



# **SARSEF**

**SOUTHERN ARIZONA RESEARCH, SCIENCE AND  
ENGINEERING FOUNDATION**

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Director of Programs

# FEW QUICK QUESTIONS...

How many of you feel you understand the value of your child(ren) completing science and engineering projects?

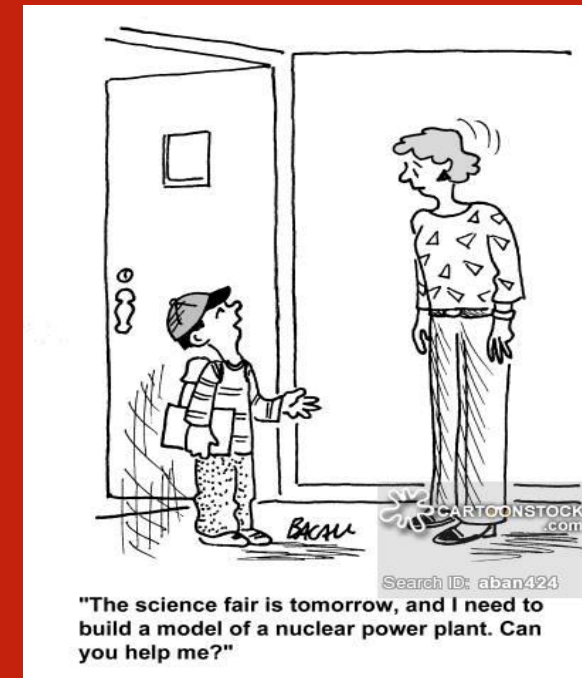
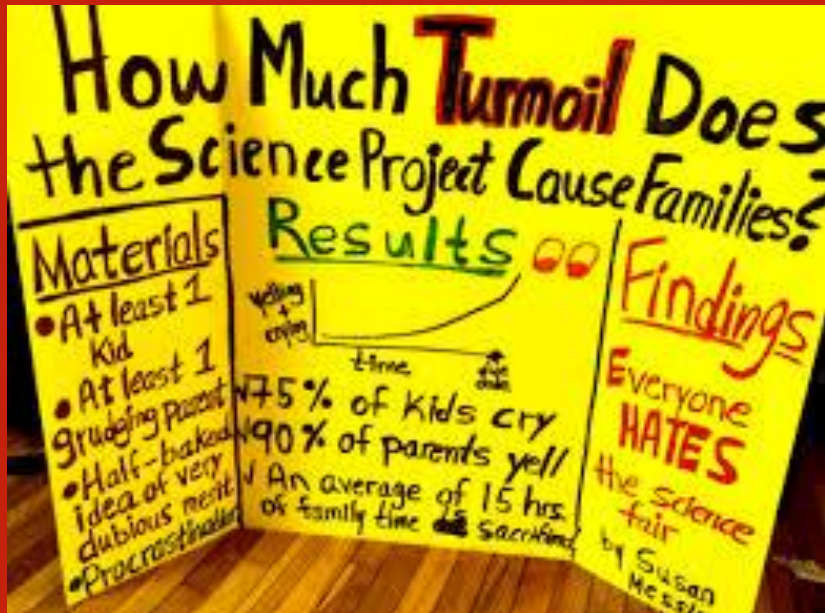
How many of you believe that you can successfully guide your child(ren) in completing award/prize winning projects?



# SARSEF – WHY ARE YOU HERE?

You just heard that your child will have to do a Science or Engineering Fair project in school.....

And you want to find out how much work this will be for YOU.



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You just heard that your child will have to do a Science or Engineering Fair project in school .....

And you can't wait to get started on YOUR idea for this year's project.



# SARSEF – WHY ARE YOU HERE?

You just heard that your child will have to do a Science or Engineering Fair project in school.....

And you can't wait to get started on a project **together**. You just need to find out what to do and how...



