

# 2018 Grants: PS185

## First Grade Scientists

Concept Statement: The first graders in my school in south Harlem deserve the opportunity to do real science and discover the wonder in the world of insects with their own eyes.

Concept Description: The 3-month long insect study will impact approximately 65 students in 3 first grade classes. We want our students will take on the role of a true scientist. They will learn how to examine with precision, paying attention to details they see. They will learn how to care for living things; developing a deeper respect for life and a heightened curiosity about insects. The insect study is inquiry based so students will get to experience and discover the wonder of metamorphosis first hand. They will observe each life cycle unfold before their very eyes. This is especially important as our students are primarily black and Hispanic. They live in an urban, high poverty area and are rarely exposed to nature. My students and their families have sought out and selected our school to provide an enriching educational environment for their children. This kind of in-depth study is just what they are looking for as it will provide multiple entry points for learning to meet the varied learning needs of all students. Through this study of insects, my first graders will have an opportunity to become flexible, resilient, and creative thinkers who are able to work collaboratively and solve problems.

Project Goals and Objectives: The first grade classroom teachers will work together to implement a 3-month long study of insects in our classrooms. We will use the timeline and plan I created with my former school to guide our in-depth study of insect life cycles. We will study 5 or 6 live insects over the course of these three months. We will

observe their bodies and their behaviors. We will observe the insects as they go through complete or incomplete metamorphosis. We will study 4 insects (mealworms, waxworms, silkworms, and painted lady butterflies) that go through complete metamorphosis and 1 insect that does not (milkweed bugs). If there is time at the end of the unit, we will also study crickets- but mostly to observe their unique behaviors as opposed to their life cycle. We will order all the insects and the materials needed to keep the insects alive (containers, food, etc.) before the start of the unit. We will begin by studying mealworm larvae. We will observe the structures of the larva and within a couple of weeks we will observe that the mealworm molts and grows. Shortly after the arrival of mealworm larvae, we will get waxworm larvae. We will compare and contrast the larva bodies. We will learn about the different parts and functions of a waxworm larva. To help students own the vocabulary, we will make model waxworm larvae out of clay or plasticine. Meanwhile, the mealworm larvae may be changing into pupae. Once one student finds a pupa in their vial, they may think it is dead. I will encourage them to wait and see what happens next before we conclude that it has died. One student will be brave enough to touch their pupa and discover that it often twitches when you touch it, confirming that it is, in fact, not dead. Students will care for their new insect pets in vials and cups. They will make sure the insects are fed and taken care of. Once the mealworm and waxworm larvae are underway and making changes, we will get milkweed bug eggs to observe. Students will be surprised to see that these insects do not share the same characteristics as the larvae they've come to know so well. The eggs don't even have legs! In just a few days, the milkweed bug eggs turn bright orange and hatch. At that point, students confirm that what they first observed were eggs and now they see an insect with legs. They will still observe that the milkweed body is different from the larvae. After the milkweed bug eggs have hatched, we'll get another egg in the classroom. This time, students will be sure

that the silkworms are eggs. It will take longer for these eggs to hatch, and unlike the milkweed bug eggs, students will observe that the silkworm eggs do not change color. After a week or two, the silkworm eggs will hatch and students will recognize that larva body again. By this time, students will have revisited the mealworms to find that the adult stage is a beetle. They will be amazed that a mealworm larva could make that kind of transformation! We will start putting all the beetles together in one container to find out what happens next! The waxworm larvae will also have gone through some changes. They will observe that the pupae often wrap up in silk cocoons. Then, they will observe the moths emerge. They will observe that the moths look different from each other and they will find out that you can tell the difference between male and female moths (males have a smaller body and rounded heads, whereas the female bodies are larger and they have a pointed part on their heads). The milkweed bug nymphs will also be growing bigger and students will confirm that these insects are not larvae. They will see the milkweed bugs molt and progress through their nymph stages until they become adults. We will also observe painted lady caterpillars. Students usually have a lot of prior experience with caterpillars, so they often can predict the life cycle of the butterfly. This life cycle will be one of the fastest they observe. Students will be able to prove that the caterpillars are larvae because they can identify the similarities to the other larvae they've seen. They will observe that the painted lady larvae have more bristles than other larvae they have observed. At the same time, the silkworm larvae are growing bigger and eating a ton of mulberry leaves. Because both the painted lady and silkworm larvae grow so big, the similarities become more apparent. At this point, many of the adult insects will have mated and laid eggs, beginning the life cycle again. They will be able to observe many insects mating. For example, the milkweed bugs stay connected, abdomen to abdomen, for a few days. Students will be able to observe the new eggs and sometimes they will

catch the female insects actually laying the eggs. For the mealworms, they won't be able to find the eggs, but they will be able to find new larvae. Students will be so excited to have new larvae and nymphs in our classroom again! Throughout the study, students will complete different projects to help solidify their knowledge of what they have observed. For each insect, they will keep an observation journal where they can keep track of their observations and the insect changes. We will also create posters of the different insects to focus on the different body parts. We will learn about scientific diagrams and the importance of precision and accuracy. We will use different mediums to demonstrate our understanding: oil pastels, water colors, modeling clay, etc. We will also go on field trips to observe insects in their natural habitat. We will visit museums that have insect exhibits and speak with docents who have additional expertise. We always go out with a trip sheet to record new ideas and answered questions. At the end of the study, we will also have a chance to further explore students' curiosities that resulted from discoveries made during the study. Students are often interested in how insects defend themselves and how something so small can survive. This study also piques students' interest in other insects that we don't have in our classroom, so we allow time to further explore other insects.

