

1. Based on the mean (period and team), which of the colors is the preferred color of the butterflies?

② ①

The means show a preference for yellow and blue.

2. Based on the median (period and team), which of the colors is the preferred color of the butterflies?

② ①

The medians show a preference for yellow and blue.

3. Is/are there any colors that are clearly the least preferred color?

The least preferred color is green.

4. What is/are the benefit(s) of using team data over period data?

The team data contains more samples. More samples increases the likelihood that our data is close to the true mean and makes outliers less impactful.

5. What are some limitations on using the mean or median for determining the food color preference of the butterflies?

The mean is impacted by outliers. Extremely high or low outliers can shift the mean from its "true" value. Using the median limits the effect outliers have.

6. What could we do in this investigation to ensure that we reduce the variance in our response? (That is, we all had the same data, but many of us counted different totals for each color.)

We need to establish clear rules for what counts as each color. We can also cross reference with other counters: those who counted red dots can ask others who counted red dots. They can review each other's sheets and make decisions as if to something is red or not.

7. Based on your analysis of the data, write explanatory hypotheses for all colors **except** red. Fill in the blank with "least," "most," or "2nd most"

Why was green the **least** preferred?

Sample hypothesis: Butterflies learn they do not receive nectar when landing on green surfaces (e.g. leaves).

Why was yellow the **2nd most** preferred?

Sample hypothesis: Butterflies remember the yellow flowers of the fast plants and associate yellow with nectar.

Why was blue the **most** preferred?

Sample hypothesis: Butterflies associate blue with the ultraviolet spectrum, which is visible to butterflies on flowers.

8. Based on research done by the 7th grade science teachers, we found that blue flowers are not a common choice of butterfly. How does our data from this investigation compare to the teacher's conclusion from reviewing scientific literature?

Our data disagrees with their conclusion. Blue was the most preferred color.

9. What might this tell us about the findings?

Our findings may have been reached through a different method than the articles the teachers read (e.g. the research the teachers read was based on real flowers, not plastic feeding systems); different types of butterflies were used; not all the same colors were used in both investigations, etc.

12. Based on the last article (Kandori et al), what would be the benefit of re-doing our experiment using only male or female butterflies?

Female cabbage white butterflies are demonstrated to have higher learning rates than males. Therefore, they may show a stronger preference for a certain color than males. If we re-do the experiment using only male or female, we can compare color preferences of both sexes. For example, female cabbage white butterflies may need more energy and therefore need to pick one color to ensure they will always have nectar. Males may not need as much energy so they visit several, different colored flowers.