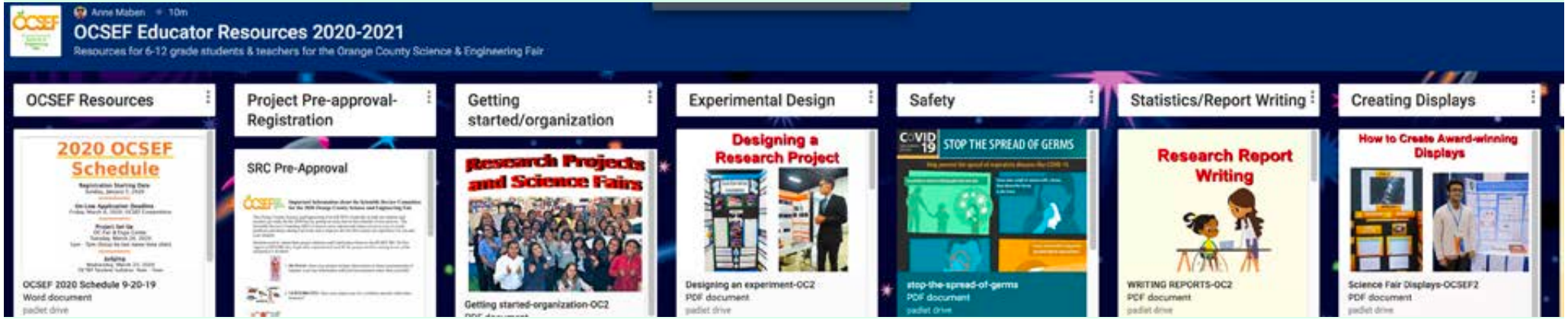
# Research Projects and Science Fairs

# Padlet Resource Link

## HOW TO USE PADLET:

- **All the resources are downloadable and may be used for your classroom. To download, click on a resource and once it appears, click on the downward arrow on the upper right. You can read through resources with multiple pages by scrolling up and down with the curved arrows on the upper left.**
- ***Scroll down the side* of each column to see the full extent of the resources. *Scroll to the right at the very bottom of your screen* to see ALL the columns, including NGSS and Inquiry posters for your classroom. Enjoy!**

**https://padlet.com/afmaben/vf0k85endmhsv1us**



# Why Do Science Fairs?

- Science Fairs are a **fun and meaningful hands-on** learning activity for students at **ALL** ability levels.
  - Encourages students to **wonder, explore and discover** new ideas and new knowledge
  - Helps to promote deep, **lifelong passion for science and engineering**.