#### Project Budget:

- Live insects ~ \$500 – Mealworm larvae – Waxworms larvae – Milkweed bug eggs – Silkworm eggs – Painted lady larvae – Crickets
- Consumable materials ~ \$240 – Containers with lids – Vials – Insect food (seeds, oatmeal, bran, potatoes, etc) – Hand lenses/magnifying glasses –

- Soil and sand Art supplies ~ 250 – Model magic – Watercolors – Oil pastels – Colored pencils – Crayons – Markers – Sharpies – Tissue paper – Card stock
- Field trips – Park rangers – Zoo – Museums
- (See details below)

2018 Funding: Requested \$999. Partially funded at \$600

# Insect Study Timeline

By Grace Loew & Grade 1  
PS130 Spring 2016

Date	Focus	Questions/Meetings	Observations/Activities
Week 1 2/29	Introduction and Assessment	<ul style="list-style-type: none"> <li>What do you think you already know about insects?</li> <li>What do you wonder about insects?</li> <li>How will we study insects?</li> </ul>	<ul style="list-style-type: none"> <li>Gathering Resources</li> <li>All insect sorts</li> <li>Illustration of first ideas about insects</li> <li>Sticky notes about insects</li> </ul>
Week 2 3/7	<b>Mealworms (larva)</b>	<ul style="list-style-type: none"> <li>What do insects need?</li> <li>What are the structures and behavior of mealworm larvae?</li> <li>Live organisms need to be treated with care and respect</li> </ul>	<ul style="list-style-type: none"> <li>Students begin their study of insects. They meet mealworms and observe their structures and behaviors. Each student keeps 2 mealworms and attends to their need and starts recording observations</li> <li>Set up mealworm habitat</li> <li>Insects need air, food, water, and space</li> <li>Record first observations of mealworm larva on paper</li> </ul> <p><b>Field Trip: Prospect Park or Front Yard</b></p>
Week 3 3/14	<i>Mealworms (larva begin changing to pupa)</i>	<ul style="list-style-type: none"> <li>How do mealworms grow and change?</li> <li>What are the structures and behavior of mealworm larvae, pupae, and [eventually] adults?</li> </ul>	<ul style="list-style-type: none"> <li>Record changes in mealworms on observation sheets</li> <li>Tape molt into observation books</li> <li>Mark changes on calendar/create timeline</li> <li>Discuss molting, pupation</li> <li>As insects grow, they molt their hard, external covering.</li> </ul>
Week 4 3/21	<b>Waxworms (larva)</b>	<ul style="list-style-type: none"> <li>What are waxworms?</li> <li>What do waxworms need?</li> </ul>	<ul style="list-style-type: none"> <li>Insects need air, food, water, and space</li> <li>Record first observations of waxworm larva on paper</li> <li>Waxworms and mealworms have similar structures and behaviors</li> <li>Compare waxworm larva to mealworm larva in a Venn diagram</li> <li>Larvae produce silk</li> </ul> <p><b>Field Trip: Brooklyn Botanical Gardens</b></p>
Week 4 3/21 (continued) (Good Friday)	<i>Mealworm adults</i>	<ul style="list-style-type: none"> <li>How do mealworms grow and change?</li> <li>What are the structures and behavior of mealworm adults?</li> </ul>	<ul style="list-style-type: none"> <li>Learn the parts of an adult insect: head, thorax, abdomen</li> <li>Insects have characteristic structures and behaviors.</li> <li>The structures of some insects change as the insect grows</li> <li>Observe, compare, and draw mealworms as they progress through the stages</li> </ul>
Week 5 3/28	<b>Milkweed Bugs (Eggs)</b>	<ul style="list-style-type: none"> <li>How do insects begin their life?</li> <li>What do insect eggs look like?</li> </ul>	<ul style="list-style-type: none"> <li>Observe tiny yellow or orange milkweed bug eggs in vials and guess what they are (many kids think they are jellybeans)</li> <li>Try to observe and record eggs twice- once</li> </ul>

