Stage 1 – Identify Desired Results

Established Goals:

G

SC12.3.4.a Identify different types of adaptations necessary for survival (morphological, physiological, behavioral).

- *Nebraska Department of Education*

What understandings are desired?

Students will understand that. . . **U**

Over-Arching: Biology helps explain the world around us and make informed decisions about our world. Biology gives insight into our bodies, our environment, and our world. There are many reasons why living things are the way they are including their environment and strategies for survival.

Topical: Bacteria have at least 10 different and important structures. These structures help a bacterium to survive and thrive in its environment. The different structures of a bacterium can help it to make proteins, exchange genetic material, to attach to surfaces, and to move.

What essential questions will be considered?

Q

Over-Arching: Does biology matter? How is biology important in my life? Why are living things the way they are?

Topical: What structures do bacteria have? Why are these structures important? What are the functions of the different structures?

What key knowledge and skills will students acquire as a result of this unit?

Students will know. . . K

That the different structures of a bacterium help it to live in its environment.

That a plasma membrane, cell wall, cell capsule, nucleoid, plasmid, ribosomes, pili, and flagellum are all important parts of a bacteria cell.

That Gram staining is an important procedure for scientists.

What different bacteria can do in an environment or their bodies.

Students will be able to. . . S

Draw the different structures of a bacteria cell.

Explain in their own words what the plasma membrane, cell wall, cell capsule, nucleoid, plasmid, ribosomes, pili, and flagellum are all important parts of a bacteria cell do.

Articulate the difference between parts of a cell envelope.

Perform a Gram staining lab and answer questions about its importance for scientists.

Answer questions about how different structures help bacteria to survive in different environments.

Stage 2 – Determine Acceptable Evidence

What evidence will show that students understand?

Performance Tasks (summary in GRASPS form):* **T**

G=Goal Create an ad that pitches a bacterium and explain the different structures of that bacterium and what they do.
R=Role Students in a sophomore biology class, they are the learner and performer of this task.
A=Audience The teacher and other students will listen to this task.
S=Situation Students will have received direct instruction and performed Gram stain lab.
P=Performance Draw bacteria ad with group, create pitch to sell bacteria, explain structures and functions.
S=R=Rubric See attached rubric.

Other Evidence

OE

Informal assessment throughout lessons, evidence of graphic organizer completion. *To be continued later in unit.*

Student Self-Assessment and Reflection:

SA

What did you like most about this three day unit?

What did you like least about the unit?

What was hardest for you during the unit?

What was easiest?

What could I do better next time to help students learn?

Any other comments you would like to make?

Day 1

Student Teacher: DO **Grade Level:** 10 **Date:** March 10, 2014
State Standard: Nebraska DOE **Subject:** Biology

Name of Lesson: Bacterial Structure **Period / Time:** Periods 1-2, 8:47 AM – 8:47 AM, 8:50 AM - 9:37 AM

I. Goal: • To help students understand the basic structures of a bacteria cell and their functions.	**Required Adaptations/Modifications:**
II. Objectives: • When presented with a picture of a bacterium students will be able to label each structure. • Students will be able to explain the functions of structures of bacteria.	**Required Adaptations/Modifications:**
III: Faith / Values Integration: • I will provide a good model for students in their interactions with others and will explain how creative God is with the smallest of organisms.	**Required Adaptations/Modifications:**
IV. Integrated Technology: • A Powerpoint presentation will be used to provide structure to the lecture; it will include pictures and basic notes.	**Required Adaptations/Modifications:**
V. Materials: • Computer, powerpoint, the graphic organizers (see attached Lessonplan1,bacteriagraphicorganizer2), extra note sheets for the students (see attached Lessonplan1,bacterianotesheet), sheet for extra vocabulary (see attached Lessonplan1,extravocaubularysheet), the lab handout for day 2 (see attached Lessonplan1,labhandout) a balloon, and a beaker. Students will also need a blank piece	**Required Adaptations/Modifications:**