# SARSEF – WHAT IS IT?



**130,000 students from across Southern AZ participate in their school fair to become one of over 2000 projects at SARSEF. This experience starts with your child's Science or Engineering Design project!**

# COMPETE FOR \$100,000 IN CASH AND PRIZES

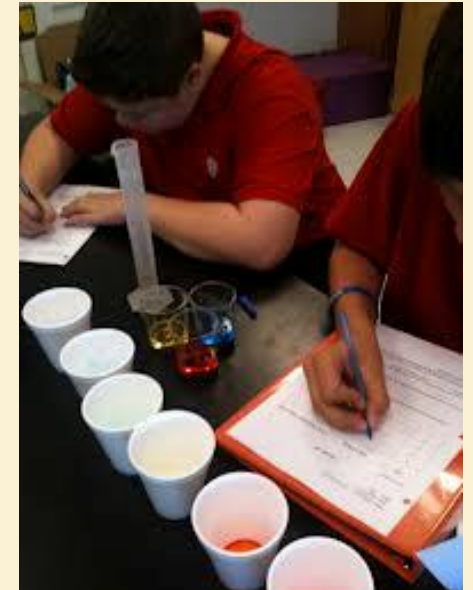


- Cash prizes from \$25-\$2500
- Trophies, plaques, certificates, medals, and ribbons
- Kindles, Ipods, calculators, computers, books, gift cards
- Camps, gift bags, memberships
- TV, Media, Newspaper, Magazine Interviews
- Scholarships (High School)
- Trips

# WHY DO A PROJECT?

Students who complete science and engineering projects:

- Score higher on Arizona Standardized Assessments in Science, Math and ELA
- Improve critical thinking and problem solving skills
- Engage in hands-on learning
- Fulfill school requirements
- Learn to collaborate
- Practice communication skills
- Have FUN!
- Have opportunity to compete and earn prizes



# HOW MUCH DO I HAVE TO HELP??

Just like in sports or other activities your children have a coach or mentor. But just like sports and other activities, they don't do the activity for the students!



# SCIENCE AND ENGINEERING PRACTICES

## Science

- How nature works -begins with a **question**
- Researches question
- Observations/investigations are conducted
- Data is collected from experiments
- Interpret, analyze and construct explanations

## Engineering Design

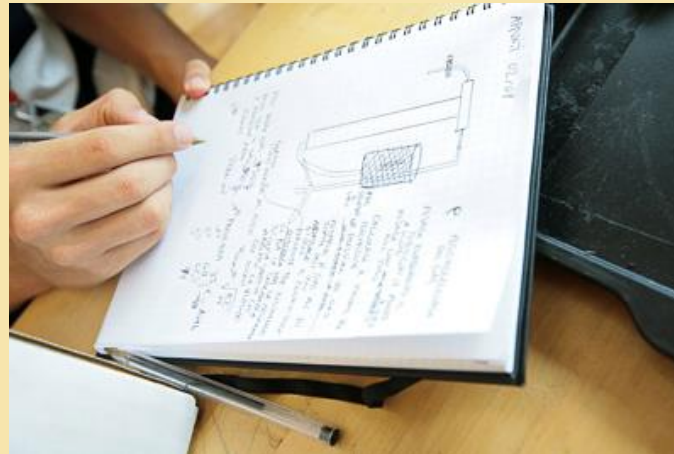
- Creates solutions – begins with a **problem**
- Researches problem
- Possible alternatives to problem are developed
- Prototypes are created and tested
- Data is collected
- Evaluate ability to solve problem



# START YOUR LAB BOOK/ENGINEERING DESIGN BRIEF

As soon as your child starts thinking about their topic it is time to start keeping track of your investigation in a lab book.

