

# WANT WITH

outreach program volunteers



# CHEMISTRY MAGIC DOG

for 4<sup>th</sup> grade students all over New Mexico

By order of **Jeremiah Sears** Chief Marshall, A.B.Q

WANTED  
DEAD OR ALIVE



REWARD

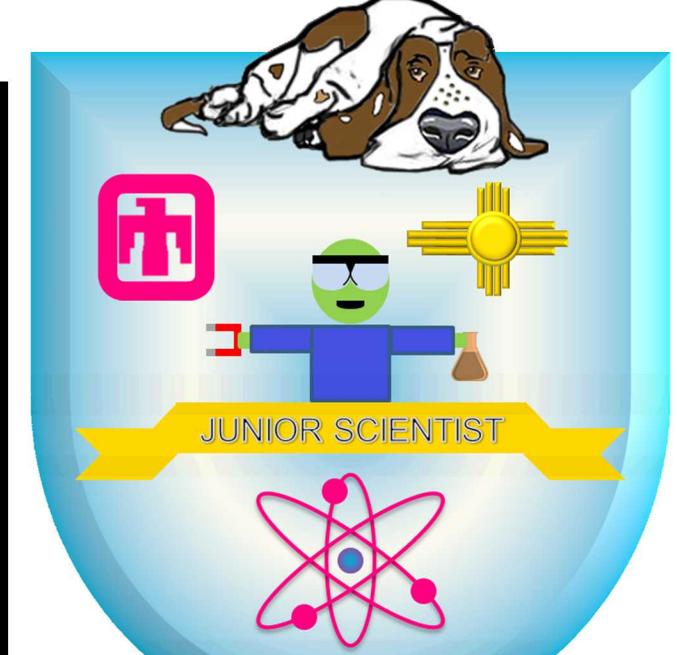
# CSI: DOGNAPPING WORKSHOP – a Sandia Outreach Program

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## Fliers

### CSI DOGNAPPING

Coming JANUARY 2017 Hurry! Reserve Your Class Now by Oct 11, 2016!



WANTED: 4th Graders to Help Save Our Chemistry Magic Dog!!! We Need Your Help!

WILL YOUR CLASS SAVE OUR CHEMISTRY DOG?

A **FREE** 4 hour field trip for your 4th grade students designed to give:

- ✓ A fun hands on experience with NM State Science Standards
- ✓ Meet national laboratory scientists & engineers
- ✓ Solve a 'crime' & get ice cream

Supplied: **BUSES**, Safety Equipment, GOODIE BAGS, DESSERT, FUN DAY OFF for Teachers!

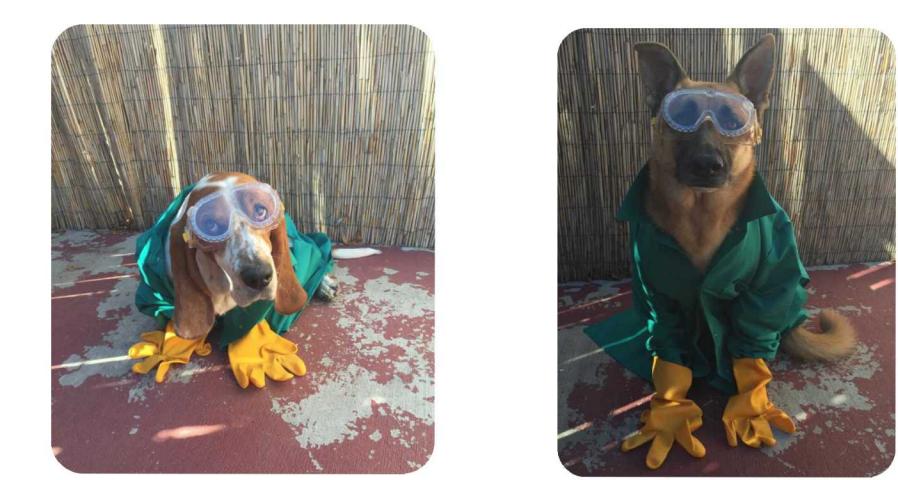
See us in action:

