Swimming with Bacteria

Monica Y Orozco
Northline Elementary School

INTRODUCTION

Since I was a child, health and injury issues have been very important in my life. I was raised by my parents on a farm located in a small town called Sanatana Boyaca, Colombia, South America. My father and the other workers would spend more than ten hours a day in the fields with very few breaks. They would work rain or shine, healthy or sick, and without any health insurance. Given the type of work they did, many of the workers were routinely bitten by insects or cut by sharp make-shift farming tools such as swords, knives or broken scraps of metal. At the end of the day, I would check them for cuts or infections. Because I was only six years old, it seemed like a fun activity. Somehow, I was drawn to helping people in need. Because we were on a farm and all of the workers were poor, we utilized a holistic type of medicine. I would clean them up with hot water and then I would give them an herb, which in Spanish is called "desenconadera." It was my job to gather this red and green plant in the nearby forest. In fact, I would chase butterflies in the morning, gather "desenconadera" and boil it in the late afternoon, and then have it ready for my father and the workers by six pm. Again, this was one of my fondest memories growing up and one of the earliest I had concerning health issues.

As a teacher, one of my major concerns is still health education. I am still passionate about helping others. I enjoy teaching my students and their parents about health issues. Given that our school is located in a lower socio-economic neighborhood, I know how difficult it is to find good health care. If I could teach them the basics principles of health education, they can use preventative measures to help live healthier lives.

For example, I will teach them that healthy living begins at home. Not only would I show the children the proper way of cleaning up before they eat, washing their fruits and vegetables, and brushing and flossing their teeth after every meal, but I will explain to them the benefits and consequences of not maintaining a healthy life style. I will also explain to them how to prevent the spread of food borne pathogens by proper food handling and cooking techniques. I want them to be aware of how bacteria exist, grow and proliferate in our food and on our bodies. Given simples tasks of proper food preparation, we can prevent the harmful effects of bacteria.

"Swimming with Bacteria" will allow students to be aware of various important health issues. In addition, the activities will also instill a solid science background and teach them to think critically. Using the skills they will learn in "Swimming with Bacteria," students will be better prepared to discuss health issues and make informed and responsible decisions. The interdisciplinary units will develop and build on skills learned in early grades. It will develop positive attitudes and problem-solving skills that will be useful throughout their lives.

I believe one of the most effective techniques for promoting education, especially science education, is through themes, which capture the student's attention and enhances scientific inquiry, discovery, and learning. The traditional teacher-center instruction, which consists of being told what to memorize and regurgitate answers either orally or in a written test form, does not allow students to think critically. Therefore, I plan to pro-actively involve the students in their education throughout this unit.

UNIT OBJECTIVES

The main objectives of the unit will be to promote health education and develop critical thinking and decision-making skills that are essential for Texas Essential Knowledge & Skills **(**TEKS). First, I will promote health education by focusing lesson plans on bacteria and their roles in bacterial infection. Students will learn the basics of what are bacteria. Students will further learn about bacterial diseases, foodborne pathogens and how to prevent them. They also will learn about antibiotics and vaccinations. Second, students will actively participate in scientific experiments and investigations. Through scientific discovery, students in third grade will use scientific inquiry methods to investigate the bacteria themes in a laboratory setting. They will plan and implement descriptive investigations, including asking well-define questions, formulating testable hypotheses, and using equipment and technology. They will collect information by observing, measuring, analyzing and interpreting information to construct reasonable explanations from direct and indirect evidence. Finally they will be able to construct simple graphs, tables, maps, and charts to organized and evaluate information.

Texas Essential Knowledge & Skills (TEKS) Objectives

TEKS was designed as a part of the required elementary curriculum to ensure that sufficient time is provided for teachers to teach students about English language arts, mathematics, science, social studies, fine arts, health, physical education, and technology application. More specifically, the TEKS Scientific Processes for Grade 3 requires students to conduct field and laboratory investigations, use scientific inquiry methods during field and laboratory investigations, develop critical and scientific problem solving skills and be knowledgeable of a variety of tools and methods to conduct science inquiry. "Swimming with Bacteria" allows students to meet these requirements as well as being introduced to mathematic and health topics and to technology applications. Furthermore, this unit will also cover TEKS Science Concepts by introducing students to a bacterial ecosystems as well as adaptations (or lack there of) that allow bacteria to thrive, become ill, or perish.