1. Your ideas
2. Research
3. Materials
4. Experiment Set Up
5. Data & Results
6. Data Analysis
7. Conclusions

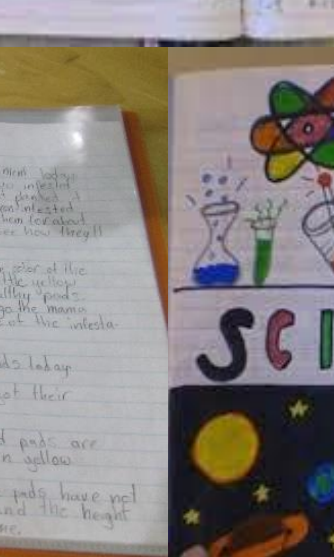
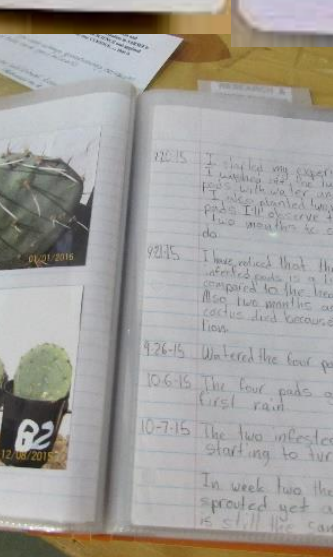
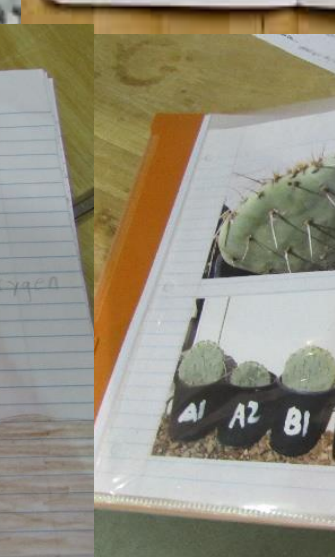
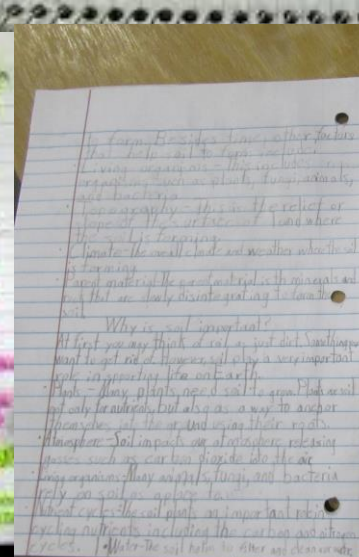
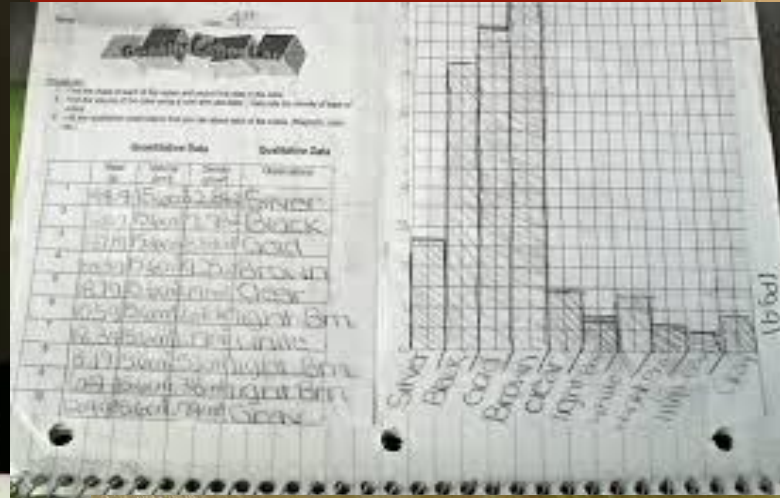
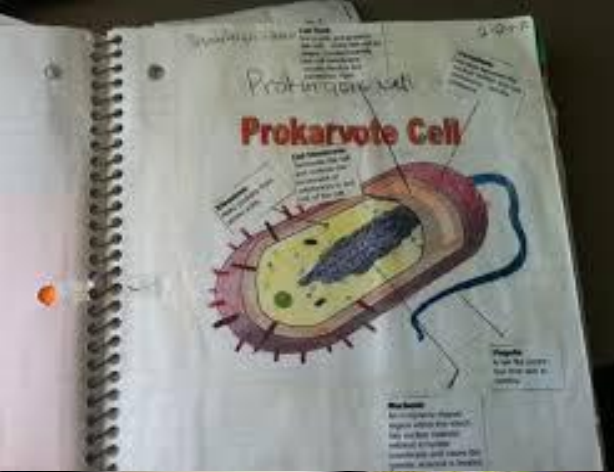


Write an entry for each day you work on your investigation.

Date it!

One of the most IMPORTANT things a Scientist/Engineering can do!!

# SAMPLE LAB JOURNALS AND ENGINEERING DESIGN BRIEFS



# Part 1: Get an Idea - Ask a Question Or Determine the Problem

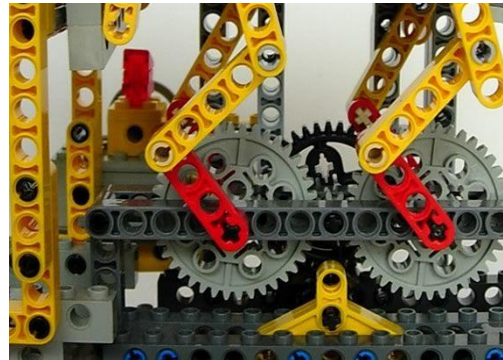
Science and Engineering ideas  
come from your child's mind; from what  
your child likes to do