		<ul style="list-style-type: none"> <li>Live organisms need to be treated with care and respect</li> </ul>	when they are yellow and again when they are red (usually about 4 days later)... they are just about to hatch!
	<i>Waxworm pupa</i>	<ul style="list-style-type: none"> <li>How do waxworms grow and change?</li> <li>What are the structures of a waxworm pupa?</li> <li>What are the behaviors of waxworm pupae?</li> </ul>	<ul style="list-style-type: none"> <li>Record changes in waxworms</li> <li>Record changes on a calendar</li> <li>Discuss molting and pupation</li> <li>Compare stages to mealworm stages</li> </ul>
Week 6 4/4	<b>Silkworms (Eggs)</b>	<ul style="list-style-type: none"> <li>Do insects begin as eggs?</li> <li>Live organisms need to be treated with care and respect</li> </ul>	<ul style="list-style-type: none"> <li>Observe silkworm eggs in vials</li> <li>Record ideas (this time, students are pretty sure they are eggs—they learned from milkweed bugs!)</li> <li>Record date we got the eggs on a calendar (these will take the longest time to hatch)</li> </ul>
	<i>Milkweed Bug Nymphs</i>	<ul style="list-style-type: none"> <li>What do milkweed bugs need?</li> <li>How do their needs compare to those of other insects?</li> </ul>	<ul style="list-style-type: none"> <li>Insects hatch from eggs</li> <li>Once the nymphs are big enough: Prepare milkweed bug habitats (WITH students) providing them with food (raw sunflower seeds), water, air, and space.</li> <li>Insects need air, food, water, and space and these are met in different ways for different insects</li> <li>Draw and label milkweed bug habitats to show what insects need to survive</li> </ul>
Week 7 4/11	<b>Mealworm Life Cycle</b>	<ul style="list-style-type: none"> <li>How do new mealworms begin?</li> <li>What is the life cycle of a mealworm?</li> </ul>	<ul style="list-style-type: none"> <li>New larva hunt: Using beetle culture, scoop out a small amount of bran on a paper plate. Use a hand lens to find tiny new larva.</li> <li>Record new larva observations</li> <li>The life cycle of the beetle is egg, larva, pupa, and adult, which produces eggs (though the only evidence of eggs are the tiny new larvae)</li> <li>Begin life cycle project if there is a lull in other insects</li> </ul>
	<i>Waxworm Adults</i>	<ul style="list-style-type: none"> <li>How do waxworms grow and change?</li> <li>What are the structures of a waxmoth?</li> <li>What are the behaviors of a waxmoth?</li> <li>What are the differences between a male and female waxmoth?</li> </ul>	<ul style="list-style-type: none"> <li>Learn the parts of an adult insect: head, thorax, abdomen</li> <li>Insects have characteristic structures and behaviors.</li> <li>The structures of some insects change as the insect grows</li> <li>The female waxmoth and male waxmoth can be distinguished from one another.</li> <li>Observe, compare, and draw waxworms as they progress through the stages</li> <li>Draw and label the difference between male and female waxmoths</li> <li>Transfer moths to an adult-only culture so they can mate and lay eggs</li> </ul>
	<i>Silkworm Larva</i>	<ul style="list-style-type: none"> <li>What came out of the eggs? → insects hatch from eggs</li> </ul>	<ul style="list-style-type: none"> <li>Observe and record new larva</li> <li>Tape in mulberry leaves to observation record</li> </ul>

		<ul style="list-style-type: none"> <li>What do silkworms need to live?</li> <li>Are the new insects similar to the milkweed bugs that hatched out of eggs?</li> <li>How are the new insects similar or different from waxworms/mealworms?</li> </ul>	<ul style="list-style-type: none"> <li>Record how long it took insects to hatch from eggs on a calendar or timeline</li> <li>Insects need air, food, water, and space</li> <li>Set up class habitat for tiny silkworm larvae</li> </ul> <p><b>**SEND HOME MULBERRY LEAVES LETTER</b></p>
Week 8 4/18	<i>Milkweed Bug Nymphs</i>	<ul style="list-style-type: none"> <li>How do milkweed bugs grow and change?</li> <li>Do all insects go through larval and pupal stages?</li> <li>What are the behaviors of milkweed nymphs?</li> <li>What are the structures of a milkweed nymph?</li> </ul>	<ul style="list-style-type: none"> <li>What is the black spider-looking thing in the habitats? As insects grow, they molt their hard external covering.</li> <li>Record observations of milkweed bug nymphs</li> <li>Tape molt into observation record</li> <li>Insects have different structures to help them grow and survive</li> <li>Observe changes in milkweed nymphs- how are the larger nymphs different from the smaller ones? What is similar? What is different?</li> </ul>
	<i>Waxworm Eggs</i>	<ul style="list-style-type: none"> <li>How do new waxworms begin?</li> <li>Males and females mate</li> <li>Females lay eggs</li> </ul>	<ul style="list-style-type: none"> <li>Observe new eggs and record observations</li> <li>Compare and contrast waxworm and mealworm life cycles</li> </ul>
	Open Observation	<ul style="list-style-type: none"> <li>Establish center expectations</li> </ul>	<ul style="list-style-type: none"> <li>Observe mealworms/pupae/beetles/new larva</li> <li>Observe waxworms/pupae/moths/eggs</li> <li>Observe milkweed eggs or nymphs</li> <li>Compare/contrast different insects at the same stage</li> <li>Compare/contrast an insect at different stages</li> </ul>
SPRING BREAK			
Week 9 5/2	<b>Butterflies (caterpillars/painted lady larva)</b>  <i>Complete 2 observations this week (one when insects first arrive and another at the end of the week)</i>	<ul style="list-style-type: none"> <li>What do insects need?</li> <li>What are the structures of a butterfly larva?</li> <li>What are the behaviors of a butterfly larva?</li> <li>Insects need air, water, food, and space</li> <li>Live organisms need to be treated with care and respect</li> <li>Insect larvae have common structures, such as six legs and three body parts.</li> </ul>	<ul style="list-style-type: none"> <li>Observe butterfly larva closely to determine its structures</li> <li>Observe the larva behaviors: eating, moving, molting</li> <li>Write and draw observations</li> <li>Compare/contrast larvae to other larvae</li> <li>Write a prediction of how larvae will grow and develop</li> </ul> <p><b>Field Trip: Brooklyn Children's Museum</b></p>
	<b>Waxworm Life Cycle</b>	<ul style="list-style-type: none"> <li>What is the life cycle of a waxworm?</li> <li>How does a waxworm life begin?</li> </ul>	<ul style="list-style-type: none"> <li>Observe new larvae</li> <li>Discuss where new larvae came from</li> <li>The life cycle of a waxworm is egg, larva, pupa, and adult moth, which produces eggs.</li> <li>Begin life cycle project if there is a lull in other insects</li> </ul>
	<i>Growing Silkworm Larvae</i>	<ul style="list-style-type: none"> <li>What are the structures and behaviors of silkworm larvae?</li> </ul>	<ul style="list-style-type: none"> <li>Build small paper habitats for each table to closely observe larvae</li> <li>Draw and label habitats showing what insects</li> </ul>



