Sickness & Soap:
Defining Microbes and Emphasizing the Importance of Washing Hands with Soap

Background Information: Access to improved water and sanitation facilities does not lead to improved health. Hand-washing with soap can significantly reduce the incidence of diarrhea as well as other diseases (such as pneumonia and trachoma). As pointed out by the United Nation Children's Fund, the key to increasing the practice of hand-washing with soap is promoting behavioral change through motivation and education. One way of doing this is by developing hygiene lessons for children in schools.

Objective of the Lesson: The overall aim of this lesson plan seeks to encourage children to demonstrate good hygiene to their families and communities. Through educating children about microbes and demonstrating to children the importance washing hands with soap (especially before eating and after using the restroom), this lesson helps to promote positive behavioral change.

- Objective 1: Visualize germs and microbes that are on our body and clothes.
- Objective 2: While objects may look clean, they may actually be coated with microbes. Our hands are prime targets for contamination by germs.

Materials To Be Used (for a class of 25-30 students):

- Glitter (1 jar)
  - Glitter should be colorful- good colors to use are red, green, and blue. As glitter represents microbes, the more visible the glitter is on the children's hands, the better.
- Glue Stick (2 sticks)
  - Any type of glue will work. However, the glue stick is not as messy as the glue paste. Also, the glue stick does not have as strong of a hold as the other glues (like glue paste or rubber cement glue), and so is easier to wash off objects and children's hands.
- Rulers (minimum 10) / Pencils (minimum 10) / Crayons (minimum 10 boxes)
  - Not all of these objects are necessary for the lesson. Choose the object that fits with the class the best. If the class is engaged, use the crayons and have the students draw their own microbe. If the class consists of older children, incorporate the pencils into a writing assignment (have students take notes about the presentation). If you are talking with a large class, it may be best to use the rulers. Regardless, the objects will be passed around the classroom. Each student will be touching the objects for a specified amount of time (like 1-3 minutes) and then will pass the object off to another student. While it would be best for every student to start off with an object, there may be some constraints (such as not enough pencils or rulers available). Therefore, for a class of 25-30 students at least 10 objects should be utilized.
- Sheets of Paper—if using crayons and pencils (enough for each student)

- If you are using the pencils or crayons for writing/drawing, it is important to bring paper! Each student should have his/her own sheet.

- Hand-washing Soap (minimum 5 bars)
  - The more bars of soap, the better. However, any amount of soap is good. Kids tend to prefer liquid soap as it is easier to use.

Plan: What Are Microbes?

- Introduction: Before jumping into the lesson, it is important to talk with the students briefly about what a microbe is. When presenting this information to the kids remember to keep it fun and engage the class. For instance, when the word "microscope" is discussed hold up the picture of the microscope for the students to see. Use words appropriate for the age level (simple and easy to understand).
  - *Opening Questions*: Engage the students by asking them to raise their hands in response to the opening questions:
    - How many here have heard of microbes before?
    - How many here know what a microbe is?
  - *What is a Microbe?*
    - A microbe is a very small living thing (organism). You can't even see microbes with your eyes. You need a microscope to see them! *[hold up picture of a microscope]* There are different types of microbes *[hold up pictures of microbes]*- and they can help or hurt you. Microbes make up one of the largest number of living organisms on the planet! It helps to be small.
    - There are a lot of different types of microbes! Microbes can be **solitary**- live alone- or **colonial**- live with others like a family. An amoeba may be solitary living by itself in water. But *E. coli* bacteria live in colonies.
    - Microbes can either eat other things (**heterotrophic**) or make food for themselves (**autotrophic**). Humans are heterotrophic but plants are autotrophic.
  - *The Good Microbes…*
    - Although microbes are tiny, some actually do good things! For instance there are bacteria in the roots of plants that help them absorb nitrogen (nitrogen fixation). This is important for plant growth!
    - Bacteria can also help cows eat *[show picture of cow]*. There is a bacterium in the cow that helps it break down the cellulose in plants.
  - *The Bad Microbes…*
    - While there are good microbes, there are also bad microbes as well. And the bad microbes can make you really sick. We call these bad, harmful microbes "germs." Many types of bacteria cause diseases and sickness in humans, animals, and plants!

