My Butterfly Science Fair Journal

A sample student notebook • Grades 5–7

Student: Maya R. (fictional example and hypothetical research)

Project dates: September 3 – October 1

This is what a real science notebook *can* look like:

- dated notes and research, questions, new vocabulary
- crossed-out ideas, circled or highlighted ideas
- mistakes,
- measurements,
- more questions & ideas as they are thought of

My journal rules:

1) Date every entry
2) Write what actually happened
3) Record numbers, not just guesses
4) Never change data to make it look better

Journal Tip

Record lots of interesting facts you learn while researching your topic. Likewise, write down alternate questions and solutions in your journal.

Your hypothesis, procedures, methodology, experiments, analysis, results and conclusion (also in your journal) will focus on your ONE chosen question and that will also be the focus of your display board and abstract.

Project Brainstorming

September 3

I LOVE butterflies! I see them near our garden. I wonder if they like some flower colors better.

Ideas and questions I thought of about butterflies:

☐ Does wing size affect how far a butterfly flies? (Hard to measure without touching them.)

☐ Do butterflies visit flowers at different times of day? (would require a lot more experiments with multiple times of day. Do I have time to do all of that?)

☑ Do butterflies visit purple or yellow flowers more often? (I can COUNT visits!)

My first idea was to count all the butterflies in the yard, but that would not answer my color question. I need to count VISITS to *each* color, so I will choose to focus on the **last** question for my science project.

My Research

Date: September 4, 5, 7, and 9

September 4 — I read a library book about butterflies. I learned that butterflies can see colors and use flowers for nectar.

Vocabulary

pollinator -an insect or other agent that conveys pollen to a plant and so allows fertilization

September 5 — I read a university extension article about planting flowers for pollinators. I learned that flower shape, scent, and nectar can also matter, not only color. It said that some type of butterflies are attracted to certain colors. Like the Painted Lady likes purple flowers more.

September 7 — I talked with my teacher. She said I should use the SAME kind of flower, with similar numbers of open blooms, so I do not accidentally test two things.

Research questions I still have (maybe for a different experiment?)

If two plants have different amounts of nectar, will that change visits? Probably! I will mention that as a limitation in my conclusion.

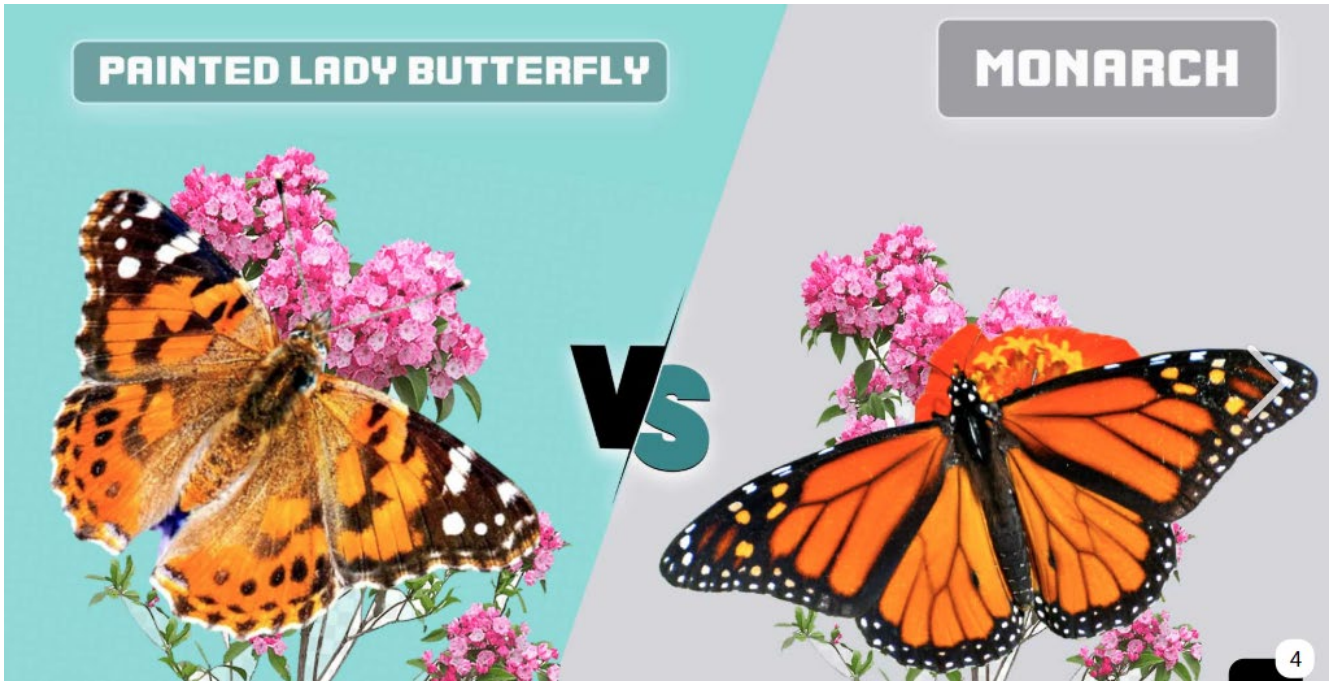
I wonder if I could minimize nectar differences for my experiment?