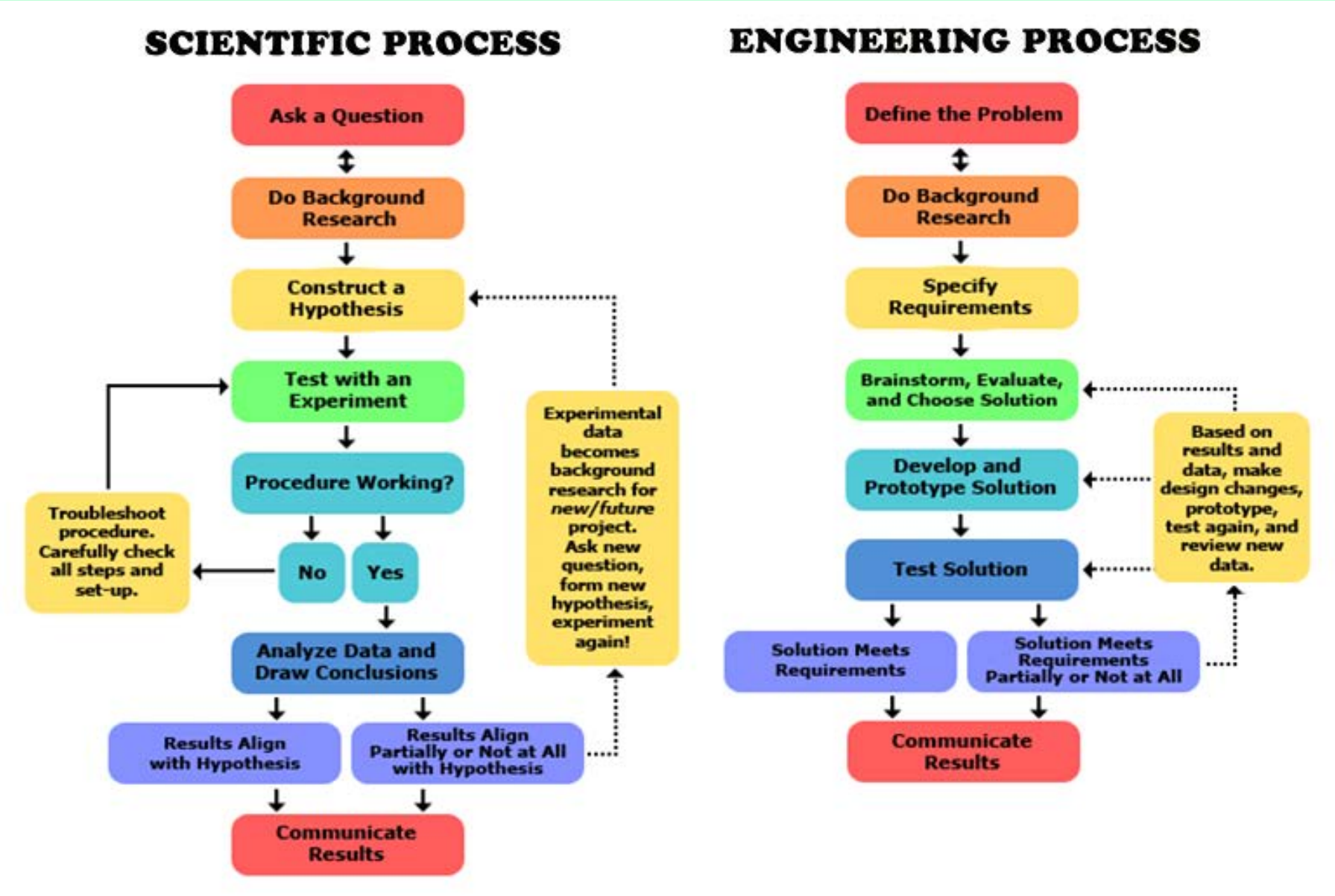
*Courtesy of the White House Science Fair, 2014*

# NGSS Science & Enginering Practices

**The practices work together – *they are not separated!***

1. Asking **questions** and defining **problems**
2. Developing and using **models**
3. Planning and carrying out **investigations**
4. Analyzing and interpreting **data**
5. Using **mathematics** and computational thinking
6. Developing **explanations** and designing **solutions**
7. Engaging in **argument** from **evidence**
8. **Obtaining, evaluating, and communicating** information

# Comparing Design Processes



# Students Use Open Inquiry

- **Inquiry Level 3** = Students decide ***what*** to investigate, ***how*** to investigate it, ***how*** to interpret the results they generate and form **conclusions** or find **solutions**.
- Incorporates most **NGSS SEPs**