- There are some good types of *E. coli* (a type of bacteria) that live in our stomach. But there are also bad types of *E. coli* that can be in contaminated water [*show picture of contaminated water—important to mention that sometimes even when the water looks clear that doesn't mean it is clean. Microbes are tiny and may be in the water*]. This bad *E. coli* can cause you to feel really sick (and have diarrhea). Gross!
- Viruses are harmful microbes. They cause the flu and colds.

- In-Class Activity:
  - *Too Many to Count, Too Small to Find- How Microbes Spread:* Many of these bad and harmful microbes are passed from one person to another. The diseases caused by microbes can make you really sick. Here are some ways that harmful microbes can spread *[use gestures to demonstrate]*:
    - In the air: When people sneeze or cough, microbes fly into the air. They can get into our bodies if we breathe it in.
    - Through contact with animals: Animals can carry harmful microbes. Malaria is a disease spread by the mosquito.
    - Through contaminated food: Food can have harmful microbes on it or in it. If you eat food with microbes on it, it can make you really sick (food poisoning). Cooking food kills many of the microbes. Not handling food with care (not washing vegetables and fruit before eating, for example) can lead to you eating microbes and becoming sick.
    - Through touch: Microbes can be passed from one person to another, or when someone touches an object that another person has just handled. Washing your hands reduces the chance of spreading microbes.
    - In water: Water can have harmful microbes in it. When you drink water, microbes can get into your body. You can become really sick and have diarrhea from contaminated water. Knowing water is contaminated is important. Through boiling or adding chlorine to the water, you can reduce the chance of spreading microbes.
  - *Glitter, Glitter, Glitter Everywhere!*: It is important to introduce the concept of glitter to the students. Tell the students the following, "To show you just how microbes spread, we are going to do a class activity. The glitter represents harmful microbes. I am putting the glitter on these [rulers, pencils, crayons]. We will pass these objects around and see just how many "microbes" we come into contact with."
    - If using crayons: Ask students to draw a picture of their own microbe. Each student starts out with a color crayon. Every 1-2 minutes have the students pass their color crayon down two

people. (This increases the exposure/ the amount of times the students touch each of the objects).

- If using pencils: Ask students to take notes on your presentation or to write down what they find interesting. If you use pencils, it is important to distribute the pencils prior to starting the lesson. Throughout your talk (or before you present new information), have the students exchange pencils.
- If using rulers: This is the fastest of the three objects. This is best for a large class. Have the class continuously pass the rulers around. It may be best to get the class into a circle. Pass the rulers around the circle at least twice.

- Closure: At the end of the activity, have the students hold up their hands and look around the classroom. The hands should be quite glittery! In ending this part of the lesson ask students the following closing questions:
  - How many of us now know what microbes are?
  - How many students think we should wash our hands now?

Plan: Why Should I Wash My Hands (With Soap)?

- Introduction
  - Hand washing can help reduce the spread of microbes/ germs. This prevents us from becoming really sick.
  - The proper way of washing your hands is to use soap *[hold up soap]*, warm water, and to spend at least 20 seconds scrubbing your hands. [*Demonstrate to the class*.]

- In-Class Activities
  - Have the class wash their hands for 20 seconds in order to get the "microbes" (glitter) off their hands. Teach them the hand-washing song. You can say, "Standing there washing your hands for 20 seconds isn't a lot of fun. But if we sing a song and wash our hands it'll be more fun. By the time the song is done, you'll be done washing your hands."
    - **Lavarse las Manos (sung to the tune of "Happy Birthday"**

      lavarse las manos
      lavarse las manos
      con jabón y con agua
      lavarse las manos

      entre los dedos
      debajo de las uñas
      con jabón y con agua
      lavarse las manos

antes de comer
después de jugar
con jabón y con agua
lavarse las manos

- Closure: At the end of the activity, ask the students when they think they should wash their hands (before eating, after using the restroom, etc.). Ask the students why it is important to wash hands. This is a great way to reiterate the lesson taught and to gauge what was learned.

In Conclusion: Through educating children about microbes and demonstrating to children the importance washing hands with soap (especially before eating and after using the restroom), this lesson helps to promote positive behavioral change.

References Used:

"Disease- Spreading Microbes." *BBC- KS3 Bitesize*. BBC News, 2012. Web. 23 Apr. 2012.<http://www.bbc.co.uk/schools/ks3bitesize/science/organisms_behaviour_health/disease/revise4.shtml>.