- What affects differing amounts of nectar in a flower? Age of bloom? Hydration of plant and water availability? Genetics of the plant?
- Can butterflies smell? I wonder if a flower that has more nectar smell differently to a butterfly?

September 8

On an internet search, I pinpointed the most common type of butterfly in my yard. It is a "Painted Lady". I also learned how to tell the difference between a Painted Lady and a Monarch, because they look very similar. Monarchs have a stained-glass wing pattern with dark lines outlining each orange area. The Painted Lady has more patchy, mosaic look, with brownish-orange tones and no outlines. Monarchs are usually larger too.

url _____



Vocabulary

Entomology – The study of insects

What I learned

Butterflies may use several clues to choose a flower. My project can test whether visits are different in my small garden setup, but it cannot prove that color alone explains every visit.

Source reminders: write down the real author, title, publisher/site, URL, and date accessed. Do not make up sources.

Book/Source 1_____

Book/Source 2_____

Write sources down as they occur in your research journey, but don't forget to compile them into one page when your research is complete.

September 8

I called the University of Arizona Agriculture extension office and asked if there was someone I could talk to about butterflies. There was!

Spoke with _____, Professor of Entomology at UofA.

I learned several things from my phone call with_____

_____

_____

_____

_____

_____

September 8

I called the Tucson Botanical Gardens and spoke with

_____, who has a PHD in lepidopterology.

I remembered that the Tucson Botanical Gardens has a butterfly exhibit every year. I spoke with their butterfly expert and learned that butterfly wings are angled to absorb heat. They also have tiny scales to reflect sunlight, and the darker patches on their wings help them warm up when it's cold. I don't think this has anything specifically to do with flower color choice, but it is fun to know.

Maybe it does though. Maybe if butterflies are cold, they would choose a darker flower because the darker purple flower would absorb more heat and possibly be warmer than the yellow flower?

Butterflies also reabsorb water from their waste to lessen their water loss.

Question? Maybe I should put out water for the butterflies to help attract them to my plants. If I do this, I have to make sure that each plant has an equal amount of water and use the same saucer or container for each. I also have to make sure the butterflies can't fall in the water.

When I buy the plants, I should probably give them all water in equal amounts to make sure each plant is equally hydrated.

Vocabulary

Lepidopterology – A specialized branch of entomology which focuses on butterflies. The name comes from the Greek word *lepidos* (meaning scales) and *pteron* (meaning wing). Butterflies have scales on their wings that reflect light. A scientist who studies butterflies is called a lepidopterist.

Questions?

Why are pollinating insects important?

Because they pollinate about 35% of global food crops (fruits, vegetables, nuts, seeds). We need to understand pollinating insects more.

Q

I heard that pollinator populations are declining? Could my experiment help understand pollinators better and maybe one day come up with a solution to their declining population?

Tools & Supplies Brainstorming

What do I need to COUNT butterfly visits and keep my test fair? I made a list before buying anything.

September 8 — I checked my list with my teacher. We agreed the notebook, timer, plants, pots, and measuring tape are enough to begin.

Things I still need to figure out: Where can I borrow a timer? Can I find plants with similar open flowers?

My first idea was to use a butterfly net. NOPE! I am only watching, not catching them.

Maybe? A phone camera could help me check a confusing landing, but I do not NEED one.