ACADEMIC SETTING

Statistics indicate that foodborne illnesses continue to be a health issue in the United States. Each year, 1 in 4 Americans will become sick, 1 in 1,000 will come hospitalized, and 5,000 will die due to foodborne illness (*Houston Health*). The Center for Diseases Control and Prevention (CDC) estimates that foodborne disease causes approximate 76 million illnesses, 325,000 hospitalizations, and 5,000 deaths in the United Stated each year (2002 Final FoodNet Surveillance Report). Food borne illnesses are estimated to cost thousands of dollars in lost wages, insurances, medical bills, and deaths. With these statistics, knowledge of how to prevent foodborne illness is important.

In Houston there are three prevalent foodborne diseases, hepatitis A, shigella and salmonella. Between 1995 and 1999 foodborne illness has and average of 282 cases of salmonella (Salmonellosis Infections). In this unit we will emphasize bacteria and the most severe cases of foodborne illnesses that are caused by salmonella. Salmonella infections tend to occur in the young and old, those who have an illness that reduces their immune system, or in healthy people exposed to a very high dose of this organism. Salmonella ranked as the fifth most commonly reported infectious diseases between the years 1995 to 1999. During this period, health care providers reported to Houston Department of Health and Human Services (HDHHS) a total of 1,259 salmonella cases, and an average of 252 annually (http://tdh.state.us/ideas/data). Salmonella is a bacteria infection causing fever, diarrhea, and abdominal cramps. It usually lasts four to seven days and most people recover without treatment (Chalker 111-124). However, in some people, the diarrhea may be so severe that hospitalization is needed. In these cases patients,

the infection may spread from the intestine to the bloodstream, then others sites and can cause death if it is not promptly treated with antibiotics.

Children under the age of five accounted for more than 44% percent of the reported salmonella cases, making them the most affected segment of the population. In terms of race and ethnicity, Hispanic had the highest number of cases at 36 %; follow by the whites, 28 %; blacks, 19 %; unknown 9 %; and Asian an others; 8% (*Houston Health*).

UNIT BACKGROUND

My unit will focus on bacteria. Most people have a negative opinion about bacteria. We use a variety of products for disinfecting and killing bacteria. For example, we take antibiotics at the first sign of the "sniffles." We use cleansers to clean our kitchen and bathrooms, bleach to wash our clothes, and we buy antibacterial hand soap to clean our hands. Contrary to the general public's opinion, bacteria play a beneficial role in our daily lives. For instance, we can find the "good bacteria" in daily foods such as yogurt, cheese, and other milk products. Furthermore, bacteria are used to break down waster material to an essential part of the nitrogen cycle, and help to recycle the environment.

Through this unit students will learn what bacteria are, how they affect the human body and describe, analyze and evaluate how the human body will react to bacteria. Then the students will relate the relationship between hygiene and bacteria. To finish the unit students will learn how to prevent contamination from food poisoning, which could be prevented with proper care and handling of food products.

What Are Bacteria and Where Do They Live?

Bacteria are small, simple, single cells organisms, and not all bacteria look the same. In fact, scientists classify bacteria according to their various shapes. Round bacteria are called cocci and rod-shaped are called bacilli (www.cdc.gov/drugresistance/glossary.htmm). Two types of spiral shaped bacteria are called spiralla and spirochetes. Bacteria are living organisms, but they are not plants, animals, algae or fungi. Bacteria live almost everywhere, even in hot springs and places where no other life forms can grow (*Bacteria, Viruses, and Allergies*). The air, water and upper layers of soil contain many bacteria. A large number the bacteria live in the intestines of people and others animals. Bacteria can also live on the skin and in the mouth and breathing passages.

Bacteria Move, Divide and Multiply

Although bacteria are small, no one can stop them from migrating. They have long trips in the air or water currents. Clothing, utensils, and other objects also carry bacteria. Various kinds of bacteria have flagella, (or thin hairs) which allow them to swim. Some species lack flagella and move by wriggling (*Bacteria, Viruses, and Allergies*).

Under good conditions, bacteria grow slightly in size and length. Most bacteria reproduce when each cell divides into two identical cells. If the environment is optimum, they usually reproduce quickly. The two identical cells or daughter cells may divide into four in twenty minutes. If one of these cells has enough food, it could produce more than a billon of bacteria in 10 hours (Sullivan).