<http://www.sandia.gov/news/publications/labnews/articles/2016/22-01/dognapping.html>

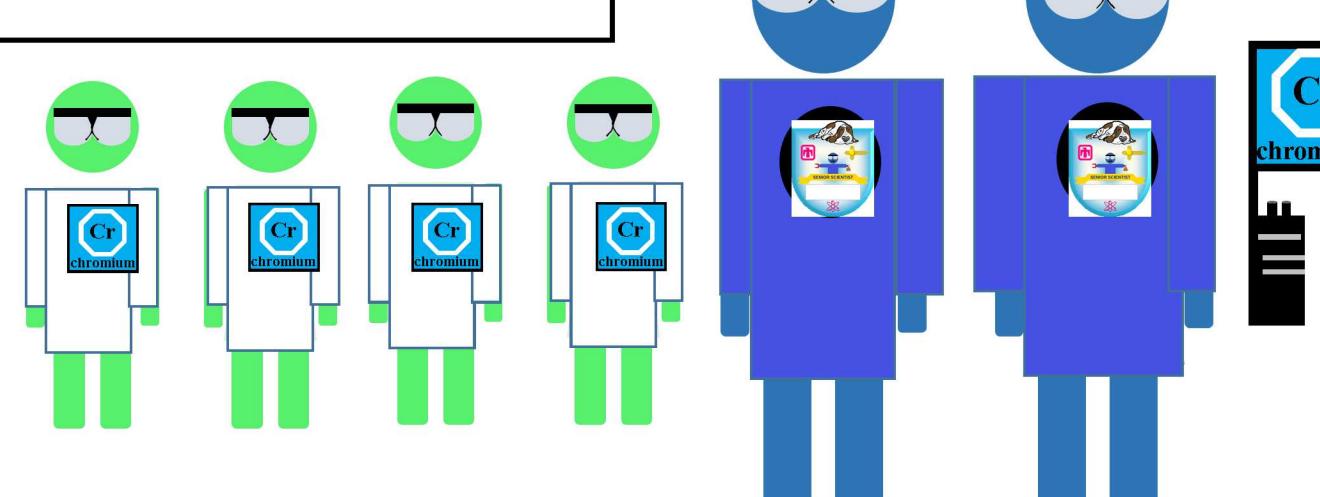
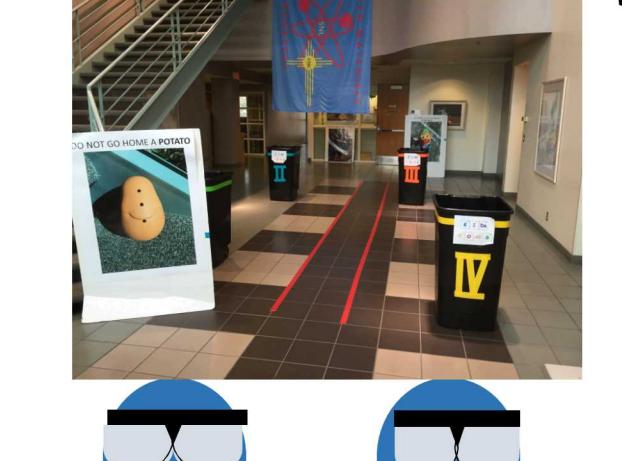
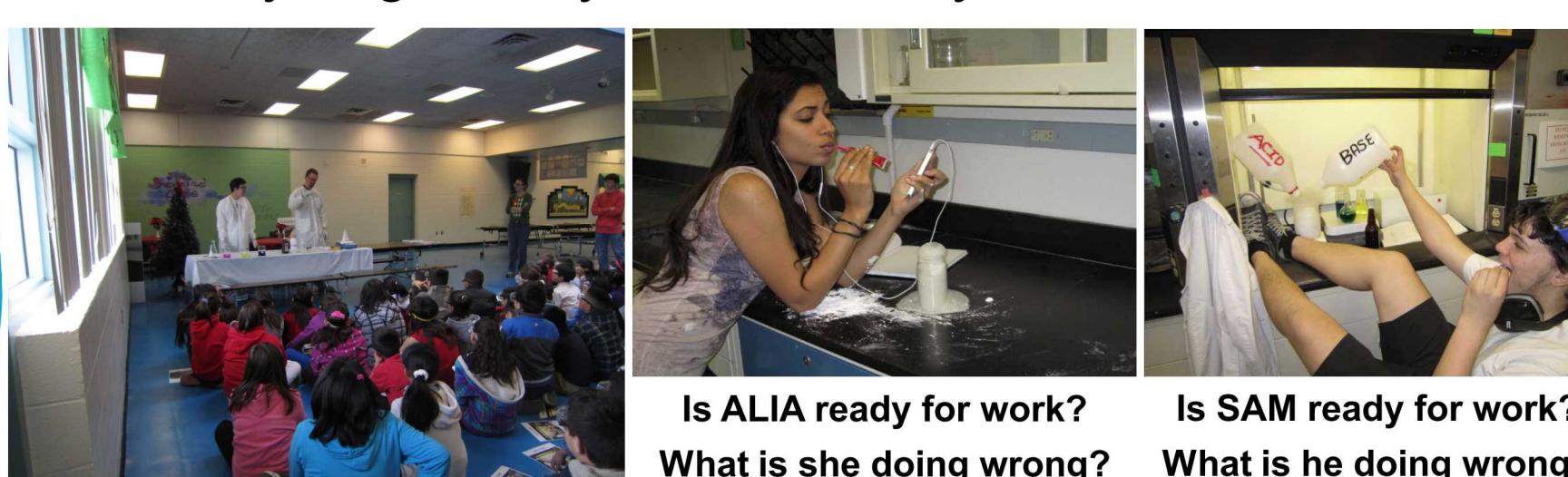
<http://cenblog.org/the-editors-blog/2011/01/csi-dognapping-at-sandia/>