☑ **Chair + water + sun hat** — I will sit quietly, stay hydrated, and watch without touching butterflies.

☑ **Tally sheet or clipboard** — so I can count each landing without losing my place.

☑ **Ruler or measuring tape** — to space the plants evenly and mark where I sit each time.

☑ **Four equal-size pots** — so pot size remains the same. The pot is a controlled variable.

☑ **2 purple + 2 yellow zinnia plants** — same kind of flower, *with* about the same number of blooms.

☑ **Timer or watch** — each observation must last exactly 20 minutes. I can borrow a timer.

☑ **Notebook & pencil** — I need to write down dates, weather, and tally marks right away.

☑ **Measuring Cup** — so I can hydrate each plant with the same measured amount of water.

Hypothesis & Variables

September 9

My Hypothesis: IF I put similar purple and yellow zinnia plants side by side, THEN butterflies will make more visits to purple flowers during equal observation times, BECAUSE flower color may influence which flowers they notice. I chose purple, because in my research, I learned that Painted Lady butterflies like darker colors and there are a lot of those at the location I will be doing my testing.

Reminders:

- Independent variable — **what I CHANGE**: flower color only (purple vs. yellow).
- Dependent variable — **what I MEASURE**: number of butterfly landings on each flower color during a 20-minute observation.
- Controlled variables — **what I KEEP THE SAME**: flower species (zinnias), number of plants, similar open bloom counts, observation length, location, and observation time, pot size, amount of water I give to each plant. I will switch left/right viewing positions each day
- I will wear the same beige color of shirt each day with jeans, no patterns, color, or especially flower patterns.

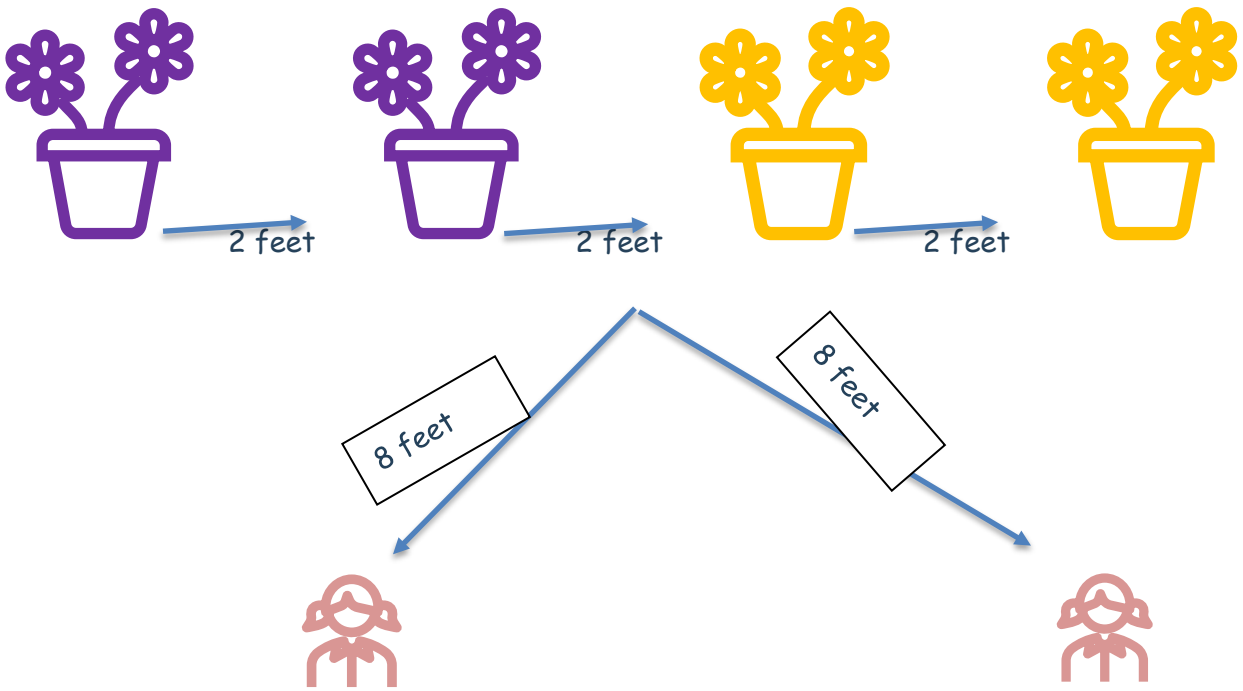
What counts as ONE visit?

