

**TEXAS 4-H**  
**4-H STEM District-Wide Research Project**

**Title:** Explore the Scientific Method Lifecycles

**Grade Level:** 3<sup>rd</sup> and 4<sup>th</sup>

**TEKS:**

Science

3.1(A), 3.2(B)(C)(D)(E)(F), 3.3(A), 3.4(A)(B), 3.10(C)

4.1(A), 4.2(A)(B)(C)(D)(E)(F)(G), 4.3(A)(B)(C), 4.4(A), 4.6(A), 4.7(C), 4.8(B)

Math

3.1(A)(B)(E), 3.8(B)

**Title of Lesson:** Ladybug/Mealworm Life Cycles

**Objectives (2 to 4):**

The participants will:

Learn the Steps of the Scientific Method

Learn about Ladybug life cycle

Practice the 15 STEM Abilities (build, categorize, collaborate, demonstrate, describe, contrast, solve, design, evaluate, hypothesize, invent, infer, interpret, measure and learn the basics of graphical representation)

**Supplies:**

6 small boxes or petri dishes

lady bugs (Available on insectlore.com Tubes with 10 larvae each)

Cold (4°C) Refrigerator, hot (24°C) heat lamp and warm (20°C) room temperature source.

Three thermometers

**Time Allotment): 60 – 90 minutes for initial experience, with follow-up observation time of 30 minutes.**

Observe ladybugs every day for a period of 4 weeks. Change food sources once a week or when necessary.

**Explore the Content:**

Vocabulary:

**Life cycle:** a series of stages through which a living thing passes from the beginning of its life until its death

**Metamorphosis:** Also called transformation. A change in the form and often habits of an animal during normal development after the embryonic stage. Metamorphosis includes, in insects, the transformation of a maggot into an adult fly and a caterpillar into a butterfly and, in amphibians, the changing of a tadpole into a frog

**Larvae:** define, the active immature form of an insect, especially one that differs greatly from the adult and forms the stage between egg and pupa, e.g., a caterpillar or grub

**Pupa:** define an insect in its inactive immature form between larva and adult, e.g., a chrysalis

Main Question: Does temperature affect the time (in days) in which the ladybugs go through metamorphosis

Independent Variable: Cold Temperature, Warm Temperature and Room Temperature

Dependent Variable: Time (in days)

Possible Hypothesis:

If ladybug larvae are in a cold environment, metamorphosis will take longer to occur.

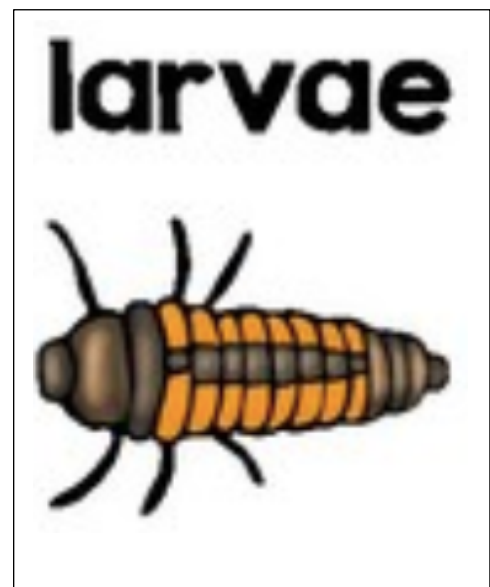
If ladybug larvae are in a warm environment, metamorphosis will take shorter to occur.

**Do (Activity/Experience):**

Activity 1

Learn the Ladybug Life Cycle – could each section of this be on a separate sheet of paper and groups of 4 participants would have one of each life cycle stage to organize in the correct order and act out or demonstrate to the other groups?

Use the complete Ladybug Life Cycle as a reference, then forming groups of 4 participants assigned one of each life cycle stage one per participant and help them organize the stages in the correct order demonstrating and sharing with other groups



