Institute
Inquiry Based Learning
Educational Consultants

3275 Berryhill Rd.
Lima, OH, 45801

419.234.5701
john@iblinstitute.com

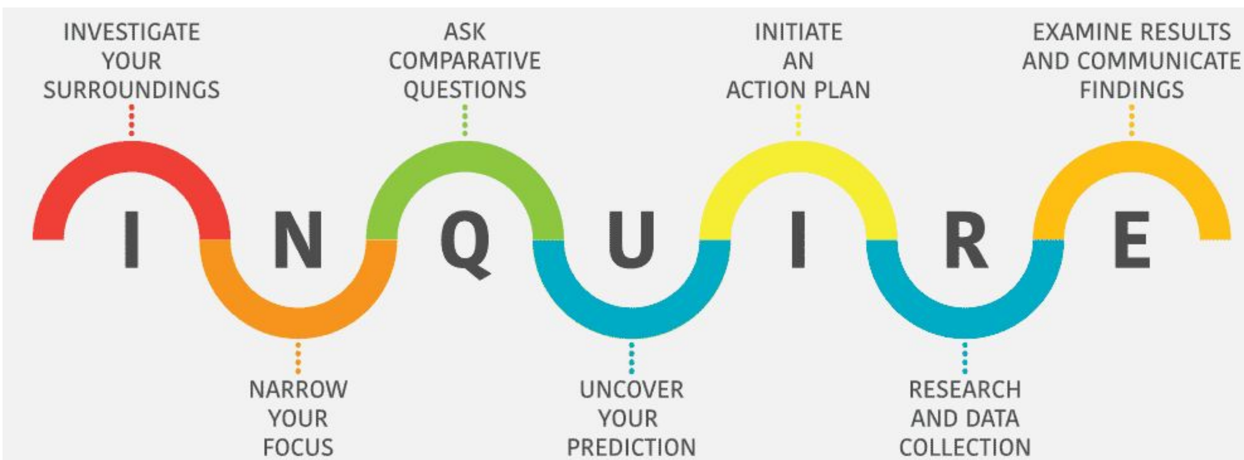
We hope the lesson plans add value incorporating inquiry into your classroom and they become part of your teaching arsenal.

We would appreciate feedback. We would also appreciate a $20 contribution which helps us maintain the website so we can continue distributing these lesson plans to other educators.

Mail your feedback and contribution to:
IBL Institute
Attention: John Hoffman
1101 N. Cole St., Lima, Ohio 45805

Water Quality Assessments Using Ceriodaphnia Dubia

An inquiry-based lesson plan designed to promote critical thinking by integrating content with traditional and inquiry-based learning.



All Hands-On Learning is NOT Inquiry-Based Learning

Inquiry based learning is process-oriented and does not focus on a single correct answer, but rather emphasizes the process of gathering information and forming a conclusion. Traditional hands-on learning tends to be product-oriented and has students follow a pre-planned procedure to come to a single, specified answer.

Key Terms

Process skills (PS)

Skills that students will engage in while thinking critically. These include observing, questioning, predicting, planning, investigating, interpreting, and communicating. These skills are found in each step of the inquiry process.

Investigating Surroundings

Observing the overall surroundings. What do I see? What is understood about the topic? What still needs to be understood?

Narrowing Focus

Observing student needs and interests, as well as academic content. Find the balance between natural curiosity and standards-based concepts. What area can be concentrated on to best promote growth and learning?

Questioning

Forming questions about what is not fully understood. Comparative questions can be investigated. They need to be able to lead into an action plan. What can be found out?

Uncover Prediction

Logically thinking to form a prediction about what could happen. What do I expect to happen based on my experiences and knowledge?

Initiate Plan

Figure out the action plan. Design an experiment which will answer the comparative question. What can I do to answer this question? How can I find this out?

Research and Collect Data

Investigating the elements of the experiment. Researching and collecting data that applies to the action plan.

Examine Results

Interpreting the data collected. What does this data mean? What else do I want to find out?