**Experimental/Engineering Design Proposal**

**Ask a Question (science) or Define a Problem (engineering)**

**Hypothesis (science) or Specify Requirements (engineering)**

**Independent Variable (IV):**

**Dependent Variable (DV):**

**The Control (science) or Proposed Solutions (engineering)**

**Things to keep Constant:**

**1)**

**2)**

**3)**

**# of Trials/Groups:**

**Procedure:**

**Safety Requirements/Costs**

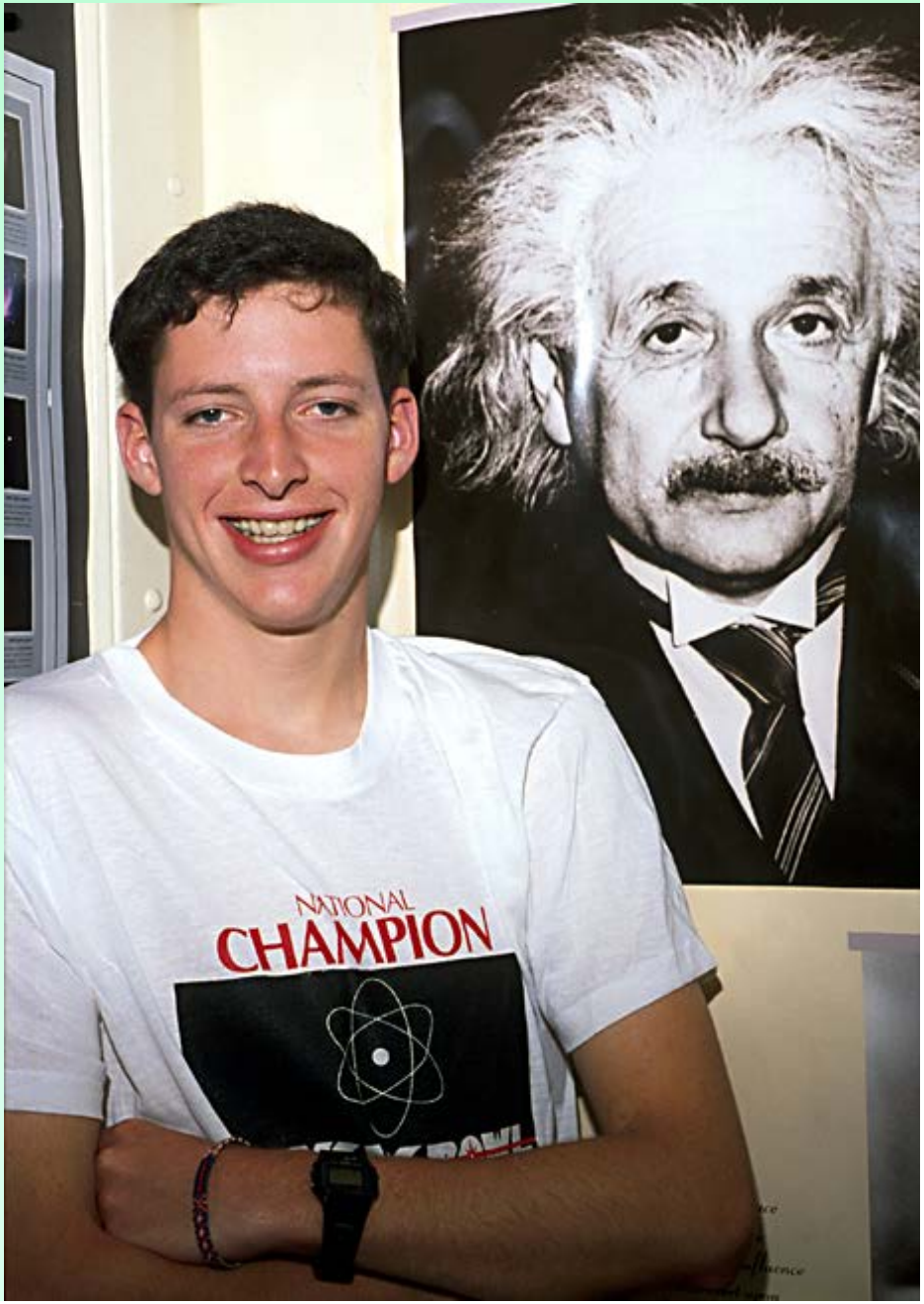
**Expected Results:**

# Interdisciplinary

- **Integrates, into one activity**
  - *Reading* *Critical Thinking*
  - *Writing* *Computer Science*
  - *Spelling* *Science & Engineering Practices*
  - *Math* *Graphic Arts*
  - *Grammar* *Logic*
  - *Statistics* *Self-learning*
  - *Ethics*
  - *Presentation skills*

# Helps College Acceptance

- Seniors with projects accepted to regional fairs are more likely to **be accepted** by schools of their choice



# Higher Level Collaboration/Presentation Skills

- Students **practice higher-level communications skills** when fine-tuning their presentations to the judges. ***(One of the NGSS SEPs)***

- By participating in a more global event, it helps develop a feeling of **confidence** and competence among students, and **fosters a spirit of scientific inquiry**.