**eggs**



**larvae**



**adult  
ladybug**

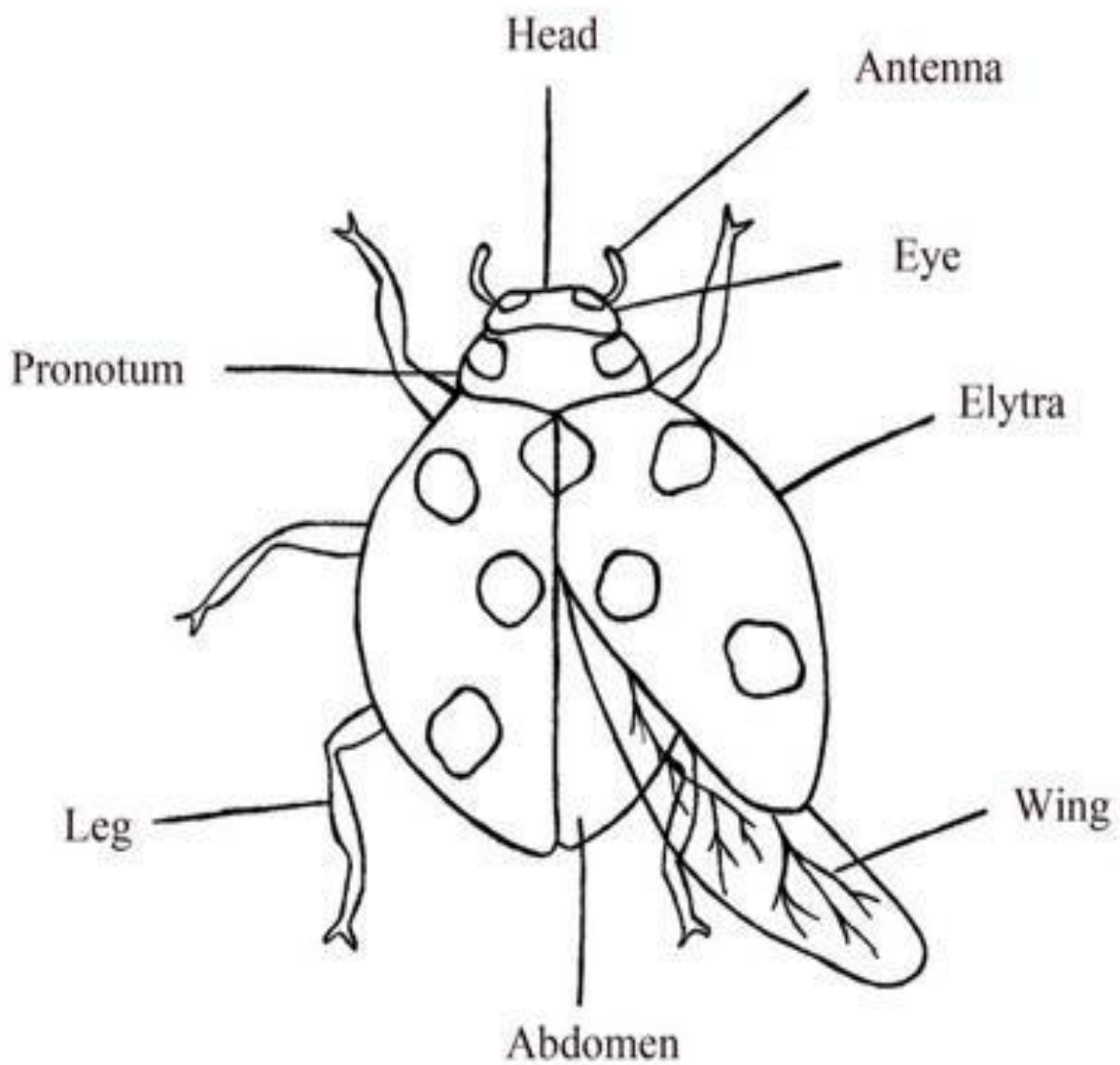


**pupa**

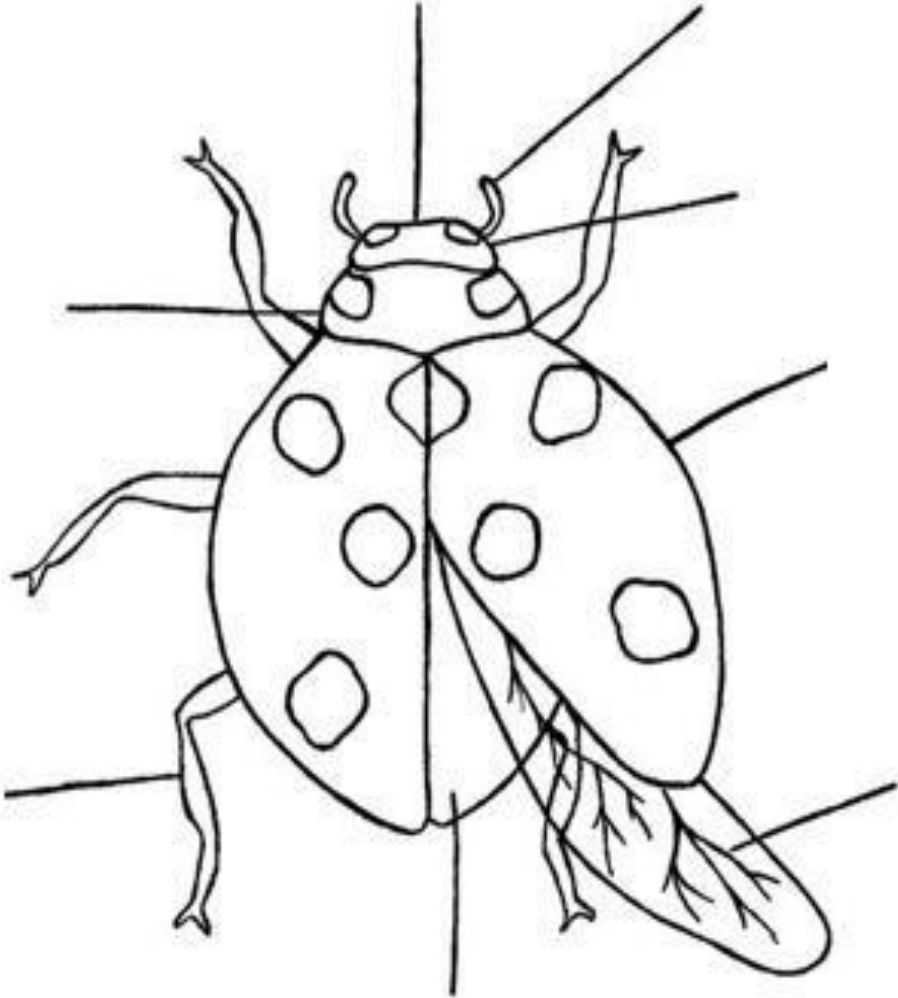