Communicating

Communicating the information that was found to someone else. The way the data is presented. What will the audience want to know? What will the audience be able to understand about this?

Table of Contents

1. Overview and Practical Application 4
2. Lesson Plan 5
    a. Objectives
    b. Educational Standards
    c. Materials
    d. Vocabulary
3. Introduction 7
4. Instructional Overview 8
5. Post-Assessment 8
6. Journaling 9
7. Background Science 10
8. About Inquiry-Based Learning as it Applies to this Lesson Plan 12
9. Pre-Experiment Preparation 14
10. Experiment: Group Procedures 16
11. Appendix 1 – Data Sheet 17
12. Appendix 2 – Vocabulary Defined 18
13. Appendix 3 – Student Feedback Form 19
14. Appendix 4 – Teacher Feedback Form 20
15. Appendix 5 – Experiment Calendar 21
16. Appendix 6 – Photos 22

Overview

This is an inquiry-based learning lesson in which students learn about *C. dubia* and their habitat. Students will be engaged in hands-on activities to culture *C. dubia* and set-up an experiment to answer a comparative question regarding reproduction under various environmental conditions. Finally, the project will link IBL with the biology involved in evolution and how species adapt. More questions will emerge to continue scientific investigations and further the learning process.

Practical Application

This experiment allows students to understand toxicity levels in their own water samples, using techniques that would be used in a real lab setting. Each student will have practice with the scientific process, including interpreting and documenting data.

Lesson Plan

Grade Level: 7-9

Class:

Teacher:

Time Required/Duration: Day one (Friday)- 40 minutes/ full class period
Each day- take 10 minutes to feed and count the water fleas
Final day (Next Friday)- 40 minutes/ full class period

Objectives

1. Incorporate the process of inquiry-based learning into a traditional direct instruction classroom setting.
2. Assess the toxicity of various surface waters from different environmental settings.
3. Students will be able to identify the life cycle, morphology, and habitat of *C. dubia*.
4. Students will recognize ways that species, specifically *C. dubia*., adapt to their environment.
5. Differences in adaptation will lead to a comparative question that the teacher will provide to the class.
6. Students will work together in groups to maintain stock cultures of *C. dubia* and complete an action plan to explore various adaptations to different environments.
7. Students will collect, tabulate and present scientific data as well as journal their process.
8. Students will uncover additional questions and think critically about the data found.

Educational Standards

Scientific inquiry – Students develop scientific habits of mind as they use the processes of scientific inquiry to ask valid questions, and to gather and analyze information. They understand how to develop hypotheses and make predictions. They can reflect on scientific practices as they develop plans of action to create and evaluate a variety of conclusions. Students are also able to demonstrate the ability to communicate their findings to others.

Life Science (Topic: Species and Reproduction)

8.LS.1 Diversity of species, a result of variation of traits, occurs through the process of evolution and extinction over many generations. The fossil records provide evidence that changes have occurred in number and types of species.

8.LS.2 Every organism alive today comes from a long line of ancestors who reproduced successfully every generation.

8.LS.3 The characteristics of an organism are a result of inherited traits received from parent(s).

Materials

Needed:

1. Stereoscope (magnifying glass will work, but it won't be as clear)
2. Four different sources of naturally occurring water (i.e., river, pond, lake, stream, ditch, etc.)[1]

IBL Institute Provided at No Charge (Shipping and handling fees will apply):

1. *C. dubia* stock cultures in moderately hard synthetic rearing water
2. Laboratory supplied culture water to transfer organisms
3. Eye Droppers
4. Sampling cups with lids
5. Disposable 30 ml cups
6. *C. dubia* food supply: YCT (yeast, Cerophyll and trout chow) and unicellular green algae (*Selenastrum capricornutum*).
7. Cheesecloth to filter samples

Nice to Have Items (Grant funding may be available):

1. Grow light bulb (no fixture) - estimated cost $15 to $20 [2]
2. Digital or mechanical timer – estimated cost $12 to $30
3. Lighted magnifying glass – estimated cost $20-$50

To order the IBL Institute provided supplies, please contact Jessica Begonia at 419-223-1362. Supplies will be scheduled for delivery two days before the experiment starts.