# Win Big Prizes

- The first step in competitions that lead up to the **international level**, where prizes total over $3,000,000 and the top winners take home $50,000 scholarships.

- Besides **cash prizes**, students receive *recognition and/or* ***scholarships.***

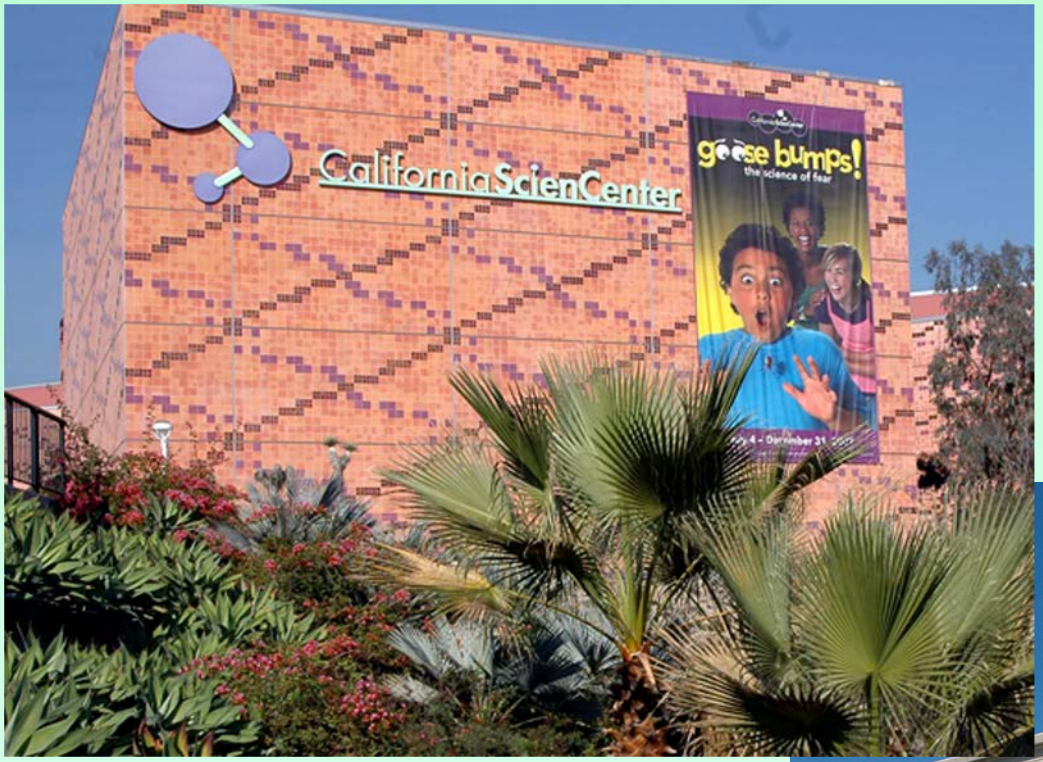
# Begins with a Class or School Science Fair