Harmless/Helpful Bacteria

Of the many thousand types of bacteria, most are harmless and many are actually quite helpful organisms. Those that live in intestines help in digestion and in destroying other harmful organisms (Shahani). Intestinal bacteria also produce vitamins needed by the body ("Which Is More Deadly"). Many bacteria help decompose or brake down dead organisms and animal wastes into carbon, nitrogen and other chemical elements. Other bacteria help change these elements into forms that can be used by plants and animals.

Other “helpful” bacteria are found in cheese and other milk products. They help milk to ferment or chemically change. In this process, the solid parts of milk (the curd) separate from the watery parts (the whey) (Wassenaar). Cheese is made from the cord. And that’s not all bacteria are good for. Sewage treatment plants use bacteria to purify water. Bacteria are also used to produce some medicines.

How Bacteria Attack

To become infected, bacteria have to first enter our bodies. They are in the air we breathe, in and on the food we eat, and on the surfaces of most things we touch. Apart from our normal flora, bacteria that come into contact with us have to pass our various defense mechanisms, our dry skin and our acidic stomach. Once a bacterium has infected the body it is free to grow and spread. Nearly all infectious diseases start out as small and localized and will only spread through the body if the bacteria gain access to the blood stream (Ramel).

Bacterial Diseases

The body is subject to numerous diseases, including colitis, diabetes, meningitis, rheumatoid arthritis, thyroid diseases. A deficiency in friendly bacteria can bring a host of additional problems associated with bowel toxins (Huenel 1433-1439). Certain bacteria produce toxins or poisons that cause diphtheria, scarlet fever, tetanus, and other diseases. Living bacteria produce some toxins, but others are released only after bacteria die (“Which Is More Deadly”). Some bacteria destroy healthy cells, which prevent the body from functioning properly. Such species of bacteria cause cholera, pneumonia, tuberculosis, typhoid fever, whooping cough, and other diseases.

Bacteria that usually live harmlessly in the body may cause infections when a person’s resistance to disease is low. If bacteria in the throat reproduce faster than the body can get rid of them, a person may get a sore throat (“Which Is More Deadly”). Resistance to disease lowers when a person doesn’t get enough sleep or nutrients.

The Most Common Bacterial Disease, Strep Throat

The complaint of a sore throat (pharyngitis) is one of the most common reasons that children visit the pediatrician’s office. Strep throat is a throat infection that is caused by bacteria called ***Group A Streptococci (GAS).*** Many bacteria and viruses can cause sore throats, but approximately 10% of all sore throats are due to actual "strep throat" infections. Strep bacteria are passed from one person to another through infected nasal discharge and saliva. The infected droplets can be passed when an infected person coughs sneezes or touches an object with unclean hands. All age groups can get “strep throat,” but children between the ages of 5 and 15 years are most often affected (http://www.northshoregeneralpediatrics.com/strep.htm). A child with “strep throat” complains of a very painful throat, often making it difficult for the child to swallow. She may also have fevers (with or without chills), may feel tired; complain of body aches, headaches, abdominal pain and nausea. Oftentimes a child’s appetite will decrease during the onset of a strep infection (http://www.northshoregeneralpediatrics.com/strep.htm).

Antibiotics: “Bacteria Fighters”

An antibiotic, also known as antimicrobacterial drug, is a drug that fights infections caused by bacteria (*Background on Antibiotic Resistance*). It is possible many children have heard about penicillin, amoxicillin, or tetracycline when they have visited the doctor. These drugs are made from bacteria, fungi, or some other microbes. They kill or weaken infectious organisms (http://www.hivandhepatitis.com/health/110701a.html). They came into widespread use during the 1940s. After the introduction of antibiotics, the number of deaths caused by tuberculosis,

pneumonia, meningitis and scarlet fever decreased (Ahmad). One of the reasons antibiotics are so effective is because they can attack infectious microbes without harming human cells too much.

Antibiotics do not fight colds, influenza, or other diseases caused by viruses. And the diseases causing microbes and cancer cells that they do kill can become resistant to them over time (http://www.tdh.state.tx.us/ideas/prevention/cold_flu).

Penicillin History

Before antibiotics a simple throat infection could easily spread to the lungs and throughout the body and kill thousands of people who became infected. At the start of the 20th century, many people still died from infections diseases that today are easily cured. Penicillin was a discovery by Alexander Fleming in 1928 that would lead to the modern antibiotics known today ("1928: Penicillin").