"The Littlest Organisms." *Radar's Biology4kids.com*. Andrew Rader Studios, 2012. Web. 22 Apr. 2012. <http://www.biology4kids.com/files/micro_main.html>.

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Notes: This lesson plan was developed by ASU iGEM in collaboration with Kelly McGowan and Dr. Jonathan Maupin for a school in the municipality of Acatenango located in the department of Chimaltenango, Guatemala. The lesson plan is based on research conducted with the Guatemalan school by Michaela Staley and Madeline Sands during the summer of 2011.

Sands, M. (2012). Cleaning up a muddled definition: defining hygiene in the central rural highlands of Guatemala. [Honors Thesis] School of Human Evolution and Social Change, Arizona State University.

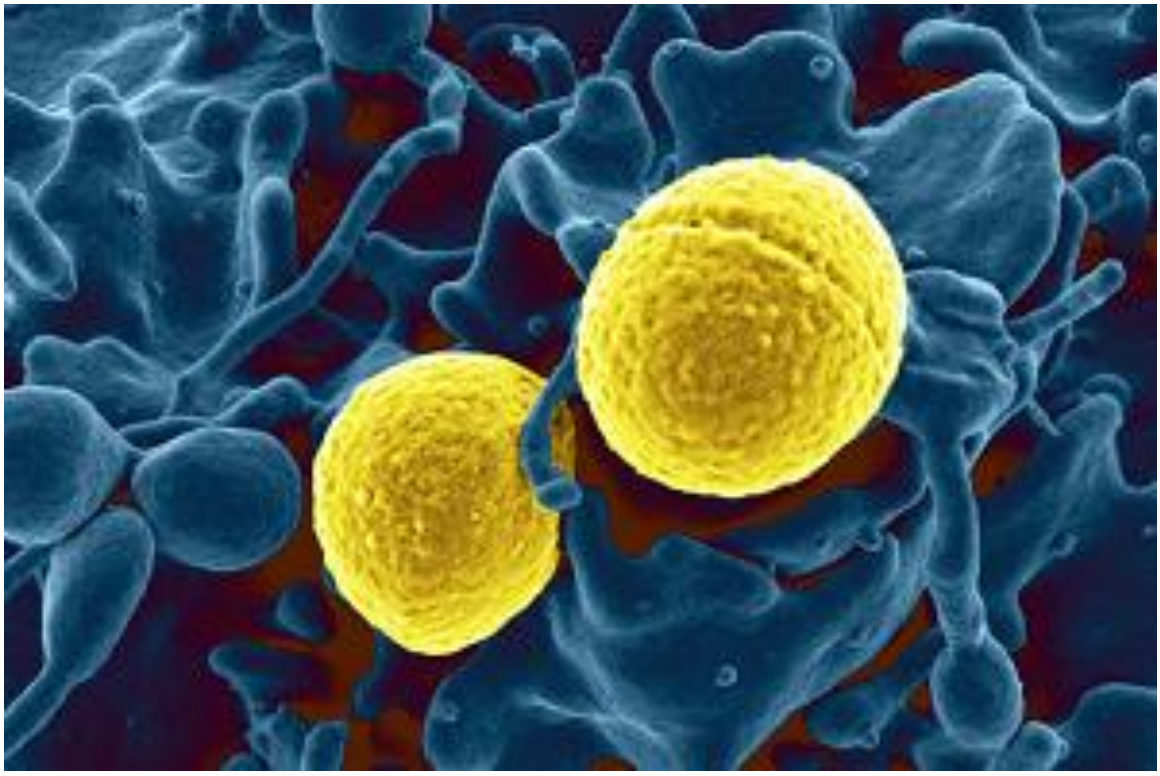
Staley, M. (2012). Understanding the role of education systems in disseminating information on hygiene and diarrheal disease in the central highlands of Guatemala. [Honors Thesis] School of Human Evolution and Social Change, Arizona State University.

Supplemental Material: On the proceeding pages you will find material to go along with this lesson plan (such as pictures and the hand out of the song).

