

LESSON 5 - RECORDING, COMPILING, AND ANALYZING THE DATA COLLECTED FROM THE CLAM FIELD EXPERIMENT

Title: Clam Field Experiment Data

Content Area Subjects:

Science, Math, English Language Arts

Grade level(s):

Grades 3 -12+ (can be adapted to any level)

Standards:

Maine Learning Results

- Career and Educational Development. Interpersonal Skills (A3.pre-k to diploma.a,c)
- ELA. Informational texts (A3.3.c); (A3.3.e); (A3.6.e); A3.9-diploma.b); Research (C1.3-5.a,c,d)(C1.6-8.g); (C1.9-diploma.a,c); Listening (E1.3-diploma.c); (E1. 9-diploma.a); Speaking (E2.3-8.d); (E2. 9-diploma.a)
- Health and Physical Education. Cooperative Skills (I1.pre-k to diploma.a-d); Responsible Behavior (I2.pre-k to diploma)
- Math. Data (B1.4-8.a,b); (B1.9-diploma); Measurement and Approximation (B1.4-diploma.a,b); (B1.9-diploma.a,b,c); (B2.3-6); (B2.7.1a, 1b); (B2.8-diploma.3)
- Science. Scientific Inquiry and Technological Design (B1.3-diploma.a); (B1.3-diploma.b); (B1.3-diploma.c); (B1.3-diploma.d); (C1.3-diploma.a)
- Social Studies. Taking Action Using Social Studies Knowledge and skills (A3.3-diploma)

Common Core:

- ELA. (V.3-12.6); (SL.3-12.1c); (SL.3-5.1); (L.3.5b);(L.3.5b)
- Science and Technology. (R.6-12.4); (R.7-12.4)

STEM Skills

Hypothesis/Brief Description:

- How does the place where juvenile soft-shell clams, *Mya arenaria*, live on a flat (upper, mid, and lower tidal zone) affect how they grow and survive?

LESSON 5 - RECORDING, COMPILING, AND ANALYZING THE DATA COLLECTED FROM THE CLAM FIELD EXPERIMENT

The field-based experiment will consist of four main parts: preparation of materials, planting/deploying the experiment, harvest/termination of field component, and analysis. Students will prepare and place the experimental units containing juvenile clams (ca. ½-inch in shell length) into the soft-bottom environment at high, middle, and low tidal zones. Several months later, the units will be excavated and their contents inspected for living and dead clam individuals. An accurate count of surviving clams and a measure of each shell (for growth rate) will be taken to collect data to answer the essential question/hypothesis.

Adaptations for different age levels:

All students in the schools K-12 were able to be involved in sieving, collecting juvenile clams, measuring and compiling information. Groups were successful with mixtures of students. Accuracy could be maintained when students were instructed carefully about recording how their data. Even the youngest students were able to manipulate the caliper measurements with help. All students may complete the worksheets that accompany the lesson individually, in groups, or with a partner. For younger students, the instructor could lead a discussion using the worksheet as a guide and having the younger students moving through the concepts as a group.

Objectives/goals:

After completing the activities, the students will be able to:

Record information about the living and dead clams found in the clam containers.

Compile/summarize/analyze their group findings and determine what their findings might mean.

Speculate on the “next steps” that might happen as a result of their findings.

Time needed: 1 day (A sample processing flow chart is included for time management)

Keywords:

data, final length, growth rate, hypothesis, initial length, juvenile clam, *Mya arenaria*, hatchery mark, high tide, high water line/mark, low tide, low water line/mark, mortality rate, survival rate, tidal zones: upper intertidal zone, middle intertidal zone, and lower intertidal zone, tidal height, tree line

Materials Needed:

LESSON 5 - RECORDING, COMPILING, AND ANALYZING THE DATA COLLECTED FROM THE CLAM FIELD EXPERIMENT

- Screens (sieves). Should be wooden boxes with fine mesh (window screening may be used or larger 1/8th-inch hardware cloth). The contents of each container is placed into the sieve and then the sediment is sprayed with water to reveal the clams that remain in the container;
- Water source for washing the mud/sand;
- Plastic baggies (empty) for collecting the tag from each container and the clams/shells left on the screen after washing;
- Data sheet for each container (data sheet should contain information about the name of the study site, the tidal height where the clams were planted, the type of container the clams were in (i.e., completely netted or un-netted), and the initial and final shell length of each live clam (see below). In addition, each data sheet should have a place where the student(s) who collected the data can write name(s);
- flow chart to help the day flow smoothly
- The baggies that have been uniquely tagged and refrigerated and contain the contents of each container after washing (living and dead clams – shell remains);
- A Classroom size Data Sheet for individual totals;
- Markers/Pens/Pencils;
- Calipers; or,
- Twine and measuring sticks (If calipers are not available, another method of measuring could be used. For example, twine could be used to measure the clam in three steps: 1) Holding one end of the twine at one edge of the shell, play out the twine to the other edge of the shell. 2) Carefully continue to hold the twine and move to a “measuring stick” or “paper measure” that has been constructed for this portion of the lesson. 3) Check the measurement number and record it on the data sheet) (Measuring sticks could be rulers or cardstock rulers that had been made up beforehand and taped down so the rulers couldn’t easily move around during the measuring process);
- Soap, water, and towels for clean up when finished; and,
- “KWHL”(Know/Want to know/How/Learn) sheets (if available use the partially completed sheets that students started in the Lesson 2 for their notebooks-if not use blank KWHL” sheets and complete the notebook later as a review);
- “Puzzle It Out” exercise as a review

The Procedure:

Introduction

The Instructor will begin the lesson by saying, “Today is the day we collect our data as the next step in our scientific procedure. We planted clams in the plastic containers last spring at three different heights along the tidal zone. We have recently retrieved the containers and brought them back to the lab where we will wash them and inspect the contents of each.”