of paper so they can make a nameplate for themselves.	
VI: Procedure: Set / Hook: • I will begin the class with a short introduction of myself to the students. While I give my introduction students will create name plates for themselves out of paper so I can know their names. Then, I will transition into a story about Aimee Copeland, a Georgia woman who had both her arms and legs amputated because she was infected with flesh eating bacteria. I will also show pictures of a cow, cheese, soybeans and yogurt, things that cannot exist without the help of bacteria. This will be supported by the powerpoint presentation which contains pictures of Aimee Copeland, a cow, cheese, soybeans and yogurt (see attached powerpoint Lessonplan1,powerpoint). (4-7 minutes) Transition: • "So, bacteria can be helpful or harmful for us. What do they look like and what are they made of?" (1 min) Main Lesson (33 min): • Show students picture of bacteria cell. This is the overall picture of the lesson. Students will see a whole cell so they know where we are going in the lesson. • You have talked about bacteria cells briefly before. Can anyone tell me if bacteria are prokaryotic or eukaryotic cells? • Show students picture of bacteria cell. This is the overall picture of the lesson. Students will see a whole cell so they know where we are going in the lesson. a.You have talked about bacteria cells	**Required Adaptations/Modifications:**

briefly before. Can anyone tell me if bacteria are prokaryotic or eukaryotic cells? (Literal) b. Why do we label them this way? (Interpretation) c. What difference does it make in the function of a cell if it is prokaryotic instead of eukaryotic? (Application) • Move on to powerpoint slide with nucleoid and plasmid. The nucleoid is the genetic center of the cell. a. Which part of your cells contains genetic information? (Literal) b. Why is genetic information important for living things? (Application) • Move on to the powerpoint slide with ribosomes. Ribosomes are in all living cells. They make proteins for cells. Ribosomes have two subunits, the large and small subunits, which are made up of many different proteins. a. Ribosomes are prokaryotic, so what normal part of organelles do they not have? (Literal) • Move on to powerpoint slide with plasma membrane. Students should know what this structure is from previous classes. Ask students these questions: a. What is this structure? (Literal) b. Of what molecule is this structure made? (Literal) c. What does this do? (Application) i. Show example on the white board of gradient across cell membranes to help students review diffusion. • Move on to picture of cell envelope. Explain that the cell capsule is the name for the cell wall, cell membrane, and cell capsule together. Explain the cell wall and that is made of peptidoglycan. This makes the cell walls of bacteria much different than the	

cell walls of plants. Ask students several questions: a. What substance constitutes the cell wall of plants? (Literal) b. What good would having a cell wall do a bacteria cell? (Application) i. Get a student to volunteer for a demonstration. Have the student blow up a balloon. Then have the student put the balloon inside the beaker and try to blow it up. The beaker should keep the balloon from expanding to be as big as it was when the student did not have the beaker around the balloon. This will help demonstrate that the cell wall of a bacteria cell keeps the cell from breaking open when it is in an aqueous environment. c. Why would it be good for the cell wall to be outside of the plasma membrane rather than inside the plasma membrane? (Application) • Discuss the importance of the cell capsule, which is only found in bacteria. It is made of polysaccharides, which are complex sugars. They help protect the cell from phagocytosis. Bacteria cells with a cell capsule have a high virulence factor, which means the bacteria causes illness. • Move on to slide about pili. These are made of the protein pilin. They are hair-like projections on the outside of a cell which help bacteria attach to different surfaces and to other bacteria. a. Bacterial pili help bacteria attach to teeth, which is why the dentist tells you to floss in between your teeth. Bacteria are very good at sticking there.	

• Move on to slide on sex pili. These structures help bacteria cells attach to other bacteria cells. This helps the bacteria exchange genetic material. a. Why would it be good for bacteria to exchange genetic material. • Move on to slide about flagella. Explain that flagellum is from the latin word meaning whip. It got its name because it looks like a whip. The flagella is used in motility, which means it helps the bacteria cell move. Some bacteria have only one flagella, others have very many. Flagella move around in a motion like a boat propeller, not like an alligator tail. a. Move on to slide with motion graphs. • Move on to slide about Gram staining. Explain how Gram staining is an important technique for scientists because it helps scientists determine which bacteria are so they can treat them in the most appropriate way. Transition: • "Tomorrow we will get to perform a Gram staining lab to see how scientists work". (1 min) Conclusion: • Hand out lab procedure sheet, review structures of bacteria. Students may begin work on lab handout for tomorrow. (3 min)	
VII. Assessment: • I will walk around and make sure that all students have their graphic organizers filled out. The graphic organizers will help me to know if the students understand the structures of bacteria and their ability to represent them visually. • I will also check to see if all extra vocabulary	**Required Adaptations/Modifications:**

