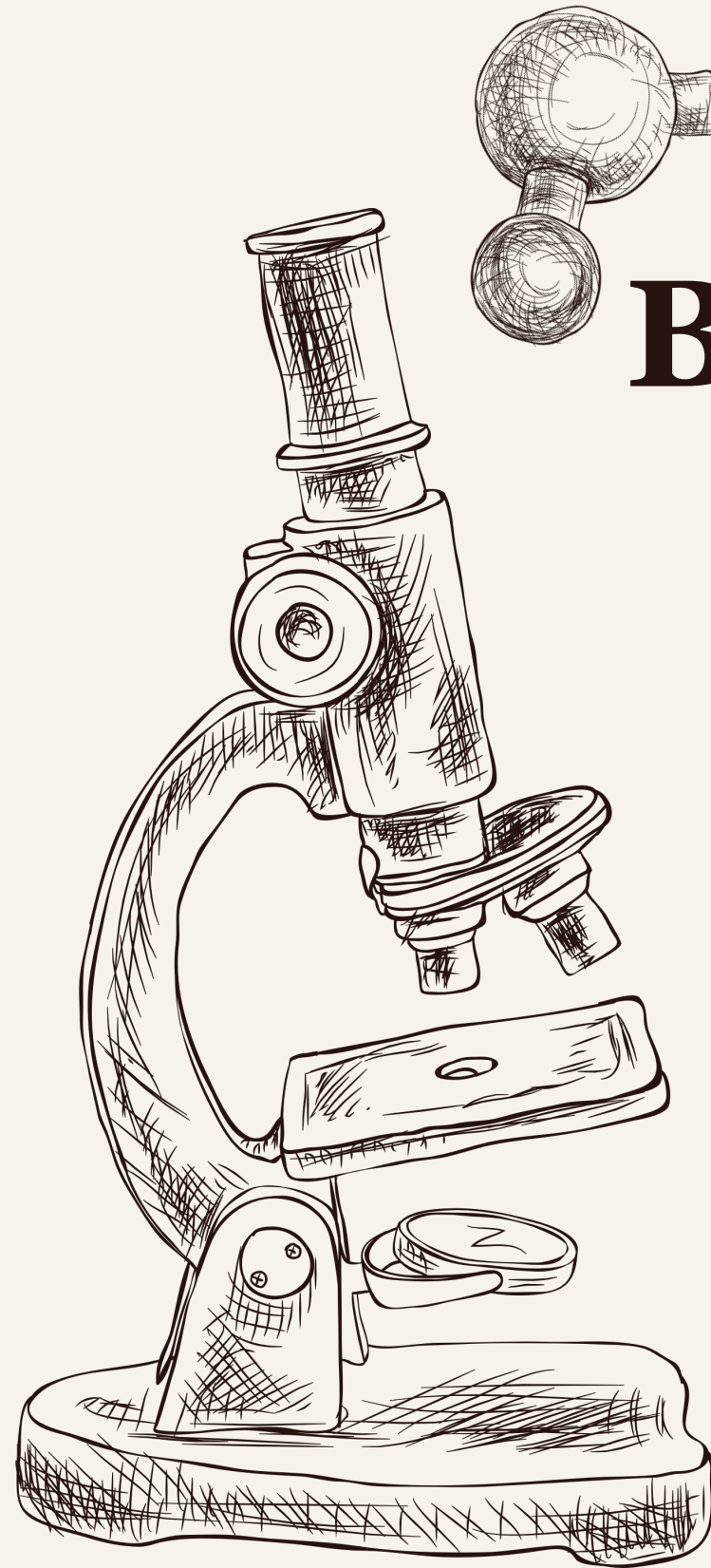
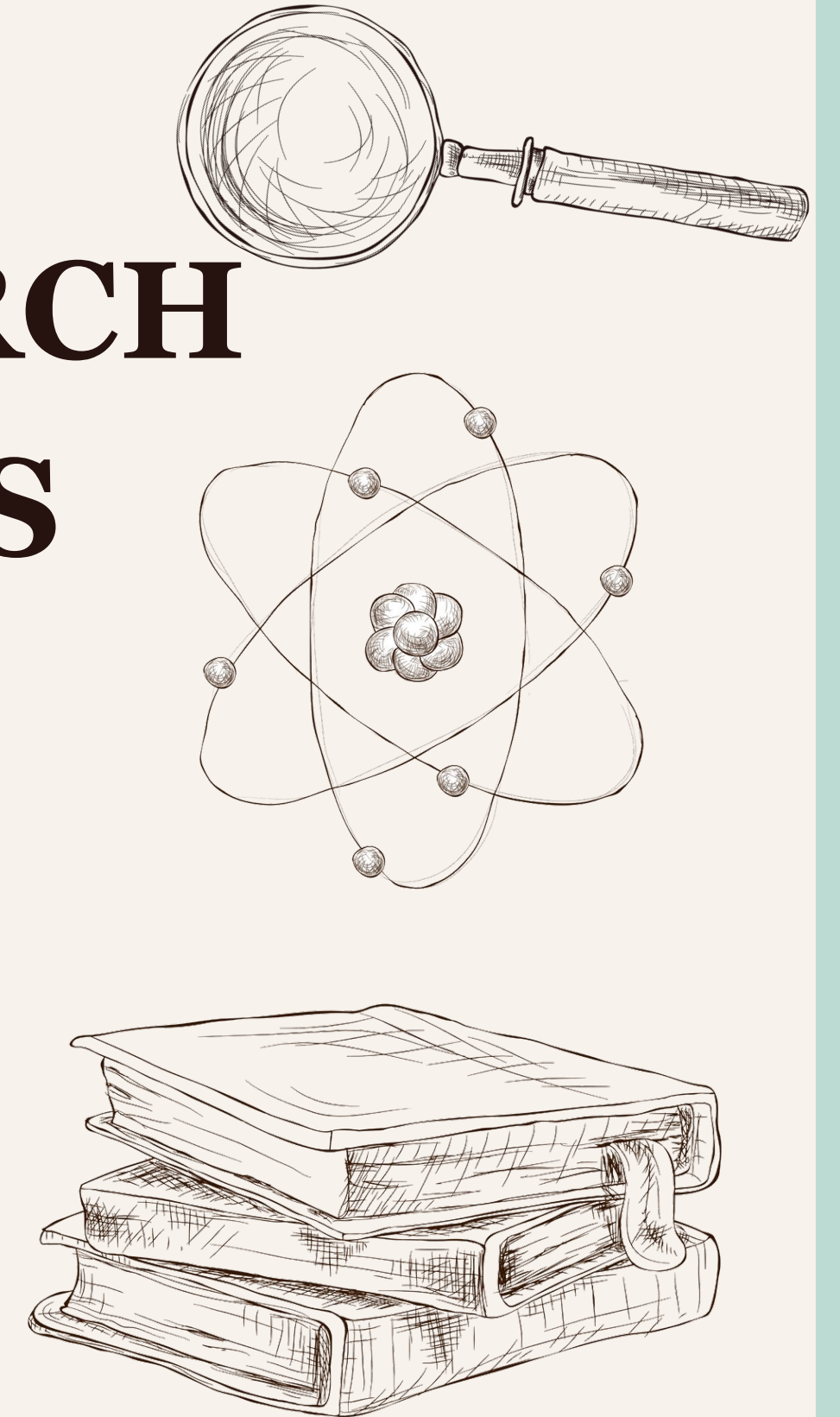




