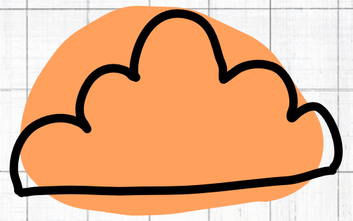
Science Fair Success

Dodging the Most Common

Project Pitfalls

Alaina Garza

RESEARCH QUESTION SELECTION PITFALLS



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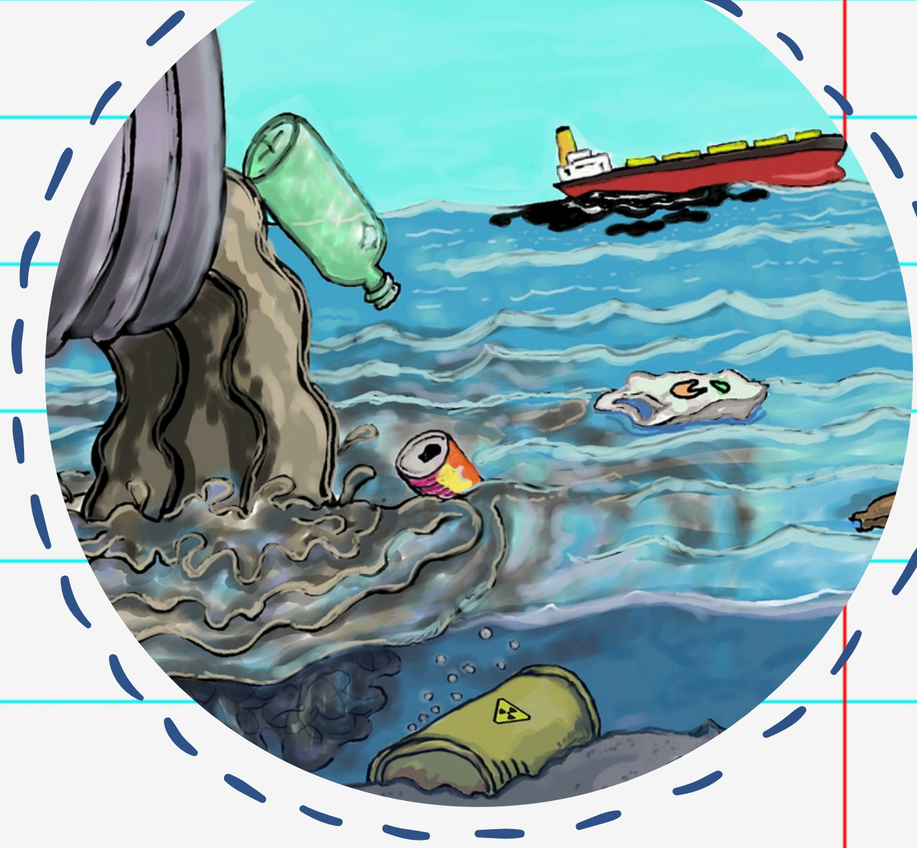
Choose a narrow topic



Needs to be:

- testable
- measurable

Too broad: How does pollution affect the environment?

Better: "Does the amount of plastic in saltwater affect the growth rate of algae?"

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Start With a Big Idea

- READ READ READ articles on current research about it

Narrow the Topic

- Focus on a specific species, location or independent variables

Originality

- Google your question, has this already been studied?
- What variable can you add that hasn't been tested?

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Make it Testable- Not just a demonstration

- "How does ____ affect ____?"
- "What is the effect of ____ on ____?"

Check for Feasibility

- Can you do this with available materials?
- Can you measure the results in numbers (height, time, count, pH, etc.)? Sometimes, qualitative data works well too.
- Can you repeat it for reliable data? Larger sample sizes allow for more accurate data and repeatability.