is noted on the extra graphic organizer. • I will check to see if the lab handouts for the next day are started. • I will informally assess throughout with questions and guide answers that make this a formative assessment.	
VIII. Assignment: • Complete the first part of the Gram stain lab handout, in which the students will go through the procedure and draw the steps so they know what is going on.	**Required Adaptations/Modifications:**
IX. Self-Evaluation: • Did I use stories or humor to build relationships with the students? • Did my hook work? • Were students engaged in my lecture? • Did the lecture flow freely or was it forced? • Did my questions make sense and help students learn?	**X. Coop's Comments:**

Day 2

Student Teacher: DO **Grade Level:** 10 **Date:** March 11, 2014
State Standard: Nebraska DOE **Subject:** Biology
Name of Lesson: Bacterial structure **Period / Time:** Periods 1-2, 8:47 AM – 8:47 AM, 8:50 AM - 9:37 AM

I. Goal: • Teach students the procedure and importance of Gram staining bacteria.	**Required Adaptations/Modifications:**

II. Objectives: • When asked to explain the process of Gram staining students will be able to thoroughly articulate its steps. • Students will be able to explain the importance of Gram staining and its use to the teacher. • Students will be able to demonstrate which part of a bacteria cell Gram staining affects.	**Required Adaptations/Modifications:**
III: Faith / Values Integration: • I will provide a good model for students in their interactions with others and will explain how creative God is with the smallest of organisms.	**Required Adaptations/Modifications:**
IV. Integrated Technology: • This lab will include work with Bunsen burners, microscopes, slides, and two different types of dye, but no exceedingly modern technology.	**Required Adaptations/Modifications:**
V. Materials: • We will need microscopes, toothpicks, slides, slide covers, Bunsen burners, pipettes, crystal violet stain, Gram's iodine, safarin dye, and ethanol.	**Required Adaptations/Modifications:**
VI: Procedure: Set / Hook: • Welcome kids to class. Instruct kids to consider their lab handout from day 1 (see Lessonplan1,gramstainlabhandout – used in lesson 1) Discuss the steps of the lab which	**Required Adaptations/Modifications:**

are as follows, and demonstrate the step if necessary: ○ Place a very small drop of water on a slide with a dropper. ○ Rub a toothpick thoroughly against your teeth, gums, and cheeks. ○ Put your toothpick into the water on the slide to let them get into the water. Spread the organisms over the middle of your slide with the toothpick. ○ Allow your slide to air dry. ○ Use a tweezers to hold your slide, then pass your slide through your Bunsen burner flame several times to heat-kill and fix your organisms to the slide. ○ Cover your bacterial smear as many drops necessary of crystal violet stain. Let it stand for 20 seconds. This stains all cells purple. ○ Rinse your slide with water from a dropper. Drain off excess water into a cup. ○ Cover your smear with Gram's iodine solution from a dropper. Let it stand for 1 minute. This helps the crystal violet "stick" to gram positive bacterial cells. ○ Decolorize your slide by rinsing it with 95% ethanol from a dropper for ≈10 seconds, until the flow coming off the slide is colorless. This will remove the purple stain from all the gram negative stain-they are now clear again. Gram positive cells will remain purple. ○ Wash the slide with a gentle stream of distilled water. ○ Cover the smear with the pink stain, safarin, from its dropper bottle. All unstained cells will become pink. Purple cells will still look purple since the purple is so dark the pink that is	Groups are randomly assigned and of mixed abilities. This will allow higher students to help lower students understand the lab. I will spend my time around the class to determine if students