MDtRI's
BIOMEDICAL RESEARCH
TRAINING & SKILLS
DEVELOPMENT
PROGRAM
WHAT I LEARNED!

Presented by Harshita Sinha

Mentor: Dr. Lokendra Thakur



Introduction

01

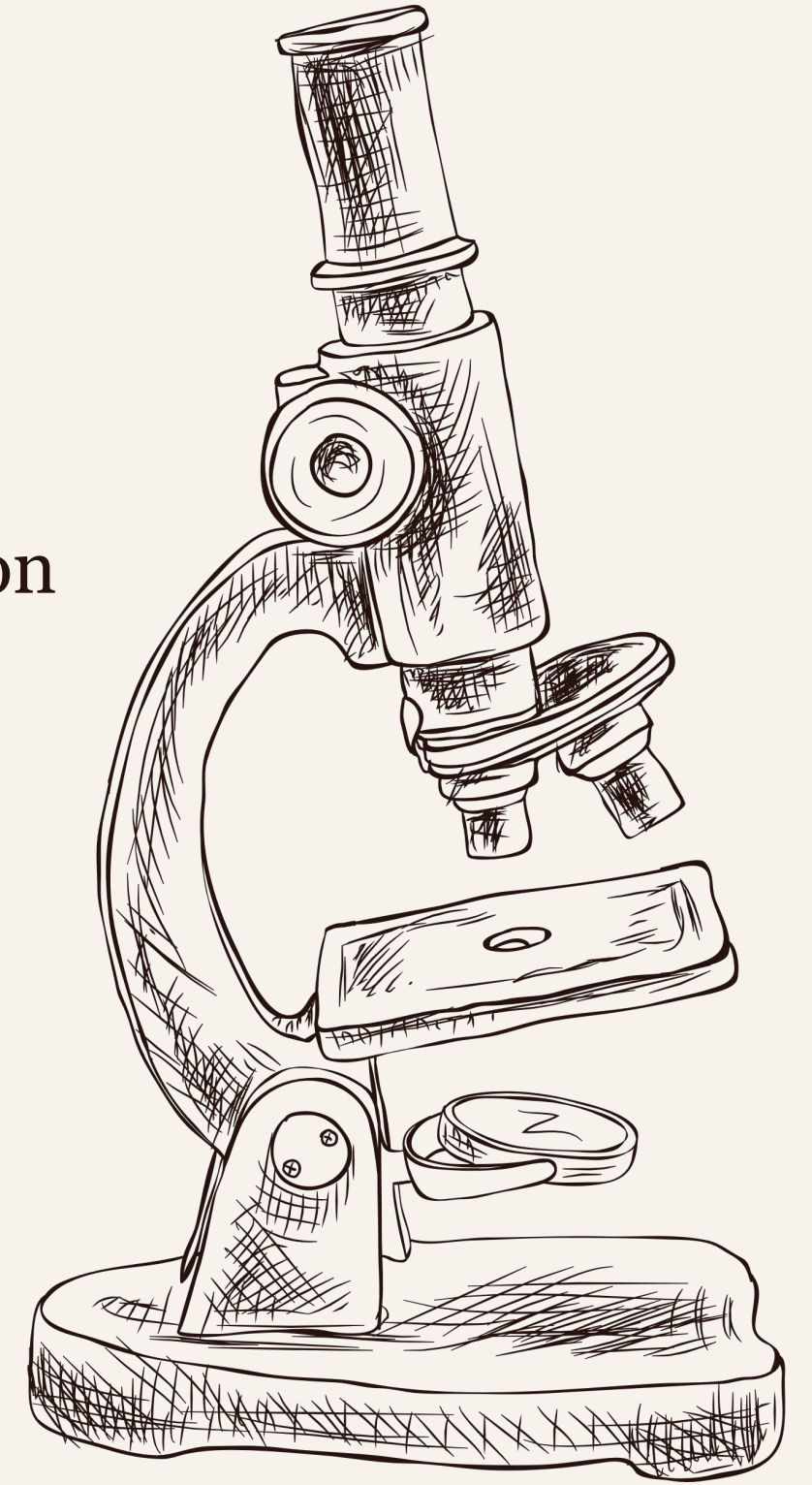
Why I joined the program?

- Intrigued by research there's, always more to learn
- Building a strong foundation in research

02

Roadmap of presentation

- To go over main aspects of what I learned
- What I hope to do next!