## Safety First



Student interaction begins with a school visit that introduces the 'magic' we are capable of. The students help us identify the five senses and how we can protect them to make observations. This time is also used to showcase our magic dogs and two former laboratory workers whose habits were not to our standards. Can you identify all of the Alia's and Sam's errors below? Are our magic chemistry dogs ready for laboratory work?



## Magical Showdown

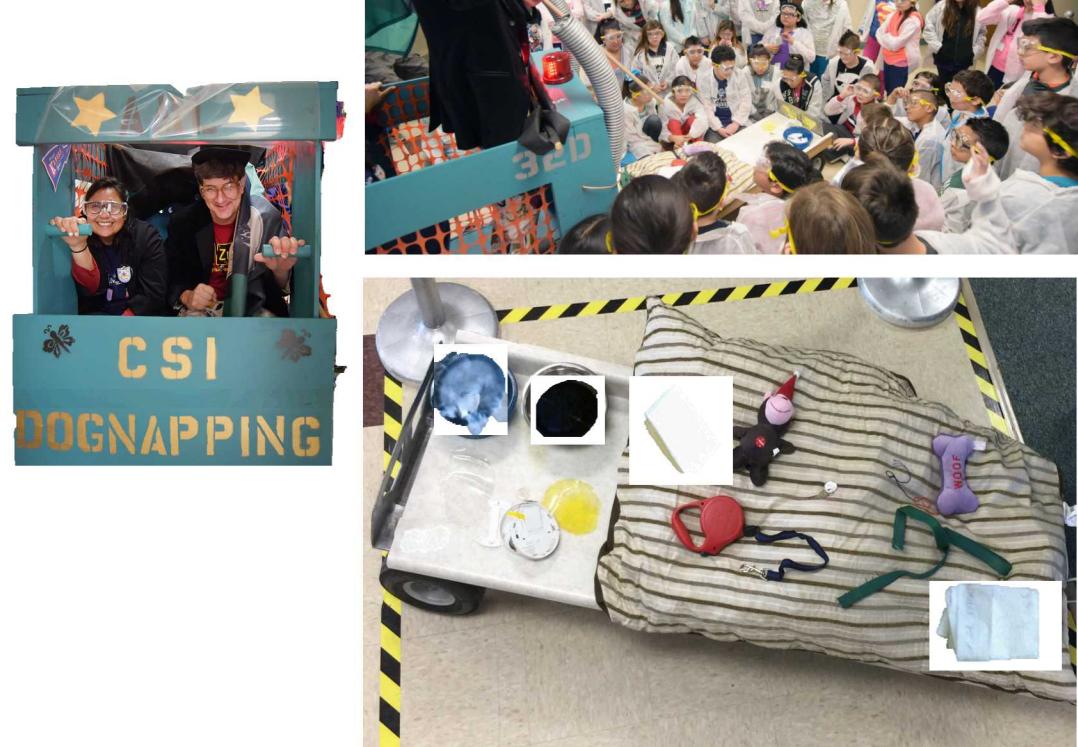


Scientists compete to work with the chemistry magic dog. Experiments showcased are foggy bubbles, silver mirror flask, rainbow in a flask and elephant toothpaste. Experiment recommendations are always welcomed. At this point I am unable to locate our magic chemistry dog and our guests become **SUSPECTS!**