taken into them won't show through. Allow it to sit for 1 minute. ○ Wash the slide with a gentle stream of distilled water from a dropper. ○ Blot it dry with a paper towel. ○ Observe your slide under the microscope. (5-7 min) Transition: • "Now that you know what to do, have at it." (1 min) Main Lesson: • Students will work in groups of two to complete the lab. They will also clean up lab as necessary. (30-35 min) Transition: • "Everybody finish cleaning up if you haven't already and begin working on questions from your worksheet". (1 min) Conclusion: • For as many questions as time allows, discuss lab questions with students to make sure they are on the right track. (3 min)	understand the lab and I will spend more time with students of a lower ability and students who don't understand.
VII. Assessment: • Students will complete lab handout worksheet. It contains questions pertaining to the procedure of the lab as well as questions assessing their understanding of its importance. • Formative assessment throughout lab to insure that students understand how the lab works. • Walk around throughout class to make sure students are staying on task and completing	**Required Adaptations/Modifications:**

everything required.	
VIII. Assignment: • Students will complete the lab handout from day 1 to be turned in on day 3.	**Required Adaptations/Modifications:**
IX. Self-Evaluation: • Did I build relationships with the students in an effective and appropriate manner? • Did the students understand the importance of safety in the lab? • Was discussion of the questions on point and thorough?	**X. Coop's Comments:**

Day 3

Student Teacher: DO **Grade Level:** 10 **Date:** March 12, 2014
State Standard: Nebraska DOE **Subject:** Biology
Name of Lesson: Bacterial Structure **Period / Time:** Periods 1-2, 8:47 AM – 8:47 AM, 8:50 AM - 9:37 AM

I. Goal: • Teach students about marketing and help them to creatively express facts about bacteria.	**Required Adaptations/Modifications:**
II. Objectives: • Students will be able to work effectively in small groups. • Students will be able to give a satisfactory presentation explaining bacteria and their advertisement. • Students will be able to use creativity to describe a bacteria cell. • Students will be able to draw a bacteria cell	**Required Adaptations/Modifications:**

and label its different parts. • Students will articulate in writing what each part of a bacteria cell does and the substance of which it is made.	
III: Faith / Values Integration: • I will provide a good model for students in their interactions with others and will explain how creative God is with the smallest of organisms.	**Required Adaptations/Modifications:**
IV. Integrated Technology: • This class will not need any special technology.	**Required Adaptations/Modifications:**
V. Materials: • We will need colored pencils and blank paper. Students will also need the handouts from the two previous days.	**Required Adaptations/Modifications:**
VI: Procedure: Set / Hook: • Welcome students to class, hand out group project assignment (see Lessonplan3,bacteriaadvertisementhandout). Explain marketing applications to the lives of students and explain how anything can be marketed. I will then explain the assignment and my expectations for it. I will also randomly assign groups. (5 min) Transition: • "Now that you have your groups and instructions, go to it". (1 min) Main Lesson: • I will walk around during class to help students on their projects if needed. I will remind them to complete certain portions of the	**Required Adaptations/Modifications:** Students will be in groups of mixed abilities. Students will be evaluated

assignment that could be easily forgotten. (20 min) • Having finished their projects, students will present them briefly to the class. This is an opportunity for the students to gain experience presenting in front of a class and gain experience briefly speaking of a biology topic using pertinent vocabulary and concepts. (8 min). Transition: • "Thank you all for your contributions to today's class, I appreciate your efforts." (1 min.) Conclusion: • If time allows, I will debrief with students about the experience and how they enjoyed it, if it helped their learning, and if I should do it again. • Students will complete an evaluation of the whole capstone experience (see Lessonplan3,capstoneevaluation). • Students will hand in their advertisement pictures to me so I can hang them around the room. (1 min)	based on the rubric (see Lessonplan3, rubric) so I can evaluate them individually based on progress rather than a black and white distinction.
VII. Assessment: • I will grade the pictures and presentation using the checklist provided to the students. • I will do formative assessment throughout the period and steer students in the right direction.	**Required Adaptations/Modifications:**
VIII. Assignment: • None, students will finish project in class.	**Required Adaptations/Modifications:**
IX. Self-Evaluation: • Did I effectively and appropriately build relationships with the students? • Did the students enjoy the project? • Was the project effective in helping students	**X. Coop's Comments:**

display their knowledge? • Did I effectively control the classroom in a constructive manner?	