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Suggestions for narrowing your focus:

1. Choose a specific research question within your broader science topic to investigate thoroughly.
2. Focus on a particular aspect or variable related to the topic.
3. Narrow down the target population or sample size to make the study more manageable.
4. Concentrate on a specific time frame or historical period for your research.
5. Select a particular geographical area or ecosystem to study the impact of environmental factors.
6. Opt for a well-defined experimental design to explore a specific hypothesis.
7. Limit the number of variables you investigate to maintain clarity and precision in your findings.
8. Concentrate on a specific species or group within a biological study to delve deeper into their behaviors or characteristics.
9. Choose a specific technology or technique to analyze and improve upon in your engineering project.
10. Exploring the applications and implications of a scientific concept within a specific industry or field.

Narrowing the focus of engineering projects:

1. Focus on optimizing a particular component or subsystem of a larger engineering system.
2. Concentrate on a specific industry or application for the engineering solution.
3. Choose a particular material or technology to explore its feasibility and performance in a specific context.
4. Address a specific challenge or problem within the chosen engineering field.
5. Concentrate on a particular demographic or user group to tailor the engineering solution to their needs.
6. Opt for a specific budget constraint or resource limitation to design a cost-effective engineering solution.
7. Address a particular environmental or sustainability aspect of the engineering project.
8. Choose a specific geographic location or setting to adapt the engineering solution to local requirements.
9. Focus on enhancing a specific performance metric or characteristic of the engineered product or system.

Project Question/Goal Peer Review

Question/Goal:

_____

_____

1. Is the research question clearly stated and specific?

2. Does the research question have an answer already?

3. Does the research question address an important and relevant issue in the field?

4. Is the research question feasible and realistic in terms of data collection and analysis?

5. Does the research question build upon existing knowledge and literature in the field?

6. Is the research question testable and can it be answered through data?

UTILIZE PEER REVIEW

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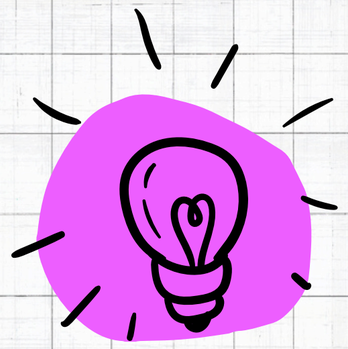
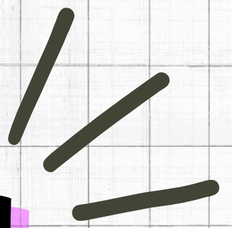


EXPERIMENTAL DESIGN PITFALLS



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Controlled experiments

- Constants- isolate the effect of the IV and limit confounding variables
- Control Group- comparison to determine IV effect

NUMBER OF VARIABLES

- Focus on a few to study well

SAMPLE SIZE

- For accuracy and reliability, test as many times as feasibile

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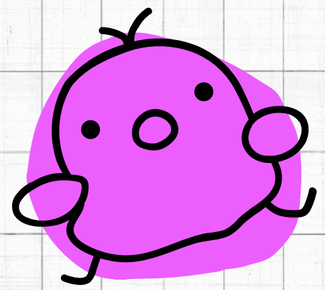
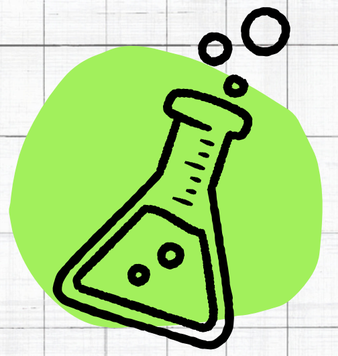
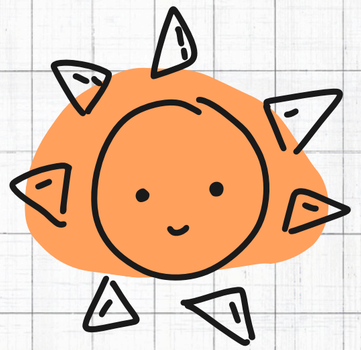