## Activity 2

### Part A – Learn the Ladybug (Adult) parts



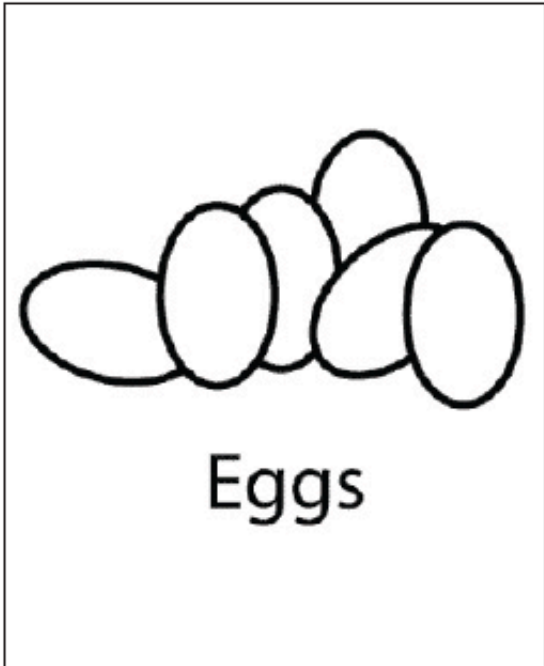
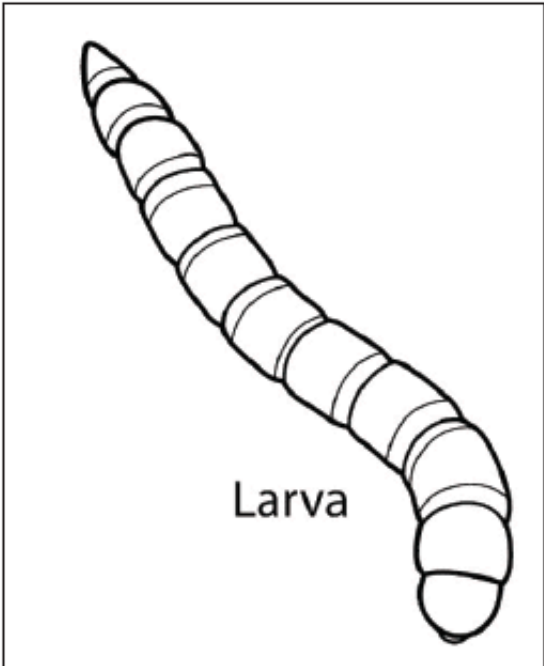
