**Teaching Science as Inquiry (TSI) Lesson Plan**

**Module 3: Biological Aquatic Science**

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Activity: Modeling Microevolution

1. Why did you choose to do this activity?

This activity fits well into my life science content. I’m just wrapping up asexual/sexual reproduction, and this activity is a good model of advantages/disadvantages of asexual reproduction. It will also be a good introduction to the next concept of DNA, genetics, and mutations.

2. What are your classroom learning goals?

* Students will be able to explain why some bacteria are different (despite being asexually reproduced)
* Students will be able to explain why some bacteria survived and reproduced, and some didn’t, using the vocab words “mutation”, “variation”, and/or natural selection.

3. How does this activity tie into your classroom learning goals?

The activity will help students to make the connection between the concepts they learned in our reproduction unit, to the concepts in the next unit which will be on DNA, genetics, mutations, and natural selection.

4. What date do you plan to start this activity? 3/6/13

*5. If applicable:* HIDOE standards this lesson will address

* 7.5.4: Analyze how organisms’ structures contribute to their ability to survive and reproduce.

**Ocean**

6. Describe how you will connect this activity to the ocean:

Students will be asked to describe examples of variation in ocean organisms. Students will then be asked to describe what kinds of environments those variations would help the organism to survive in.

7. Select the Ocean Literacy Principle(s) that you anticipate this activity will address. (check all that apply)

**x 1. The Earth has one big ocean with many features.**

□ 2. The ocean and life in the ocean shape the features of the Earth.

□ 3. The ocean is a major influence on weather and climate.

□ 4. The ocean makes earth habitable

**x 5. The ocean supports a great diversity of life and ecosystems.**

□ 6. The ocean and humans are inextricably interconnected

□ 7. The ocean is largely unexplored

**Preparation**

8. How will you prepare your students for this activity? (For example, review of prior knowledge.)

We’ll do a class review of what asexual reproduction is, and what kind of offspring is created in asexual reproduction (identical to the parent). Students will discuss with partner to review why the offspring is identical. Then students will discuss with each other about what could possibly cause the offspring to be different. This is how I’ll introduce the concepts of “mutation” and “variation”.

9. Explain any instructional struggles that you foresee and how you will address these issues. (For example, student misconceptions, classroom discussion, aspects most difficult for students to grasp, etc.)

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| INSTRUCTIONAL STRUGGLES | HOW I WILL ADDRESS |
| Confusion on how to do the simulation | I will do a few rounds to show them an example of what to do. |
| Student misbehavior (playing with the paper clips or dice) | I’ll review the demeanors of a scientist prior to the activity to remind students that they are “scientists” doing a model/simulation, and that they are to act like scientists. |

10. What ***TSI inquiry*** *questioning strategies* will you use to help your students meet your learning goals?

Since this is the first time the students are being introduced to some of these concepts, I will probably have to do a lot of Clarifying, Extending, and Lifting questioning strategies. I will also ask the students to summarize the activity after completing it by using Summarizing and Analyzing Results questioning strategies.

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| Use the following table to plan your lesson using TSI.  For each phase:   * **Teacher:** Describe what you will be doing * **Student:** Describe what your students will be doing * **Assess:** Describe how you will assess your students in this phase so you can monitor their progress through the activity |

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| **INTERPRETATION** | | **INITIATION** | |
| Teacher | Monitor students. Display graphs from all groups on the board to help analyze results and see if replication occurred. | Teacher | Ask students review questions about asexual reproduction, offspring, and DNA. Then show the class a video about antiobiotic resistance at http://vimeo.com/15175424 |
| Student | Students will graph their simulation data as a line graph. Working in partners, they will answer the follow-up questions. | Student | Students will answer questions in partners or groups. Students will view video and be asked to think about the review questions as they are watching the video. |
| Assess | Data table, graph, and follow-up questions will be part of the overall assessment of this activity. | Assess | Class discussion after watching the video. |
| **INSTRUCTION** | | | |
| Teacher | Review directions with class. Do a few sample rounds so students know how the model works. Remind students of what a mutation is, and which paper clip is the mutated one and why. Also remind students of how bacteria reproduce. | | |
| Student | Listen to teacher directions, and ask questions if confused. Discuss questions with partner or group during the class discussion portions of this activity. | | |
| Assess | Students will be randomly called with popsicle sticks to check for understanding of the concepts and activity directions. | | |
| **INVESTIGATION** | | **INVENTION** | |
| Teacher | Monitor students | Teacher | Monitor students |
| Student | Conduct the simulation by following the written directions. Record data into table. | Student | Students will make predictions on how many of each type of bacteria will survive the six generations. |
| Assess | I will be looking for data tables to be filled out correctly so that I know students are correctly following the directions. | Assess | Predictions will be checked for student’s reasoning (why they made their predictions). |

11. Briefly describe how you will guide your students through the TSI Phases of Inquiry. (You are the research director of your classroom, and thus guide or facilitate the learning in your classroom, even if an activity is very student-directed).

I will have the TSI phases poster up on the board. Before starting the activity, I’ll refresh the students’ memories about the time when they learned about these phases, and we’ll do a quick review. Periodically throughout the lesson, I’ll call on students to see if they can identify which phase of the lesson they are in at the time their name is called.

12. What *overarching* TSI mode(s) will you focus on for this activity? Why?

Modes: Curiosity, Description, Authoritative knowledge, Experimentation, Product evaluation, Technology, Replication, Induction, Deduction, Transitive knowledge

Replication will be the overarching mode because students will (hopefully) see similar results across all groups and that the process of microevolution and natural selection is a valid process that does not happen by mistake.

Please provide any additional comments that will help you prepare to teach this activity or help the TSI facilitators understand how you plan to teach this activity.

I plan to follow the TSI directions pretty closely, with not much modification. If I feel necessary, I’ll do a more in-depth “authoritative knowledge” session with the students if they are not showing me they have much prior knowledge on the concepts of mutation, variation, and natural selection. After the activity, if time allows, I would like part of the assessment to be the ocean connection I described earlier in the lesson plan.