The Baseline

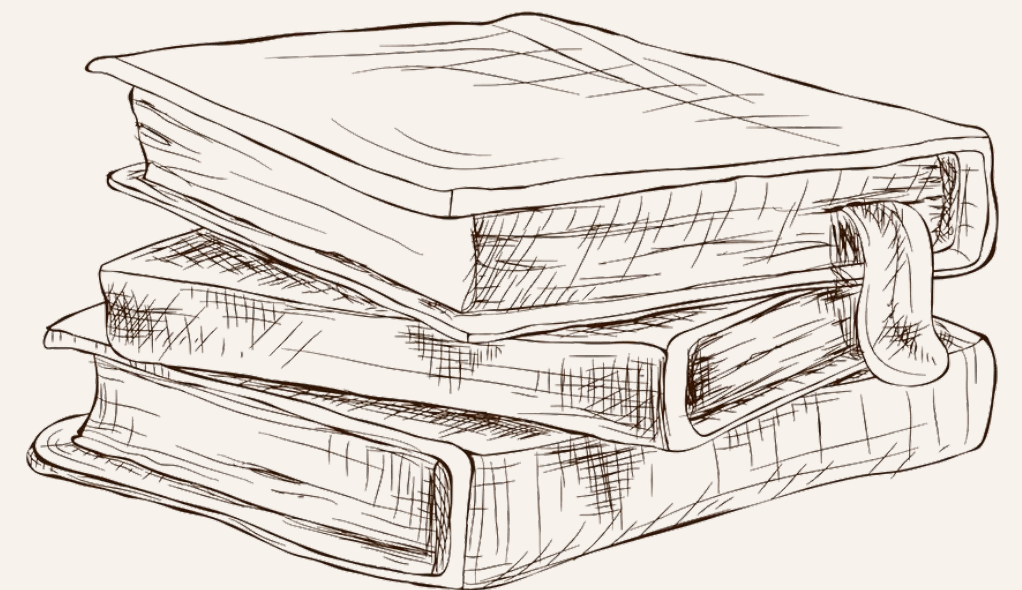
How I started off

What I thought research would be:

- You must follow the “rules” of research
 - Creativity shouldn’t be a big priority
 - The answer is the big idea not the question
-

Early questions I had

- What defines a good research project?
- Where do scientists' ideas come from?
- How do I develop a worthy hypothesis?