In 1871, Joseph Lister noticed that some molds could make other microbes grow weaker ("1928: Penicillin"). He did not realize the potential of this observation and did not follow it any further. It was years later, in 1928, that Alexander Fleming made a similar observation.

Fleming was trying to find different ways of killing bacteria that infect a person through cuts and wounds and turn septic. This was a serious condition and could cause death if the infections spread to the blood. Fleming noticed that the growth of bacteria had been inhibited on a Petri dish that had been accidentally contaminated with the mold Penicillium Notatatum. He realized that the mold must produce a chemical that prevented the bacteria from growing. He cultivated the mold and investigated its properties on bacteria that cause diseases such as anthrax, meningitis and diphtheria. Fleming's discovery was not totally exploited until the second Word War in 1931. Infected wounds had caused many deaths so Howard Florey and Ernst Chain were assigned to find new medicines to treat wounded soldiers. They realized the importance of Fleming's work and had the resources to grow large amounts of the *penicillium* mold. After much work they were able to develop a powdered form of penicillin. In 1941 the firs human was successfully treated.

Penicillin has an amazing strength in destroying many of the bacteria that have plagued mankind for thousands of years. However, some people have a negative reaction to penicillin, with shock and death resulting ("1928: Pencillin").

Vaccines

Biologically active materials derived from microorganisms (bacteria or viruses) stimulate an immune response in the body to prevent future infection by similar microorganisms. Vaccines may consist of living or killed organisms or chemical substances derived from organisms. Most vaccines are given by injection, although some are taken orally (http://www.gulflink.osd.mil/medsearch/glossary/glossary_vwxyz.shtml). Dead or weakened bacteria or viruses are used to make vaccines. Vaccines are injected into the body, where they produce mild or no symptoms of the disease. These killed or weakened microbes (vaccines) trigger the blood to make antibodies, which attacks these agents that cause the diseases ("Which Is More Deadly"). Some vaccines protect the body from infection for several years or longer. In some cases, a person needs a booster dose of a vaccine after awhile to maintain protection against the disease (Wagner).

Bacteria and Food Borne Diseases

From the benefits of bacteria, we could also focus on the negative aspects such as food poisoning. Food poisoning, which results from eating food that is contaminated with chemicals, parasites, fungi, viruses or bacteria, represents one of the major public health problems worldwide. It is also a major source of illness in developed countries such as United States. Although the actual incidence of bacteria contamination is unknown, the Centers of Diseases

Control and Prevention report an estimated 76 million people in United States become infected, with over 325,000 hospitalizations and 5,000 deaths. While most food borne illnesses can be prevented through proper cooking and handling of foods, the U.S. spends an estimated 3 to 7 billion dollars per year on food borne illnesses (*Bacterial and Foodborne Illness*). Therefore, I would like to educate my students in the symptoms, treatments, and prevention of bacterial food poisoning.

Since bacteria, such as *Salmonella* and *Escherichia coli* (*E. coli*) can be found in many raw foods, it is important to know how to properly prepare foods. It has been shown that poor personal hygiene, improper cleaning of storage and preparation areas cause contamination of raw and cooked foods. Therefore, it will be beneficial for my students to learn about preventive strategies at an early age.

Foodborne illnesses result from eating food contaminated with bacteria or other pathogens such as parasites or viruses. Food poisoning symptoms range from an upset stomach to more serious symptoms including: diarrhea, fever, vomiting, abdominal cramps, and dehydration (*Bacterial and Foodborne Illness*). Most cases of food borne illness can be prevented through proper cooking or processing of food, which kill bacteria. In addition, because bacteria multiply rapidly between 40° F and 140° F, food must be kept out if this danger zone (*Bacterial and Foodborne Illness*). To prevent harmful bacteria from growing in food, always: Refrigerate foods promptly. If you let prepared food stand at room temperature for more than 2 hours, it may not be safe to eat. Set the refrigerator to 40° F or lower and your freezer to O° F.

We will also talk about cross-contamination and how to prevent it. Bacteria can spread from one food product to another throughout the kitchen and can get onto cutting boards, knives, sponges, and countertops. People should keep raw meat, poultry, seafood, and their juices away from other foods that are ready to eat.