- A butterfly landing on a flower.
- If it leaves and lands again, that is another visit I will count.
- I will not count butterflies just flying past.

Important note to myself: The flower plants are not perfectly identical. This is a real-life limitation that I will include in my conclusion.

Sketch of my setup

[PURPLE zinnia] 2 feet apart [YELLOW zinnia]



Same sunny garden area. I sit about 8 feet away and stay still.

I should wear the same beige color of shirt for my experiments so I don't influence the butterflies. I think it might be important *not* to wear a bright color and especially stay away from wearing anything with a flower pattern.

I've given each plant 2 measured cups of water each at the beginning of the observation period, so they will be equally hydrated.

Method / Procedure Brainstorming

Teacher Tip

Students should design their own methodology, procedure, and supply list (instead of following a pre-build recipe for a project).

How should I conduct the experiment to make everything fair?

Date: September 9

Materials Brainstorming & Planning

- 2 purple potted zinnia plants
- 2 yellow potted zinnia plants
- notebook; pencil;
- timer
- ruler
- chair;
- tally sheet
- thermometer (optional)
- measuring cup
- water

Procedure Brainstorming & Planning

1. Choose a sunny location and put two purple and two yellow plants in equal-size pots. Match the number of open flowers as closely as I can.

2. Place plants in two groups the same distance apart, 2 feet apart. Record the number of open blooms before each test.

Mark a spot for me to sit, always 8 feet from the plants.

3. Watch for 20 minutes at about 9:00 a.m. each test day. Do not touch or catch butterflies.

4. Make a tally every time a butterfly LANDS on a purple or yellow flower.

5. Record weather, start time, and anything unusual (wind, shade, people walking by).

6. Switch the left and right flower-group positions on the next test day.

7. Repeat for **six** observation days. Add the visits for each color and compare totals and averages.

Am I missing any steps? Maybe I should brainstorm with a friend and see if they have additional ideas for me.

Safety

- Tell an adult where I am outdoors.
- If I am conducting this experiment in a park or outside of my yard, I should take an adult with me.
- Drink water, wear sun protection, and leave insects alone.

Is the test fair? Am I only changing ONE thing? I will try to keep bloom numbers similar and record differences I cannot control.

Experiment & Observation log — week 1

Date: September 12, 14, and 16

I used a 20-minute timer each day. A tally means one butterfly landing.

Date	Purple visits	Yellow visits	Notes
Sept. 12	7	4	Sunny; 8 purple blooms, 8 yellow
Sept. 14	5	6	Windy; swapped positions
Sept. 16	9	5	Sunny; 9 purple blooms, 8 yellow

Sept. 12: A butterfly landed on a purple flower, flew away, and came back. I counted two landings because that is my rule.

Sept. 14: Surprise! Yellow got more visits today. I almost wrote "purple wins," but I need more trials.

Sept. 16: I noticed one purple plant had an extra open flower. I wrote it down instead of hiding it.

My questions / changes for next time

- I will keep the 20-minute test the same.

- I should write down in the notes how many flowers are open each observation time, because that might affect the result.

Experiment & Observation log — week 2

Date: Sept. 19, 21, and 23

Date	Purple visits	Yellow visits	Notes
Sept. 19	8	6	Warm; 8 blooms each
Sept. 21	6	3	Partly cloudy; swapped positions
Sept. 23	10	7	Sunny; 9 purple blooms, 9 yellow

September 19: I saw two butterflies at once! I used a tally for each landing.

September 21: Cloud cover changed during my observation. Maybe weather affects how active butterflies are.

September 23: I finished six tests. I did NOT change the time length or my counting rule.

Progress over time

I started researching butterflies on September 3rd.

After I did a lot of research, I designed my experiment by coming up with the supplies I would need, and designed the method that data would be collected.

Then I collected data on SIX different days instead of relying on one lucky day. I also wrote down days when my hypothesis did not seem right.