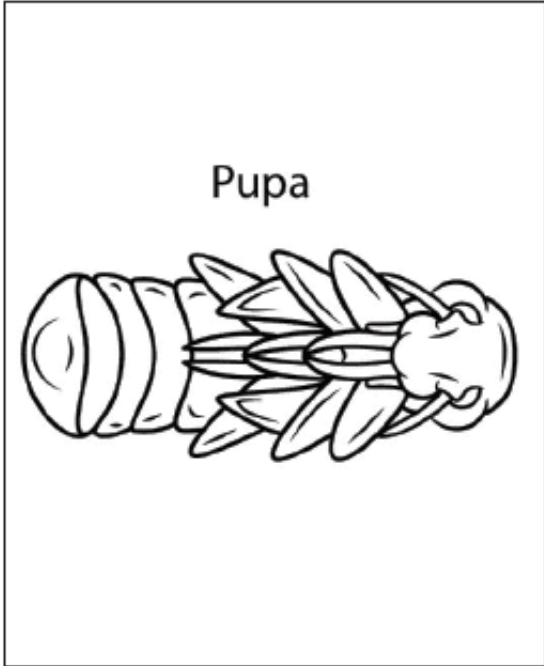
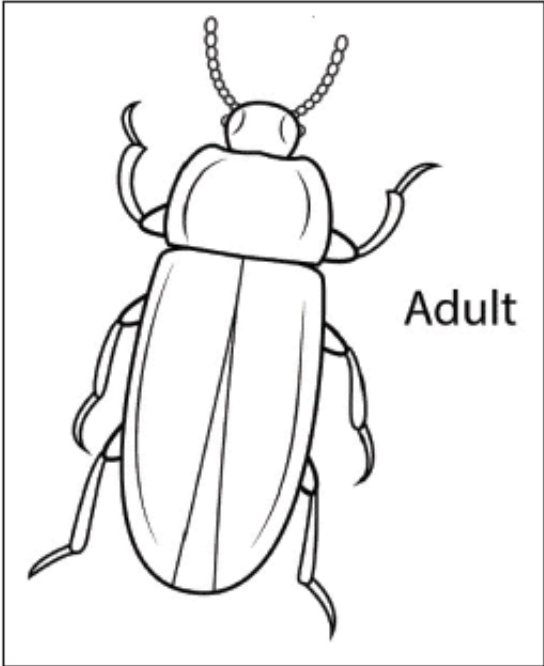
Part B- Name the Ladybug Adult parts



