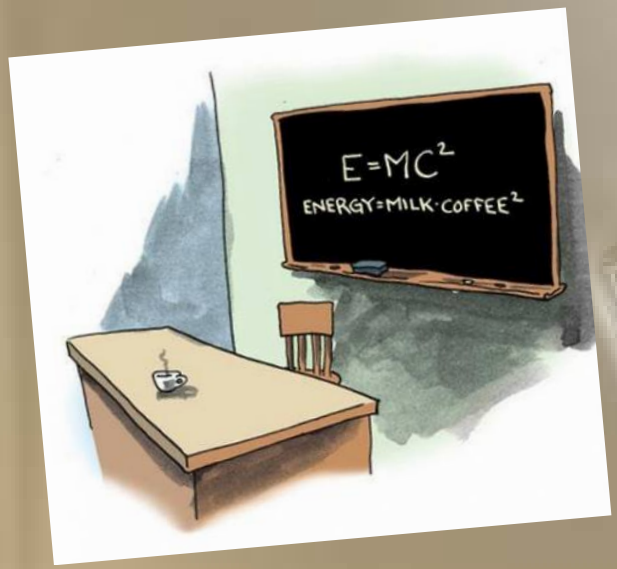
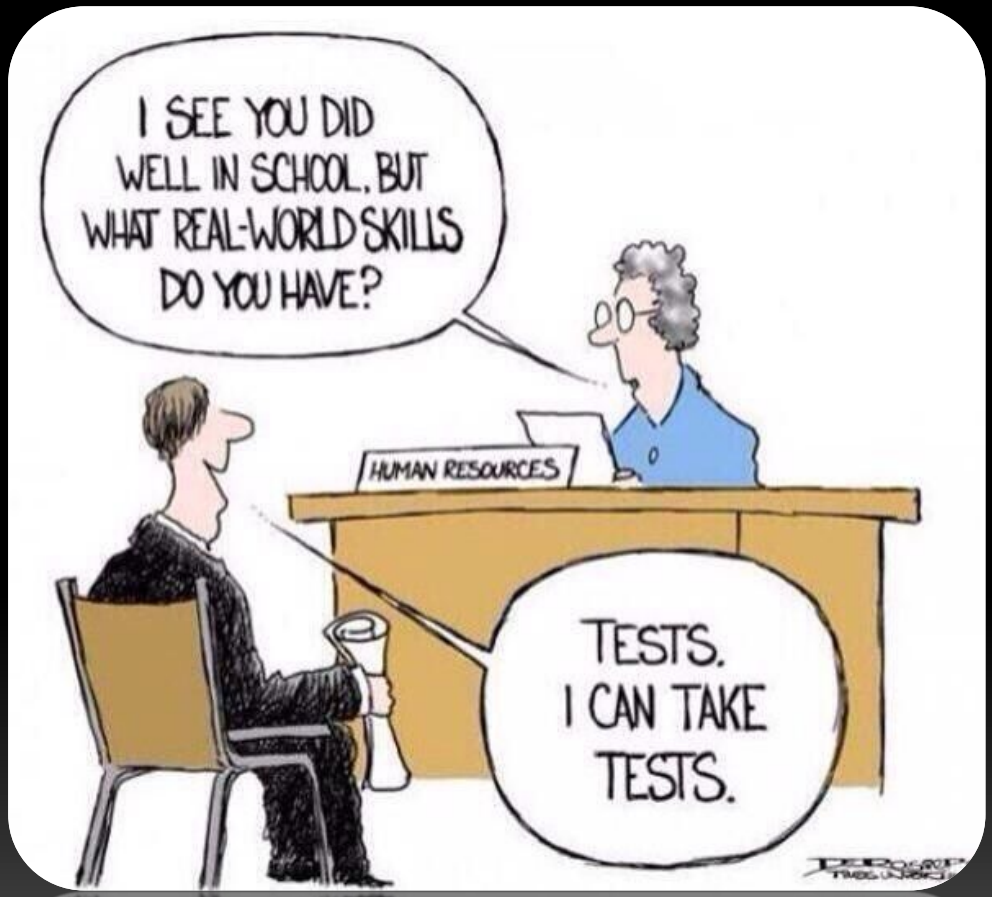

