

Helen Haskell

Unit Plan: Microbes and Me

7th grade life science

Course Concepts I would like to address in this unit plan:

- Investigating the World
- Recognizing perspectives

Reflection on completing section two:

While this section is not required I wanted to put down some thoughts so that I can address them next time I work on this. Since completing this I have spent more time reading the Asia Society “Educating for Global Competence” and in the Week Five assignment, I focused much on the global competence matrices. I want to spend time looking at these more before working on part three, and I anticipate adding to the transfer tasks as well as the established goals. My challenge again becomes incorporating and increasing the voices and perspectives that are not only those on paper or websites. I need to look at more opportunities to share my students’ knowledge with others as well as to encourage communication and collaboration with other schools around the world. This may or may not be the unit in which this works well, but I need to think about this more as I move forward in the upcoming weeks and months.

Reflection on completing section three:

This year in my teaching, I have focused, at least with the 7th grade life science classes (I also teach 9th grade Geology) on science content that reflects current issues. For example, in conjunction with both my plant unit and my entomology unit, we have examined the complexity of CCD (Colony Collapse Disorder) with bees and the impact that will have on food security, and we are also examining the complexities of biodiesel fuel, including the consequences such as rainforest losses, increased agricultural jobs, child labor, and use of restaurant used oil versus new oil in biofuel production. While we are only about 14 weeks in to the school year, I am realizing that my seventh graders are grasping pretty strongly the complexity of these issues, and while they may not be able to articulate yet at a level we want them to in terms of science depth, they are seeing issues from multiple perspectives, and that more than just the USA is battling these issues. I am excited about ‘issues based’ science. It’s tricky as it’s important that students see ‘light at the end of the tunnel’ and actions that can be taken, and this needs to remain at the forefront of my units.

Microbes and Me

Stage 1 Desired Results		
<p>ESTABLISHED GOALS</p> <p><u>From Global Education Checklist</u> http://www.globaled.org/fianlcopy.pdf</p> <p>Global Issues – Knowledge:1a. Students are aware that global issues exist and effect their lives</p> <p>Global Issues – Knowledge:1c. Students are aware that global issues are interrelated, complex and challenging.</p> <p>Global Issues – Participation:3a. Students can approach global issues, problems and challenges objectively, with neither undue optimism nor unwarranted pessimism.</p> <p>Culture-Knowledge: 4h. Students know and understand that there are universals connecting all cultures.</p> <p>Global Connections – Knowledge: 7a. Student can identify and describe how the USA is connected with the world ecologically.</p> <p>Global Connections – Knowledge: 7b. Students understand that global interconnections are not necessarily benign and that they have both positive and negative consequences in the United States.</p> <p>Global Connections –Skills: 8b. Students recognize, analyze and evaluate interconnections of local and regional issues with global challenges and issues.</p> <p>Global Connections – Skills: 8c. Students recognize, analyze and evaluate the interconnections between their lives and global issues.</p> <p>Global Connections – Skills: 8d. Students generate alternative projections for the future and weigh potential future scenarios.</p>	<p><i>Transfer</i></p>	

<p>From NM State Science Standards, 2003 http://www.ped.state.nm.us/mathscience/dl08/Standards/G7ScienceStandards.pdf S1, S1, 5-8 BI - Use scientific methods to develop questions, design and conduct experiments using appropriate technologies, analyze and evaluate results, make predictions, and communicate findings: S1, S1, 5-8BII - Understand the processes of scientific investigation and how scientific inquiry results in scientific knowledge. S1, S1, 5-8 BIII – Use mathematical ideas, tools and techniques to understand scientific knowledge. SII, SII 5-8 BI – Explain the diverse structures and functions of living things and the interdependence of living things and their environments SII, SII 5-8 BI – Understand how traits are passed from one generation to the next and how species evolve. SII, SII 5-8 BIII – Understand the structure of organisms and the function of cells in living systems.</p> <p>From National Science Standards (see below Stage 3) http://www.nextgenscience.org</p> <p>From ITSE (International Society for Technology in Education) http://www.iste.org/docs/pdfs/nets-s-standards.pdf?sfvrsn=2 Communication and Collaboration: students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.</p>		
	<p><i>Students will be able to independently use their learning to...</i></p> <ol style="list-style-type: none"> 1. Understand there are more perspectives to an issue 	