# Orange County Science & Engineering Fair

***Top 15 projects <u>per school</u> can register, including*** **team projects of 2-3 students**

**District Fairs may enter up to 100 projects**

# State Science Fair




**CA Science Center, Los Angeles, CA**


**Top 1st, 2nd & 3rd in category per County Fair**

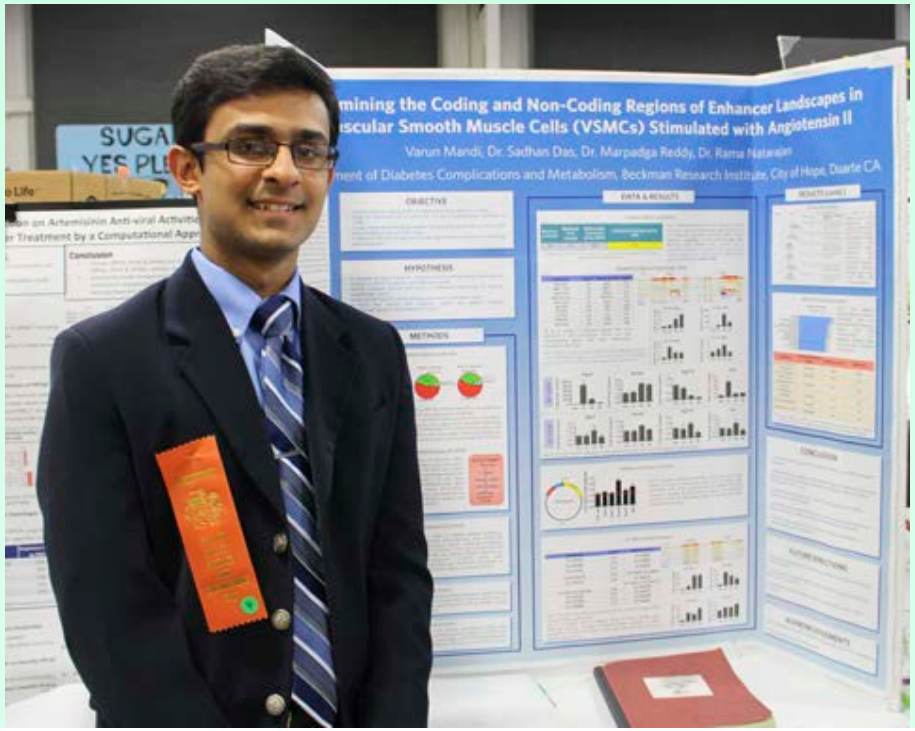
# State Science Fair

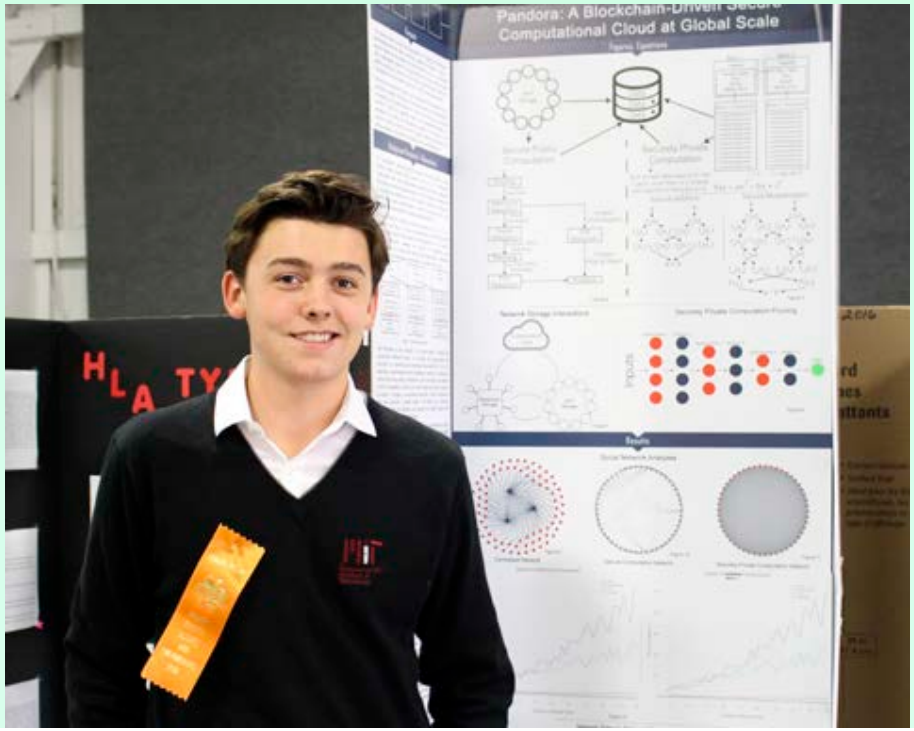


**Awards Ceremony in Big Lab**

# International Science & Engineering Fair


- **Top 2- 6** student projects in the Senior Division may be selected *for international* competition!



# Choosing a Topic

- Projects should be **student driven.**

- Project ideas ***should come from the students***, and the project should be driven by them.