		<ul style="list-style-type: none"> <li>How do they compare to other insect larvae?</li> <li>Silkworm larvae have unique behaviors and structures.</li> </ul>	<p>need to survive</p> <ul style="list-style-type: none"> <li>Observe mealworms feeding and growth</li> <li>Record observations of larvae</li> </ul>
Week 10 5/9	<i>Milkweed Bug Adults</i>	<ul style="list-style-type: none"> <li>What is the life cycle of the milkweed bug?</li> <li>How are all adult insects the same and different?</li> </ul>	<ul style="list-style-type: none"> <li>Insects have three body parts: head, thorax, and abdomen.</li> <li>The female milkweed bug and male milkweed bug can be distinguished from one another.</li> <li>Observe, compare, and draw milkweed bugs as they progress through the stages</li> <li>Draw large representation of adult milkweed bugs</li> <li>Observe mating of adult milkweed bugs (they remain connected for one or two days); record observations/drawings</li> </ul>
	<i>Butterflies (chrysalis and pupa)</i>	<ul style="list-style-type: none"> <li>How do butterfly larvae change into butterflies?</li> <li>Butterflies construct chrysalises when they pupate.</li> <li>Are butterfly and moth pupae the same?</li> </ul>	<ul style="list-style-type: none"> <li>Once larvae begin to pupate in a chrysalis, they will be transferred to a butterfly net</li> <li>Observe and draw chrysalises</li> <li>Larva hang upside down in the J shape when they are ready to pupate and make a chrysalis</li> <li>Observe chrysalises 5-6 days after they first form... you might catch one changing into an adult (look for lots of shaking)</li> </ul>
	<i>Growing Silkworm Larvae</i>	<ul style="list-style-type: none"> <li>What are the structures of silkworm larva</li> <li>Larvae molt as they grow</li> <li>Do larvae have the same body parts as adult insects? Head, thorax, abdomen?</li> <li>The basic structures of all insects include six legs and three body parts</li> </ul>	<ul style="list-style-type: none"> <li>Make detailed observations of silkworm larval structures</li> <li>Observe silkworm movement</li> <li>Draw large larva diagram including all structures they have learned about</li> <li>Discuss molt / tape molt in observation record</li> <li>Record changes on a calendar</li> </ul>
Week 11 5/16	<i>Silkworm Pupa</i>	<ul style="list-style-type: none"> <li>Why do silkworms spin silk?</li> <li>What is the next stage in a silkworm's life?</li> </ul>	<ul style="list-style-type: none"> <li>Investigate and observe silkworms spinning silk to make a cocoon around them as they pupate</li> <li>Record observations</li> </ul>
	<i>Butterflies (painted lady adults)</i>	<ul style="list-style-type: none"> <li>What is the next stage in a butterfly's life?</li> <li>Adult insects have common structures, including six legs and three body parts.</li> <li>What do you think will happen next in the butterfly's life?</li> <li>What behaviors might we see?</li> <li>How are butterflies and moths similar or different?</li> <li>What is the life cycle of the butterfly?</li> </ul>	<ul style="list-style-type: none"> <li>Observe adult butterflies – observe structures and behaviors</li> <li>Observe feeding</li> <li>Watch for mating and egg laying</li> <li>Draw and label adult butterflies and their bodies</li> <li>Create models of butterfly wings (to show the pattern is different on each side)</li> </ul>

Week 12 5/23	<b>Milkweed Bug Life Cycle</b>	<ul style="list-style-type: none"> <li>What is the life cycle of the milkweed bug?</li> <li>Where do the eggs come from?</li> <li>How are all adult insects the same and different?</li> </ul>	<ul style="list-style-type: none"> <li>The life cycle of some insects is egg, nymph stages, and adult, which produces eggs.</li> <li>Observe new eggs; record observations</li> <li>Males and females mate</li> <li>Females lay eggs</li> <li>Observe new nymphs when they hatch (they may escape through air holes...</li> </ul> <p><b>Field Trip: AMNH - ** LAST POSSIBLE WEEK for butterfly exhibit!</b></p>
Week 13 5/30 (Memorial Day)	<i>Silkworm Adults</i>	<ul style="list-style-type: none"> <li>What is the next stage of a silkworm's life?</li> <li>Do male and female silkmoths look different?</li> <li>Do silkworms mate like other adult insects?</li> <li>The life cycle of a silkworm is egg, larva, pupa, and adult, which produces eggs.</li> </ul>	<ul style="list-style-type: none"> <li>Observe silkmoths</li> <li>Draw and write about adult body parts</li> <li>Observe and record silkmoth behavior</li> </ul>
	Crickets	<ul style="list-style-type: none"> <li>What do insects need?</li> <li>What is the life cycle of crickets?</li> <li>Crickets hatch from eggs and become nymphs and then adults, which produce new eggs</li> </ul>	<ul style="list-style-type: none"> <li>Set up cricket habitat</li> <li>Close observation of behaviors: feeding, antenna activity, chirping, jumping, possible egg laying</li> <li>Draw cricket parts</li> <li>Write about structure and behavior observations</li> </ul> <p><b>Field Trip: Urban Park Rangers @ Prospect Park</b></p>
Week 14 6/6	Life Cycles	<ul style="list-style-type: none"> <li>What is the life cycle of a silkworm? What do you think will happen next in our silkworms' lives?</li> <li>How are insect life cycles similar or different?</li> </ul>	<ul style="list-style-type: none"> <li>Insect/Not an Insect Sort</li> <li>Write about the life cycle of a silkworm</li> <li>Compare/contrast life cycles of different insects</li> </ul>
Week 15 6/13	Life Cycles	<ul style="list-style-type: none"> <li>Continue discussing life cycles</li> <li>Discuss different life cycle projects that could be produced</li> </ul>	<ul style="list-style-type: none"> <li>Finish all insect study projects and prepare for celebration</li> </ul>