Microscopio

http://upload.wikimedia.org/wikipedia/commons/b/b1/Optical_microscope_nikon_alphaphot_%2B.jpg

Microbio



http://upload.wikimedia.org/wikipedia/commons/3/3f/Staphylococcus_aureus_Bacteria.jpg

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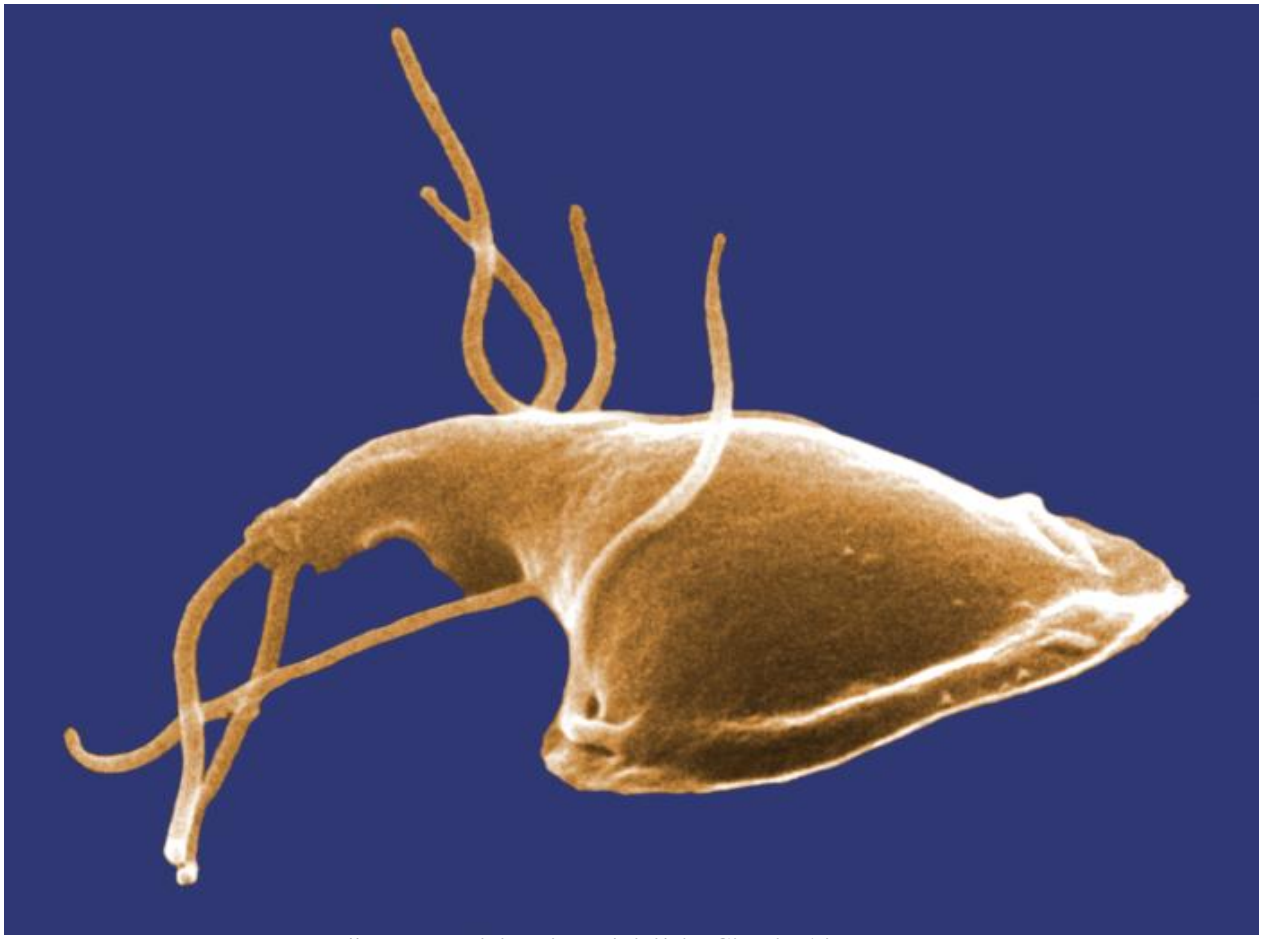

