

Global Climate Change: Meet the Creatures

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Grade Level: Middle School

Summary:

To achieve the goal of getting students interested in science and assess their ability to do inquiry this lesson called “Meet the Creatures” was modified (B.J.’s Resources, n.d.). An alternative inquiry lesson, it guides students as they adopt and observe mealworms for 6 weeks. During this time they learn the larvae body parts, life cycle, and collect data on mealworm length and mass. Through these observations each lab group develops a question to test in an experiment. A variety of investigations are conducted which may include mealworm preferences for: light or dark; dry or moist environment; type of food; type of litter to hide in and background color. Some mealworms are challenged by mazes. The data collected is graphed and results presented to the class. The lesson typically is fun and interesting for the students and lays a good foundation for future inquiry activities. Most of your students will be writing a procedure and identifying variables for the first time. While there will be some discrepancies in the data students collect it provides many teachable moments for students and helps guide the instruction for subsequent lessons.

Science Lesson Overview:

A. Concepts addressed include: use of triple beam balance to measure mass in grams; measuring using centimeters and millimeters; making observations, recording and graphing data; working in a group; identifying variables in an experiment; analyzing and presenting results.

B. Nevada State Science Standards:

N.8.A.1. – Students know how to identify and critically evaluate information in data, tables, and graphs.

N.8.A.3. – Students know how to design and conduct a controlled experiment.

N.8.A.5. – Students know how to use appropriate technology and laboratory procedures safely for observing, measuring, recording and analyzing data.

L.8.C.1. – Students know cells grow, divide, and take in nutrients which they use to provide energy for cell functions.

C1. Students initially pose questions about the mealworms on their first day of observing them and describe them in their journals. After several weeks of observing the “creatures” as a group they review these questions to see if any could be tested in an experiment. They are provided with some examples from a book called Mealworms Raise Them, Watch Them, See Them



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Change (Mason, & Vaculik, 2001). Students then meet as a group and decide which question they will investigate.

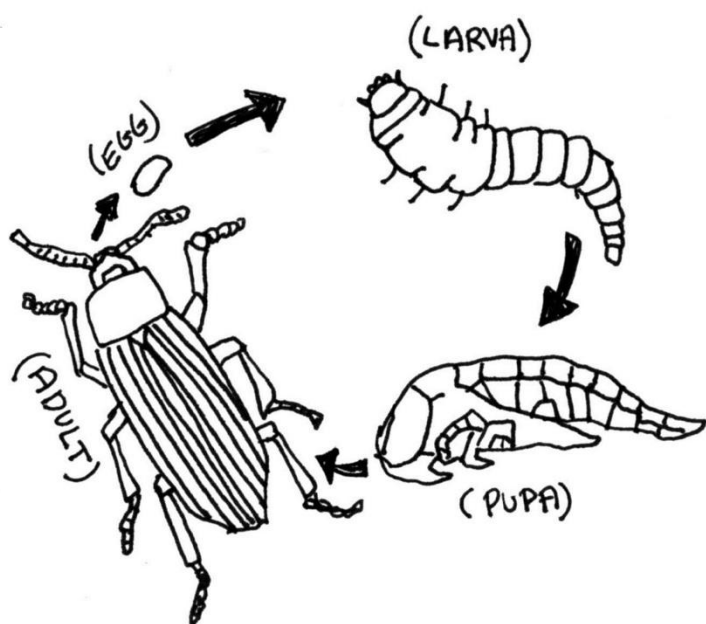
C2. Students use a template to help them identify the variables in their experiment and propose a hypothesis of the outcome based on their observations to date.

C3. For homework, students work individually to draft a procedure and then pool their ideas to write a step by step procedure to conduct their investigation. Teacher provides mealworms, trays and paper supplies. Students brought additional necessary items to conduct their experiment in class. Mealworm responses are recorded in the data table on the template.

C4. Students make bar graphs to show the number of times mealworms responded in a certain way.

C5. Students look for patterns in their data in order to see if a conclusion can be drawn.