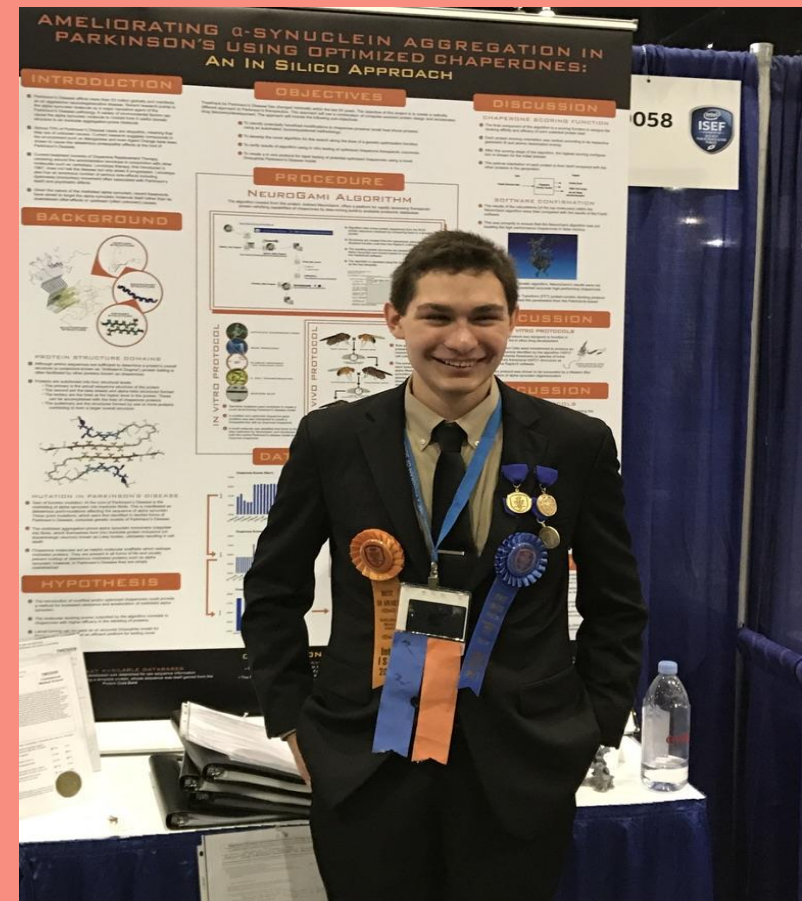
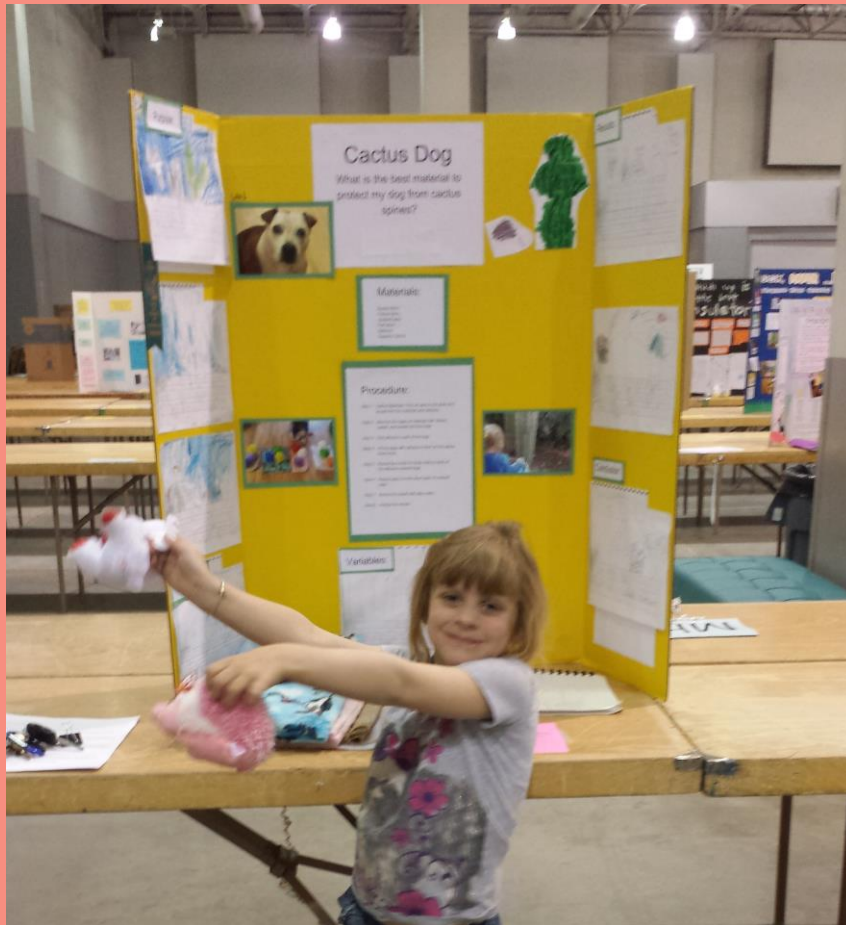
Not a book or the internet.  
Your child and you will have fun,  
and