Another topic we will address is handling food properly. Always wash your hands before touching food and after using the bathroom, changing diapers, or handling pets, as well as after handling raw meat, poultry, fish, shellfish, or eggs. Clean surfaces well before preparing food on them.

Never defrost food on the kitchen counter. Use the refrigerator, cold running water, or the microwave oven. Divide large amounts of leftovers into small, shallow containers for quick cooling in the refrigerator.

IMPLEMENTATION STRATEGIES

This unit is designed for developing the health and science curriculum in my classroom. The lessons will focus on Texas Essential Knowledge and Skills (TEKS) of living organism in science. The students will be engaged in several discussions about bacteria to determine what they know and what they want to learn. Then we will develop a K.L.W. chart to determine what the students want to learn. This activity will be designed to promote student autonomy, cooperation and learning. Students will be divided into small groups to research what bacteria are, how they affect the human body and how we can prevent cross-contamination.

Another aspect that will be addressed is personal hygiene. Students will be taught the importance and also participate in demonstrations of proper hand washing to prevent the spread of food borne illnesses. Finally, students will be taught that storing food at proper temperatures can also prevent food spoilage. The lessons will introduce them to additional scientific vocabulary and concepts such as Celsius and Fahrenheit, and temperature as well math related concepts.

Activities I will use to develop this theme will be meaningful to today's problems such as antibiotic resistant bacteria. Not only will I teach the basic skills in science, but I will also use creative strategies to keep them interested and focused. For instance, I plan to create a video where children can participate and use hands-on activities to teach good habits. For example, we could film children washing their hand and or have them "contaminate" their soups with plastic bugs representing bacteria. After the lesson the children will be evaluated answering various questions, which lead to a wide array of responses.

We could also break up into small-group discussion to emphasize lesson plan in a more intimate surrounding.

Because children at such a young age learn visually, students will create a dramatization with puppets to introduce basic information about bacteria and infection and how prevent their spread. I will invite their families to hear a lesson given by science specialist to demonstrate safe food preparation and discuss proper storage for all types of food.

By using role play, students will simulate the process of reproduction of bacteria. The students will blow soap bubbles, which represents bacteria dividing and multiplying. The new "bubble" represents a daughter bacterium, which divided from the original bacteria. Given an unsanitary environment, the students will learn how quickly bacteria grow and divide and contaminate an area.

Using hands-on activities to solve-problems will allow students to develop the fundamentals of discovery learning, critical thinking and scientific problem solving. The lessons will expose students to scientific investigations, setting up experiments in lab, and using appropriate vocabulary. The students, through these activities, will learn that "good bacteria" are called probiotics, which come from Greek words meaning "for life." For examples, by studying the digestive system students will discover these probiotics help to break down the body's bile and remove excess cholesterol in the small intestines. These microorganisms are necessary for promoting health and balancing the intestinal tract environment. Furthermore, probiotics promote health by secreting antibiotic substances such as lactic acid, acetic acid, hydrogen peroxide and others substances, which have a wide-range of activity against salmonella, pseudomonas, E. coli and other harmful food-borne bacteria. Furthermore, these "good friends" regulate and increase hormone levels, manufacture vitamins -- A and B --, help with absorption of nutrients and proper food digestion, and reduce inflammation.

Food Borne and Discovery Parents' Conference

Food borne and Discovery is a conference design to informed both parents and students about foodborne illness caused by bacteria. We will show them how easy it is get sick from food that is not handled in an appropriated way or it is not cleaned, cooked, and chilled according to the adequate temperatures needed to kill bacteria.

Because thousands of people die and get sick through bacterial contamination and hundreds of children between 5 and 12 years miss school due to food poisoning or stomachaches, it is important to start a campaign in elementary schools and educate children and parents to reduce the risk of being contaminated by bacteria.

Through this conference I will inform the parents and the community the causes, symptoms, risk factors and prevention of Bacterial and Foodborne Illness. We will try to reduce this kind of illness and at the same time reduce the sick days during the school year. This will contribute to improve the academic achievement and health concerns of the community.

To conclude this Parents' Conference, they will receive a certificate and prizes donated by the school and some stores such as WalMart, Target, and H-E-B.