	<p>than just their own, depending on an individual's situation.</p> <ol style="list-style-type: none"> 2. Understand that solving issues is complex and requires good scientific research, collaboration and communication. 3. Be more familiar with the concept that scientific knowledge and understanding is constantly changes as species evolve and technology improves. 4. Understand that different nations and cultures have similar issues and identify and have empathy with some of those issues. 	
	Meaning	
	<p>UNDERSTANDINGS</p> <p><i>Students will understand that...</i></p> <p>U1: Viruses are different to bacteria and other microbes in structure and function.</p> <p>U2: Viruses and microbes are spread via a variety of vectors.</p> <p>U3: Access to health care can affect an individual and community's</p>	<p>ESSENTIAL QUESTIONS</p> <p>E1: How does the structure and function of a microbe (virus, bacteria, protozoan) support its lifestyle.</p> <p>E2: What role have microbes played in local and world health issues and how has that changed over time?</p>

	<p>success in protection from viruses and other microbes.</p> <p>U4: Other factors including water sources and nutrition, government policies and lifestyle impact an individual and community's ability to control virus and microbial spread.</p> <p>U5: Factors such as increased use of antibiotics has made 'superbugs' that are resistant to current treatments.</p> <p>U6: Ongoing medical research and global collaboration are essential to world health.</p> <p>U7 There are multiple factors that allow or limit an individuals access to and/or education of health care in different communities.</p> <p>U7 There are multiple factors that contribute to the spread of disease.</p>	<p>E3: What are factors that enable or limit access to health care?</p> <p>E4: What factors influence the spread of disease?</p> <p>E5: How are scientists researching and learning about the diseases and how has this changed over time?</p> <p>E6: How can collaboration and shared goals between different nations support world (health) issues?</p>
	Acquisition	
	<p><i>Students will know...</i></p> <p>K1: Viruses are not considered a living organism.</p> <p>K2: Bacteria and protozoa have similar but different structures.</p> <p>K3: There are multiple mechanisms that determine if an individual will contract a disease. Some are out of their control.</p> <p>K4: In many instances it takes the support of other individuals,</p>	<p><i>Students will be skilled at...</i></p> <p>S1: Identifying bacteria under a compound microscope.</p> <p>S2: Designing an experiment or activity that illustrates the spread of a disease in a community.</p> <p>S3: Debating the issues communities face in access to health care.</p> <p>S4. Explaining the roles that individuals, NGO's and governments</p>

	communities, government policies and the support of NGOs to fight infectious diseases.	play in health care and disease control. S5: Reflecting on the impact a disease can have on an individual and a community.
Stage 2 - Evidence		
Evaluative Criteria	Assessment Evidence	
<p>1. Student accurately constructs a range map and names and identifies countries where Malaria is found. Student creates a detailed understanding of factors that increase the likelihood of malaria in an environment.</p> <p>2. Diagrams are clear, scientifically accurate and show understanding of the different structures and can identify components of each structure.</p> <p>3. Student can set up, care for and pack up a compound microscope. Student properly uses pre-made slides and cleans up. Student follows safety protocols.</p> <p>4. Student is able to comprehend scientific content within a written and audio news article. Student can paraphrase and summarize from a written account and interpret</p> <p>5. Student can analyze oral dialog from podcast accurately and interpret and infer issues that are faced by individuals. Students can summarize the content and communicate it orally, and articulate their understanding of another's perspective.</p> <p>6. Student can evaluate the different aspects of the activity: student uses scientific data to create a professional product used</p>	<p>TRANSFER TASK(S):</p> <p>1. Mapping Malaria: Using information from this website http://www.cdc.gov/malaria/about/distribution.html as well as one other resource of your choice, name ten countries where malaria can be found and plot on a range map. Describe factors that make areas of the countries hospitable for mosquitos to carry malaria. Using the following site, describe how history of malaria in the USA. http://www.cdc.gov/malaria/about/history/elimination_us.html</p>	