\*\* Insects arrive on Wednesdays. We will have to organize them so most insects will be launched on Thursdays (which makes this calendar a little tricky to follow since the week actually begins on Thursday, not Monday). You may use the calendar more as a 5-day flow—don't worry too much about the dates.

Because the insect timeline is impossible to predict, I've copied and pasted each insect below so you can see the flow of that insect, regardless of when exactly the change happens.

PLEASE USE THIS TIMELINE IN CONJUNCTION WITH THE FOSS INSECT GUIDES!!

Before launching each insect, READ the "Background for Teacher" and "Teaching Children About \_\_\_\_" sections!!

On-going activities throughout the study:

- Observations: Enlarge photo on Smartboard- What do you notice? What surprises you? Questions? (discuss or post-it... during Morning Meeting or at other times)
- Art projects: watercolor images of insects at any stage, model magic models of adults or life cycle, collaged murals of insects in habitats
- Field Trips: Museum of Natural History, Prospect Park Zoo, Urban Park Rangers, Botanical Gardens
- Visitors: Any entomologists we know?
- Observations of insects in study books
- Class books (interactive and shared writing)– Question and Answer Book, Descriptive reports (including features of non-fiction), Life Cycle Books

# March

2016

Monday	Tuesday	Wednesday	Thursday	Friday
	1	2	3	4
7	8	9 Mealworm Larva Arrive	10	11
14	15	16	17	18 Mealworm Larva CHANGE to Pupa
21	22	23 Waxworm Larva Arrive	24	25 Mealworm Pupa CHANGE to Adult Beetles (earliest possible)
28	29	30 Milkweed Bug Eggs Arrive	31	

# April

## 2016

Monday	Tuesday	Wednesday	Thursday	Friday
				1 Waxworm Larva CHANGE to Pupa
4	5 Milkweed Bug Eggs Hatch into Nymphs	6 Silkworm Eggs Arrive	7	8
11	12	13 Silkworm Eggs HATCH into Larva	14 Mealworms: New Larva hunt?	15 Waxworm Pupa CHANGE to Adults
18 Milkweed Bug Nyphs Growing	19	20	21	22 Waxworm Eggs?
25	26	27	28	29
SPRING BREAK				

# May

## 2016

Monday	Tuesday	Wednesday	Thursday	Friday
2 Silkworm Larva Growing	3	4 Butterfly Larva Arrive	5	6
9 Milkweed Bug Nymphs CHANGE into Adults	10	11 Silkworm Larva Growing	12	13 Butterfly Larva CHANGE into Pupa/Chrysalis
16	17	18 Silkworm Larva CHANGE into Pupa	19	20 Butterfly Pupa CHANGE into Adult Butterflies
23 Milkweed Bugs: New Eggs?	24	25	26	27 Butterflies: Eggs?
30 Crickets Arrive	31 Silkworm Pupa CHANGE into Adults			

## MEALWORMS

<b>Mealworms (larva)</b>	<ul style="list-style-type: none"> <li>• What do insects need?</li> <li>• What are the structures and behavior of mealworm larvae?</li> <li>• Live organisms need to be treated with care and respect</li> </ul>	<ul style="list-style-type: none"> <li>• Students begin their study of insects. They meet mealworms and observe their structures and behaviors. Each student keeps 2 mealworms and attends to their need and starts recording observations</li> <li>• Set up mealworm habitat</li> <li>• Insects need air, food, water, and space</li> <li>• Record first observations of mealworm larva on paper</li> </ul>
<i>Mealworms (larva begin changing to pupa)</i>	<ul style="list-style-type: none"> <li>• How do mealworms grow and change?</li> <li>• What are the structures and behavior of mealworm larvae, pupae, and [eventually] adults?</li> </ul>	<ul style="list-style-type: none"> <li>• Record changes in mealworms on observation sheets</li> <li>• Tape molt into observation books</li> <li>• Mark changes on calendar/create timeline</li> <li>• Discuss molting, pupation</li> <li>• As insects grow, they molt their hard, external covering.</li> </ul>
<i>Mealworm adults</i>	<ul style="list-style-type: none"> <li>• How do mealworms grow and change?</li> <li>• What are the structures and behavior of mealworm adults?</li> </ul>	<ul style="list-style-type: none"> <li>• Learn the parts of an adult insect: head, thorax, abdomen</li> <li>• Insects have characteristic structures and behaviors.</li> <li>• The structures of some insects change as the insect grows</li> <li>• Observe, compare, and draw mealworms as they progress through the stages</li> </ul>
<b>Mealworm Life Cycle</b>	<ul style="list-style-type: none"> <li>• How do new mealworms begin?</li> <li>• What is the life cycle of a mealworm?</li> </ul>	<ul style="list-style-type: none"> <li>• New larva hunt: Using beetle culture, scoop out a small amount of bran on a paper plate. Use a hand lens to find tiny new larva.</li> <li>• Record new larva observations</li> <li>• The life cycle of the beetle is egg, larva, pupa, and adult, which produces eggs (though the only evidence of eggs are the tiny new larvae)</li> <li>• Begin life cycle project if there is a lull in other insects</li> </ul>