- **Parents** should use their best judgment and provide <u>some</u> guidance, but it is important that **students consider the project their own.**

# Choosing a Topic

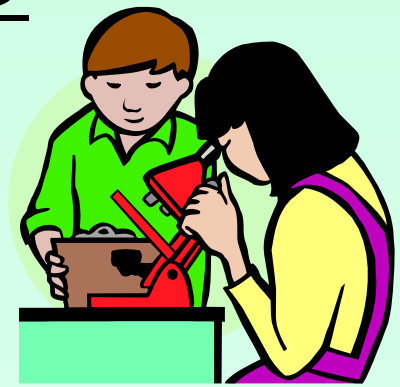
- Step 1 - **Library/Online Research**
  - Make a list of 5 things that seem interesting to you

# Choosing a Topic

- Step 2 - **Pick a Topic That Matches Your Interests**
  - **NEVER** have someone pick it for you!
    *It will seem like **work***
  - Decide what you are ***PASSIONATE*** about outside of school and design a project that matches it...
    - *It will seem like **play!***

# Choosing a Topic

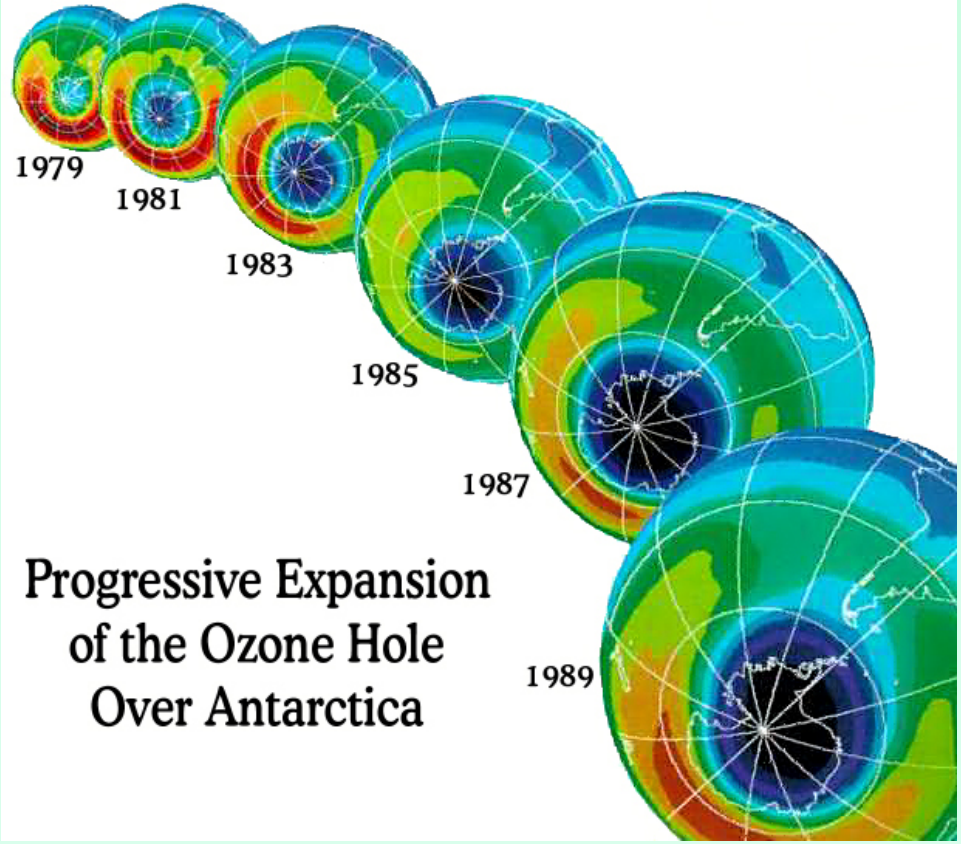
- Step 3 - ***Narrow your topic*** so that it involves:
  - *Experimentation <u>or</u> Engineering Design <u>or</u> Observational Comparisons <u>AND</u>*
  - *Data collection*