Vocabulary

(See Appendix 4 for Vocabulary Defined)

C. dubia/ Daphnia
Asexual reproduction
Sexual reproduction
Brood
Neonates

[1] There is an opportunity here to allow the students to inquire even more about the environment around them. If possible, instruct your students to bring the water samples from home. When the results vary, it will make the student question the environment they live in which is the essence of inquiry learning.

[2] There are other grow light bulbs with fixtures that can be used as a substitute. If not accessible, setting cultures near a window will work as well.

Introduction

The teacher will:

1. Show the photo of the daphnia on the board and briefly discuss the morphology of *C.dubia*. (See Appendix 6, page 22)
2. Lead a discussion of the ecology, life history, and life cycle of *C. dubia*. **(INVESTIGATE SURROUNDINGS)**
3. Explain that students will be taking home a sample cup and bringing back a water sample to use in the experiment. Approve of each student's location for the water sample, to ensure differences in the samples. **(NARROW FOCUS)**
    a. Sample sources could include ponds, ditches, streams, aquariums, culture water from the sampling kits, etc.
4. Provide information to bridge the scientific background with the hands-on part of the lesson.
5. Review the difference between sexual and asexual reproduction.
6. Explain that the lesson will use asexually reproducing organisms that are genetically identical (clones).
7. Discuss how species can adapt to their environment and evolve.
8. Let students know they will be working in groups of 4 to 5 dependent on class size.
9. As a class, come up with a comparative question. **(ASK COMPARATIVE QUESTIONS)**
    a. For example, will average brood sizes as measured by the total number of young in three broods be larger in more nutrient rich waters (like agricultural runoff)?
    b. Which student thinks water from around their house will produce the largest broods? Why/Why not?

Instructional Overview

1. Introduce the students to the materials provided, discuss the logistics and dynamics of the hands-on learning and make assignments.[3]
2. Students will observe the daphnia (both in the water through a microscope and through photography) and sketch one. [4]
3. They will proceed with the actual experiment.
4. Students will collect and record data.
5. Provide the detailed background information to the students with a lecture.
6. The teacher may play the video provided regarding C.dubia and acute toxicity if time allows.

Post-Assessment [5]

1. After the experiment is over and the data has been recorded, post the comparative question again for students to read.
2. Ask students to think about their answer to this question and the processes that lead them to get to that answer.
3. Students will be given a partner from a different group[6]. They will write to that partner:
    a. The steps they took to find the answer.
    b. Why those steps led them to the conclusion they have.
    c. What is left unanswered, or any new questions they have after the experiment.
4. After writing, have them share their paragraph with their partner to read.
5. While reading their partner's work, students should think about:
    a. What is different about their partner's work?
    b. What caused it to be different from their own work?
    c. Does the way their partner thought about the process change the way they personally think about it?
6. Have the partners discuss their thinking with one another. **(COMMUNICATE FINDINGS)**
7. If students have changed their thinking in any way from what they had written, they can make notes on what has changed and what made them change their mind.
8. Students will turn in their writing to the teacher. Check to make sure:
    a. They have stated their conclusion to the question.
    b. Their conclusion was made logically using the data found in the experiment

[3] This is what is covered in the anticipatory set. This part could take up to two class periods.
[4] Students can infer what part of the daphnia is which and what purpose each part serves.
[5] This can be done using pencil and paper or using the preferred technology of the classroom.
[6] If groups get different answers, try to pair students from groups with different answers to the question. This will create more points of discussion and can expand their thinking on their own answer.

Journaling

Students will document their data, thoughts, and questions every day for the duration of this lesson. This can be done with technology such as Google Docs or Word, with pencil and paper in a notebook, or any other method that best fits the class. Each class, the students will respond to prompts provided by the teacher. For class periods covering the anticipatory set, students will respond to prompts at the end of class discussing the material, as well as any questions they have. For class periods spent on the experiment, while students are working they will record data and respond to prompts discussing what they observe.