E=MC²
ENERGY=MILK·COFFEE²

Content Post-Tests

8:30



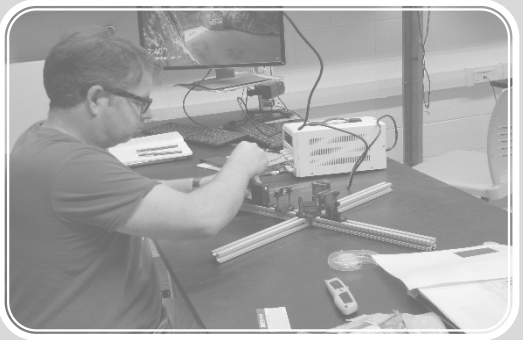
Long-Term Experimentation

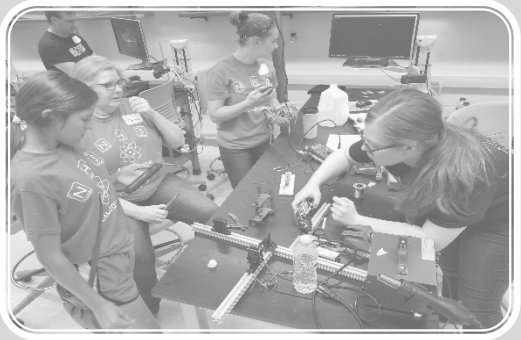
9:15

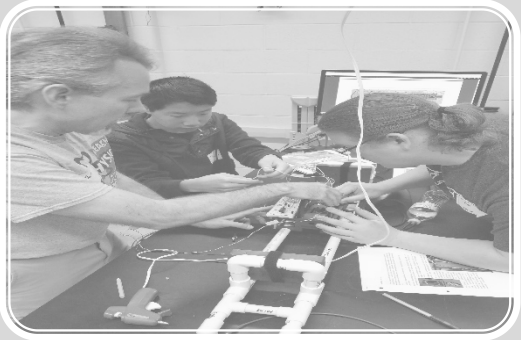
Agenda

- Where do you go from here?
- What is PhysFESTT?
- Conference funding
- Science and Engineering Fairs
- PhysFESTT planning
- Traffic Intersections

Where do you go from here?







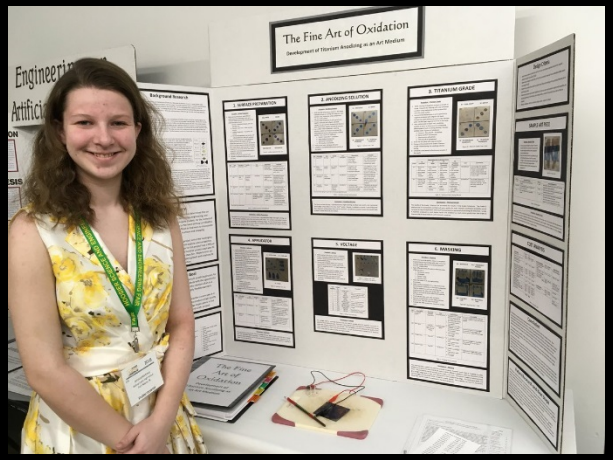
Demos

Lessons

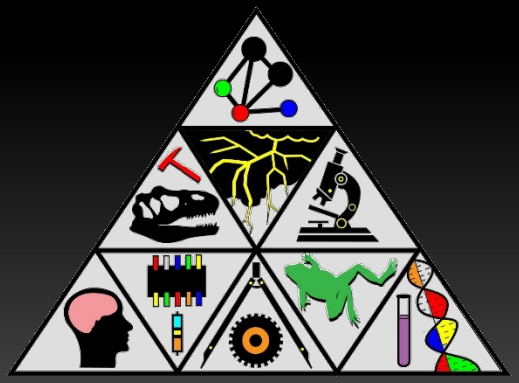
Long-term Experiments

Demos: What is PhysFESTT??

