

## Cell Division

Watch Out! This section contains a few common mistakes or practices that occur in this lab. Read this section before beginning your lab.

1. **Faulty Questions** – The initial question asked has to be answerable via through empirical observation or experimentation. For example: Why are M&M's round?
2. **Assumptions** – Do not make assumption within your question. For example: Why do M&M's taste different?
3. **Subjective measurements** - Testing for subjective or immeasurable factors ie: How crunchy is an M&M? When do M&Ms get soft?
4. **Preconceived Notions** – Expectations in your outcome ie: I think the green M&Ms will taste different than the red ones. I took a green one, tasted it, and it was different than the red M&M that I tasted.
5. **Uncontrolled variables** - Having multiple uncontrolled variables and not accounting for them during the experiment. ie: How long will it take an M&M to melt in a glass of water? Potential uncontrolled variables: water temperature, size of glass, amount of water, color of M&M, size of M&M, etc.
6. **Bias** – a process where the scientists performing the research influence the results, in order to portray a certain outcome. There are 3 main types of bias.
  - a. Mining data: Preferentially taking parts of data to prove what you believe to be true ie: One out of 6 bags of M&Ms had 4 greens, so I'll just show that 1 on my graph.
  - b. Unconscious observer bias: Interpreting the results of your data based on what you believe to be true. ie: One out of 6 bags of M&Ms had 4 greens, so there must be something wrong with the other bags.
  - c. Small sample size: taking a small sample size to highlight random variation rather than general trends. ie: I sampled 1 bag of M&Ms, which had 4 greens. Therefore, all bags of M&Ms must have 4 greens.
7. **Not acknowledging potential error** - Coming to conclusions without critically examining your materials, methods, data collection, or results with the intent of finding possible pitfalls. ie: I counted 4 M&Ms. Nobody else counted, because I paid attention when I counted.