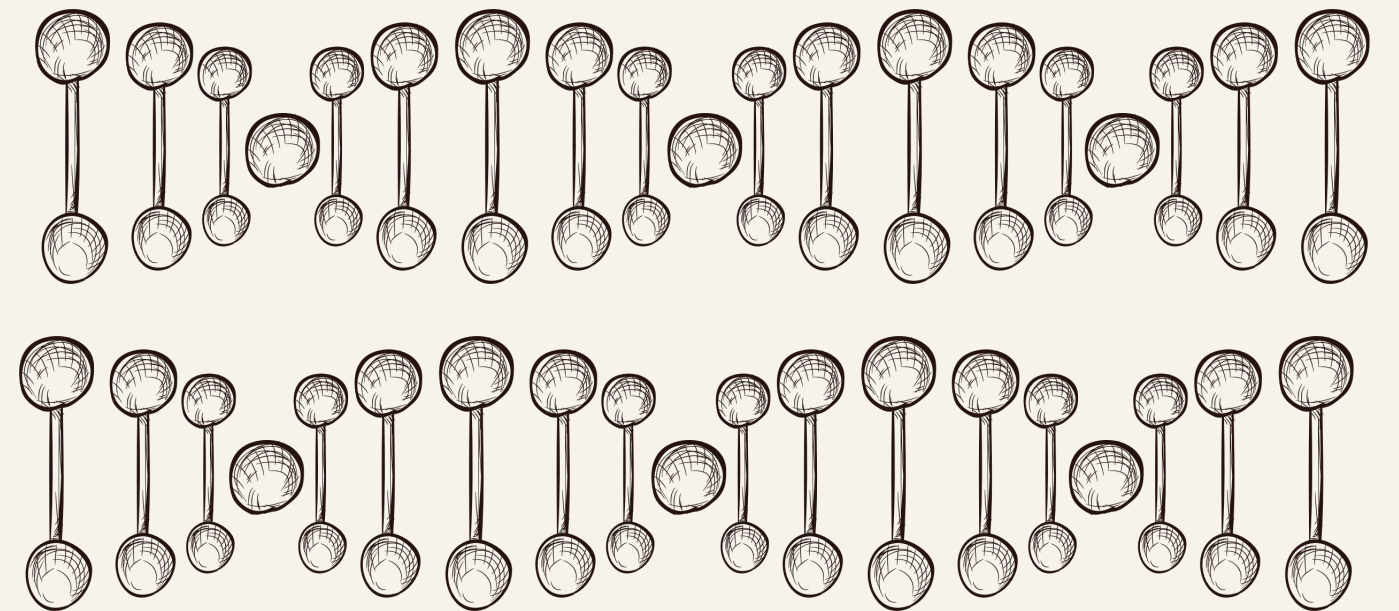


Training Overview

Focus: Research methodology,
data analysis, scientific
communication

My training was broken up into 4 main weeks

1. Scientific Methods
2. Research Methods & Lab Design
3. Developing Research Question
4. How to present your research?

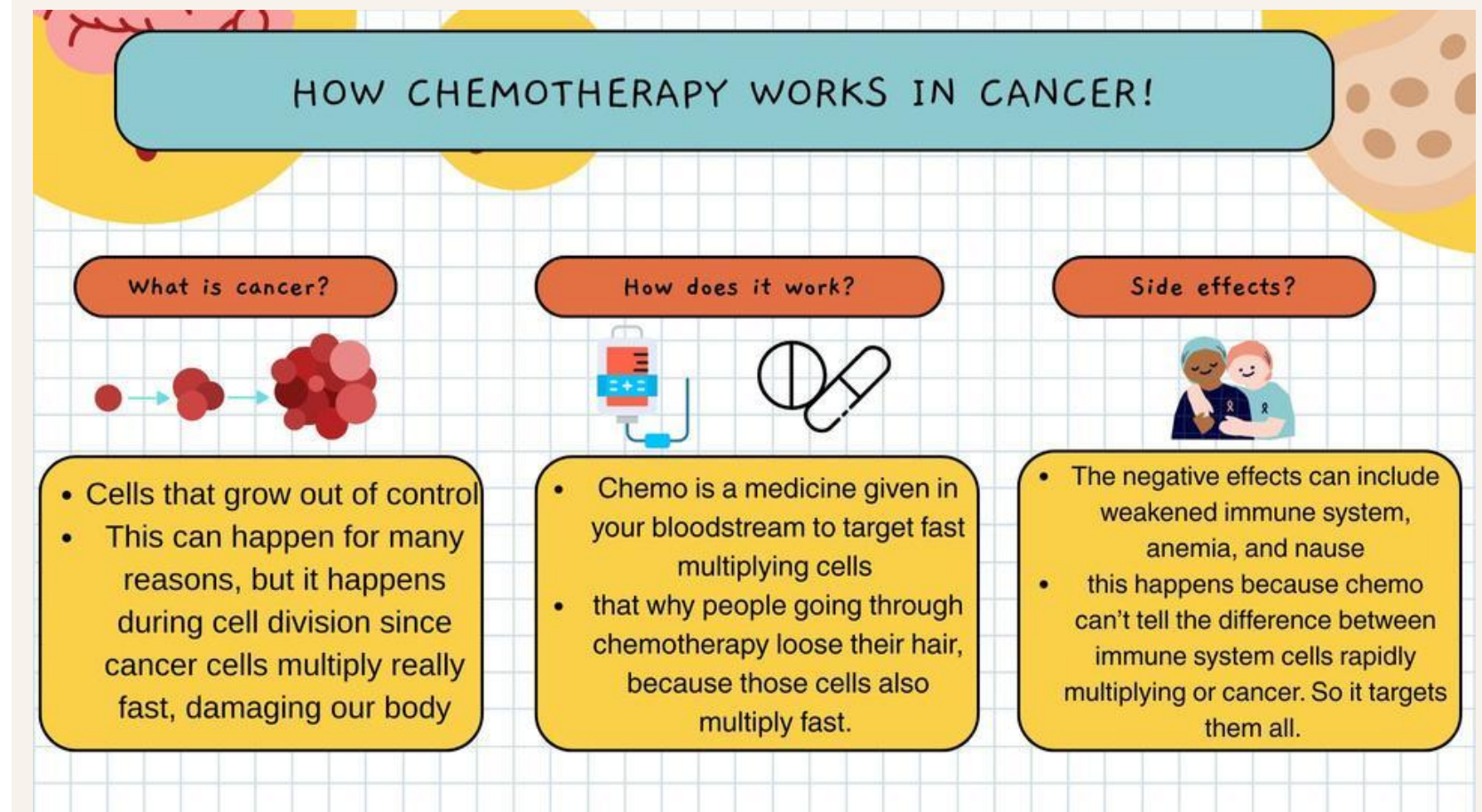
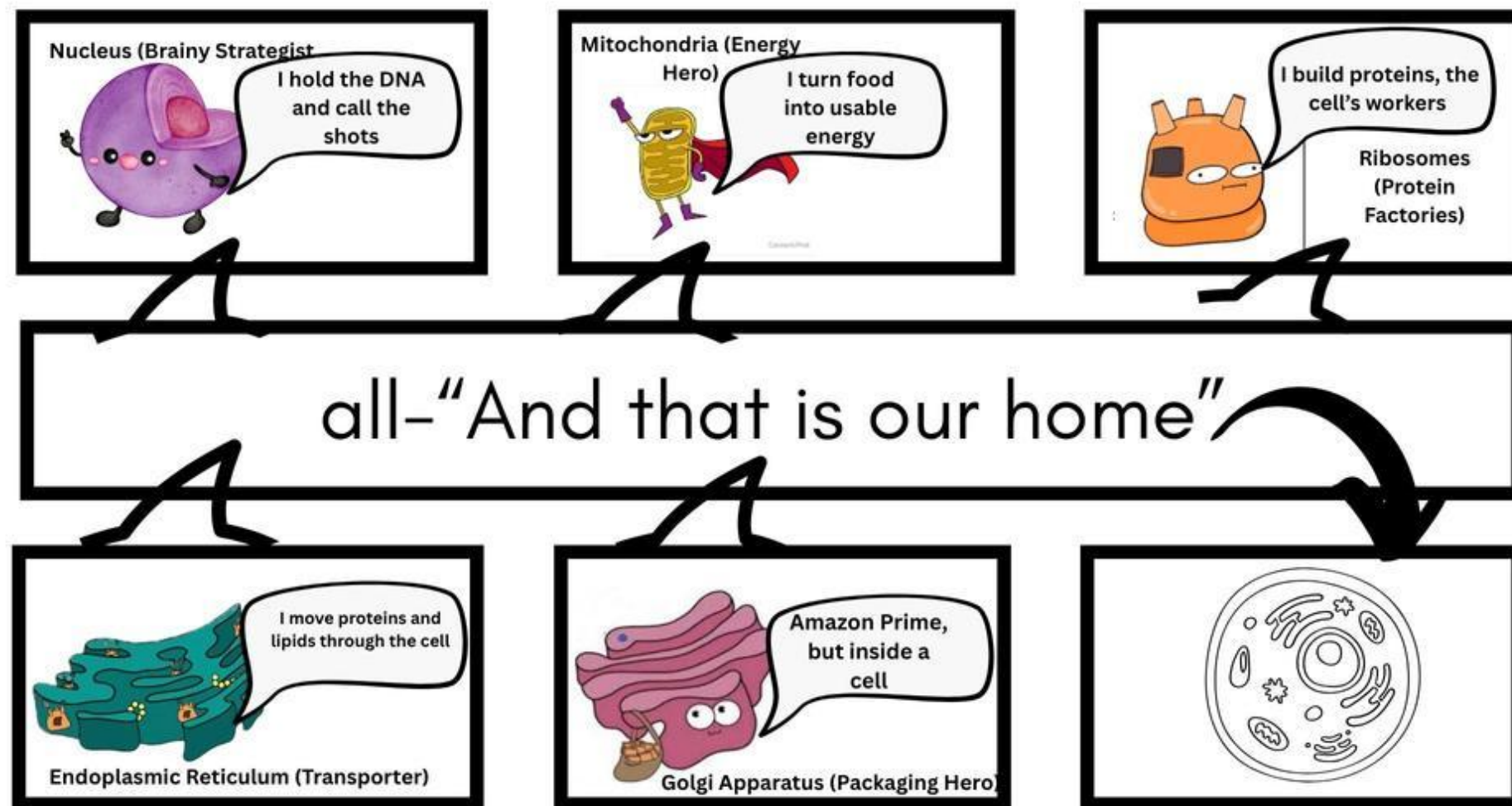