- WHEN:
  March 16, 2019
  Walb Student Union
  12:00 – 3:00pm



- During the afternoon of the 64th annual NEIRSEF

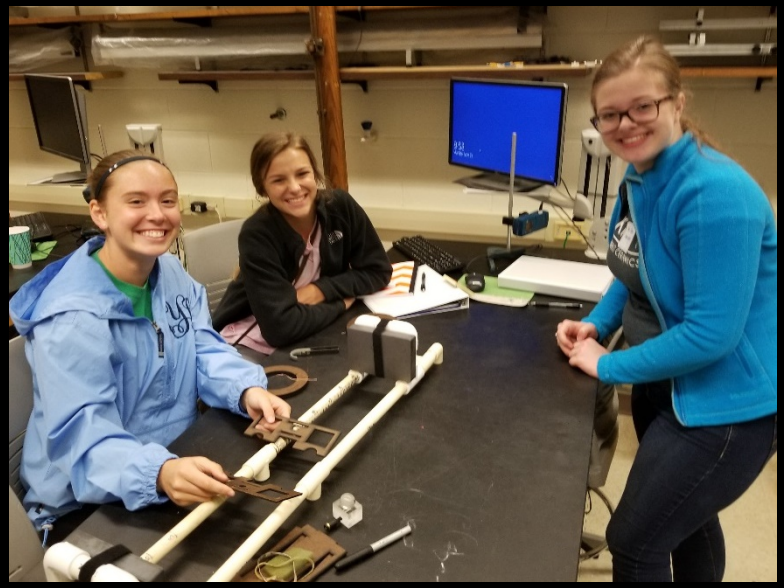


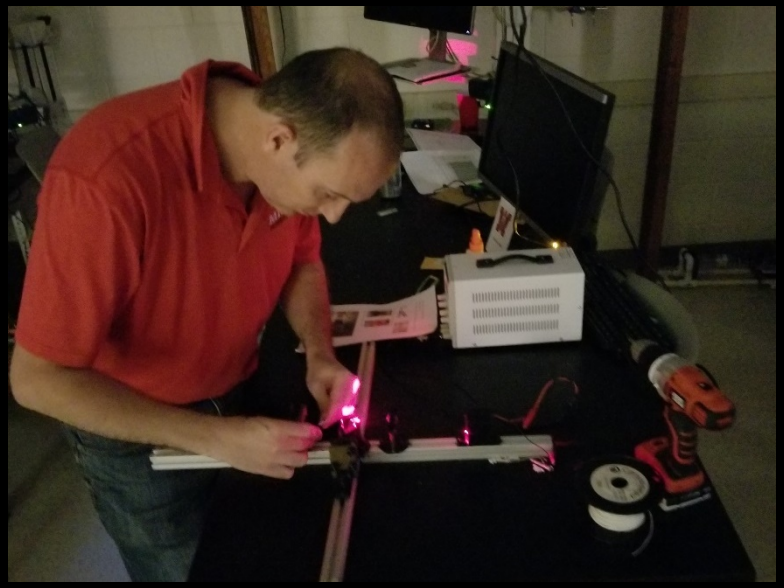
http://www.neirsef.org

Applied Physics Workshop

PURDUE UNIVERSITY FORT WAYNE

PhysFESTT is YOU!!!





- Create a project board
- Demonstrate your demo!!!
- Share your research

Conference Funding

- AAPT Winter meeting

  January 12-15, 2019 - Houston, TX
- Indiana STEM Education Conference

  January 2019 - West Lafayette, IN
- HASTI

  February 17-19, 2019 - Indianapolis, IN
- AAPT Summer meeting

  July 20-24, 2019 – Provo, UT
- IN-AAPT

  April 2019?
- Other meetings???

Demo, Lesson, or LTE???

How do you see these used in your HS physics classrooms?