## WAXWORMS

<b>Waxworms (larva)</b>	<ul style="list-style-type: none"> <li>• What are waxworms?</li> <li>• What do waxworms need?</li> </ul>	<ul style="list-style-type: none"> <li>• Insects need air, food, water, and space</li> <li>• Record first observations of waxworm larva on paper</li> <li>• Waxworms and mealworms have similar structures and behaviors</li> <li>• Compare waxworm larva to mealworm larva in a Venn diagram</li> <li>• Larvae produce silk</li> </ul>
<i>Waxworm pupa</i>	<ul style="list-style-type: none"> <li>• How do waxworms grow and change?</li> <li>• What are the structures of a waxworm pupa?</li> <li>• What are the behaviors of waxworm pupae?</li> </ul>	<ul style="list-style-type: none"> <li>• Record changes in waxworms</li> <li>• Record changes on a calendar</li> <li>• Discuss molting and pupation</li> <li>• Compare stages to mealworm stages</li> </ul>
<i>Waxworm Adults</i>	<ul style="list-style-type: none"> <li>• How do waxworms grow and change?</li> <li>• What are the structures of a waxmoth?</li> <li>• What are the behaviors of a waxmoth?</li> <li>• What are the differences between a male and female waxmoth?</li> </ul>	<ul style="list-style-type: none"> <li>• Learn the parts of an adult insect: head, thorax, abdomen</li> <li>• Insects have characteristic structures and behaviors.</li> <li>• The structures of some insects change as the insect grows</li> <li>• The female waxmoth and male waxmoth can be distinguished from one another.</li> <li>• Observe, compare, and draw waxworms as they progress through the stages</li> <li>• Draw and label the difference between male and female waxmoths</li> <li>• Transfer moths to an adult-only culture so they can mate and lay eggs</li> </ul>
<i>Waxworm Eggs</i>	<ul style="list-style-type: none"> <li>• How do new waxworms begin?</li> <li>• Males and females mate</li> <li>• Females lay eggs</li> </ul>	<ul style="list-style-type: none"> <li>• Observe new eggs and record observations</li> <li>• Compare and contrast waxworm and mealworm life cycles</li> </ul>
<b>Waxworm Life Cycle</b>	<ul style="list-style-type: none"> <li>• What is the life cycle of a waxworm?</li> <li>• How does a waxworm life begin?</li> </ul>	<ul style="list-style-type: none"> <li>• Observe new larvae</li> <li>• Discuss where new larvae came from</li> <li>• The life cycle of a waxworm is egg, larva, pupa, and adult moth, which produces eggs.</li> <li>• Begin life cycle project if there is a lull in other insects</li> </ul>

## MILKWEED BUGS

<b>Milkweed Bugs (Eggs)</b>	<ul style="list-style-type: none"> <li>• How do insects begin their life?</li> <li>• What do insect eggs look like?</li> <li>• Live organisms need to be treated with care and respect</li> </ul>	<ul style="list-style-type: none"> <li>• Observe tiny yellow or orange milkweed bug eggs in vials and guess what they are (many kids think they are jellybeans)</li> <li>• Try to observe and record eggs twice- once when they are yellow and again when they are red (usually about 4 days later)... they are just about to hatch!</li> </ul>
<i>Milkweed Bug Nymphs</i>	<ul style="list-style-type: none"> <li>• What do milkweed bugs need?</li> <li>• How do their needs compare to those of other insects?</li> </ul>	<ul style="list-style-type: none"> <li>• Insects hatch from eggs</li> <li>• Once the nymphs are big enough: Prepare milkweed bug habitats (WITH students) providing them with food (raw sunflower seeds), water, air, and space.</li> <li>• Insects need air, food, water, and space and these are met in different ways for different insects</li> <li>• Draw and label milkweed bug habitats to show what insects need to survive</li> </ul>
<i>Milkweed Bug Nymphs</i>	<ul style="list-style-type: none"> <li>• How do milkweed bugs grow and change?</li> <li>• Do all insects go through larval and pupal stages?</li> <li>• What are the behaviors of milkweed nymphs?</li> <li>• What are the structures of a milkweed nymph?</li> </ul>	<ul style="list-style-type: none"> <li>• What is the black spider-looking thing in the habitats? As insects grow, they molt their hard external covering.</li> <li>• Record observations of milkweed bug nymphs</li> <li>• Tape molt into observation record</li> <li>• Insects have different structures to help them grow and survive</li> <li>• Observe changes in milkweed nymphs- how are the larger nymphs different from the smaller ones? What is similar? What is different?</li> </ul>
<i>Milkweed Bug Adults</i>	<ul style="list-style-type: none"> <li>• What is the life cycle of the milkweed bug?</li> <li>• How are all adult insects the same and different?</li> </ul>	<ul style="list-style-type: none"> <li>• Insects have three body parts: head, thorax, and abdomen.</li> <li>• The female milkweed bug and male milkweed bug can be distinguished from one another.</li> <li>• Observe, compare, and draw milkweed bugs as they progress through the stages</li> <li>• Draw large representation of adult milkweed bugs</li> <li>• Observe mating of adult milkweed bugs (they remain connected for one or two days); record observations/drawings</li> </ul>
<b>Milkweed Bug Life Cycle</b>	<ul style="list-style-type: none"> <li>• What is the life cycle of the milkweed bug?</li> <li>• Where do the eggs come from?</li> <li>• How are all adult insects the same and different?</li> </ul>	<ul style="list-style-type: none"> <li>• The life cycle of some insects is egg, nymph stages, and adult, which produces eggs.</li> <li>• Observe new eggs; record observations</li> <li>• Males and females mate</li> <li>• Females lay eggs</li> <li>• Observe new nymphs when they hatch (they may escape through air holes...</li> </ul>