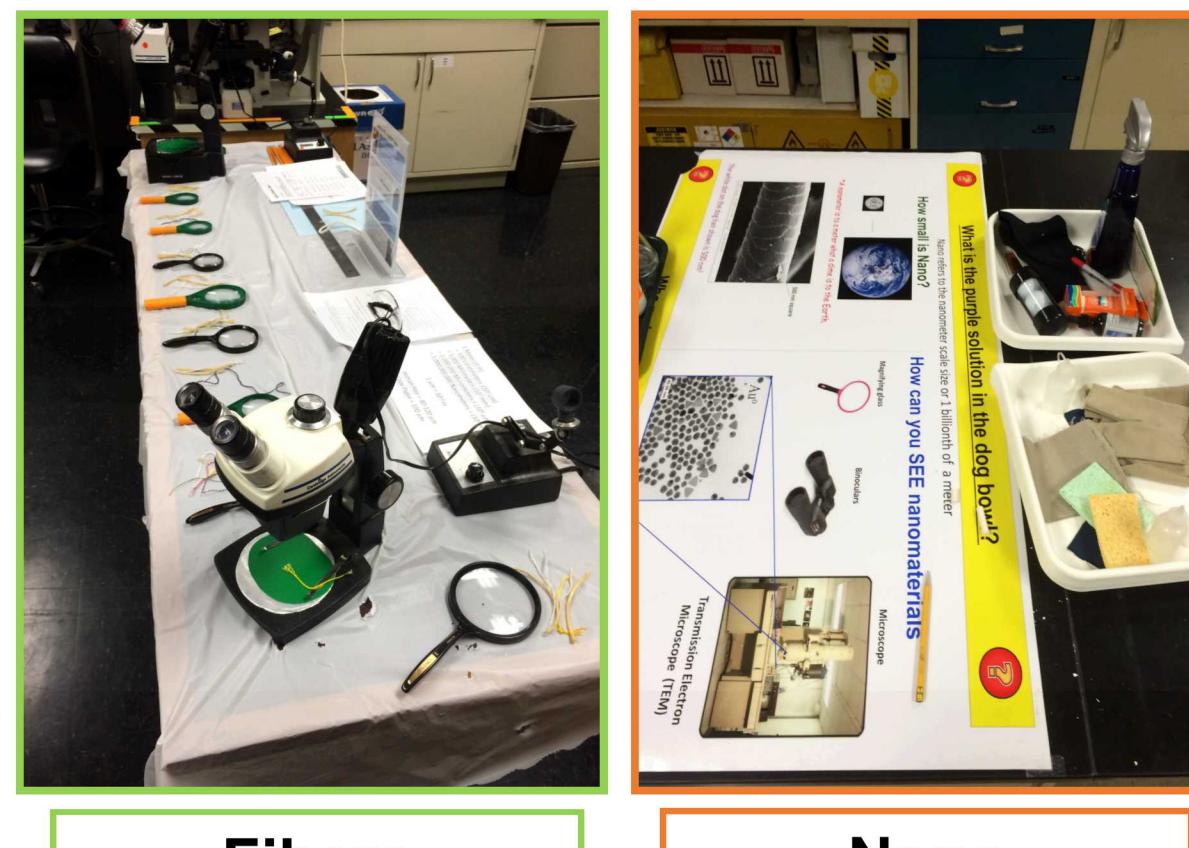


## Analysis

The crime scene is located and brought to the junior scientists via our exclusive AML mobile crime scene unit. Ten items that do not belong are identified from those that belong on a dog bed. What items don't belong?



## Clue Sheets



Fibers Nano

Small groups of Junior Scientists rotate through ten stations with clue sheets. Each station focuses on a scientific concept. The clue sheets use topics from the stations for the identification of the dognapper. Have an idea for a station? Let me know!

Lab Station	Clue Questions	Suspect Questions	Suspects			
			1	2	3	4
Gases	What are the states of matter? solid, liquid, and gas	Who uses DRY ICE?	x	x	x	x
Name	Can you see a GAS? sometimes	Who can make transistors?				
Bio	How small is NANO?	What Color is NANOGOLD?				
Rad	Were three enzymes in the spill?	Who has enzymes				
Popcorn	Can you see enzymes?	Who wears radiation?				
Spills	Is ammonia an ACID or BASE?	Who likes acidic drinks?				
Magnets	What is the pH of lemon juice?	Who uses magnetic materials?				
Fibers	A magnetic material produces a field. Which metal is magnetic?	Which metal is magnetic?				
Yuck	Dog hair NATURAL or SYNTHETIC?	Who wears nylon clothes?				
Glow	What table do chemists use?	Who had white powders?				
Secret Messages	Is it hard to synthesize YUCK?	Who likes fluorescent materials?				
	Do all ROCKS glow in the dark?	What do you need to make rocks glow?				
	What are your science self-assessments?	Black light messages; Chemical indicator messages				
	Based on the number of clues WHO'DONIT	Based on the number of clues WHO'DONIT				