Introduction prompts:
What made you excited about today's lesson?
What is one thing that you learned today?
What is one thing you are curious about?

Experiment prompts:
What differences did you observe?

- Size, color, movements
- Draw a picture of the differences, if possible

What have you noticed about the *c. dubia* today, and what do you think that means?

- If they died, why do you think that happened?
    - What could you do now?
    - What could you learn using the materials available to you?

Experiment data:
How many *C. dubia* are in each container?
A
B
C
D

Background Science

Life Cycle

- *C. dubia* are filter feeders and feed on algae and other particulates through their movement.
- During the normal part of their life cycle they reproduce asexually. Show the following video:
  - https://www.youtube.com/watch?v=i9zj9V8OWRk
  - Diploid eggs develop into larvae that grow in a brood chamber.
  - Young are typically released after about three days.
- Throughout their life cycle *C. dubia* adapt to extreme environmental conditions including over population, cold weather, lack of food, and toxic environments.

Reproduction

- Under extreme environmental conditions *C. dubia* reproduce sexually and fertilized eggs can remain dormant for extended periods of time until environmental conditions improve.
  - This is important because sexual reproduction allows for evolution of the species maintaining some sense of gene flow. *Daphnia* mutate to adapt to environmental conditions and then pass genes on to future generations. This combination helps the species to survive.
  - When the *C. dubia* recognizes changes in the environment, she will give birth to males (instead of just females) so that sexual reproduction can occur.
  - An asexually reproducing female *C. dubia* can have three broods in as little as six days.
    - Because of this short life cycle, mutations can occur quickly, and the species can adapt easily.
    - *Daphnia* can easily provide insight into evolution because they reproduce quickly, they are easily observed, and adaptations are often quick and in direct response to their environment.
      - One adaptation to extreme environmental conditions is the ability to reproduce sexually.

Adaptation

- A number of genetic traits in *C. dubia* are evident and observable. These traits include mobility, size, age, morphology, behavior, predator response, and their immune system.
- Predators can also bring about traits that result in adaptations.
    - For example, when predatory fish are around, daphnia will respond with smaller offspring; conversely in the presence of midges(small flies), they will often have larger offspring.
    - Kairomones are the chemicals present in the predators that induce changes in the *Daphnia* that result in a change in the size of offspring
- *Daphnia* have the ability to adapt to a broad range of environmental conditions; this is known as ecological generalization. Narrow environmental tolerance is referred to as ecological specialization. *Daphnia* can adapt to increasing levels of salinity.
    - Two challenges for an organism in a saline environment are dealing with osmosis and toxicity from the sodium and chloride. Usually, generalization results in some cost, but *daphnia* populations that have a broad range of tolerance do better with increasing levels of salinity, than do populations with narrow environmental

    tolerance. There does not seem to be an obvious cost to the *daphnia* that lends itself to a remarkable ability to survive and evolve.
  - *C. dubia* are one of the species used to assess toxicity of water. If we put some *C. dubia* into pond water, and they die, that water is said to be acutely toxic. If they live, but reproduce at lower than expected rate, the water is said to exhibit chronic toxicity.

Distribution

- *Daphnia* are one of the most studied species. It is an important species because it is widespread and important to the ecology. This zooplankton spans over much of the northern hemisphere, and was thought to have spread as a result of glacier activity. The genus is regularly found in some regions (including Japan) but not to others (like Russia) and so it is difficult to pinpoint the exact area of speciation.

About Inquiry-Based Learning As It Applies To This Lesson Plan

This is a project that works best when students work in small groups (4-5). Inquiry is collaborative in nature. The process takes advantage of students' strengths to contribute to the project. Some are great communicators, some are problem-solvers, and some have well-developed technical skills. In the workplace, we also work in groups. We work as part of a team. The inquiry process develops skills necessary to solve complex problems in the world.