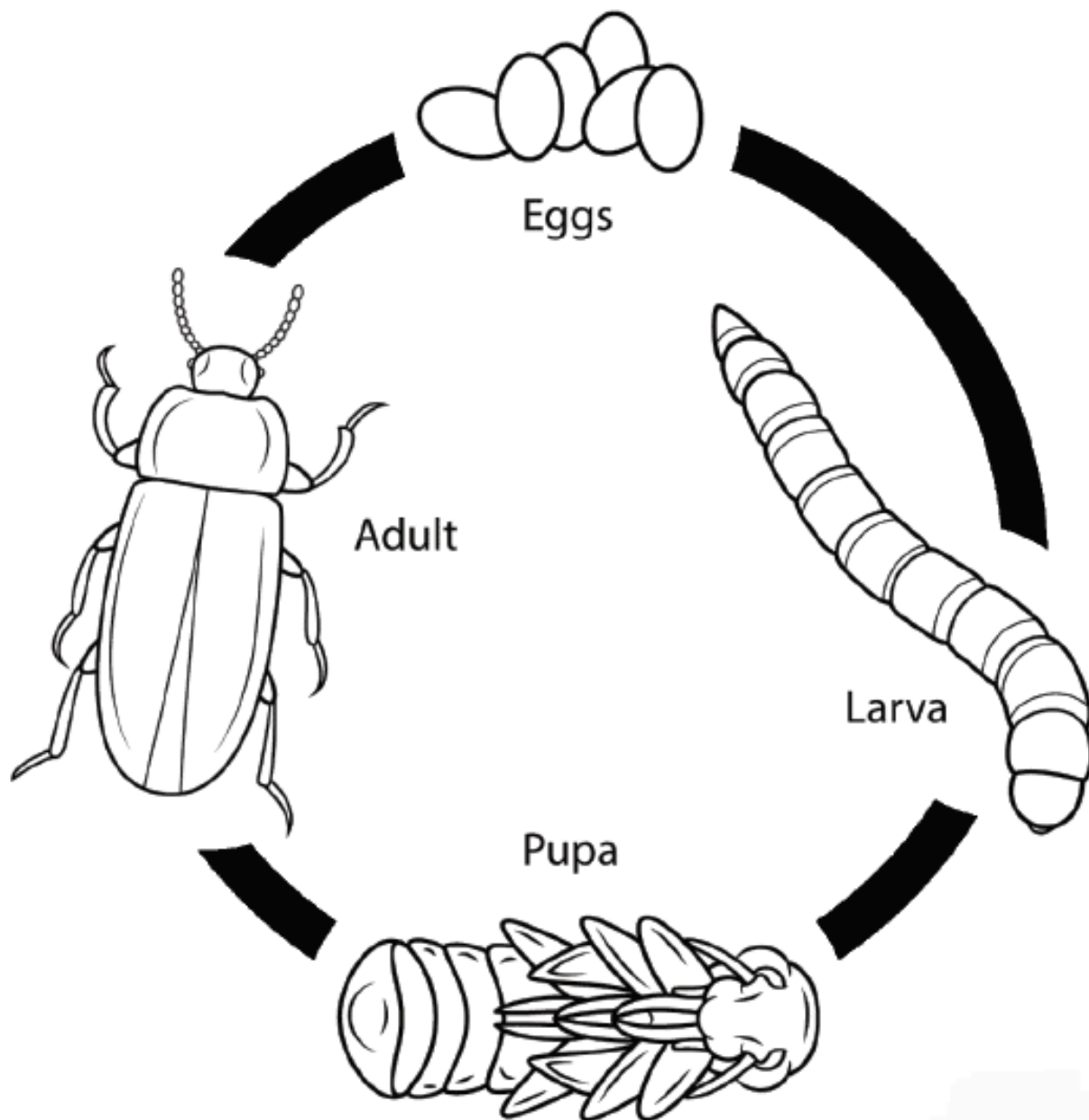
### Alternative Mealworm Activity 1

Learn the Mealworm Life Cycle – could each section of this be on a separate sheet of paper and groups of 4 participants would have one of each life cycle stage to organize in the correct order and act out or demonstrate to the other groups?

Use the complete Mealworm Cycle as a reference, then forming groups of 4 participants assigned one of each life cycle stage one per participant and help them organize the stages in the correct order demonstrating and sharing with other groups