- NMR
- AFM
- Spectroscope
- Interferometer
- Acoustic Levitation

(5 mins – WB)

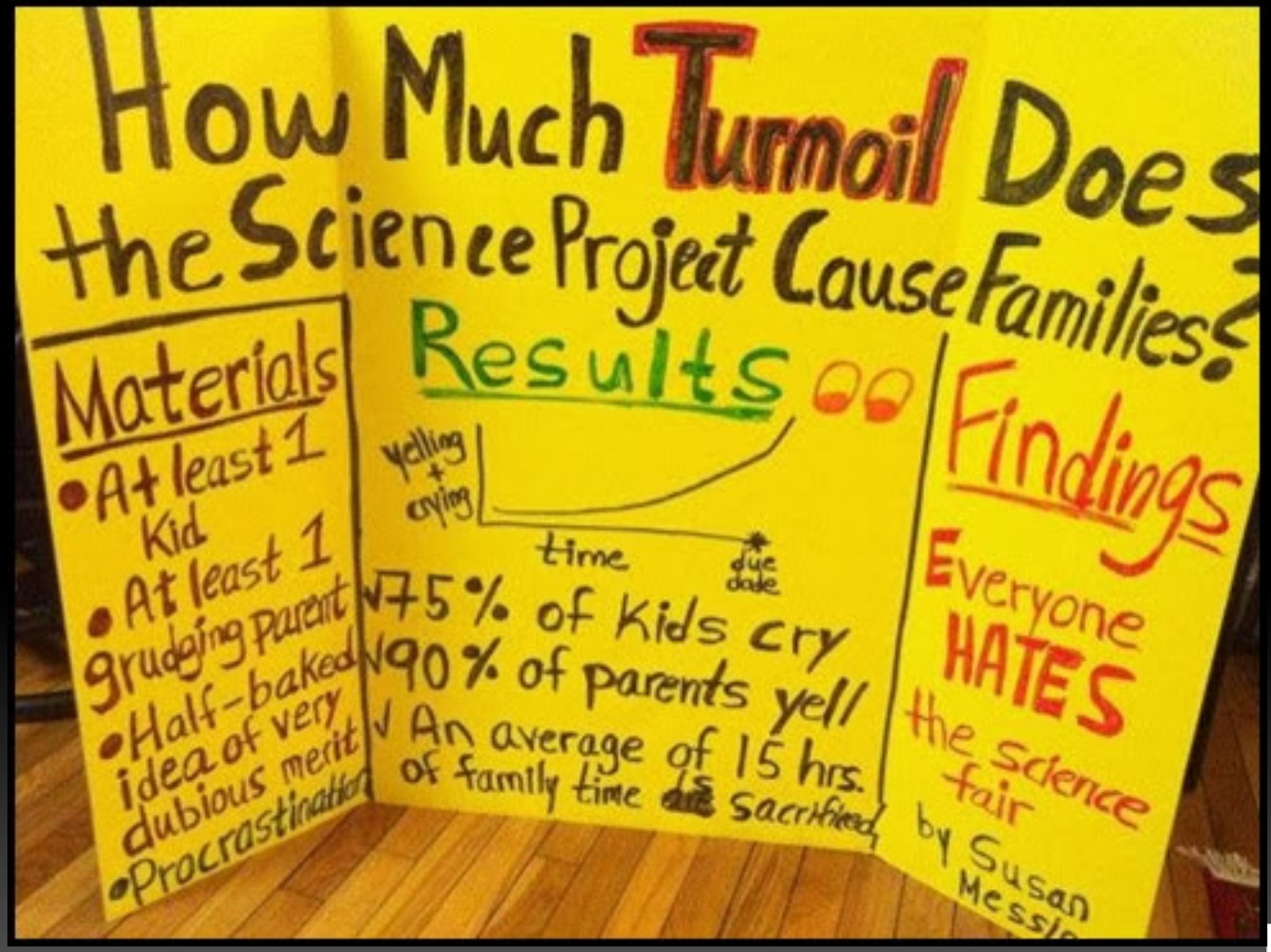
Long-Term Experiments (LTE)

- Science and Engineering Fairs
  http://www.sefi.org

- NEIRSEF
  http://www.neirsef.org

- Intel ISEF
  https://student.societyforscience.org/intel-isef

Science Fair?