- Should be **specific** enough to make into a problem & a research study

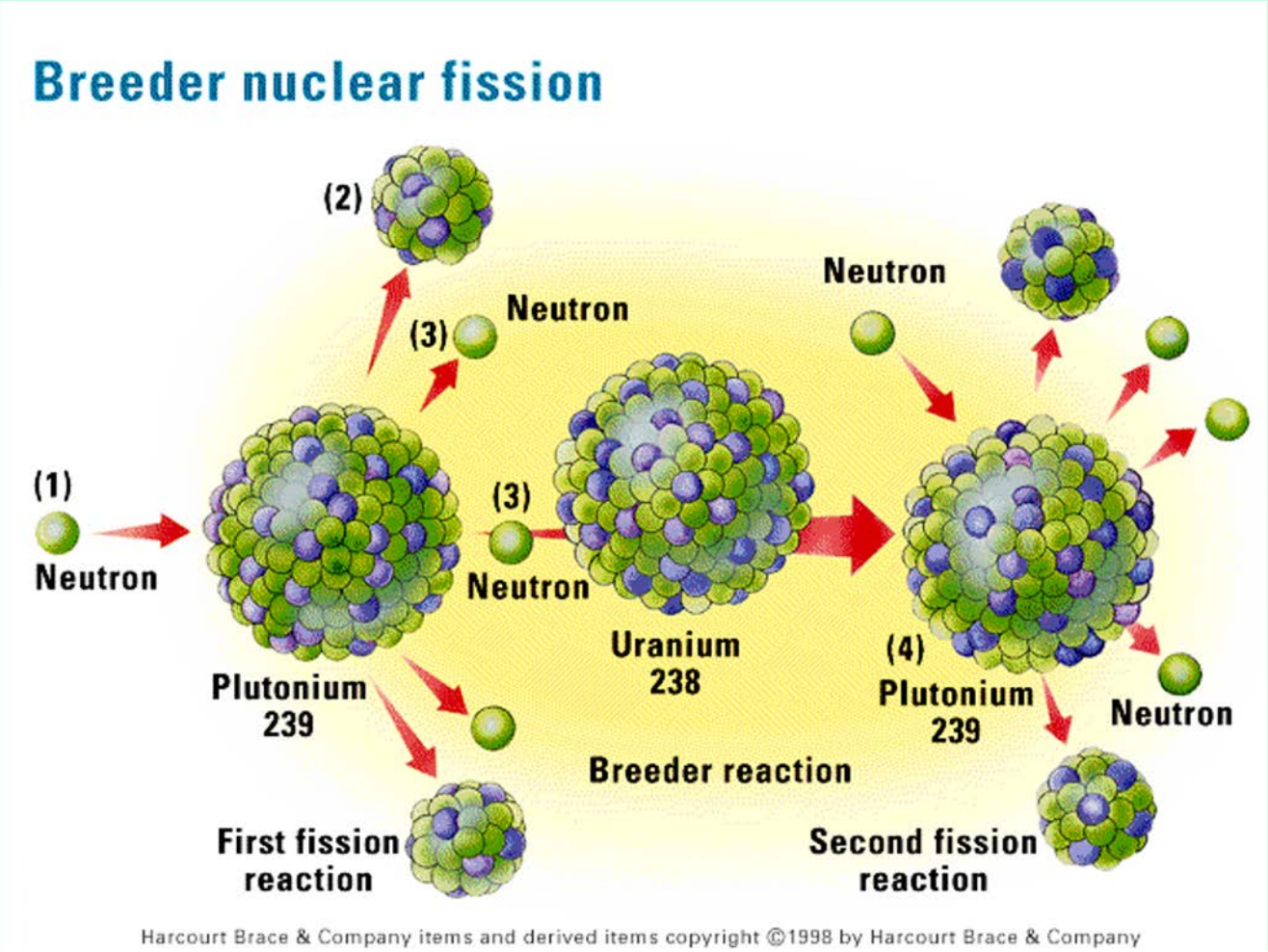
# CAUTION!