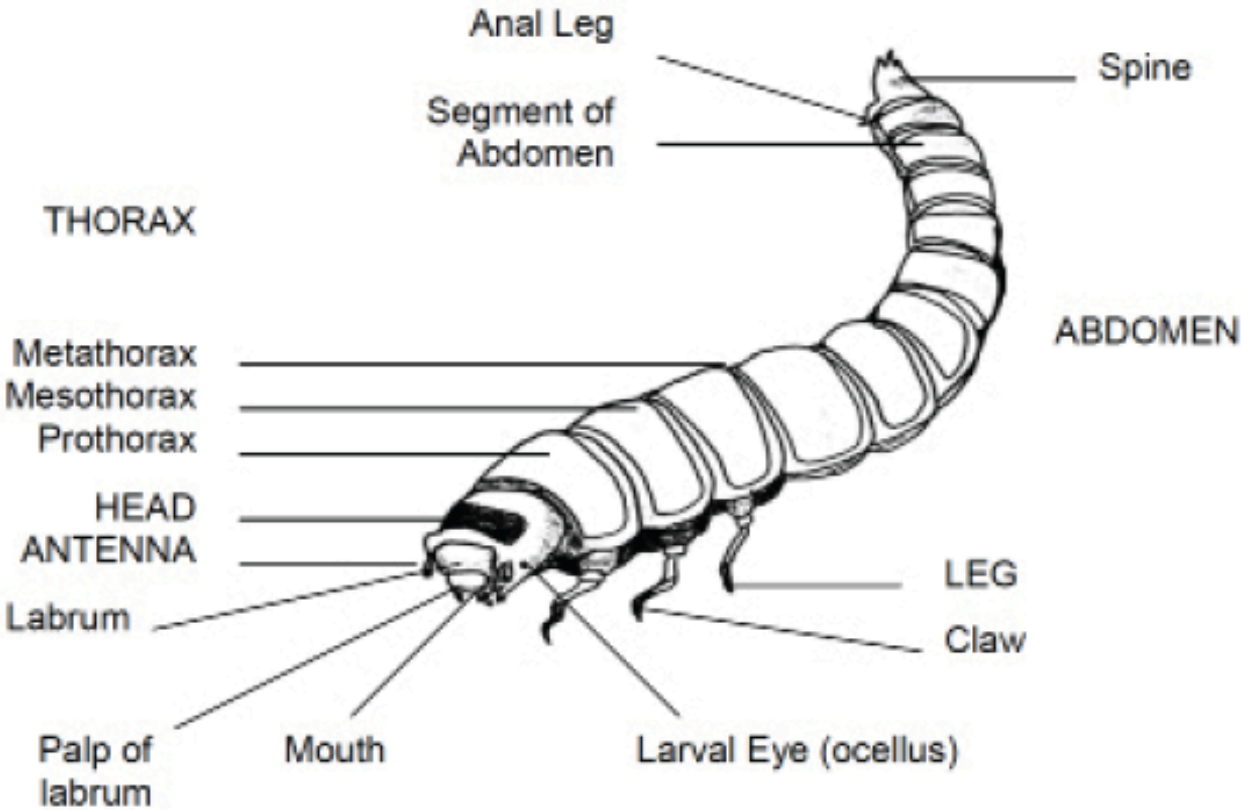




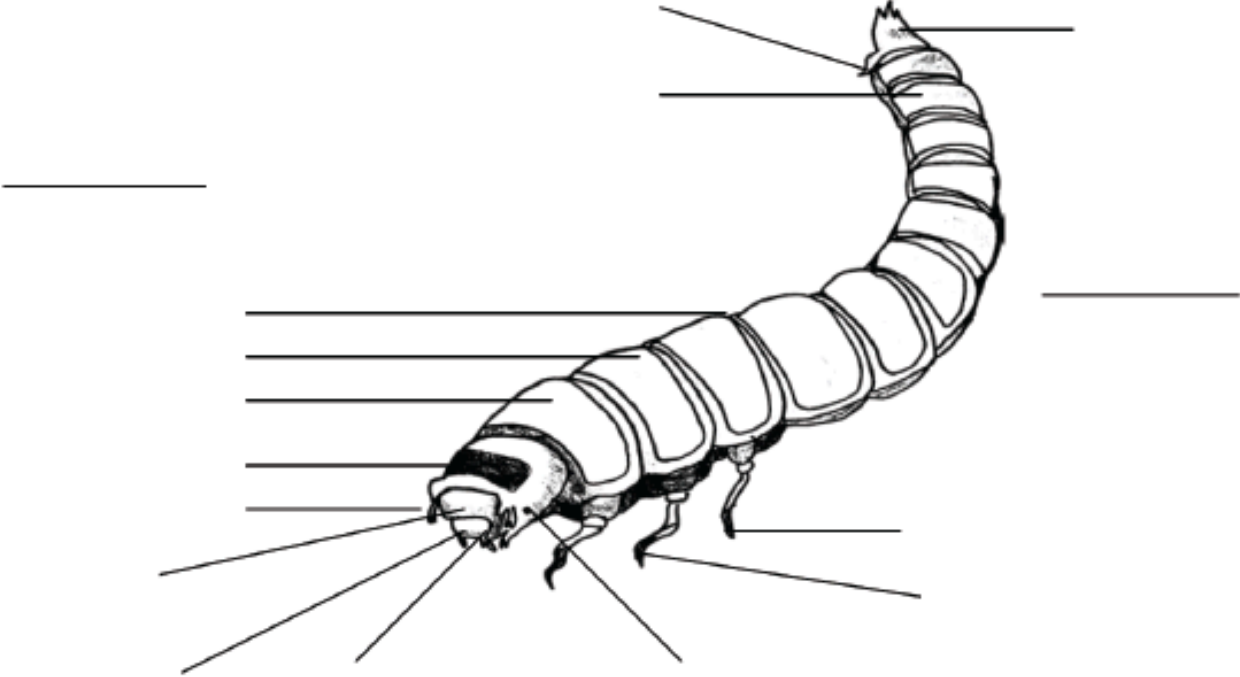
## Activity 2

Educational programs of the Texas A&M AgriLife Extension Service are open to all people without regard to race, color, sex, disability, religion, age, or national origin. The Texas A&M University System, U.S. Department of Agriculture, and the County Commissioners Courts of Texas Cooperating.