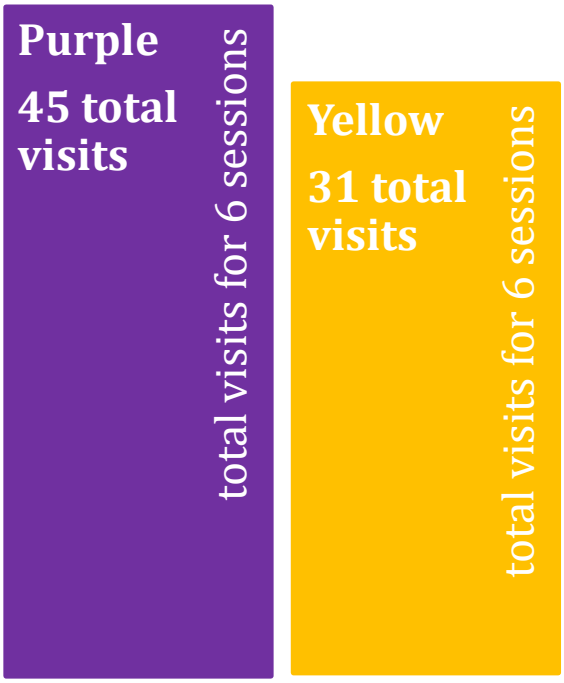
September 24 — My next job is to add the numbers, make a bar graph, and look for patterns.

Results + analysis – combining the data I gathered

Date: September 25–27

I checked my tally sheet twice. These are the numbers I recorded:

Trial	Purple	Yellow
1	7	4
2	5	6
3	9	5
4	8	6
5	6	3
6	10	7
TOTAL visits for each color	45	31
AVERAGE / 20 min	7.5	5.2



September 26 — My graph idea: Make a bar graph with flower color on the bottom and total landings on the side. Purple bar = 45, yellow bar = 31.

I might need help with this. I'm not sure I'm making my graph right.

September 27 — Analysis: Purple got 14 more visits overall. Purple had more visits on five of six days. Yellow had more on Sept. 14. This might suggest something… but not sure what?

BUT I cannot say all butterflies everywhere prefer purple! I tested only two colors, a small number of plants, and six mornings. Flower nectar, bloom counts, weather, and individual butterflies may have affected my counts.

Conclusion & References

Date: September 29 – October 1

September 29

Conclusion:

My results SUPPORTED my hypothesis in this experiment. Purple zinnias had 45 landings and yellow zinnias had 31 across six equal observation periods.

What I learned:

Repeating tests matters for science research. One day yellow had more visits! I also learned to record problems instead of pretending the experiment was perfect.

What I would improve:

Use more plants, match the number of blooms more closely, observe at different times, and repeat over more weeks. I could also try more flower colors.

My NEW question: Does time of day affect butterfly visits more than flower color?

Questions I have:

Should I have only counted Painted Lady Butterfly visits, rather than all types of butterflies, to make my experiment more specific and targeted?

I wonder if the result would be different in the spring?

I would like to go to the Tucson Botanical Gardens to see their butterfly exhibit. I will call them or look at their website to find out the months that the butterflies have hatched.

I wonder if butterflies pollinate flowers of edible plants. Maybe I can try to assist the pollination population by growing plants that butterflies like!

Compilation of References — fill in your ACTUAL sources

References (sample)

Book: Author _____ Title _____ Publisher _____ Year _____

Book: Author _____ Title _____ Publisher _____ Year _____

Book: Author _____ Title _____ Publisher _____ Year _____

Website/article: Author or organization _____ Title _____

URL _____ Accessed on _____

Interview with: Name _____ Role/title _____ Date _____

Interview with: Name _____ Role/title _____ Date _____



TIP: Compile your ABSTRACT from the things you've learned and documented in your journal. It is usually 1-3 sentences per bullet point.

- **Intro/Purpose – why this project is important**
- **ONE Question or Problem you want to solve (one sentence)**
- **Hypothesis – clearly state what you thought would happen**
- **Procedure- your approach to testing your question**
- **Results – most important findings with specific numbers or measurable outcomes. (do not include tables or graphs)**
- **Conclusion – state whether you met your objectives, what your results mean, and any broader impact or learning you've achieved.**

An abstract is always written in past tense. Don't forget to put your project title at the top of your abstract.

TIP: A judge should be able to understand your project just from reading your abstract.