Week 1

The goal of this week was to learn how to show science creatively

I was given so much freedom with the creativity I felt overwhelmed

But at the end of day, I learned that if you do not know how to show science creatively it will never be out there



Scientific Method Foundations:

Observation → Question → Hypothesis → Experiment → Analysis → Conclusion

Week 2

This was my hardest week

- I struggled immensely on how to develop a good research question
- I didn't understand why a research question was so important



To overcome this, I focused on looking at the key aspects of a research question “**SMART**”

- **S**pecific
- **M**easurable
- **A**ttainable
- **R**elevant
- **T**imely

Another idea I used was

- to look around me to find a research topic that mattered
- with the passion I was able to drive the implementation forward

HYPOTHESIS POSTER

01

OBSERVATION

My observation was from my first day of school, when I saw the amount of girls in the high level classes I was in. It stood out to me the entire day. Seeing this I thought more of how I could study this



02

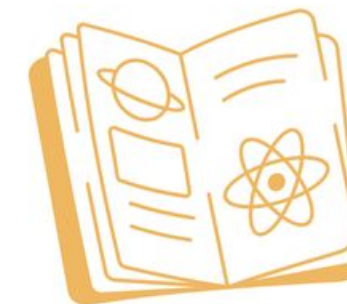
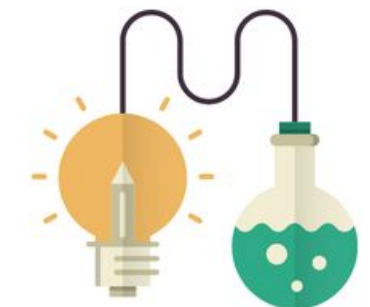
HYPOTHESIS/QUESTION

At Lake Stevens High School in the 25-26 school year, do male and female students differ in their enrollment for applied computer science in comparison with regular computer science? I choose computer science, since there will be a higher sample size.

03

EXPERIMENT/ANALYSIS

I would create a questionnaire with questions including questions of why they are in the class and asking gender, and grade level. Obtain teacher/admin permission to send out questionnaires to all computer science classes. I would analyze this through graphs and taking percentage.



04

CONCLUSION

Depending on what the numbers show, draft a conclusion based on reasons why a certain gender is higher.

Week 2 Continued...

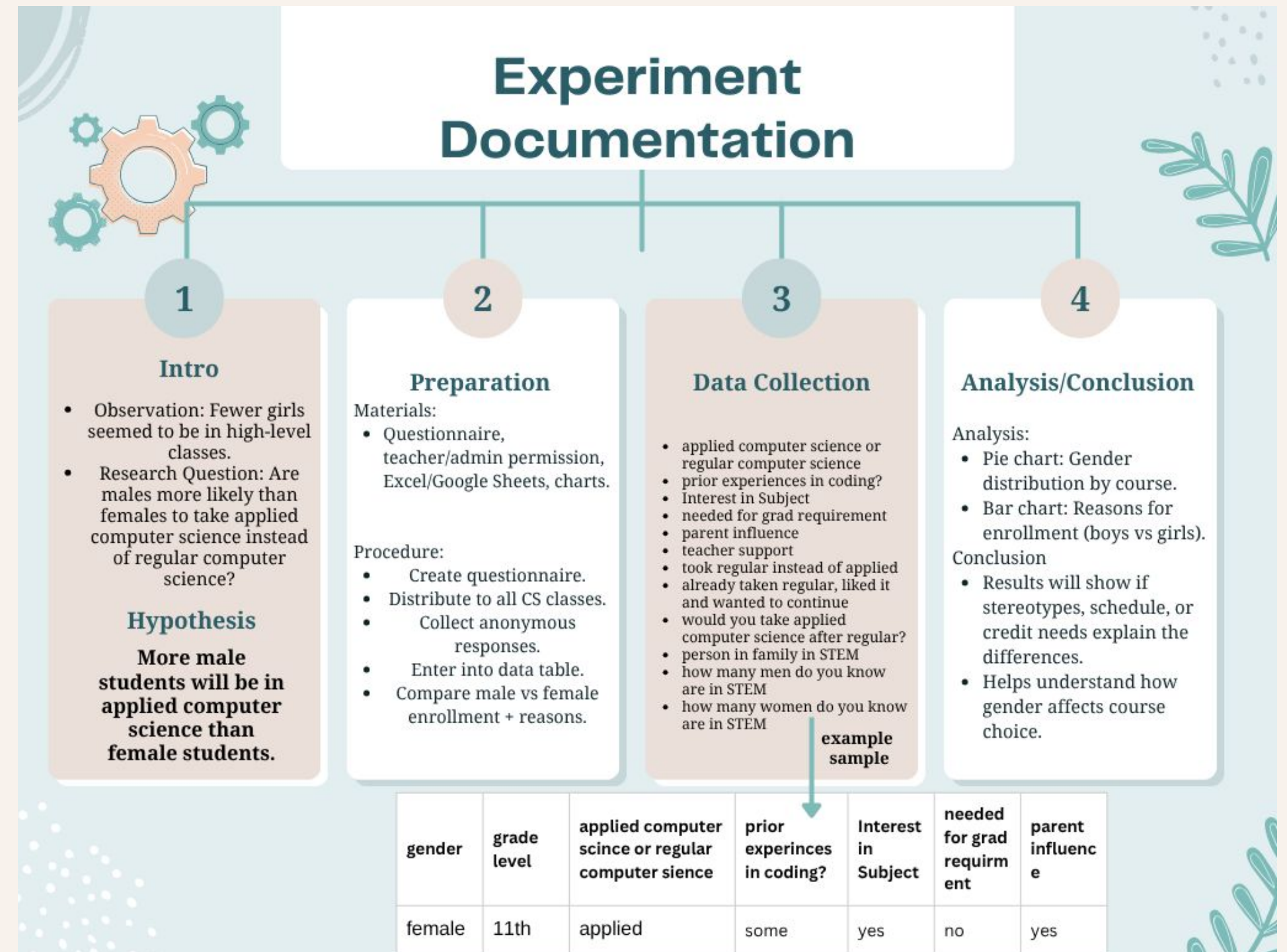
This week I also learned that research isn't about following steps 1,2,3