The students will benefit from background science of *C. dubia*. Make sure the section on the background science is available to each group. Some in the group may have little interest in the material provided whereas others will want to read it in depth, but the end result will be that everyone in the group will know more about the test organisms. It's important for them to know that *C. dubia* are indigenous to most streams, rivers, ponds, and many other natural surface water sources. Connect the relevance of the group working with this test species as it relates to the comparative question. *C. dubia* are one of the species used to assess toxicity of water. If we put some *C. dubia* into pond water and they die, that water is said to be acutely toxic. If they live but reproduce at lower than expected rate, the water is said to exhibit chronic toxicity. Students will either bring in water samples from a local pond, stormwater outfall, stream, standing water in the yard, etc. or the samples would be provided by you. Have enough source water for each group to work with two of the water sources. Four water sources would be fine for 5 or 6 groups.

Investigate your surroundings and narrow your focus: Encourage each group to observe the test organisms. Have them get familiar with the light and magnifier to see how the *C. dubia* move. Have them transfer some test organisms using the dropper to new water. It is important that they transfer organisms carefully to avoid introducing air bubbles, which may damage the organism. Have them discuss different sizes, what they see, how they move, and what techniques help them see the organisms best. This is a good time for students to write down questions. We suggest having them write individual questions on individual pieces of paper so the questions can later be sorted. It's not important to sort those now, but this can be revisited once the students are more in tune with the inquiry process.

Ask comparative questions: At the heart of inquiry is the comparative question. Comparative questions are ones that can be investigated. Some questions are very good questions, but they are very difficult to investigate. For example: Why are butterflies attracted to my flower garden? Good question, but difficult to investigate. However, we can take that question and change it to: Are butterflies attracted more to red flowers or white flowers? Do you see where we are going with this? You can now design an experiment to count how many butterflies visited each of the colors and compare the results. What will come of this will be more questions. Do the findings hold up for different kinds of butterflies? Another experiment can be designed. In the case of the *C. dubia*, the comparative question, at least initially, is being provided by you. This makes the lesson plan a guided inquiry. An open inquiry is one in which the students pick the topic, create the questions, create the action plan, etc. The comparative question for this lesson plan is: Does water from source A exhibit more or less toxicity than from source B? Later, we will revisit the questions the students asked above and have them separate those questions that can be investigated and those that cannot. Often, questions that would be difficult to investigate can be made investigable by turning them into comparative questions.

Uncover your prediction: We are not talking about group-think here. What do you individually think? At this point, each group has two water samples from different sources and a supply of C. *dubia,* and soon they will have an experiment to follow. Each student will have a prediction and they should record that prediction. Which water sample will exhibit more toxicity? Will it be the water from the aquarium in the room, or will it be from a local pond? Some observation is involved here. Are there differences in turbidity? Color? Debris? A prediction is not the same thing as a hypothesis. A hypothesis might be: All swans are white. A prediction would be: I think the next swan I see will be white. A prediction is based upon the individual's experiences, observations, opinions, knowledge, and instincts.

Initiate an action plan: The experiment has been provided. The action plan was designed to help students answer the comparative question. Neither you nor I know which water sources will exhibit more or less toxicity. It's not one of those "do the experiment and I will let you know the right answer." There is no right answer. Ask the students to record their data on the data sheet provided. To make future lesson plans or repeats of this one more inquiry-based, simply ask them to make a data sheet and record their findings. Perhaps have half the groups use the data sheet provided and then let the other half come up with their own. Part of inquiry requires you to give up some control to allow your students to figure it out.

Examine results and communicate findings: Each group will present their findings to the class. Typically, each group would prepare a graph, data table, chart, pictures or whatever they want to communicate their findings to the class. A poster or section of white board is helpful. The group goes to the front and each member usually participates. As a group, they share which water samples they used and any noteworthy observations. They share their individual predictions. They share the mortality of the test species, the reproduction rate, and their findings regarding toxicity. How do they answer the comparative question? What did they learn from the experience? Classmates then have an opportunity to ask questions to the presenting group.