## SILKWORMS

<b>Silkworms (Eggs)</b>	<ul style="list-style-type: none"> <li>• Do insects begin as eggs?</li> <li>• Live organisms need to be treated with care and respect</li> </ul>	<ul style="list-style-type: none"> <li>• Observe silkworm eggs in vials</li> <li>• Record ideas (this time, students are pretty sure they are eggs—they learned from milkweed bugs!)</li> <li>• Record date we got the eggs on a calendar (these will take the longest time to hatch)</li> </ul>
<i>Silkworm Larva</i>	<ul style="list-style-type: none"> <li>• What came out of the eggs? → insects hatch from eggs</li> <li>• What do silkworms need to live?</li> <li>• Are the new insects similar to the milkweed bugs that hatched out of eggs?</li> <li>• How are the new insects similar or different from waxworms/mealworms?</li> </ul>	<ul style="list-style-type: none"> <li>• Observe and record new larva</li> <li>• Tape in mulberry leaves to observation record</li> <li>• Record how long it took insects to hatch from eggs on a calendar or timeline</li> <li>• Insects need air, food, water, and space</li> <li>• Set up class habitat for tiny silkworm larvae</li> <li>• **SEND HOME MULBERRY LEAVES LETTER</li> </ul>
<i>Growing Silkworm Larvae</i>	<ul style="list-style-type: none"> <li>• What are the structures and behaviors of silkworm larvae?</li> <li>• How do they compare to other insect larvae?</li> <li>• Silkworm larvae have unique behaviors and structures.</li> </ul>	<ul style="list-style-type: none"> <li>• Build small paper habitats for each table to closely observe larvae</li> <li>• Draw and label habitats showing what insects need to survive</li> <li>• Observe mealworms feeding and growth</li> <li>• Record observations of larvae</li> </ul>
<i>Growing Silkworm Larvae</i>	<ul style="list-style-type: none"> <li>• What are the structures of silkworm larva</li> <li>• Larvae molt as they grow</li> <li>• Do larvae have the same body parts as adult insects? Head, thorax, abdomen?</li> <li>• The basic structures of all insects include six legs and three body parts</li> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• Make detailed observations of silkworm larval structures</li> <li>• Observe silkworm movement</li> <li>• Draw large larva diagram including all structures they have learned about</li> <li>• Discuss molt / tape molt in observation record</li> <li>• Record changes on a calendar</li> </ul>
<i>Silkworm Adults</i>	<ul style="list-style-type: none"> <li>• What is the next stage of a silkworm's life?</li> <li>• Do male and female silkmooths look different?</li> <li>• Do silkworms mate like other adult insects?</li> <li>• The life cycle of a silkworm is egg, larva, pupa, and adult, which produces eggs.</li> </ul>	<ul style="list-style-type: none"> <li>• Observe silkmooths</li> <li>• Draw and write about adult body parts</li> <li>• Observe and record silkmooth behavior</li> </ul>

## BUTTERFLIES

<p><b>Butterflies (caterpillars/painted lady larva)</b></p> <p><i>Complete 2 observations this week (one when insects first arrive and another at the end of the week)</i></p>	<ul style="list-style-type: none"> <li>• What do insects need?</li> <li>• What are the structures of a butterfly larva?</li> <li>• What are the behaviors of a butterfly larva?</li> <li>• Insects need air, water, food, and space</li> <li>• Live organisms need to be treated with care and respect</li> <li>• Insect larvae have common structures, such as six legs and three body parts.</li> </ul>	<ul style="list-style-type: none"> <li>• Observe butterfly larva closely to determine its structures</li> <li>• Observe the larva behaviors: eating, moving, molting</li> <li>• Write and draw observations</li> <li>• Compare/contrast larvae to other larvae</li> <li>• Write a prediction of how larvae will grow and develop</li> </ul>
<p><i>Butterflies (chrysalis and pupa)</i></p>	<ul style="list-style-type: none"> <li>• How do butterfly larvae change into butterflies?</li> <li>• Butterflies construct chrysalises when they pupate.</li> <li>• Are butterfly and moth pupae the same?</li> </ul>	<ul style="list-style-type: none"> <li>• Once larvae begin to pupate in a chrysalis, they will be transferred to a butterfly net</li> <li>• Observe and draw chrysalises</li> <li>• Larva hang upside down in the J shape when they are ready to pupate and make a chrysalis</li> <li>• Observe chrysalises 5-6 days after they first form... you might catch one changing into an adult (look for lots of shaking)</li> </ul>
<p><i>Butterflies (painted lady adults)</i></p>	<ul style="list-style-type: none"> <li>• What is the next stage in a butterfly's life?</li> <li>• Adult insects have common structures, including six legs and three body parts.</li> <li>• What do you think will happen next in the butterfly's life?</li> <li>• What behaviors might we see?</li> <li>• How are butterflies and moths similar or different?</li> <li>• What is the life cycle of the butterfly?</li> </ul>	<ul style="list-style-type: none"> <li>• Observe adult butterflies – observe structures and behaviors</li> <li>• Observe feeding</li> <li>• Watch for mating and egg laying</li> <li>• Draw and label adult butterflies and their bodies</li> <li>• Create models of butterfly wings (to show the pattern is different on each side)</li> </ul>