Learn more if you pick something  
that interests them!

# WHERE DO IDEAS COME FROM?



**IF POSSIBLE CONNECT YOUR TOPIC TO MAKE A DIFFERENCE OR HAVE AN IMPACT ON OTHERS**



# WHAT ENGINEERS CAN DO HOW DO THEY GET STARTED?

What are the things that that your child sees that could be better or are problems for others?



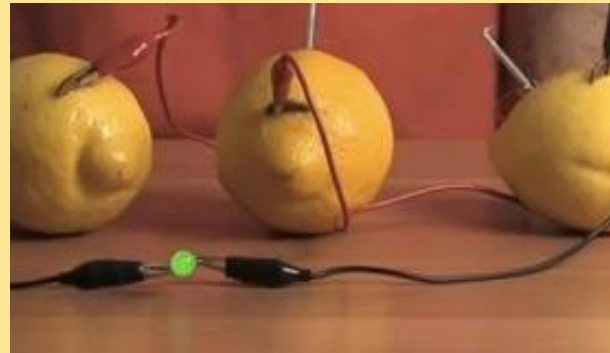
# EXPLORE SOMETHING NEW!!!

## HELP YOUR CHILD BECOME A SCIENTIST OR ENGINEER

### USING THEIR IDEAS!!

#### AVOID THESE IDEAS:

Batteries,  
Paper Airplanes,  
Popcorn,  
Eggs,  
Breakfast Cereal,  
Germs at School and Home,  
Baking Soda and Vinegar,  
Finger Nail Polish,  
Cleaning Pennies,  
Mentos in Coke Bottles,  
Volcanoes,  
Sink or Float  
Ideas from Science Buddies



# SCIENTISTS HAVE TO **THINK, PROBLEM SOLVE,** AND **GATHER DATA** TO BE *DOING* SCIENCE AND ENGINEERING!



1. Flipping water bottles
2. Mento in Pepsi bottle
3. Volcanoes



# THE BIG QUESTION SCIENTISTS CREATE A TESTABLE QUESTION

A good scientific question can be tested by some experiment or measurement that you complete.



- ✓ Evidence – Proof
- ✓ Requires that you change one factor (variable) while keeping all the rest the same.
- ✓ Measured using numbers.
- ✓ Written in a way that can be actually be tested.

# PROJECT STATEMENTS



**Science:** My testable science question: Who can snap their fingers faster – adults or children

**Engineering:** My engineering statement: People **need** paper clips that are sturdy and won't break **because** they lose work and/or everything becomes disorganized.

**A SCIENCE OR ENGINEERING PROJECT IS  
BORN BASED ON YOUR CHILD'S  
IDEAS!**



# A QUICK PROJECT JOURNEY



Who can snap their fingers faster  
– adults or children?

# RESEARCH

You will want to find out:

- What others already know about your topic?
- What have they already done?
- What questions are still being asked?
- Does your school require a research paper?
- Think– why, when where, which, how????



# OUR RESEARCH QUESTIONS

## FINGER SNAPPING

1. How do you snap your fingers?

<http://www.tribalwar.com/forums/archive/index.php?t-182084.html>

2. Who holds record for fastest finger snapping?

(Morten Bentsen – 369/minute)

<https://recordsetter.com/world-record/finger-snaps-minute/11973>

# DESIGN A PLAN TO ANSWER QUESTION OR DESIGN PROTOTYPES

THINKING AND PROBLEM SOLVING TIME!!

- Develop **predictions** based on your current understanding of the question or problem.

Design **a specific plan** that will help you solve the problem or answer the question.