Based on my research question, I developed plans for analysis right at the start

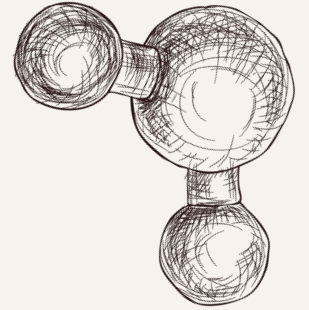


I put together

- The type of data I wanted to collect
- Figured out ways I could analysis is
 - Chi square test
 - Looking for reasons behind the numbers
- Brainstormed ideas to showcase my data



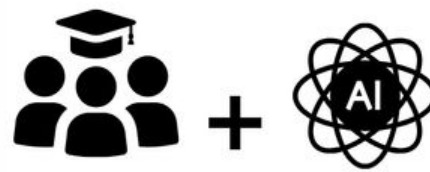
Week 3



During my first day of school, I looked for problems or things that stood out in my class



Two major things I saw was gender diversity in advanced classes and the talk of how to use AI



From there I developed drafts of research questions such as: Does gender have an impact on what class students take?



I looked at the table given and refined it based on SMART, is it specific, measurable, attainable, realistic, and time based

SMART

From there I got:
At Lake Stevens High School in the 25-26 school year, do male and female students differ in their enrollment in advanced-level courses (e.g., AP Biology vs. regular Biology).

This research question is something I can take action on through surveys of my students or asking my school for classes and how many of each gender are in it.



03

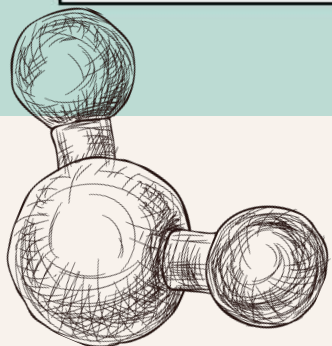
Research Question

At Lake Stevens High School in the 25-26 school year, do male and female students differ in their enrollment in advanced-level courses (e.g., AP Biology vs. regular Biology)

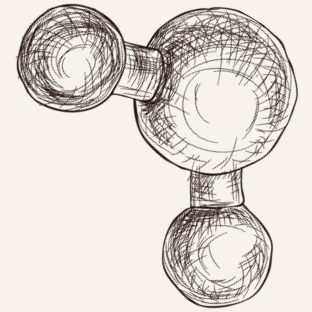


I refined this afterwards to be more measurable:

At Lake Stevens High School in the 25-26 school year, do male and female students differ in their enrollment for applied computer science in comparison with regular computer science ?



Week 4



GENDER DIFFERENCES IN ENROLLMENT BETWEEN APPLIED AND REGULAR COMPUTER SCIENCE AT LAKE STEVENS HIGH SCHOOL

BY: HARSHITA SINHA

Introduction

From my first day of school, I noticed that in the advanced classes I was in, there were more girls than I expected. This made me curious about whether gender differences also show up in other advanced classes. To narrow down my hypothesis I wanted to look at the differences between Applied Computer Science and Regular Computer Science at Lake Stevens High School.

Research Question

At Lake Stevens High School during the 2025-2026 school year, do male and female students differ in their enrollment between Applied Computer Science and Regular Computer Science?

Data Table

Features would include:

- gender
- grade level
- applied computer science or regular computer science
- prior experiences in coding?
- Interest in Subject
- needed for grad requirement
- parent influence
-

Features would include:

- teacher support
- took regular instead of applied
- already taken regular, liked it and wanted to continue
- would you take applied computer science after regular?
- person in family in STEM
- how many men do you know are in STEM
- how many women do you know are in STEM
-

Things to note before compiling real data

- leave room for figures, this is a simple layout, however graphs will be the main part of the results section
- the data table will be there instead of just features - will summarize the data with totals from the responses and place that here

Findings

- Percentage in number of boys in comparison to girls
 - Which gender is more in applied
- Show percentage calculations and explain what the correlation is from answers, gender, and applied versus comparison.



Degrees of freedom (df)	.99	.975	.95	.9	.1	.05	.025	.01
1	0.001	0.004	0.016	2.706	3.841	5.024	6.635	
2	0.020	0.051	0.103	0.211	4.605	5.991	7.378	9.210
3	0.115	0.216	0.352	0.584	6.251	7.815	9.348	11.345
4	0.297	0.484	0.711	1.064	7.779	9.488	11.143	13.277
5	0.554	0.831	1.145	1.610	9.236	11.070	12.833	15.086
6	0.872	1.237	1.635	2.204	10.645	12.592	14.449	16.812
7	1.239	1.690	2.167	2.833	12.017	14.067	16.013	18.475
8	1.646	2.180	2.733	3.420	13.362	15.507	17.535	20.090

Methods For Analysis

- Chi square test to see statistical significance
 - Tables of observed vs expected
 - $E = \frac{\text{grand total}(\text{row total}) \times (\text{column total})}{\text{grand total}}$
- Percentage calculations from every feature to see impact and use graph to see differences in features for each gender

Data Vizulation Tools

- Chi Square Tables
- Google sheets
 - Pie graph with percentage
 - Bar graph with gender and reasons

Conclusion

- To understand if gender is a true factor in course choice or what other reasons can impact class choice.

Things to note before compiling real data

- leave room for figures, this is a simple layout, however graphs will be the the main part of the results section
- the data table will be there instead of just features - will summarize the data with totals from the responses and place that here

04 Research Poster

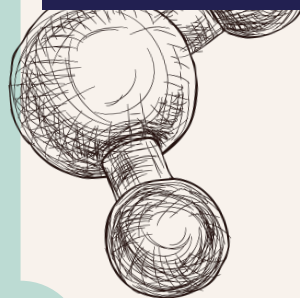
Created layout for research poster and added all known information



- Figures
- All Sections

- Introduction
- Methods
- Results/Conclusion

I never thought I would ever work on presenting my findings before having any, but the impact isn't in answers but what the question you have to solve and pointing that out

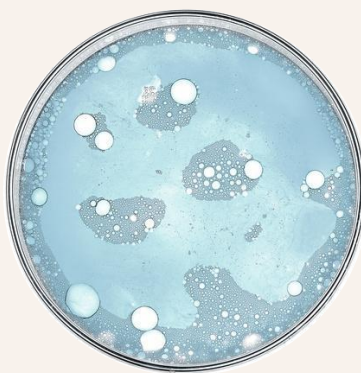


How am I implementing what I learned?