## LUNCH!

The answers from each station are discussed as a group. The tallies from each suspect are counted and the culprit is identified. The culprit apologizes for stealing the dog and is absolved of the "crime" via providing ice cream for everyone.

All members of the workshop have lunch together. This time is used for the students to review their day and allow further interaction with scientists and engineers. The workshop is completed when the students receive their ice cream.



## Workshop Impact

Nearly 500 students from New Mexico public schools were surveyed to identify their science interest and retention of workshop concepts. The effectiveness of the workshop was evaluated by a 14 question survey given to the students before (Survey #1), immediately after the workshop (Survey #2), and two months after the workshop (Survey #3). Percentages shown, were calculated based on the number of correct answers vs. the total number of answers within a given survey number and question. Science self assessments saw an initial increase. For all but one of the station related questions, the presented material yielded retained information.

Science & Engineering Survey

Name of scientist or engineer that you have met and talked to \_\_\_\_\_ Name of the science activities you have done \_\_\_\_\_

Which of these is worn during a science experiment?

- a. Sunglasses
- b. Hat
- c. Safety glasses
- d. Cape

Which has the highest viscosity?

- a. Milk
- b. Ketchup
- c. Honey
- d. Orange juice

Lessons piece is a -

- a. Stone
- b. Oil
- c. Acid
- d. Animal

What are your second relatives?