RULES



PITFALLS



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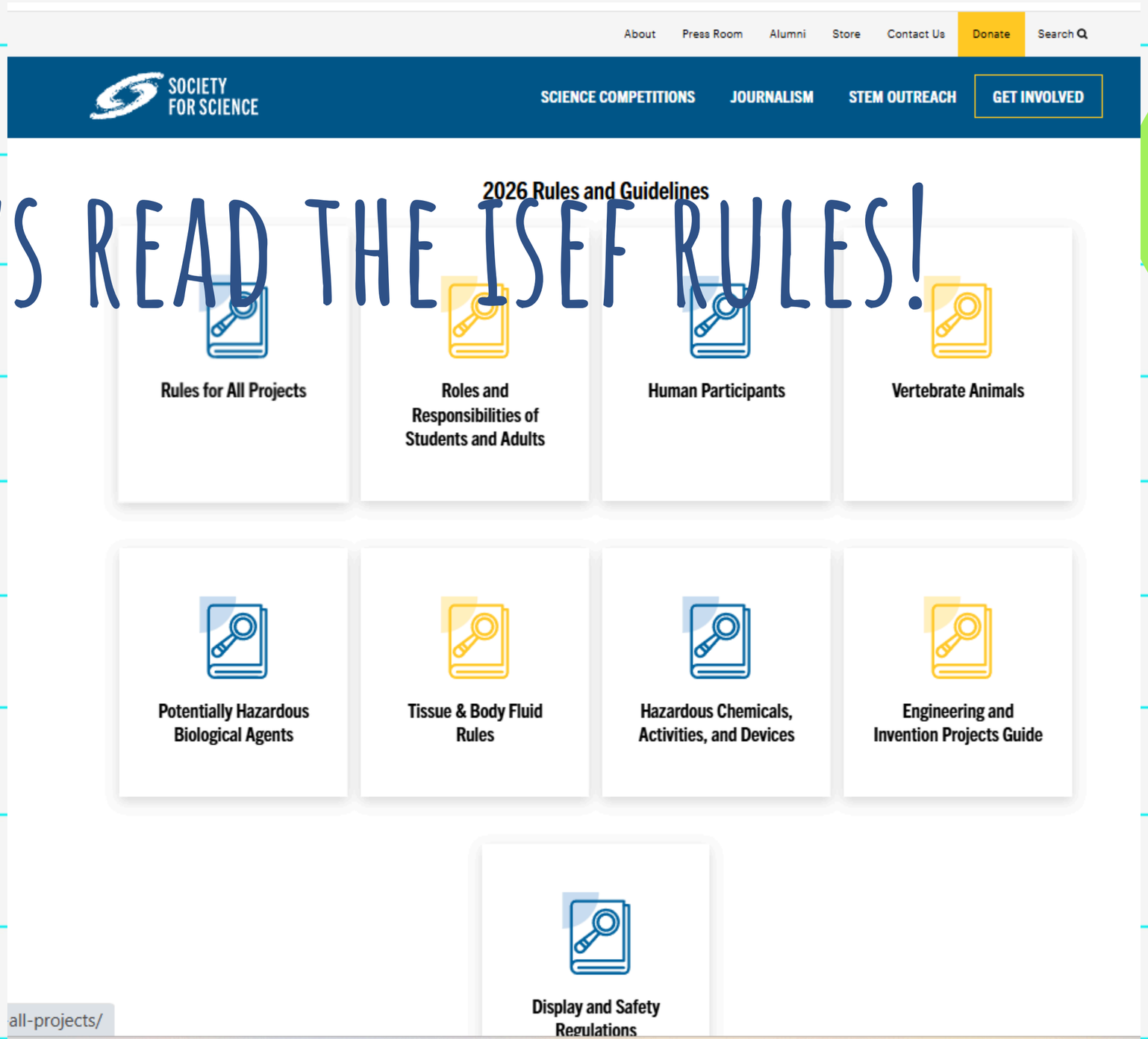
ALWAYS READ THE ISEF RULES!



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COMMON PITFALLS

Missing parent or teacher signatures

Using a vertebrate animal without approval

Missing IRB signatures for human participants.