LESSON 5 - RECORDING, COMPILING, AND ANALYZING THE DATA COLLECTED FROM THE CLAM FIELD EXPERIMENT

Key Questions

- What did we find in the clam containers from the upper tidal zone? Why?
- What did we find in the clam containers from the middle tidal zone? Why?
- What did we find in the clam containers from the lower tidal zone? Why?
- Does our research point us to any general conclusions or statements from our plant containers?

Main Activity

The students will spread the contents of their containers onto a screen and spray water over the screen until the mud/sand is removed. They will place the living and dead shells and other debris into a plastic baggie with a tag/label containing specific information about the location and treatment of the container.

Back in the classroom, the students will record their findings. The Instructor will say, “Now we need to find out what happened to each clam that was planted in the clam containers, by carefully analyzing the contents of each container and recording what we find. We must be very careful to make sure we do not lose any identifying information or tagging that shows us what container came from what location. Everything we do today is extremely important to our scientific research. Our data must be accurately recorded. If we are called upon to measure clams that are found, we must be exact in what we do. We need to check ourselves and our accuracy. A scientist must be careful to record accurate data.

“Before we start, we need to review a key phrase – the ‘hatchery mark’ (spend some time reviewing this phrase. This would be a good time to show some shells or pictures from clams with the hatchery mark).

“The mark is a disturbance line that was laid down in the shell of each clam at the time when the experiment was initiated. It looks very much like a tiny clam shell imprinted on the bigger shell that has developed over the time period. It is possible to measure the disturbance line and call it the ‘initial length’ and then measure the ‘final shell length.’ The amount of new shell growth is the final length minus the initial length (Growth = Final Shell Length – Initial Shell Length).

“Do you think you could recognize this hatchery mark if you saw it on the clams? (Make sure students understand this point.) We will make two measurements on every clam we find. We will measure the length of the hatchery mark which is the initial length; then we will measure the final length of the shell for our final length. Both measurements will go on our Data Sheets.

LESSON 5 - RECORDING, COMPILING, AND ANALYZING THE DATA COLLECTED FROM THE CLAM FIELD EXPERIMENT

“Look at your Data Sheet that you need to fill out as we go over the sheet together. (Instructor will make sure the student(s) understand what to record) Are there any questions?”

“Although we placed 12 clams in each container, we may find some clams which are not hatchery clams (wild clams) and we will do our best to record their data as well. Of course, we will not find ‘hatchery marks’ on them.”

The students will then measure and record the information from the contents of the sieved containers (baggies) and write the information on their Data Sheets. As they analyze the contents of each baggie, they must try to be as accurate as possible. They should be able to record information from their own clam containers if the tagging system was accurate. (The instructor should be prepared to handle situations where containers got mixed up or misplaced-students may be upset if this happens, and they will need to be included in some way back into the project)

The students will carefully record the contents of each of their clam containers. They will need to measure each live clam for two measurements-the hatchery mark and the final length. (The instructor will need to move through the group and provide assistance as needed)

Data analysis itself could extend to several lessons on subsequent days, depending on the age of the group and the instructor’s wish to use the data. If data activities are organized by the instructor, DEI encourages the use of averages being compiled for use in graphing exercises to give a more accurate picture of what happened in the project. DEI staff members will meet with teachers to present a summary of the project and offer suggestions of ways to effectively analyze what has happened. DEI will offer suggestions of ways to help younger students summarize what happened.

Conclusion

The Instructor will lead the group in some overall discovery after the completion of their Data Sheets. (It would be very helpful if a giant class-size data sheet could be compiled as well, using a blackboard, whiteboard, or computerized sheet to tally totals.)

The Instructor should go back to the key questions to review student findings. Finally go back to the Hypothesis and break it down:

How does the place where juvenile soft-shell clams, *Mya arenaria*, live on a flat (upper, mid, and lower tidal zone) affect how they grow and survive?

How did living in the upper tidal zone affect our clams? The middle tidal zone? The lower tidal zone?

LESSON 5 - RECORDING, COMPILING, AND ANALYZING THE DATA COLLECTED FROM THE CLAM FIELD EXPERIMENT

What effects, if any, did netting have on clam growth rate? On clam survival rate?

The Instructor should use the student predictions that were written earlier in the research and saved as a basis for further discussion. Their predictions are a very important part of research and summarize students thoughts. Involvement by the students is very important-whether they were “right or wrong”. Student ideas need to be encouraged,not squelched when scientific research is involved.

Assessment:

NEW questions: Use the partially completed KWHL worksheet questions to do a group wrap-up. If the sheets are not available, use blank sheets to do the column “What I Learned” individually, and then share the results as a group.

Have students think about some new questions they are wondering about, using the worksheet to give them ideas. (If the instructor had overheard any questions throughout the day, add those questions to the student-generated questions.

If the students seem unable to get started throw some “next step” type questions out. For example, “What do you think a scientist would want to do after our discoveries today? Can we make any statements based on our findings? (make them together) Do we have any questions we can talk about as to what we could do with the information we have collected? How could our project help someone else?” (Lead the discussion into the idea of management of a resource so it can survive and thrive to boost the local economy)

As a good review of the project, now or on a later day, use the activity PUZZLE IT OUT, to see if the students recall the project, its hypothesis and their roles in the project and why.

In PUZZLE IT OUT, a synopsis of the steps involved in the project is written into statements. The statements are cut up into words or phrases, depending on the abilities of the students. The words or phrases for each statement are put into individual envelopes (1 sentence to 1 envelope). Teams or individual students are given an envelope. The teams or individual put their statements back together. Once all statements are completed, the group tries to get the sentences into the correct order.