- a. Only when you get X-rays
- b. When you are sick
- c. When you are born
- d. When you are ill

What type of fiber is nylon?

- a. Synthetic
- b. Natural
- c. Plastic
- d. Linen

What is the fiber in leather?

- a. Nylon
- b. Polyester
- c. Wool
- d. Steel

What does a magnet attract to?

- a. Wood
- b. Steel
- c. Carbon dioxide
- d. Ice

What is a living thing too small to see with your naked eye?

- a. Bacteria
- b. Carbon dioxide
- c. Steel
- d. Water

What color is seaweed?

- a. Green
- b. Blue
- c. Red
- d. Yellow

How good are you at science?

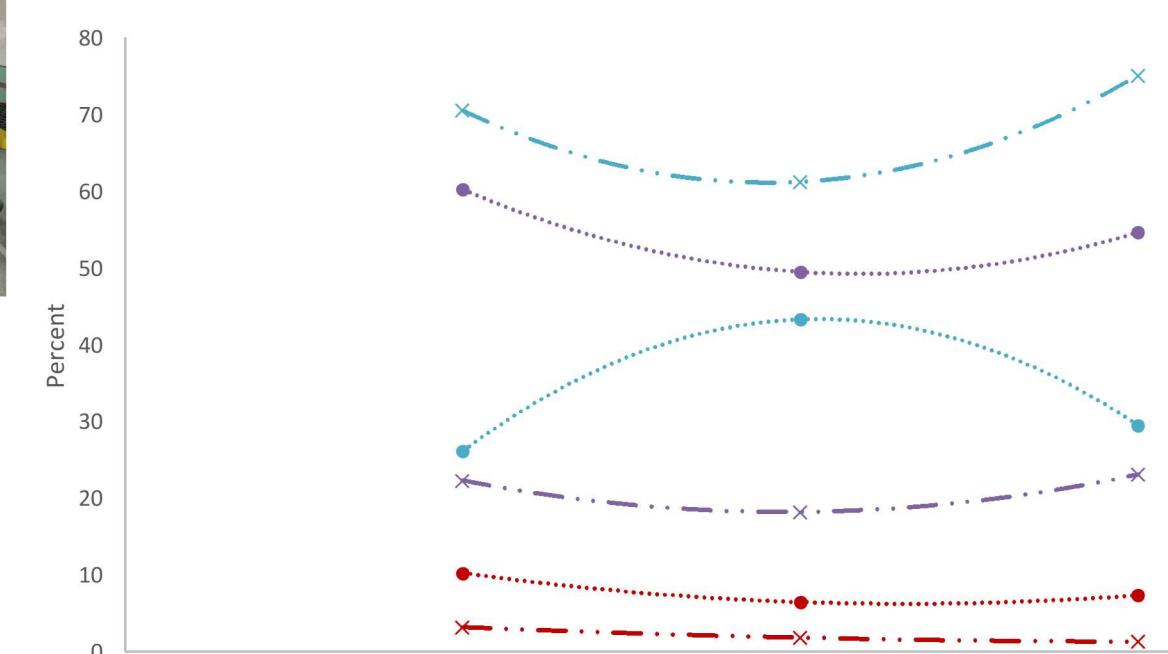
- awful
- OK
- GREAT

How much do you like science?

- YUCK!
- OK
- WOWOOW!

