause infertility or death. "Untreated gonorrhea may also increase your chances of getting or giving HIV – the virus that causes AIDS," according to the U.S. Centers for Disease Control and Prevention.

Immune system The collection of cells and their responses that help the body fight off infection.

infection A disease that can be transmitted between organisms.

influenza (or flu) A highly contagious viral infection of the respiratory passages causing fever and severe aching. It often occurs as an epidemic.

microbe Short for microorganism. A living thing that is too small to see with the unaided eye, including bacteria, some fungi and many other organisms such as amoebas. Most consist of a single cell.

microbiology The study of microorganisms, principally bacteria, fungi and viruses. Scientists who study microbes and the infections they can cause or ways that they can interact with their environment are known as **microbiologists**.

mutation Some change that occurs to a gene in an organism's DNA. Some mutations occur naturally. Others can be triggered by outside factors, such as pollution, radiation, medicines or something in the diet. A gene with this change is referred to as a mutant.

plasmid A small circular loop of DNA that is separate from the main chromosomal DNA of bacteria.

pneumonia A lung disease in which infection by a virus or bacterium causes inflammation and tissue damage. Sometimes the lungs fill with fluid or mucus. Symptoms include fever, chills, cough and trouble breathing.

resistance (as in drug resistance) The reduction in the effectiveness of a drug to cure a disease, usually a microbial infection. (as in disease resistance) The ability of an organism to fight off disease.

superbug A popular term for a disease-causing germ that can withstand medicines.

toxin A poison produced by living organisms, such as germs, bees, spiders, poison ivy and snakes.

virus Tiny infectious particles consisting of RNA or DNA surrounded by protein. Viruses can reproduce only by injecting their genetic material into the cells of living creatures. Although scientists frequently refer to viruses as live or dead, in fact no virus is truly alive. It doesn't eat like animals do, or make its own food the way plants do. It must hijack the cellular machinery of a living cell to survive.

Lesson Plan Format

Lesson Summary:

In this lesson students will both partner read and popcorn read an article from science news for students titled "Superbugs: A silent health emergency". The class will answer questions as we read the article to better engage their understanding of the topic.

Student Learning Objectives with Standards:

1. Students will be able to recognize how bacteria are changing in response to new technologies and its reaction to our immune system. SC.912.L.14.3

Materials:

Each student will have a copy of the article and the supplemental questions.

Background Information:

Please see vocabulary list for updated vocabulary words and definitions.

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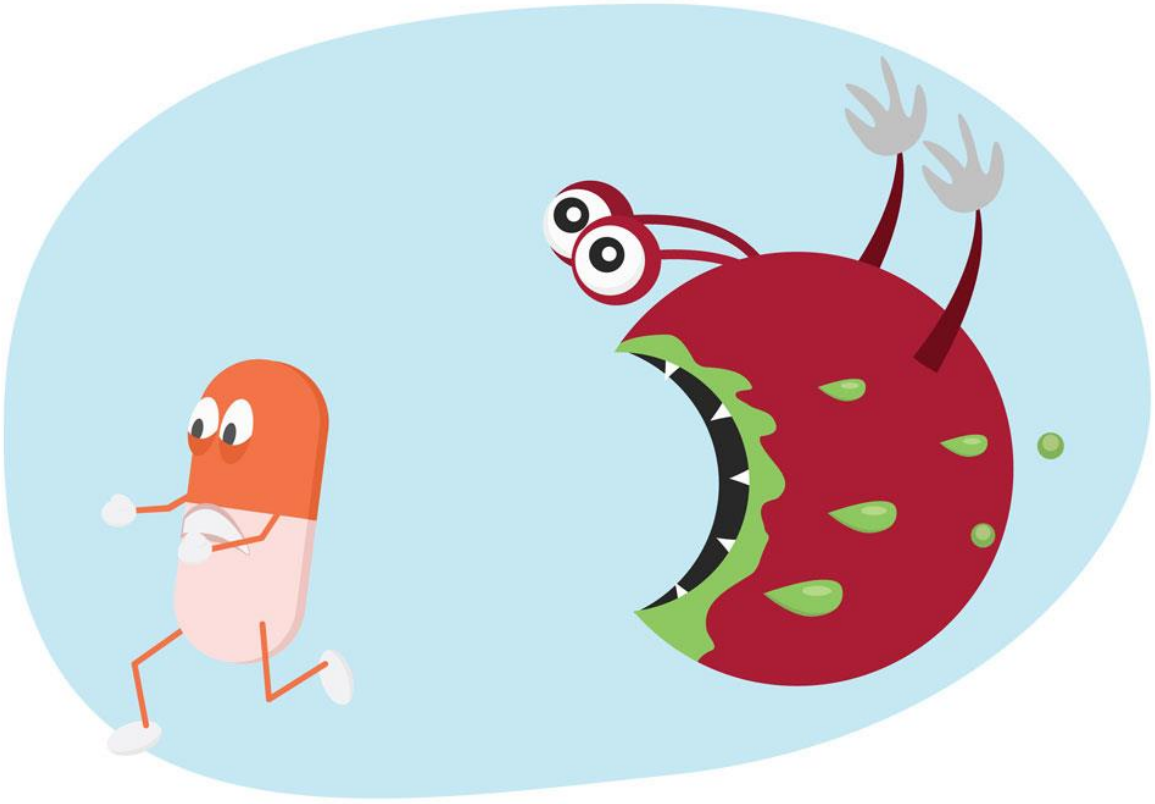
Advance Preparation:

Each student will need a copy of the article and questions. Teachers will need to read the article in advance.