C6. Students compare their results to other groups who may have conducted a similar investigation to identify common findings. Some students also read further on insect development and abilities.



D. It is not necessary for teachers to take control over these experiments as the basic requirements are outlined in the resources provided. Some groups will synthesize their own questions but likely with mixed results. All students are encouraged to utilize a series of books on insects from the public library to research the “creatures” further and add to their understanding of their results. The goal of the lesson is to ascertain the students’ ability on the whole to do free inquiry.

Integration of and Comments on the Nature of Science

As the year continues and students become better at observing and recording changes the time will come when a discussion will be relevant. Students will already be aware that the mealworms



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respond to changes in their environment so too will the plants that they grow and observe for the school year. This idea will transfer to plants when students begin to chronicle when certain species bud and bloom. Students will also be able to compare to others the records of bloom dates in the past. The question will naturally arise as to what could be causing this shift rather than simply telling them that our planet is warming. The students will be more open-minded about this idea as they will have discovered some evidence themselves. Additionally, as they include their “my spot” observations on the website they will be collaborating with other citizen scientists in the US and Canada. This is a very meaningful learning experience for a student. See Thomm (2013) for elaboration on “My Spot” science activities.

Effective use of assessment strategies

A. Begin with a pre-test on inquiry and mealworm anatomy. This same tool should also be used as a post-test to the unit. Students also complete portions of the “Meet the Creatures” packet which is collected midway in the unit to assess how students are doing and collected for grading at the end of the unit. Records of the student observations are place in their science journals as they collect measurements and wait until the pupa and adult beetles are formed. Simply looking over students’ shoulders as they are writing allow the teacher to see if they are using correct units and applying what was discussed in class. The use of popsicle sticks labeled with each student’s name so over the course of several days all students in class are pulled into the discussion is an effective way of involving more students in the discussions. As feedback is given audience members are asked to vote “thumbs up” to show agreement, “thumbs down” for disagreement and halfway to indicate uncertainty. This kind of formative assessment allows the instructor to see what students are thinking and who is struggling and who is on track.

B. The formative assessments reveal how many students are struggling with writing even in short phrases. Just because students can speak English well doesn’t mean that they can read and write it well. Lastly, encourage students to see the process of inquiry not as a lock step method (even if you use the template as a model) but rather as a journey. Students can get hung up on being right and miss the enjoyment of discovery. See to it that they understand that an unsupported hypothesis is still informative – it’s not just about being correct.

Teacher Comments and Observations

A. The goal for this lesson/unit was that all 7th graders have a similar learning experience so that by the end of the year they have gained similar skill sets and understandings. This has meant that our science department was meeting often, sometimes twice a week, to discuss the plan and our progress towards our goals. In approaching the ideal of making our science classes more inquiry-based we focused on the need to be open-minded about trying new things and giving up some of our old ways of teaching. The increased frequency of meetings was productive and provided



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much needed dialogue between colleagues and a support system for system-wide changes that we all agreed would benefit students.

B. What was different during the year this lesson was conducted was that the students seemed to be grasping these ideas earlier in the year because they conducted the inquiry experiments themselves (albeit with as much scaffolding as needed). It appeared to have really helped them understand more concepts and scientific principles. All of the students enjoyed this learning experience with the mealworms even though some of them were uncomfortable touching them in the first days of the unit. Several mentioned how they felt responsible caring for the mealworm like a pet. They were excited to see how they changed forms as they moved through their life cycle. To see such a level of excitement for the entire six-week period is very gratifying.

C. The experience of designing and conducting the experiments themselves had a more lasting impact on the students' performance. They were attracted to the mealworms and so were hooked into observing them predicting when they would change form. This scaffolded approach and giving kids lots of options to make decisions and work together helped them make the leap to a less restrictive lab experience that we could all feel successful about.

Please share your comments about successes with this method with Susan Kaiser, c/o Pine Middle School, 4800 Neil Road, Reno, Nevada 89502, 775- 689-2550, or by e-mail: Susan Kaiser <SKaiser@washoeschools.net >

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