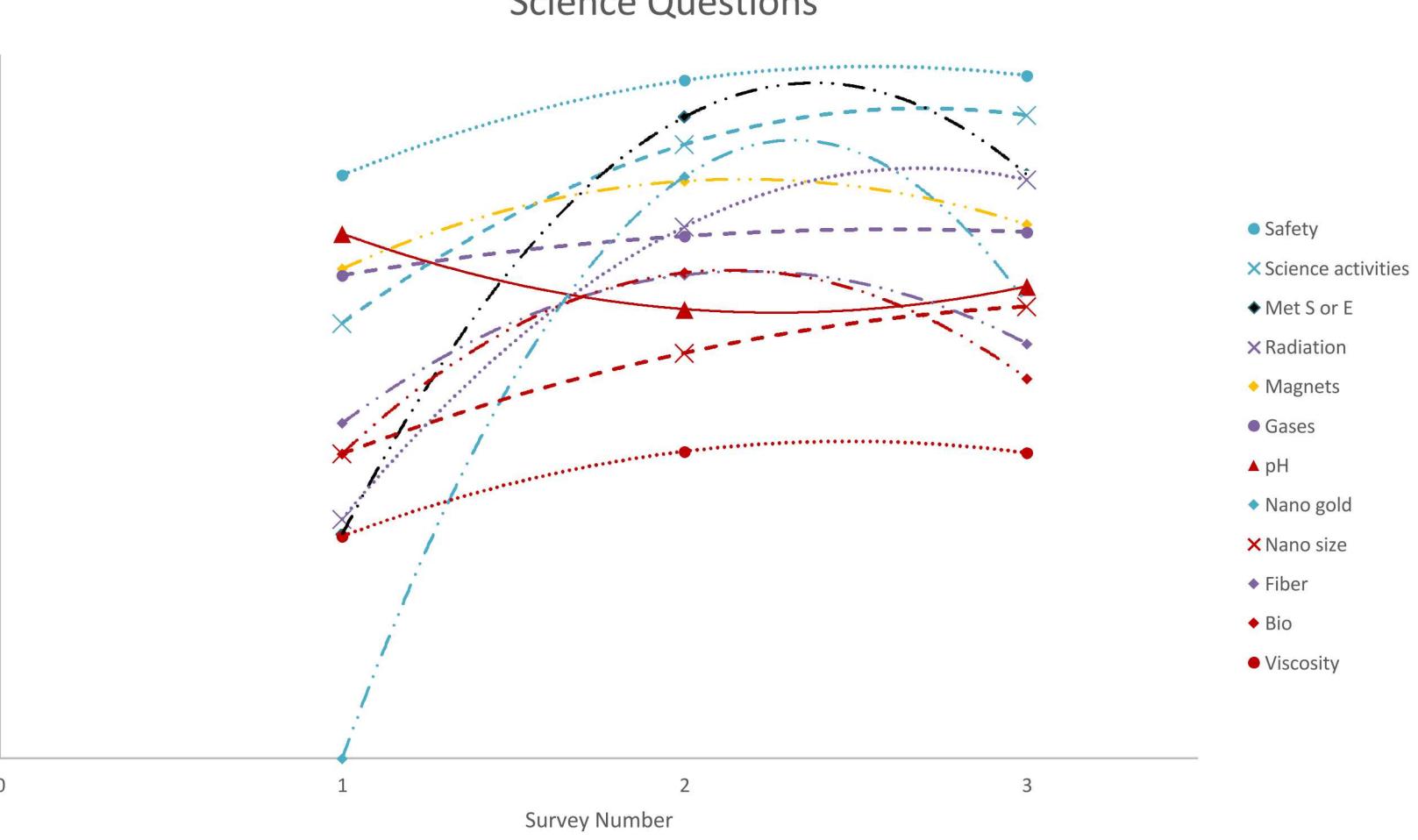
Please don't write your name.

Science Self Assessment and Interest Survey



Plot of responses to scientific interest/ ability questions from the same survey given at (a) pre- (survey 1), (b) post- (survey 2), and (c) timed (survey 3) intervals. ● denotes science self-assessment and x denotes science interest.

Science Questions



Plot of information garnered by the same survey given at (a) pre- (survey 1), (b) post- (survey 2), and (c) timed (survey 3) intervals. ● denotes answers with the general trend of a positive plateau, x denotes answers with the general trend of sequential growth, ♦ denotes answers with the general trend of a parabola, and ▲ denotes answers with the general trend of a negative plateau.

## Acknowledgments

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