<p>in the education of a community. Student devises and contributes to the educational product, honoring accuracy, attention to detail, and community engagement.</p> <p>7. Student uses evidence and data in stating their opinions and decisions. Student distinguishes different perspectives and issues. Student engages in active discussion with peers using the LMS format; dialog uses appropriate grammar and accurate spelling. Student will articulate their own perspective by consideration of others perspectives.</p>	<ol style="list-style-type: none"> 2. Diagram the physical structures of bacteria and viruses and be able to orally state similarities and differences. 3. Using a compound microscope appropriately, be able to identify bacteria cells as compared to animal and plant cells, from pre-made slides. 4. Using information from the podcast, “Cambodians Face Threat of Drug Resistant Malaria”, answer questions (Worksheet A – see lesson plans). 5. Working with your team, using evidence from the podcast you heard and the article you read, write a description of the situation and issues of bacterial resistance from the following people’s perspectives: Pin Sreymom & Pin Vantim; Dr Darapiseth Sea; LT. Col. Mark Fuku; school official in USA; healthcare worker in USA; student at a school in USA. 	
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	<p>6. Participate in the task-force (see lesson plan for more details) to educate the population (either of USA or other country) about the increase in drug resistant bacteria. Create an educational product (poster, website, radio podcast etc.) that is appropriate for your population. Be ready to discuss the issues you may be faced with in disseminating your information.</p> <p>7. Participation in LMS discussion: Using the online discussion tool, you will post your answer to two questions asked, using evidence and data collected in class. You need to respond with data and questions to responses of your peers over several days.</p> <p>“Using accurate facts and information from the sources we have used, state your ideas about a</p>	
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	<p>solution to reducing the spread of malaria.”</p> <p>“Is Malaria a world-wide issue? Is it important for other countries to get involved in the battle against this disease (or other diseases)? Explain your thoughts and ideas using detailed evidence and data from our class sources”.</p>	
Shows good use of time; Is able to articulate questions to teacher and others to enhance understanding; is organized; makes connections between own life and others; uses appropriate forms of communication; ability to be on time with assignments.	<p>OTHER EVIDENCE:</p> <ol style="list-style-type: none"> 1. Observation of the individuals and groups during class time. 2. Quizzes and tests 3. Informal class discussions 	
Stage 3 – Learning Plan		
<p><i>Summary of Key Learning Events and Instruction</i></p> <p>Lesson One: Structure and Function</p> <ul style="list-style-type: none"> • Microbe Investigation and taxonomy: Using a variety of sources (web-based and book) students will construct a graphic organizer/table that shows similarities and contrasts between organisms classed as microbes. Students will also diagram and label cell structure as 		

appropriate.

<http://www.microbeworld.org/what-is-a-microbe>

- Video on microbes - the 7 wonders of the microbe world
<http://www.youtube.com/watch?v=XuZQUEFD52I>
- <http://www.npr.org/blogs/krulwich/2011/06/01/114075029/flu-attack-how-a-virus-invades-your-body>
- Microbe roles: students will research different species of microbes to determine their taxonomy and the function/roles they play in an ecosystem.
<http://www.microbeworld.org/types-of-microbes>
<http://www.microbeworld.org/what-is-a-microbe/microbe-gallery>
- Microscopy: students will examine pre-made slides of bacteria, fungi and protists and be able to make comparisons to plant and animal cells To gain a sense of scale, students will use the following website:
<http://learn.genetics.utah.edu/content/begin/cells/scale/>
to further increase their understanding of the scale of different cells and cell organelles.

Lesson Two: Microbe Discovery in history

- Students will research about the discovery of different microbes and experiments done in history, by scientists such as Alexander Fleming, Louis Pasteur, Edward Jenner, Robert Koch and Anton von Leeuwenhoek; students will discuss where, when and examine the context in which these findings happened, including the technologies that needed to exist, and the communication and collaboration needing to happening between scientists in different countries to further academic understanding and change

prevailing attitudes of the time. (use word document with links)

Lesson Three: Microbes and our lives: case studies

- **Case Study #1** Use of microbes in the food and drug industry:
 1. Students will brainstorm and research microbial use in the food industry and make a visual display that will be used later as an educational tool for their peers. Students can watch this video to help engage their focus and understanding.
<http://www.bbc.co.uk/learningzone/clips/the-use-of-microbes-in-the-food-and-drink-industry/4198.html>
 2. Students will make bread and/or Herman the Friendship cake to explore how yeast functions and is essential to the bread making process.
 3. Students will expand their knowledge of microbial food and research one from a region of the world/culture/country and create a educational product of their choice (poster, website etc.) that includes maps, pictures, recipes, and science concepts about the microbial food. If possible, students can also research the economics of the food source and the importance of it as a staple or luxury in the region/country/culture.
http://en.wikipedia.org/wiki/List_of_microorganisms_used_in_food_and_beverage_preparation
<http://www.befunky.com> or the one I used for the other class...
- **Case Study #2** Microbes and Antibiotics, with a focus on malaria in Cambodia and drug resistant bacteria in the USA