http://commons.wikimedia.org/wiki/File:Giardia_1.jpg

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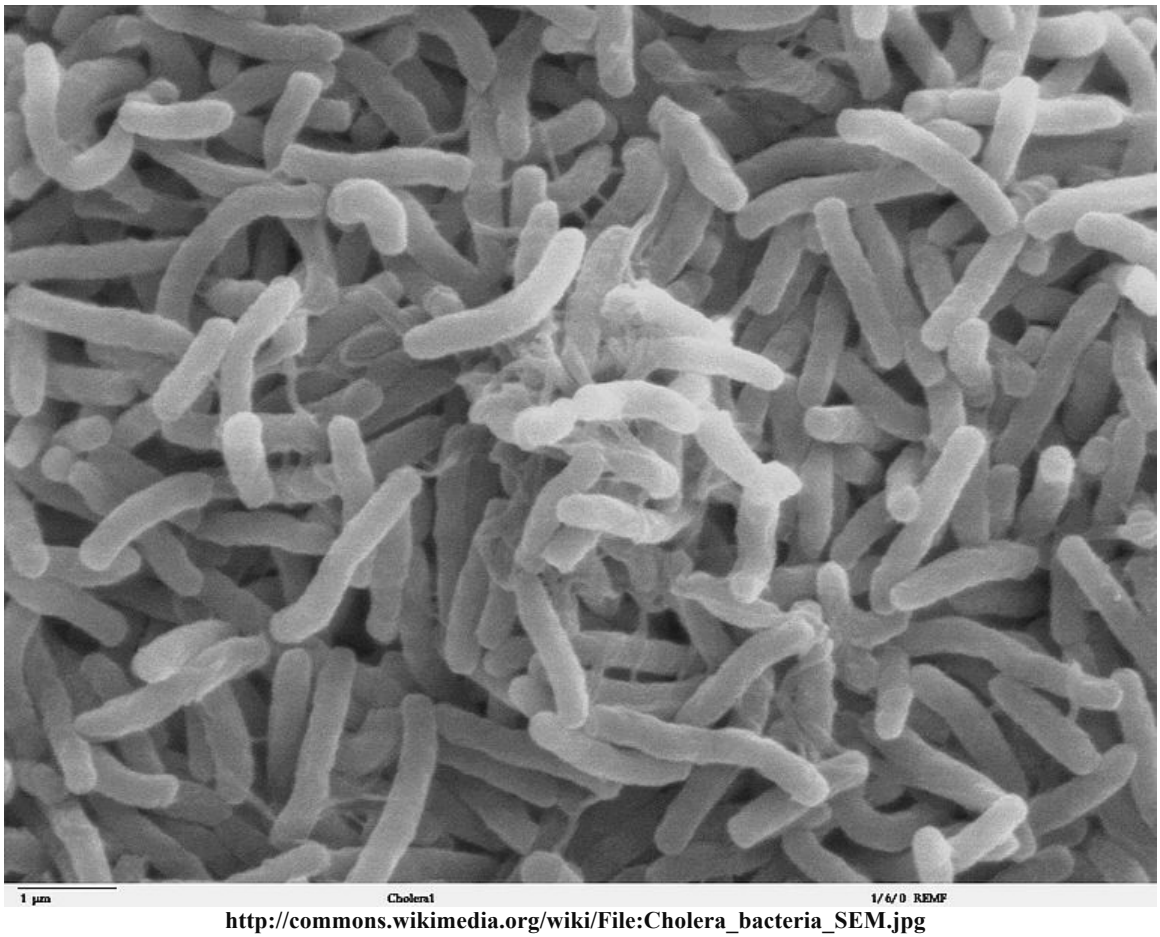

http://commons.wikimedia.org/wiki/File:Cholera_bacteria_SEM.jpg

Hay microbios buenos.

Hay microbios malos.

http://waterandmoreblog.com/wp-content/uploads/2011/07/dirty-water.jpg

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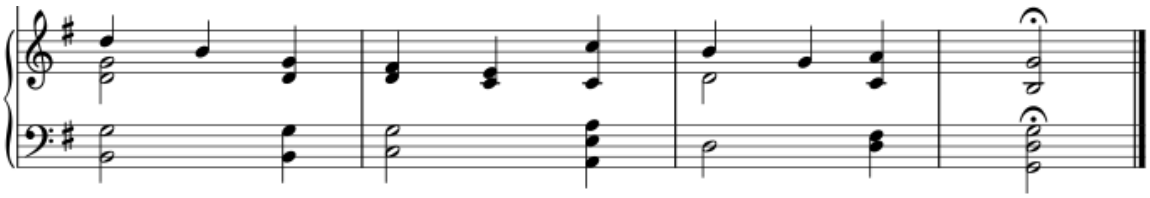

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