FIST LESSON PLAN: FISHING BACTERIA

Grade Level: Third grade

Time: 1 week

Course Title: Science

Specific Objective

In the first lesson students will learn what bacteria are through the different kinds of bacteria and lectures provide by Discovery Channel School CD-ROMs. They also will learn about their characteristics, such as their shapes, color and size and the adaptations that allow them to survive in different environments. Students will learn how bacteria grow, divide and multiply by research on http://www.cellsalive.com/ecoli.htm. By the end of the lesson students will be able to define what bacteria are, and identify various bacteria by their shapes, color and size.

Introduction

At the beginning of class I will introduce a theme by reciting a poem "Do Bugs Need Drugs?" from http://www.dobugsneeddrugs.org/public/poem.html. After reading the poem, we will discuss how bacteria can be harmful and review new vocabulary words. Then I will ask the students questions about experiences they have had with bacteria and the symptoms that are describe in the poem. To make the new vocabulary words more meaningful students will look up the definitions of the words in the dictionary, and they will make their own sentences, so at the end of the lesson each student will be able to write their own poem.

Lesson Background

In this lesson students will learn about what bacteria are, how to classify bacteria, how bacteria infect people, and how bacteria can cause infections. I will also introduce mathematical concepts such as multiplication and division as it applies to bacteria.

Bacteria Definition

Bacteria are very small, single-celled life forms that reproduce quickly.

Bacteria are microscopic unicellular, typically spherical, rodlike, or spiral and threadlike in shape. They often grow clumped into colonies. Some bacteria causes' disease, while others perform an essential role in nature such as the recycling of materials. For example, they help to decompose organic matter into a form that can be reused by plants.

Characteristics of Bacteria

Shape

- Bacilli: Rod-shape
- Cocci: Spherical
- Spiralla: Curved walls

I will have children draw pictures of differently shaped bacteria. These pictures will represent slides seen under a microscope.

Ability to Form Spores

We will discus why bacteria spores form and how this allows them to survive.

Nutritional Requirements

We will talk about the advantages and disadvantages of being a heterotrophy and autotrophs

Some bacteria are **heterotrophs** (they eat other organism), other bacteria are **autotrophs** they made their own food (http://www.enchantedlearning.com/subjects/bacterium).

Reproduction

We will discus the most likely places bacteria would grow and how to prevent contamination. Bacteria grow in colonies and reproduce rapidly by asexual budding or fission, in which the cell increases in size and then splits in two (http://www.enchantedlearning.com/subjects/bacterium). Also the bacteria need a perfect condition to grow such as food, warmth, moisture and time. They love meet, fish, daily products and eggs; they grow in danger zone between 5 and 63 Celsius.

Effects of bacteria

Even though bacteria cause many illnesses such as dental caries, strep throat, cholera and tuberculosis and cause harmful, some bacteria have many positive effects, including releasing nitrogen to plants and decomposing organic material or helping in the fermentation process and the production of cheese and yogurt (http://www.enchantedlearning.com/subjects/bacterium).

Learning Activities

1. Read the poem "Do Bugs Need Drugs." We will discuss the poem's content and introduce various themes and motivate students to conduct a investigative research on bacteria and their effects with possible cross contamination and diseases.
2. Gather the students into a large group to discuss what they know; what they want to learn about bacteria and have them they create a chart **(K.W.L)** to develop the main points during the discussion in the library.
3. After discussion students will be divided into small groups where each member of the group must have a role with specific responsibilities. Each group will be in charge of a specific research topic, which we will have a previous introductory lesson. The students will have time to go the library and they will investigate the topics and answer the questions about what they want to learn created on the K.W.L chart. Through discovery learning students will be encourage to solve division and multiplication problems of the bacteria and the perfect conditions. At the end of the lecture class they will be able to answer questions such as: are all bacteria harmful to humans? Can bacteria infect other animals besides humans? Are there drugs to attack bacteria? These activities will help students to develop problem-solving skills and stimulate scientific thinking.
4. To clarify concepts student will study a vocabulary list to make sure they have a strong understanding of the previous reading.

   Groups Topics:
   - Group Number 1 - Research what bacteria are.
   - Group Number 2 - Characteristic shapes and condition to growth bacteria.
   - Group Number 3 - Bacteria divide and multiply.
5. Finally, they will record in their journals all the information found in the library to discuss again in class.

Teaching Strategies

- During this lesson students will work in large and small groups to discuss the theme.
- Inquiry-Center Discussion: this strategy will help students to develop and stimulate their scientific thinking. Develop solving problems skills and foster the new knowledge through a process of discovery and analysis.