Student/Teacher Roles for Each Step:

Investigate your surroundings:	The students are doing this
Narrow your focus:	The teacher and students are doing this
Ask comparative question:	The teacher is doing this
Uncover your prediction:	Each student is doing this
Initiate an action plan:	The teacher is doing this
Research and data collection:	The students are doing this*
Examine results and communicate findings:	The students are doing this

*The teacher or students may generate the data sheet

Pre-Experiment Preparation

Below are the steps to be taken by the teacher/students in preparation for the start of the experiment.

Wednesday: In your kit, you will find the YCT and unicellular green algae, along with the daphnia stock culture and eye dropper. Use the eyedropper to place six or seven drops of each food source in the provided mass culture.

Now that the organisms are fed, you need to provide them with a day and night cycle. In the lab, we use a grow light on a timer to maintain a constant 16 hours of daylight and 8 hours of night. You can do the same, or you can simply put your cultures near a window.

Before the start of the experiment, you will need to have your students divided into 4 groups of 4-5 students. Either you or your students will need to collect 4 samples of naturally occurring water. The samples can be collected from a pond, a stream, or a ditch. Daphnia particularly like aquarium water, so if you have an aquarium in your class or at home, you can also use that. You can also use the culture water provided in your sampling kit. We have provided sample bottles to use for collection. It is good technique to document collection information on the bottle and subsequent data sheets used. Note the date and time, who collected the sample, where it is from, and any other pertinent information.

Thursday: Take the provided laboratory water and gently shake to aerate it. It is a good idea to gently shake the culture water and all future samples prior to transferring the organisms to provide some air for the daphnia. Never use chlorinated water as this will kill the daphnia.
Pour about 60 mL of the fresh culture water provided in your lesson plan kit into a separate, small bowl.

Next, add about 6-7 drops of the food sources to the fresh culture water. Finally, you will need to capture some of the larger daphnia and transfer them to the fresh culture water. The daphnia can be viewed best with some light from below and a magnifying glass. Identify the adults and transfer approximately 10 of them using the provided eye dropper. Please note, this eye dropper is specially prepared with a little wider hole to ensure the test organisms are not damaged while handling them. The adults separated today will produce the neonates that we will draw upon for the start of the test on Friday.

Be sure to feed both the new culture and the mass culture 6-7 drops of the food supplied and return them to their place near a window or timed grow light.

Friday Morning: Separate out an adult and 4-5 neonates for each group using the culture started Thursday. If you have four groups, you will need 16 total neonates. To distribute the samples to your student groups, you can either opt to have each group have one water source to test, or you can have each group test all 4 water sources by sharing the 4 source samples between the groups.

If possible, put a drop of food into each cup Saturday and/or Sunday.

Experiment: Group Procedures

Friday: Take one of the cups with the adult daphnia and her brood. The mom will be the large one and the babies will be very small. Observe under bright light and magnification and sketch the mom on the bottom of the data sheet. [7]

Write down the comparative question that your teacher provided. What do you (not the group, but you) think the answer to the comparative question will be? **(UNCOVER PREDICTION)**

Take 4 of the small plastic cups and label them with your group number and "A", "B" "C" and "D." Gently shake the sample of your various water sources and add the appropriate sample to each cup, filling about ¾ of the way. Using an eyedropper, add one drop of food. Next, using the eyedropper, bright light, and a magnifying glass if needed, transfer a neonate to each cup.

Place your 4 cups under the fluorescent light with the timer set to 16 hours on (daylight) and 8 hours off (nighttime), or near the window[8]. We will be counting the total number of young/neonates produced over the next week from these babies (soon to become moms). Predict how many will be in the cup on Monday, when you return. [9]

Note: We are now finished with the original cup containing the mom and her brood.