Part A – Learn the Mealworm (Adult) parts



Part B- Name the Name the Mealworm Adult parts



Activity 3

Educational programs of the Texas A&M AgriLife Extension Service are open to all people without regard to race, color, sex, disability, religion, age, or national origin. The Texas A&M University System, U.S. Department of Agriculture, and the County Commissioners Courts of Texas Cooperating.

## Conduct your own Research Project

1. Properly label each container; date and treatment (hot, warm, cold)
2. Place 4 ladybugs in each container filled with one small (1"X1") sponge (soaked with water) .
3. The first container (with 4 ladybugs larvae) should be placed in a cold environment (4-6°C)
4. The second container must be in a warm environment, under a lamp or hotplate (26-28°C) always monitoring the humidity.
5. The third container should be at room temperature (21-24°C)
6. Observe for 4 to 8 weeks and collect data using a data log sheet.

Day	Treatment (Hot/Warm/Cold)	Change (Yes/No)	Observations

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**Reflect:**

Do ladybugs/worms never change?  
Do ladybugs need a specific temperature to metamorphose (change)?

**Apply:**

Report your results in a scientific manner – see handout at end for a graphic representation  
Scientific Posters are commonly used to share your scientific project including the results.  
Typically a Scientific Posters will have the following parts:

Abstract: The summary of the experiment which includes s the purpose of the experiment, and no more than three sentences explaining the procedure, results, and conclusion.

Introduction: Describes the problem or goal of the experiment, it offers background information about; the entity, independent variable, dependent variable and the hypothesis.

Materials and Methods: It describes the experiment's design ; what materials were used, how the data was collected, how often date was collected, and how the data was analyzed. Pictures and tables can be used for this section. .

Results: Describes and displays data using; tables, photographs. Remember - the figures must always have a descriptive text (figures and tables must have a title number and units of measurement).

Conclusions: The first sentence restates the hypothesis or research question and the second should answer the research question with additional sentences explaining the results and procedures that influenced the results.

References: If images from the web were used, it is important to refer the website used. The common method to cite the sources is APA style(you find instructions for APA style on the internet)

Acknowledgments: A formal printed statement that recognizes individuals and institutions that contributed to the work being reported.

Scientific Poster Example:



## Mealworm Caring Doctors

A. Islas, I. McCann, E. Pimentel, K. Simpson

### Abstract

The experiment was to see how fast the mealworms would change from a larvae to a pupa. Three treatments were used to see which treatment happened faster. The treatments were a hot climate, cold climate and room temperature climate. The metamorphosis of the mealworms was observed for 15 days.

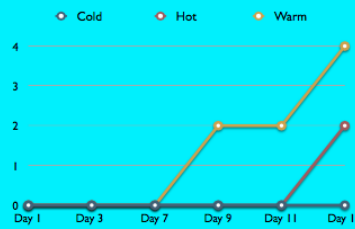
### Introduction

Chickens need mealworms to get protein and lay more eggs. Farmers need mealworms to feed their chickens so they lay more eggs and the farmers get more money by selling them. Our group thinks that the mealworms will go through metamorphosis faster in warmer temperature because they are cold blooded and they move a lot in the warmer temperatures. First a mealworm starts as an egg. Then it turns to a mealworm. After that the mealworm turns into a pupa. At last it turns into a beetle. Three different climates will be observed to see how fast a mealworm will metamorphose in each climate. The climates are a hot treatment, cold treatment and warm treatment. The hypothesis is that mealworms will change faster in warmer temperature.

### Materials and Methods

The experiment used four mealworms in three different petri dishes. Each petri dish had one ounce of oats for the mealworms to eat and they also had a potato slice that helped with moisture. The beetles also lay their eggs on the potatoes. Thermometers were used to see what temperature the mealworms were in. One petri dish was put in a tissue box and put on the hot plate. This was the hot climate. Another petri dish was in our classroom and this was the room climate. The third petri dish was placed in the refrigerator and this was the cold climate. Observations were made every 2-3 days for 15 days. Mealworms were watched to see if they went through metamorphosis. The observations were written down on the observation chart and made into a graph.