Growing bacteria or fungus at home

Using a BSL-2 organism without a lab designed for it

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APPROVALS ASSISTANCE

Middle School

Junior Level

High School

Senior Level

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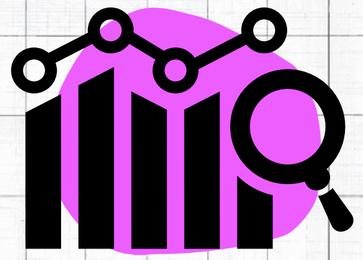

DATA COLLECTION & ANALYSIS

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REPRESENT DATA VISUALLY

- Graph results- label axes with correct and consistent units
- Use the correct type of graph
- Avoid cherry-picking data- it is okay if your hypothesis is not supported by the data!
- Error bars on graphs can show true relationships
- Include the control for comparison

Data Classroom

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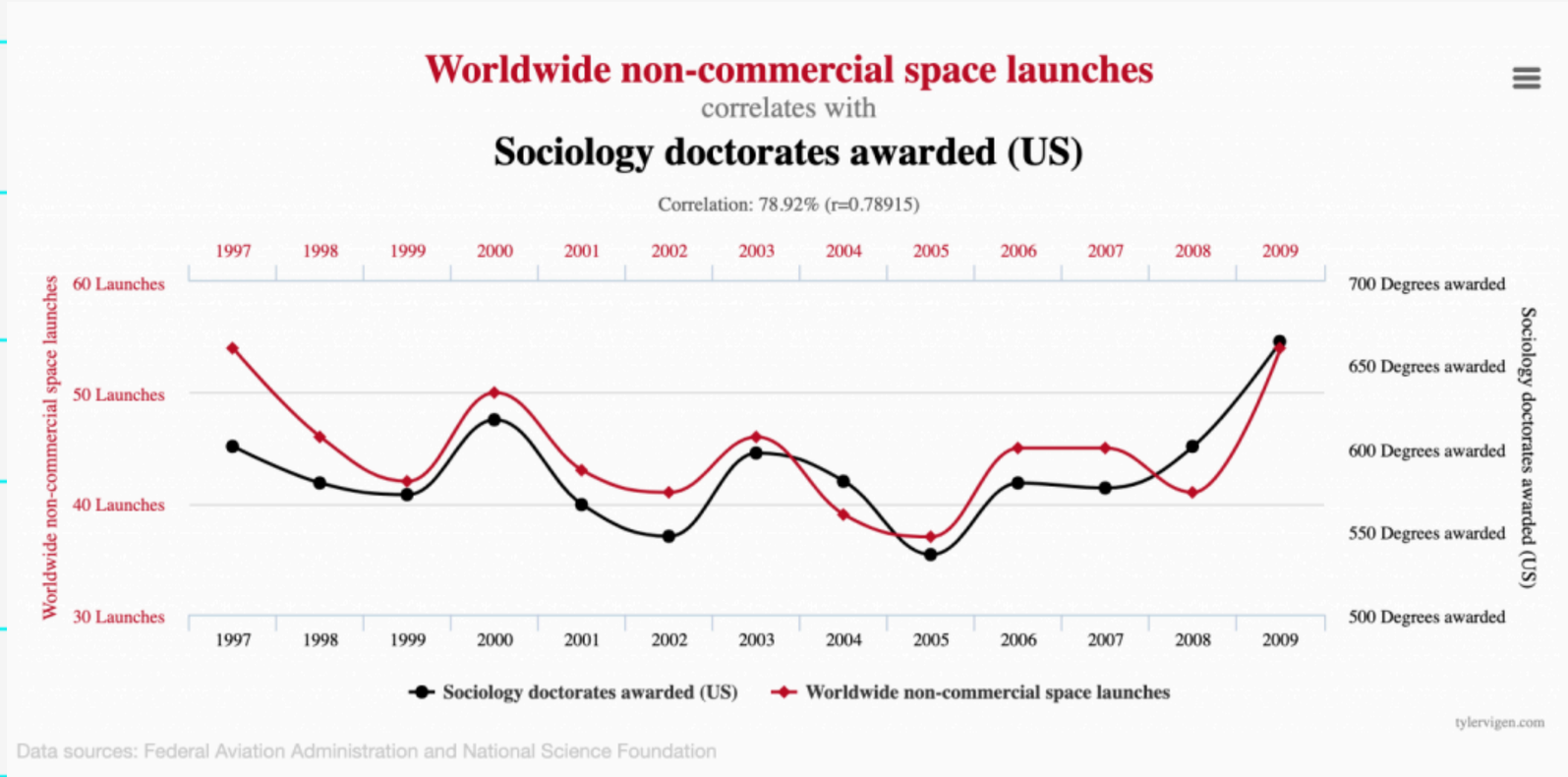
CONCLUSIONS