<p>1. Guest speaker: Dr. Diana Northup, UNM, will visit with students and discuss her research both here in New Mexico, and around the world, on sub-surface microbes and their antibiotic properties. Students will examine maps to discover where in the world Dr. Northup is conducting her research, and realize that her work is supported by the research by others.</p> <p>2. Students will discuss prior knowledge and determine misconceptions about malaria. Students will make the connection between microbes and malaria. Students may watch the following video to supplement their knowledge: http://www.pbslearningmedia.org/resource/envh10.sci.life.eco.malaria/malaria-treatment-and-prevention-strategies</p> <p>3. Students will create a present day range map of malaria using the CDC website http://www.cdc.gov/malaria/about/distribution.html as well as one other resource of their choice. They will document factors that make areas of the countries hospitable for mosquitos to carry malaria. Using the following site, they will document the historical incidence of malaria in the USA. http://www.cdc.gov/malaria/about/history/elimination_us.html and add an historical range to their map.</p> <p>4. Students will listen to podcast (or video) about Malaria in Cambodia. http://www.pbs.org/newshour/extra/teachers/lessonplans/world/july-dec09/drug_resistant_bacteria.html</p>		
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<p>Students will complete worksheet A from website. In addition students will examine a map of Cambodia to examine the geography of the country. A class discussion will help determine what understandings, misconceptions and stereotypes have been formed as a result of listening to this one piece of media. To help broaden perspectives, it may be useful to include other videos of the country, including</p> <p>http://www.tourismcambodia.org/mot/index.php?view=info_centers</p> <p>http://www.bbc.com/travel/asia/cambodia</p> <p>http://travel.nationalgeographic.com/travel/countries/cambodia-guide/</p> <p>5. Students will watch the video on malaria eradication and controversial use of DDT and discuss the various perspectives with this form of mosquito eradication.</p> <p>http://www.pbslearningmedia.org/resource/envh10.sci.life.eco.malariaddt/eradicating-malaria-with-ddt/</p> <p>6. Students will use evidence from the podcast, newspaper article and DDT video and other sources to write a description of the situation and issues of bacterial resistance from different individual's perspectives. Students will orally present their findings to the class. Students will participate in a debate as to if it is possible to eradicate malaria, and if so, how, both in person and through the school's LMS system. "Is Malaria a world-wide issue? Is it important for other countries to get involved in the battle against this disease (or other diseases)? Explain</p>		
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your thoughts and ideas using detailed evidence and data from our class sources”.

Lesson Four: Here at home

- Students will design a survey to ask their peers, teachers and family members about their prior knowledge and attitudes regarding microbes. Students will collect data, analyze it, and examine if there are misconceptions regarding microbes, drug resistant bacteria, and other issues discussed in this unit, prevalent in their community.
- Students will make correlations between access to health care in Cambodia and access to health care here in New Mexico. Using statistics from sites (yet to be determined) students will examine obstacles that New Mexico residents face in access to healthcare and healthcare education.

Lesson Five: Education Task Force

- Students will participate in a task-force to educate the population (either of New Mexico, USA or other country) about microbes from any one of the following focuses:
- The uses of microbes in society
- The increase in drug resistant bacteria.

Students will create an educational product (poster, website, radio podcast etc.) that is appropriate for their chosen population. Students need to be able to orally discuss the issues they may be faced with in disseminating their information (size of the region, geography of the region, language barriers, alternative philosophies, access to funding).

<ul style="list-style-type: none"> Students will participate in Peace Pal www.peacepal.org (for 2014-15 school year I think – as they are ‘full’ this year) (or alternative organization) and help fund raise for mosquito nets and education. 		
<p><i>More on standards – nextgen.org</i></p> <p>MS-LS1-1. Conduct an investigation to provide evidence that living organisms have different functions within a system.</p> <p>MS-LS1-2. Develop and use a model to describe the function of a biological system.</p> <p>MS-LS1-3. Use argument supported by evidence for how the components of a system interact.</p> <p>MS-LS1-4. Use argument based on empirical evidence and scientific theories to explain how biological systems affect the probability of successful reproduction of a population.</p> <p>MS-LS1-5. Construct a scientific explanation based on evidence for how biological systems interact.</p> <p>MS-LS2-1. Analyze and interpret data to provide evidence for the effect of changes to a system or its components.</p> <p>MS-LS2-2. Construct an explanation that predicts patterns of interaction within a system.</p> <p>MS-LS2-4. Construct an argument supported by empirical evidence for the effect of changes to a system or its components.</p> <p>MS-LS2-5. Evaluate competing design solutions for maintaining the stability of a system.</p> <p>MS-LS3-1. Develop and use a model to describe why structural changes to a biological system have different effects on the structure and function of the system.</p>		

<p>MS-LS4-4. Construct an explanation based on evidence that de reproducing in a specific environment.</p>		
<p>MS-LS4-6. Use mathematical representations to support explan</p>		