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

**Module 4: Ecological Aquatic Science**

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Activity: Sampling Abundance

**1. Why did you choose to do this activity?**

This activity was chosen because the topic like sampling design, ties in appropriately to my curriculum for 4th quarter for Standard 3: Organisms and the Environment.

**2. What are your classroom learning goals?**

Students should understand how to gather and record accurate data while working in groups. They should also learn to calculate and analyze data properly and consider the different sources of error.

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

Students will collect, record and analyze data and consider the kind of error when choosing a transect or quadrat. They should discuss and decide how to come to a decision about a proper method for a given sampling area.

4. **What date do you plan to start this activity?** Tuesday, April 23, 2013

5.**HIDOE standards this lesson will address**

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| **Topic** | Organisms and the Environment |
| **Benchmark SC.7.3.3** | Explain how biotic and abiotic factors affect the carrying capacity and sustainability of an ecosystem |

6. **Describe how this activity relates to at least one of the TSIA PD Themes.**

Themes: Community, Metacognition, Science as a Human Endeavor, Observations and Inference, Modeling Science, Scientific Language, Connections

Students will work in groups or communities to decide on choosing a transect point or quadrat point intersect method when sampling a given area. During this activity, students will model how scientists survey samples in their investigations using scientific vocabulary.

**Ocean**

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

 Students will be told to imagine that they are marine biologists hired to sample different species of organisms found on a beach/ocean coastline biome. They will also address errors that may occur when taking samples.

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

□ 1. The Earth has one big ocean with many features.

X 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

X 7. The ocean is largely unexplored

**Preparation**

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

Reference will be made to the previous sampling design activity and use of the vocabulary from that lesson will be done to introduce transect and quadrat procedures. A review of basic data analysis using mean, median, and mode will also be done. .

10. **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.)

Due to the type of content, students will need a lesson about types of sampling methods since they have no formal background to include “why” it is done with certain procedures. Questions may arise after they “practice” the method later in the lesson. Due to the nature of the lesson and lack of space and larger class size, there will be too much “down” time and “not enough” for most students to be busy adding less on-task time. Specific instructions and extra points to award for on-task behavior will probably have to be initiated.

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

What types of questioning or approaches to discussion will you take to support student

engagement and learning? See questioning handout for suggestions (Mod 3 Binder under “TSI Pedagogy and online in Mod 3 PD section)

Specific clarifying, focusing, and summarizing questions will be asked so students will stay on-task during the thinking process.

12. **What *TSI practices of inquiry teaching strategies* will you focus on implementing to help your students meet your learning goals?**

See TSI Practices of Inquiry teaching strategies handout for suggestions (Mod 4 Binder under “TSI Pedagogy” and online in Mod 4 PD section)

The teacher will be the research director allowing students to engage in the thinking process aloud so they can hypothesize on the best way to lay the transect lines and how to place the quadrat for proper counting procedures. Students will communicate in small and then as a larger group to decide how the class can work together as scientists surveying a study site.

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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 | Explain what different item can represent in different ecosystems.Review and lead discussion on analyzing class data with class.Discuss possible errors and how it affects data collection. | Teacher | Review M&M sampling lesson, then tie in other ways to “sample” the number of organisms using transects and quadrats. Ask students to predict which category is the most abundant or least abundant just by looking at a sample ocean/coastline study site as a whole. |
| Student | Review class data participate in discussion on results, errors, impact on a beach/coastline study site  | Student | Discuss in small groups before predicting which is the most abundant or least abundant organismExplain why they make their prediction to partner. Write prediction on worksheet. Ask students what organisms the models could stand for in a beach/coastline biome/study site. |
| Assess  | Participation in discussion, completed worksheet with activity questions, observed small group discussion during process. | Assess  | Small group discussion, then larger group regarding predictions. Written hypothesis on worksheet. |
| **INSTRUCTION** |
| Teacher | Teach sampling strategies transects and quadrats procedures as a way to track organisms in a pretend study site.Tell students to divide in groups of 3 and that they will rotate job duties (recorder, counter, observer/time keeper) |
| Student | Take notes on worksheet and may ask questions for clarification. Volunteer student to demonstrate if he/she understood instructions. Other students will observe model student as a review for their own role in their group. |
| Assess  |  Notes taken on worksheet, observe various students using transects and quadrats correctly to document “organisms” properly. |
| **INVESTIGATION** | **INVENTION** |
| Teacher | Give limited on-task time for students to collect data at specific intervals. Instruct students to carry out the problem solving method for using the quadrat method. | Teacher | Lead class in getting students to discuss and decide as a class how to lay down the transects. Remind students to stay on-task and divide roles up in collecting data to minimize wasted time. |
| Student | Collect data using specific roles in their group.Rotate job duties.Record data of organisms on table.Complete worksheet and calculate averages. | Student | Discuss in partners, then as a class lay down the transect lines and decide roles in taking data on the worksheet as a group. |
| Assess | Observed placement of quadats and discussion between students to agree as a class for the proper procedure.Completed worksheets with proper calculations of sampling abundance. | Assess | Observe placement of transect and discussion between students to agree as a class. |

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).

*Instruction:* Teach transect and quadrant sampling method as way for scientists to track biotic factors in an ecosystem. Emphasize teamwork as a group, as a class and rotating job duties as grading requirements.

*Initiation:* Tell students to imagine they are at the beach or coastline surveying organisms at a beach/coastline biome. Discuss in partners then make predictions on what is the most abundant or least abundant organism in the area. Make up imaginary organisms for each item on the model.

*Invention:* Give students the transact lines to place as a group/class goal. Remind students about teamwork, cooperation and rotating job duties as grading requirements

*Investigation:* Collect and record data using the transect method. Allow problems solving again for placement of the quadrats and practice correct method in collecting data.

Collect data again using quadrat method and record data with calculations.

*Interpretation:* Analyze the data as a class and discuss possible sources of error with the different sampling methods. Finish completing and answering question on the worksheet.

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

Description and replication will be the overarching modes for this activity. Students will be repeating different strategies for collecting and sampling model organism data as well as describing the organism. They will also explain to the teacher and other students how to properly collect and analyze data. Authoritative knowledge will also be done because the teacher will be explaining new scientific tools which are unfamiliar to students.

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.