Procedure and Discussion Questions with Time Estimates:

Lesson Plan Format



1. Use the above picture as a hook! I would do this as a Bellwork. As the students come into class I would post the question "What is this picture showing?" Spending a few minutes letting them answer and discussing their responses. It is okay to do this this twice (once for part 1 and once for part 2, some students will remember and that's what we want to build on the second time). (5 minutes)
2. Once finished I would then introduce the lesson by talking about this picture with the students. What is means really and how it relates to cells structure, function, and our body's immune response. This is when the background information could be used if need be. (5 minutes)
3. Students would then be prompted to find the article and questions (please see attachment for questions pertaining to each article) on their desk. (1 minute)
4. Instructions for the activity would be the next step. (5 minutes)
    a. Students will popcorn read and partner read throughout this assignment. We will popcorn read sections 1, 3, and 5 while partner reading will be done on sections 2 and 4. I will set a time limit for partner reading (5 minutes) which will help them answer questions together when they are finished reading their section.
    b. Students should answer questions as we go along utilizing evidence from the article as support for their answers (helps English with choosing correct quotes). Periodically I will go through and ask questions not on the student questions sheet such as "why did you write that?" or "what do you think they meant by that?". I often tell students to use highlighters if it makes finding things in the passage easier for them. By this time I have taught highlight etiquette.
    c. I also ask if there are any questions or if I need to clarify.

5. Read the article alternating between popcorn and partner answering questions. In one period the class might only get through ½ so I make article/question copies for each period marking answers the students had, where they struggled in the article, where they left off day one, and any other important information. (40 minutes)
6. With the last 5 minutes I would have a discussion with the class on what they learned, what they thought was most exciting, what they want to explore more, and any other general comments for the day. I have included some back up questions in case for prompting in the end if when those classes come up that don't have anything to say. (5 minutes)

This process will be repeated for the second time during the immune system section (semester 2 for us) using Part 2 article. Below is another picture for part 2 if variety is desired.

Assessment Suggestions:

One class will be taught the material without the reading article (in a traditional manner) while the other class will be given the article assignment. I will then use the unit test as a data comparison between the two classes. This procedure will be used again in the immune system unit.

Extensions:

While scouring the internet for references on this topic I was surprised at the small amount research I found pertaining specifically to science content and reading. There were lots of books written about way

to incorporate this idea but not so much data. The research I did find really helps to support my hypothesis on reading up to date news for science content area support.

Resources/References:

https://www.medicalnewstoday.com/articles/157973.php

(Part 1) https://www.sciencenewsforstudents.org/article/superbugs-silent-health-emergency

(Part 2) https://www.sciencenewsforstudents.org/article/war-superbugs

http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.460.2956&rep=rep1&type=pdf

https://files.eric.ed.gov/fulltext/EJ1008596.pdf *Seventh grade specific but the text seems to be universal.

Image 1:

https://images.theconversation.com/files/126076/original/image-20160610-2624-j0mkag.jpg?auto=format&q=45&w=1356&h=668&fit=scale

Image 2:

https://ajp.com.au/news/nps-on-antibiotic-resistance-winter-is-coming/

Questions Article 1:

**These are certainly changeable to fit your students need. I just wanted to give you some examples of what I might use. I ask them questions throughout the reading to make sure they are paying attention. These are very dependent on each class and can be as simple as “why did you write that?” or “what do you think they meant by that?”.

Instructions: You will be reading the article “Superbugs: A silent health emergency” both with your partner and with the class. You will be responsible for answering every question with as much detail and evidence as possible. Each question **MUST** contain evidence from the article to support your answer. This means the answers to these questions should be several sentences long.

1. With your partner brainstorm what you already know about bacteria. Then do the same for antibiotics. Write your answers below.
2. Define bacteria. Define antibiotics.
3. Explain why the WHO sees bacteria as a huge threat.
4. Analyze what is happening with the relationship between antibiotics and bacteria.
5. Find out why antibiotic overuse is so prevalent. **Make sure to follow the instructions above**.
6. Create a solution to the bacterial resistance threat. In other words, how would you decide ways to prevent further bacterial resistance?
7. Now that you have read the article brainstorm with your partner about what you now know about bacteria and antibiotics. Write your answers below.

Lesson Plan Format

Questions Article 2:

**These are certainly changeable to fit your students need. I just wanted to give you some examples of what I might use. I ask them questions throughout the reading to make sure they are paying attention. These are very dependent on each class and can be as simple as “why did you write that?” or “what do you think they meant by that?”.

Instructions: You will be reading the article “Superbugs: A silent health emergency” both with your partner and with the class. You will be responsible for answering every question with as much detail and evidence as possible. Each question **MUST** contain evidence from the article to support your answer. This means the answers to these questions should be several sentences long.

1. With your partner discuss what you remember about bacteria and antibiotics. If you need to pull out your old article to help jog your memory. Write your answers below.
2. Describe resistance and explain what happened with TB.
3. Now that you know more about our immune system revisit your creations to help prevent further bacterial resistance and invent another way to help. Write your ideas below. Hint: Think about immune systems and structures of prokaryotic cells.
4. What do you think about the CDC’s recommendation to doctors about antibiotics? How do you think this will help?
5. There are many news technologies arising give a brief explanation of the ones stated in the article and then tell how they are expected to fight this problem of antibiotic resistance.
6. You and your partner will now do some research of your own and find 3 things:
    a. An emerging antibiotic resistant bacterium and its history.
    b. What scientists are doing to eliminate this bacterium.
    c. How do you think this bacterium will affect the future of its infecting population?
7. How does our immune system fight off these invading prokaryotes?
8. With your partner discuss what you now know about bacteria, antibiotics, and the immune system. Write your answers below.