# Insect Study Budget

## Live Insect Total

## Insect Study Budget Total

**\$498.25**

**\$1,000.00**

Item	Cost per unit	Total Cost
100 Mealworms/class	\$12.25	\$36.75
75 Waxworms/class	\$25.25	\$75.75
30 Milkweed Bug Eggs/class	\$17.50	\$52.50
50 Silkworm Eggs/class	\$24.75	\$74.25
33 Painted Lady Larvae/class	\$49.50	\$99.00
100 Crickets	\$10.00	\$30.00
2nd Day Air Shipping Charges	\$130.00	\$130.00

## Art Supplies Total

## Insect Study Budget Total

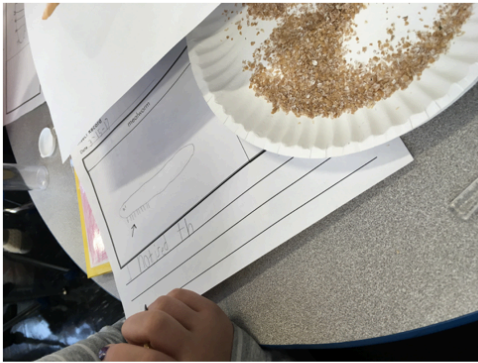
**\$264.00**

**\$1,000.00**

Item	Cost per unit	Total Cost
Watercolor paint (12 pack)	\$21.00	\$63.00
Oil Pastels (class pack)	\$52.00	\$52.00
Model Magic (class pack)	\$32.00	\$64.00
Tissue Paper	\$10.00	\$30.00
Card stock	\$10.00	\$30.00
Markers	\$25.00	\$25.00

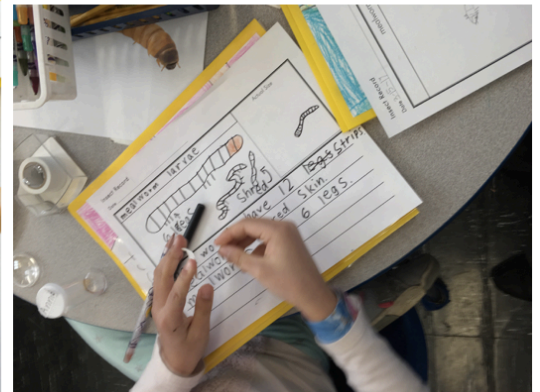
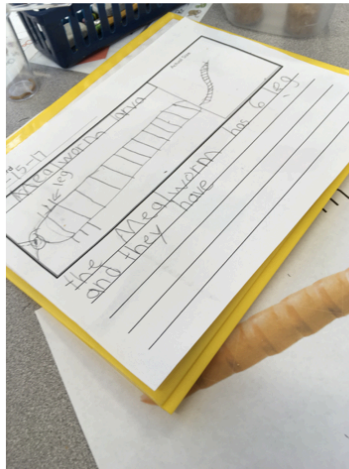
**Consumables Total****Insect Study Budget  
Total****\$237.75****\$1,000.00**

Item	Cost per unit	Total Cost
Bran	\$17.50	\$17.50
Baby oatmeal	\$3.00	\$9.00
Sunflower seeds	\$4.00	\$4.00
Extra painted lady larvae food	\$23.50	\$23.50
Plastic cups 250 mL (25/pkg)	\$3.75	\$11.25
Cup Lids (36/pkg)	\$5.75	\$17.25
Glycerine 118 mL	\$5.85	\$17.55
Hand Lenses	\$0.80	\$24.00
Jars 2L with lid	\$7.05	\$21.15
Vial 12 dram with cap	\$0.25	\$50.00
Cap and Washer set	\$1.95	\$5.85
Potting soil 4lb bag	\$4.50	\$4.50
Sand 500 mL	\$3.10	\$3.10
Screen	\$4.00	\$12.00
Netting piece	\$5.70	\$17.10
Shipping	\$0.00	\$0.00

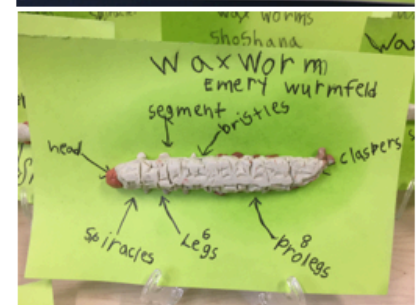
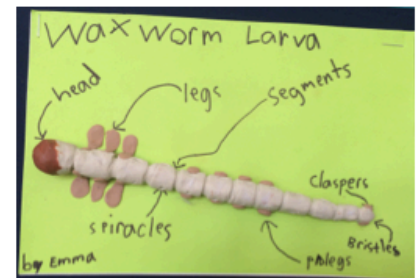


In this study of insects, we observe 5 different live insects. We draw and write about we see. We try to be as realistic as possible.

We observe body attributes and behaviors. The most exciting part is observing the changes.



We make model insects to show all the different parts.





This growth chart helps us keep track of each insect in our classroom and the changes they go through.



After close observation, we can paint realistic representations of what we see.







These insects were made from model magic and colored with marker.



This collage demonstrates what we learned about insect defenses.