Resources

- Library books
- Charts
- Poem "Do bugs need drugs?"
- Internet web pages
- Computers (10)
- Reading from Discovery Channel School CD-ROMs

Closure

Each student will demonstrate an understanding of what bacteria are, how bacteria are reproduced, and why bacteria cause illness.

Assessment

Students will be assessed on their understanding of the lesson by their class participation as well as their performance in the small research group at the library.

SECOND LESSON PLAN: UNDER THE MICROSCOPY

> *"The gifts of microscopes to our understanding of cells and organisms are so profound that one has to ask: What are the gifts of the microscopist? Here is my opinion. The gift of the great microscopist is the ability to THINK WITH THE EYES AND SEE WITH THE BRAIN. Deep revelations into the nature of living things continue to travel on beams of light"*
>
> *~Daniel Mazia*
> *U.C. Berkeley Cell Biologist, 1996.*

Grade Level: Third/fourth grade

Time: One week

Course Title: Science/Health

The second lesson is divided in two parts. In the first part I will introduce the microscope, it uses and parts. In the second half students will observe slides of bacteria samples by using microscopes to develop their observation skills.

Specific Objective

In this second lesson students will be able to observe bacteria by using microscopes. They will improve their ability to make detailed observation of a variety of bacteria. Students will identify and distinguish bacteria by their shapes and color. They also will relate the role of technology in science and how a microscope enables people to observe characteristics unobservable by the human eye.

Introduction

Introduce a microscopy by reading and presenting a power point presentation about the history of microscopes. For this introductory part of the lesson, I will use these Internet web pages: http://www.az-microscope.ca/history.htm

Lesson Background: First Part

The Microscope

Microscopes are devices that can make visible details of structure too minute to be seen by the unaided eye, or too poorly differentiated from their surroundings to be identified. The microscope

was a result of work made on the telescope. The telescope had much more practical uses in that time, because it could be used for maritime navigation.

Microscope History

***Parts of the Light Microscope*:** Provided by http://sciencespot.net

- Eyepiece: Contains the ocular lens
- Nosepiece: Holds the high and low power objectives lenses; can be rotate to change magnification
- Objective Lenses: Magnification ranges
- Stage Clips: Hold the slide in place
- Stage: Supports the slide being viewed
- Light Source: Projects light upwards through the diaphragm, the specimen, and the lenses
- Arm: Used to support the microscope when carried
- Coarse adjustment: Moves the stage up and down for focusing
- Fine Adjustment: moves the stage slightly to sharpen the image
- Diaphragm: Regulates the amount of light on the specimen
- Base: Support the microscope

Lesson Background: Second Part

Types of Bacteria

There are different types of bacteria:

- Rod-shaped called bacilli
- Round called cocci, like streptococcus bacteria
- Spiral-shaped spirilli or are incomplete spirals

Students will observe the bacteria by using the microscope, and then they will draw the observations in their journal notebook.

Learning Activities

Gather the students into a large group in the laboratory and introduce various themes by presenting and reading the history of microscopes on Power Point presentation. Students will learn about the properties of the Compound Microscope, which it is a traditional, microscope and will become familiar with other microscope such as the electron microscope.

1. To enhance a sense of organization, the student will make a timeline to organize all of the events during the Power Point Presentation.
2. Students will work with a classmate to learn how to use and manipulate the compound microscope and learn about the different parts. The students will complete a worksheet identifying all the parts of the microscope and their uses.
3. To promote cooperative and discovery learning, students will use the microscope and work in groups of five to observe bacteria slides. They will draw pictures and make notes about what they are observing on the microscope in their scientific journal notebooks.
4. At the end of the lesson a student from each group will be able to draw a conclusion about their observations, and she or he also will be able to relate the concepts learned in the prior lesson and the observation found on the microscope about bacteria. Finally the students will able to relate the importance of using technology in science as how it help scientist to learn more and advance further in science.

Resources

- Laboratory
- 5 microscopes
- Reading,"Microscope History"
- 1 copy of "The Parts of a Compound Microscope" student sheet per student
- Bacteria slides
- Science journal

Closure

Each student will demonstrate an understanding of how to use and manipulate the microscope and relate the importance of the use of technology in scientific research. They also will use the Internet web pages to learn how to make their own microscopes.