- The experiment

Using my research question and research plan I developed in my training. I followed it, and created a questionnaire



- Data Collection

- I sent out the questionnaire to all computer science students
- Currently I have 28 responses out of 54



Linked to spreadsheet for data analysis

Computer Science Questionnaire

Thank you for taking the time to fill this out. There are no right or wrong answers. This is just to learn more about what impacts students choosing classes.

harshitasinha188@gmail.com [Switch account](#)

Not shared

gender

- ☐ Male
- ☐ Female
- ☐ Other: _____

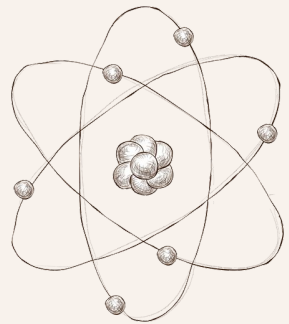
Timestamp	gender	grade level	Which class are you taking?	Prior experiences in computer science	Why did you choose this class?	Confidence in your choice	Do you think AP Computer Science is a good choice?	Who encouraged you to take this class?	Did anyone discourage you from taking this class?	If so, who?
9/30/2025 19:08:22	Male	10th	AP computer science	A lot (multiple classes, I was interested in the tr	Somewhat confident	Yes	I found interest in it mys	No	Not	
9/30/2025 19:10:03	Male	10th	AP computer science	A lot (multiple classes, I was interested in the tr	Very confident	Yes	Parent(s)	No	Not	
9/30/2025 19:10:28	Male	10th	AP computer science	Moderate (previous schv	I was interested in the tr	Somewhat confident	No	No one	No	Yes
9/30/2025 19:18:34	Male	10th	AP computer science	Moderate (previous schv	I was interested in the tr	Neutral	Yes	I found interest in it mys	No	Not
9/30/2025 19:47:39	Male	10th	AP computer science	Moderate (previous schv	I was interested in the tr	Somewhat confident	Yes	I found interest in it mys	No	Not
10/1/2025 8:05:38	Male	12th	AP computer science	A little (self taught, shor	I was interested in the tr	Very confident	Yes	Friend/peer	No	Not
10/1/2025 8:03:58	Female	11th	AP computer science	Moderate (previous schv	I was interested in the tr	Somewhat confident	Yes	I found interest in it mys	No	Not
10/1/2025 8:04:28	Male	10th	AP computer science	Moderate (previous schv	I was interested in the tr	Very confident	No	I found interest in it mys	No	Not
10/1/2025 8:37:45	Male	11th	AP computer science	Moderate (previous schv	I was interested in the tr	Somewhat confident	Yes	I found interest in it mys	No	Not
10/1/2025 8:37:50	Male	11th	AP computer science	Moderate (previous schv	I was interested in the tr	Somewhat confident	Yes	I found interest in it mys	No	Not
10/1/2025 8:38:14	Male	10th	AP computer science	Moderate (previous schv	I was interested in the tr	Very confident	No	I found interest in it mys	No	Not
10/1/2025 8:39:33	Male	10th	AP computer science	A little (self taught, shor	I was interested in the tr	Somewhat confident	Yes	Parent(s)	No	Not
10/1/2025 8:40:35	Female	10th	AP computer science	Moderate (previous schv	I was interested in the tr	Somewhat confident	No	Friend/peer	No	Not
10/1/2025 8:41:36	Male	10th	AP computer science	A lot (multiple classes, I	I was interested in the tr	Very confident	No	Myself	No	Not
10/1/2025 8:41:44	Female	11th	AP computer science	Moderate (previous schv	I was interested in the tr	Somewhat confident	No	I found interest in it mys	No	Not
10/1/2025 8:46:24	Female	11th	AP computer science	Moderate (previous schv	I was interested in the tr	Somewhat confident	No	I found interest in it mys	No	Not
10/1/2025 8:50:21	Female	10th	AP computer science	Moderate (previous schv	I was interested in the tr	Somewhat confident	Yes	I found interest in it mys	No	Not
10/1/2025 9:37:51	Female	10th	AP computer science	A lot (multiple classes, I	I was interested in the tr	Neutral	No	Parent(s)	No	Not
10/1/2025 17:46:05	Female	10th	AP computer science	Moderate (previous schv	I was interested in the tr	Somewhat confident	Yes	I found interest in it mys	No	Not



- End Goal

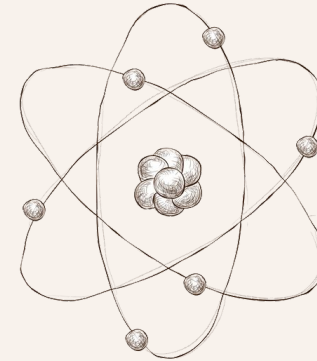
- After we get all of our data - we want to run an analysis to see if there is a statistical difference
- If so, to look at the question answers of stereotypes or influence to find reasons behind the numbers

Reflection



Change in Thought process

- Research doesn't have rules - it's about learning
- When approaching a research question - you must look at all angles
- Your hypothesis being incorrect is not a bad thing, you still learn something
- I didn't just learn how to do research - but how to think