Monday: By Monday or Tuesday, the neonates should have matured and produced broods of their own. Prepare four more sample cups by gently shaking the samples and pouring 20 mL of sample into each cup, and adding one drop of each food source to the new sample cups. Transfer the adult daphnia from each sample cup to the corresponding fresh sample leaving the neonates behind. **(RESEARCHING AND COLLECTING DATA)**

Count the neonates and record the data for each cup using the data sheet provided. Place your 4 cups under the fluorescent light with the timer set to 16 hours on (daylight) and 8 hours off (night time), or near the window. Rinse out the four cups from which you transferred daphnia using distilled water so you can reuse the provided cups on alternating days.

Tuesday: Add one drop of food to each cup.

Wednesday: Repeat the procedures from Monday.

Thursday: Add one drop of food to each cup.

Friday: Repeat the procedures from Monday and Wednesday. The original daphnia that started as neonates at the beginning of the experiment will have had 3 broods. Tabulate your data from the week and plan on how you will present your findings. **(EXAMINE RESULTS AND COMMUNICATE FINDINGS)**

---

[7] Ask if the mother and her brood are identical. How do the students know this? The mom is reproducing asexually. The babies are all "clones." That is, they are genetically identical.

[8] Be sure to place it close enough to the window that it receives light, but not too close that it gets cold overnight.

[9] Have the students predict how many babies will be in the cup tomorrow and ask them what information leads to this prediction.

Appendix 1 – Data Sheet

Group # ____
Student Names:____
____
____
____

Sample water "A" : ____
Sample water "B" : ____
Sample water "C" : ____
Sample water "D" : ____

Number of "babies" in cup

	A	B	C	D
Mon (/)	________	________	________	________
Wed (/)	________	________	________	________
Fri (/)	________	________	________	________
TOTAL:	________	________	________	________

Appendix 2 – Vocabulary Defined

C. dubia/ Daphnia: Commonly known as "water fleas", these small creatures are filter feeders who reproduce asexually, but under certain conditions they can reproduce sexually.

Asexual reproduction: Reproduction that only requires one female individual. All of the offspring will be genetically identical to the mother, or "clones" of the mother.

Sexual reproduction: Reproduction that requires two individuals, a male and a female, who combine their genetic material to create offspring. The offspring will be genetically different from their parents and siblings.

Brood: The group of young produced at one time (siblings)

Neonates: Newborn offspring

Appendix 3 – Student Feedback

1. **Did the initial *daphnia* in all 4 cups with different waters have the same number of babies?**

2. **If you repeated the test using babies from Monday, would you expect similar results, or might some adapt to the environment and do better?**

3. **What did you learn from this?**

4. **What additional questions come to mind after having done the experiment?**

5. **Was it fun and/or interesting?**

Appendix 4 – Teacher Feedback

1. **What evidence suggests students grasped the major themes of the experiment (i.e., life cycle of *C. dubia*, culturing techniques, reproduction of *C. dubia*, IBL, evolution, etc.)?**

2. **Do you anticipate other guided or open inquiry projects arising from this project? What questions did the students ask that suggest understanding and interest in the subject?**

3. **To what extent did this project fit into your curriculum and teaching agenda?**

4. **Would you consider doing this again?**

5. **What would improve the experience?**

Please return completed surveys to jessica.begonia@alloway.com

Appendix 5 – Experiment Calendar

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1	2
3	4	5	6	7 **TRANSFER ADULTS INTO CULTURE CUPS and FEED**	8 **START TEST and FEED**	9 **Optional: FEED**
10 **Optional: FEED**	11 **TRANSFER ADULT TO NEW TEST WATER and FEED. COUNT YOUNG.**	12 **FEED** **Optional: TRANSFER ADULT TO NEW TEST WATER. COUNT YOUNG.**	13 **TRANSFER ADULT TO NEW TEST WATER and FEED. COUNT YOUNG.**	14 **FEED** **Optional: TRANSFER ADULT TO NEW TEST WATER. COUNT YOUNG.**	15 **COUNT YOUNG and END TEST**	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

Appendix 6 – *Ceriodaphnia* d*ubia* Photos