Assessment

Students will be assessed on how well they understood the microscope lesson and the different characteristics of bacteria. I will also assess students by how well they performed their tasks and look for an overall learning growth curve. This growth curve will include writing, drawing, and scientific conclusions made in their journals.

THIRD LESSON PLAN: FOOD BORNE DISCOVERY

Grade Level: Third grade

Time: One week

Course title: Science/Health

This lesson introduces common food poisoning bacteria, cross-contamination, and steps to keep food safe from bacteria contamination.

Specific Objective

During this lesson students will learn the benefits of bacteria, as well as the negative aspects such as food poisoning that result from eating food that is contaminated. They will learn the importance of how to prepare foods properly and how cooking can destroy bacteria. Finally they will be aware that cross-contamination can be caused by poor personal hygiene, improper cleaning, storage and preparation of raw and cooked foods.

Introduction

To introduce the lesson students will develop a puzzle work sheet where they will work with a partner to complete it. They will also use the Internet to research the answers. Then the whole class will discuss about how important it is to handle food. Finally students will fill out the 3C&S (Clean, Cook, Chill and Separate) chart.

Lesson Background

Food Borne Illnesses

Food borne illnesses are caused by a bacteria, viruses, parasites, and fungi. Most microbes are harmless, but if they are present in food some can cause serious diseases. Your food may taste delicious but it may contain bacteria that may make you sick.

Food Poisoning

Food poisoning such as a severe gastrointestinal illness is caused by eating food contaminated with Salmonella bacteria. Symptoms typically include vomiting, stomach cramps and diarrhea.

Four Simple Tips to Avoid the 3C & S, Food Poisoning

1. **Clean:** Wash your hands; especially wash your finger and nails after using the toilet, handling pets, sneezing or coughing and before handling raw food.
2. **Cook:** Cook food at the appropriate temperature. Always use a thermometer (145 F for roasts, and steaks, and chops of beef, veal, and lamb; 160 F for pork, ground veal and ground beef; 165 F for ground poultry; and 180 F for whole poultry). Foods are properly cooked when they are heated long enough and at a high enough temperature to kill harmful bacteria that causes illness (*Bacterial and Foodborne Illness*) when food is left out in temperatures between 40 F (4 C) and 140 F (60 C) these temperature are ideal for the growth of bacteria.
3. **Chill:** Refrigerate leftovers promptly. Bacteria can grow quickly at room temperature. Refrigerate your food if they are not eaten within 4 hours. Large volumes of food will cool more quickly if they are divided into several shallow containers for refrigeration (*Bacterial and Foodborne Illness*).
4. **Separate**: To avoid cross-contamination foods should be separated into categories such as: meat, poultry and fish and make sure other meat products are never packed in the same bag. Store raw meat alone on a shelf or in the drawer of the fridge so that juices cannot drip onto other foods.

Learning Activities

Review the science and health vocabulary words with the students. The terms such as separate, cook, chill, clean, parasite, bacteria, foodborne, cross-contamination, etc.

1. Organize students into pairs to begin researching questions on the Internet to fill out the puzzle.
2. After students finish their puzzle, we will have a discussion about foodborne, pathogens and illnesses. I will teach them how we can avoid cross-contamination through the 3C&S. To simulate buying food at the store and properly storing the foods in the refrigerator, freezer or shelves, students will bring newspaper and boxes and they will paste them on a big chart to demonstrate where the food should be properly stored (3C&S Chart).
3. In a whole group discussion we will discus the characteristics of the C3&S (clean, chill, cook & separate). Students will review the concept of temperature through appropriate food handling.
4. Then they will divide into smaller groups of four students to learn how use a thermometer and make sure foods are properly cooked. They will heat water to know the appropriate temperature food should be cooked. Students will write down all the temperatures and dates observed during the activity.
5. As an extension, students will develop by themselves a KWL chart.

Resources

- Boxes, glue, newspaper
- Computers
- Thermometers
- Work sheets
- Science journal

Closure

Each student will demonstrate their knowledge of how to properly handle and prepare food. They will demonstrate how they can prevent food contamination and practice good hygiene.

Assessment

To assess students I will hand out a work sheet and they will answer some questions such as:

1. What are bacteria?
2. Write the ways you can prevent bacteria from cross-contamination.
3. Why is important wash your hands?
4. Write a poem about the 3C&S to avoid foodborne pathogens.

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