### Results



### TEKS

ELAR - 3.4, 3.15, 3.16, 3.17, 3.17 A, B, C, D, 3.23, 3.23B, 3.23C, 3.23D, 3.25, 3.25A, 3.25B, 3.26, 3.26A, 3.28, 3.29, 3.30, 3.31  
SCIENCE - 3.1A, 3.2B, 3.2C, 3.2D, 3.2E, 3.2F, 3.3A, 3.4A, 3.4B, 3.10C  
MATH - 3.1A, 3.1B, 3.1E, 3.8A

### Conclusion

We observed our mealworms every other day. We checked the potato to make sure they had moisture. We changed the potato because it was bad so the mealworms would not get sick. They got bigger and bigger. On day three we had no pupas. On day seven we had no pupas. On day nine we had two pupas in the room temperature treatment. No pupas in the other treatment. On day 11 we had three pupas in the control treatment and no pupas in the other two treatments. On day 15 we had two pupas in the hot treatment and four pupas in the room temperature and no pupas in the cold treatment. If you want to grow mealworms you have to put them in a warm temperature. You have to clean inside so it would not get them sick. The mealworms need moisture so they can turn to a pupa.

### References

Dierenfeld, E., Kutcher, S., & VanDyk, J. (n.d.) Answers to Kids' Questions About Mealworms and Beetles. Retrieved from: <http://www.scholastic.com/teachers/article/answers-kids-questions-about-mealworms-and-beetles>

no author. (2015). Mealworms. Retrieved from: [mealwormcare.org](http://mealwormcare.org)

Smith, B. (2009, September 9). Mealworms. Retrieved from: <http://www.smithlifescience.com/mlmealworms.htm>

West Knoll Farm. (n.d.) Mealworms. Retrieved from: <http://www.westknollfarm.com/Meal-Worms.html>

Merchant, M. (2015) Texas A&M NEPRIS webinar

### Acknowledgments

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### References:

Dierenfeld, E., Kutcher, S., & VanDyk, J. (n.d.) Answers to Kids' Questions About Mealworms and Beetles. Retrieved from: <http://www.scholastic.com/teachers/article/answers-kids-questions-about-mealworms-and-beetles>

Harland, D. J. (2011). *STEM student research handbook*. Arlington, Virginia.: National Science Teachers Association.

Smith, B. (2009, September 9). *Mealworms*. Retrieved from: <http://www.smithlifescience.com/mlmealworms.htm>

West Knoll Farm. (n.d.) *Mealworms*. Retrieved from: <http://www.westknollfarm.com/Meal-Worms.html>

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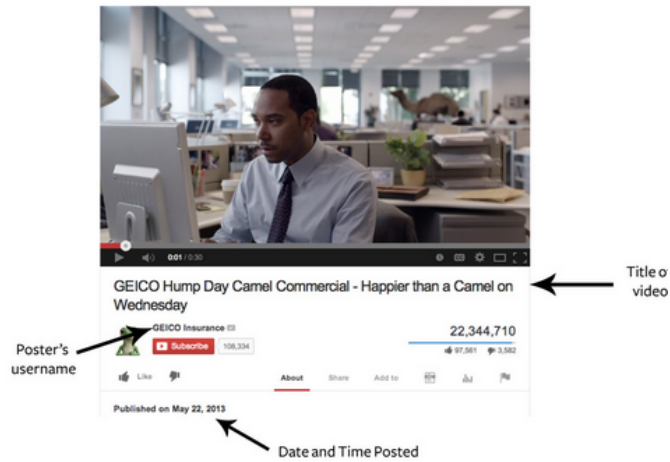
### Useful Websites

#### APA Citation

[http://writing.wisc.edu/Handbook/American\\_Psychological\\_Association\\_%28APA%29\\_Documentation\\_M.pdf](http://writing.wisc.edu/Handbook/American_Psychological_Association_%28APA%29_Documentation_M.pdf)

## APA Video Citation

Last Name, F.M. [Username]. (Year, Month Date). *Title of video*. [Video File]. Retrieved from URL.



### Example:

[GEICO Insurance]. (2013, May 22). *GEICO Hump Day Camel Commercial – Happier than a Camel on Wednesday*. [Video File]. Retrieved from <http://youtu.be/kWBhP0EQ11A>.

## Poster Creation Using Microsoft Power Point

[https://www.youtube.com/watch?v=1c9Kd\\_mUFDM](https://www.youtube.com/watch?v=1c9Kd_mUFDM)

# The scientific Method