- Use **pictures, diagrams or scale models** to help you do this
- Determine **variables and controls** for your experiment.
- Determine how you will collect the **data you need to prove** you found the answer or solved the problem



# FINGER SNAPPING CREATING THE PLAN

Students and adults will snap fingers to determine answer our question: Who can snap their fingers faster – adults or children?

## THE PLAN

1. Wait for signal.
2. Snap fingers on ONE hand for 15 seconds.
3. Count silently.
4. Remember the count.
5. Repeat.



# BE SAFE

## Do You Need Special Permission?

If you are just observing (watching) you probably do not need special permission before starting your project.

## Projects that almost always **MUST** have permission before starting:

- ✓ Human Subjects
- ✓ Vertebrate Animals



## Must have Adult Supervision if:

- Involved with Dangerous Activities (observing in wilderness, for example),
- Tools and/or Chemicals
- Growing Bacteria or Mold



**YOU MAY NEED TO FILL OUT SPECIAL SRC PAPERWORK  
ASK YOUR TEACHER FOR HELP or USE THE SARSEF WEBSITE**

# VARIABLES



Conduct a fair experiment



There are many things that could be tested that might affect the results of your experiment.

1. Identify these.
2. Choose the **ONE** you will test for.
3. Only change one of these at a time.
4. Identify any variables that you CANNOT control.

For example: one vs. two hand snapping

Let you children TEACH this to YOU!!!



# **EXPERIMENT/INVESTIGATION CARRY OUT THE PLAN**

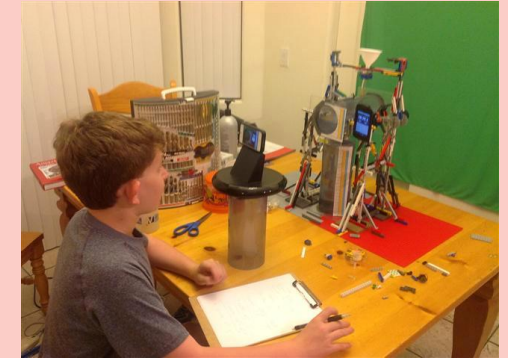
1. Repeat trials or use multiple subjects to make sure that you get the same results time after time.
2. Think the “Rule of 5”.
3. Take pictures as you do your experiment.
4. Follow your steps exactly as you planned.
5. Plan for variables
6. Prepare data collect plan ahead of time

# ENGINEERING DESIGN: PART 4

## ENGINEERING PROJECTS

Create your Design

1. Identify your **criteria**.
2. Identify your **constraints**.
3. Generate as many solutions as possible. Choose the best one to refine and improve.
4. Create or build it.
5. Test, collect data, find problems and make changes.
6. Continue to redesign, as necessary, consider results.
7. Take pictures along the way.



# DATA

- Decide what data you need ahead of time
- How will you **prove** that you found the answer to your question?
- Or solved your problem?

Sample Data Chart					
Elmer's White School Glue					
sample	Flow Distance, cm				Average Distance, cm
	test 1	test 2	test 3	test 4	
#1					
#2					
#3					
#4					

# INVESTIGATION/ENGINEERING “FAILURE”

Some times projects don't go as you expected or don't work out at all.

These are sometimes the BEST projects. Don't get discouraged and give up. Show your skills as a problem solver!

Analyze and critique your data....share what you learned, what you would do differently, what happened that you didn't expect.



# SNAP FINGERS EXPERIMENT

1. Wait for signal.
2. Snap fingers for 15 seconds. Use only ONE hand.
3. Count silently the number of snaps you make.
4. Remember your count.

LET'S DO IT!

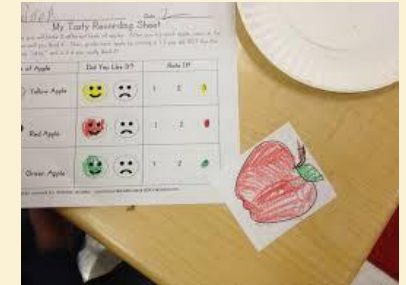
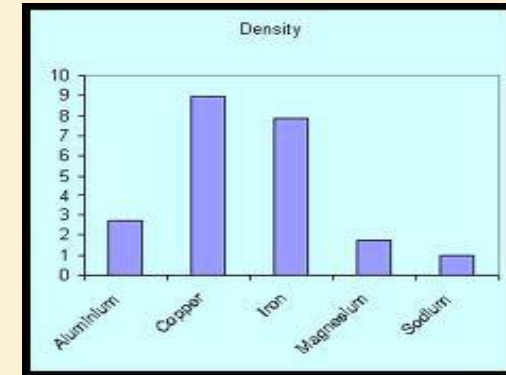