- Avoid topics that are **too general** since these cannot be made into a problem and an experiment
  - *Instead, make general ideas* ***more specific***



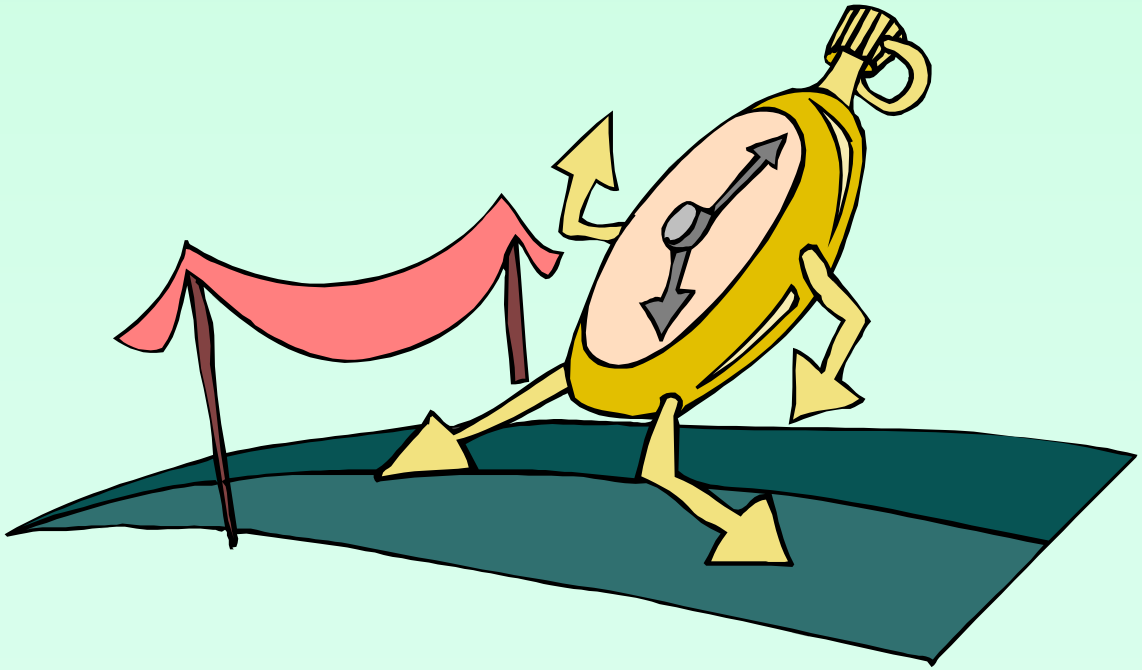
# CAUTION!

- Avoid topics that require **unavailable resources**



# CAUTION!

- Avoid projects that require **too much time**
  - Look at your overall schedule, pick a topic that's **reasonable**

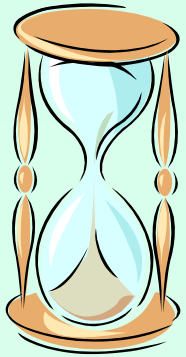


# Sample Timeline

*Get an early start (**Aug-Oct**)*

*Most school fairs are in **March**!*

| | |
|---|---|
| 1. Decide on a project | **1 week** |
| 2. Background research | **1 week** |
| 3. Hypothesis/project design | **1 1/2 weeks** |
| 4. Submit **project proposal** to teacher for approval ***before*** starting experimentation | **1 week** |



# Sample Timeline

5. Complete **Online Pre-approval Certification** *before* starting experimentation with:
   - *tissues/cell lines*
   - *human subjects*
   - *live vertebrate animals*
   - *hazardous materials or*
   - *microbes*

# Sample Timeline

| | |
|---|---|
| **6.** Experimentation | **4- 6 weeks** |
| **7.** Results, analysis | **1- 2 weeks** |
| **8.** Writing the project report | **1- 2 weeks** |
| **9.** Building a display board | **2-3 days** |

# Teacher's Role - Facilitator

- To help students create a **workable, scientifically sound experimental design**
- To set a **reasonable timeline** for completion
- To encourage **creativity** and independent thinking
- To **periodically check** on and/or grade progress
- To arrange for a **public audience** and **peer review**

# Developed by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***For the***

Orange County Science & Engineering Fair

**http://www.ocsef.org/**