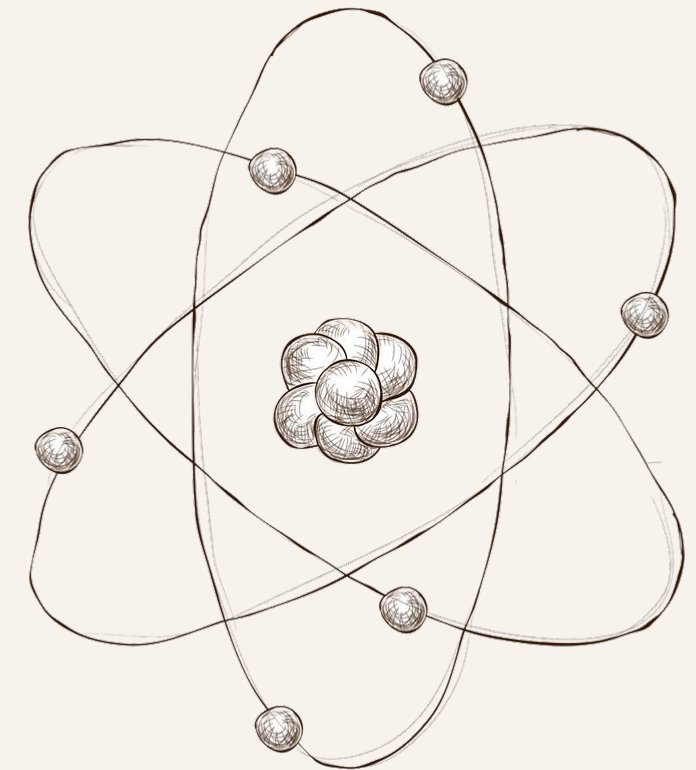
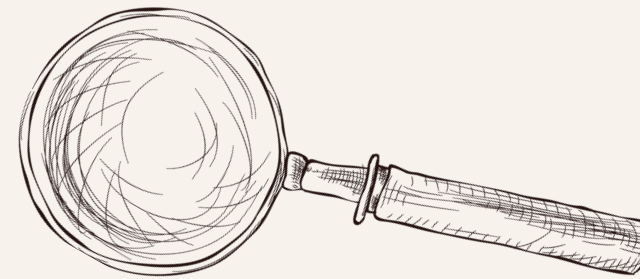
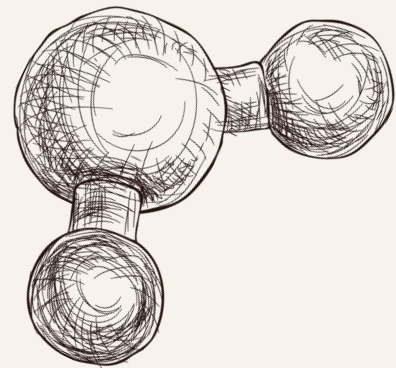
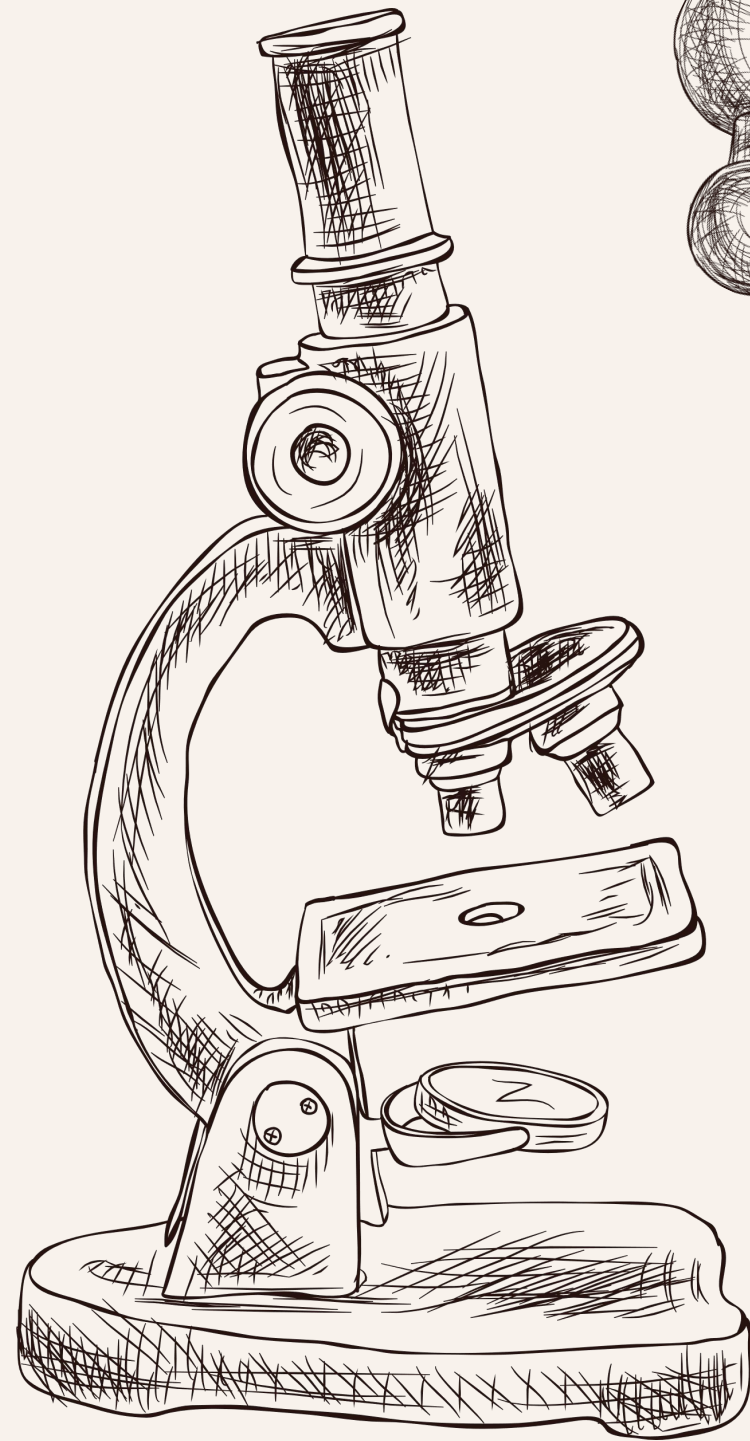
What I learned

- When developing a topic, it should be something you are passionate about
- Remember that research is an iterative process - expect to refine your approach as you learn
- It will never be perfect - and you have to be okay with that.

Future Goals

- As a highschooler I have time but I have a few aspirations I look up to
- I would like to major in Molecular Biology
 - I am really fascinated by genetics so hopefully that's something I can study
- I would be grateful to work towards getting my PhD in the far future





Thank you!

Do you have any questions?