# SAMPLE DATA

	Student 1	Student 2	Student 3	Adult 1	Adult 2	Adult 3
Trial 1	31	45	33	49	58	53
Trial 2	30	35	40	48	55	51
Trial 3	33	33	39	44	57	53

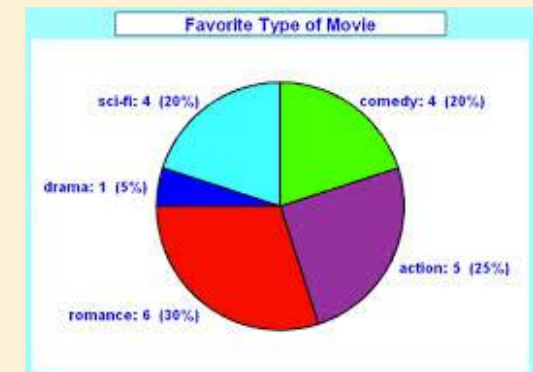
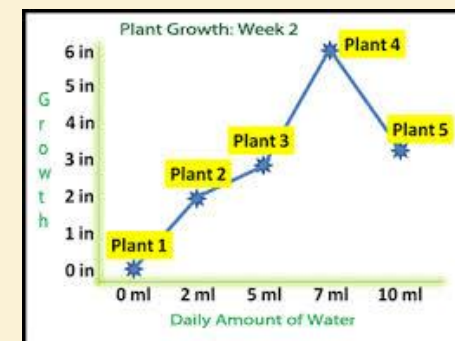
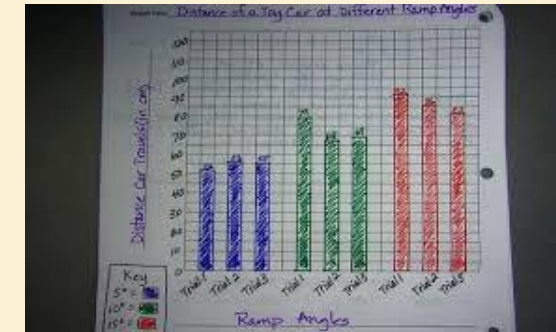
# PROJECT PRACTICES: PART 5