- Discuss how the data relates to the hypothesis and the research question.
- Avoid confusing causation with correlation



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CONCLUSIONS

- Discuss how the data relates to the hypothesis and the research question.
- Avoid confusing causation with correlation
- Report error analysis and limitations of the experiment
- Beware of overgeneralization

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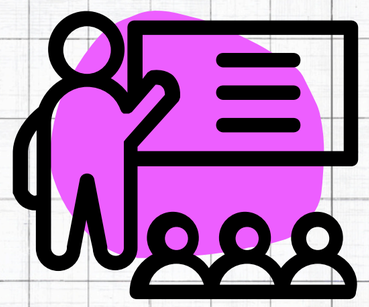

POSTER DESIGN & PRESENTATION

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POSTER & DISPLAY

- Over crowding can be hard to follow- add more visuals
- The poster should have a flow
- Read the Rules! Not everything can be displayed

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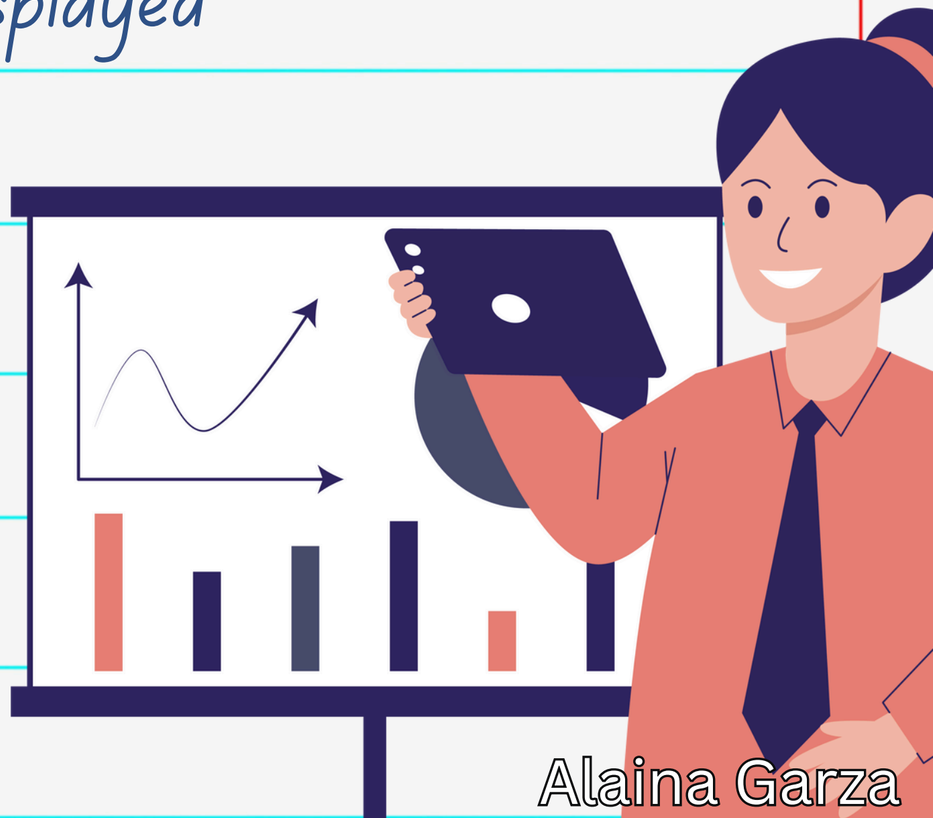
PRESENTATION

- Don't read from the board- this is your story, tell it
- Make eye contact and limit fidgeting
- Interact with the board and any items displayed
- Plan elevator speech for 2-3 minutes
- Don't be afraid to say I don't know
- Be kind and thank your judges
- PRACTICE PRACTICE PRACTICE



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BEST PRACTICES DISCUSSION

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