## Data Analysis

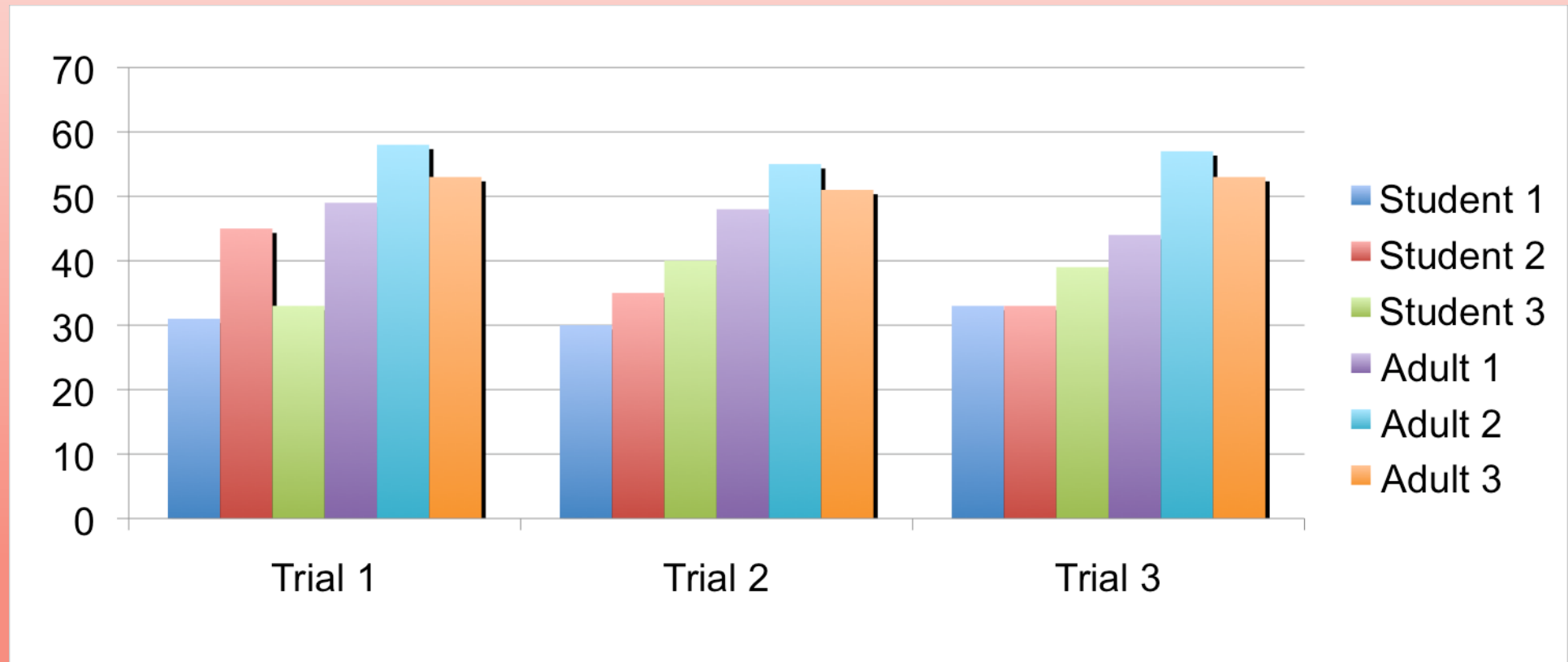


Evaluate your data.

- What does the data show you?
- Do you need more data?
- How will you display the data to make sense to others?
- How will your data help you explain the results of your investigation?



# FINGER SNAPPING GRAPH



# PROJECT PRACTICES: CONCLUSION

## Help your child to:

- Summarize the project
- Explain their theory for your results.
- Evaluate and analyze their data.
- Use math in the explanation.
- Explain what might future investigations look like?
- Discuss what went wrong?
- Describe what they WISH they could have done differently?



**It's time to shine as a critical thinker and problem solver!**  
**This is where students grow!**

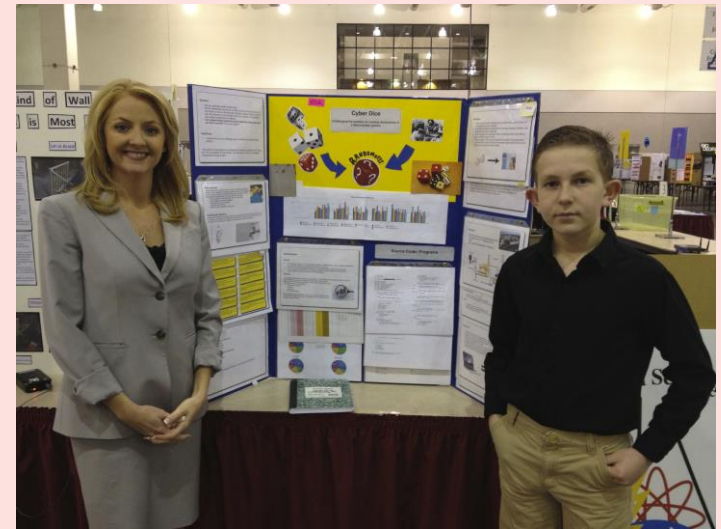
# HELP YOUR STUDENTS COMMUNICATE THEIR EXPERIENCES

Students will create a display board that helps tell their story to others.

Do not bring: liquids, soil,  
live animals, plants, food, or  
glass.

If you bring things that can be  
broken or stolen, they could be  
be damaged or disappear.

You have to be okay with that!



# A GOOD EXAMPLE

- It is colorful
- It has photos
- There is a log book
- There is a chart and a graph
- It is not cluttered



# WHAT CHANGES WOULD YOU MAKE?

This young  
lady won  
First Place,  
but says there  
are many ways  
to make it better.  
What would  
you suggest if this  
is your child?



# MIDDLE AND HIGH SCHOOL STUDENT INTERVIEWS

Interviews are not required for Middle School Students, but is **STRONGLY** encouraged.

The judges are interested in you and your projects. You will be able to explain your project to experts in the field.

Maintain good eye contact, dress appropriately and use formal language.

Only those interviewed will be eligible for the INTEL trip!

Good time to practice before required in high school.



# AND FINALLY....

How many of you better understand the value for your child(ren) in completing science and engineering projects?

How many of you now believe that you can successfully guide your child(ren) in completing award/prize winning projects?



# IT'S TIME TO START