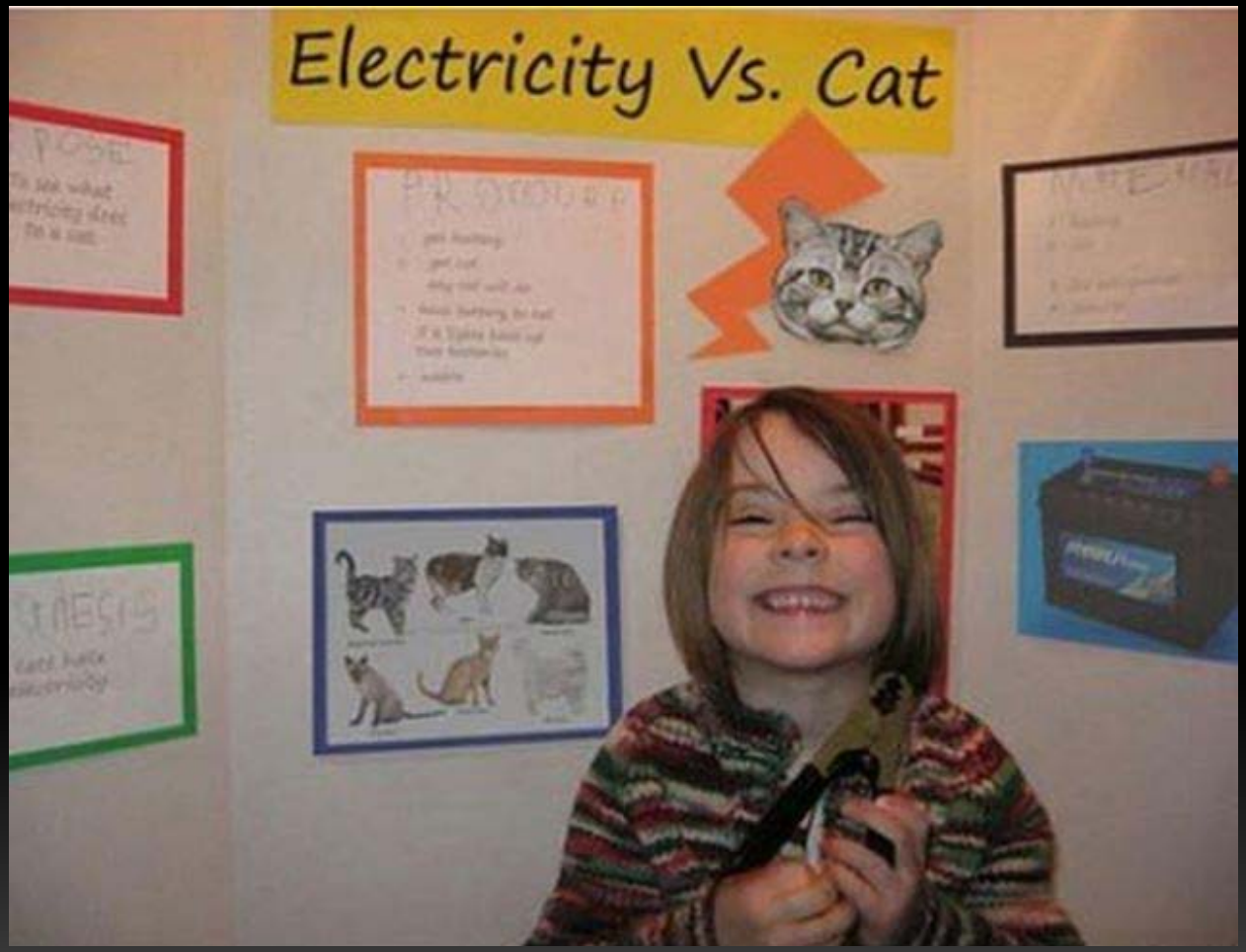
http://www.huffingtonpost.com/susan-messina/that-fake-science-fair-poster-that-went-viral-i-made-it-heres-why_b_5053008.html

NSTA Position Statement

Science Competitions
http://static.nsta.org/pdfs/PositionStatement_Competitions.pdf

- Student and staff participation in science competitions should be voluntary and open to all students.
- Emphasis should be placed on the learning experience rather than on the competition.
- Science competitions should supplement and enhance other educational experiences and be closely aligned or integrated with the curriculum.
- The emphasis should be on scientific process, content, and/or application.
- Projects and presentation should be the work of the student with proper credit to others for their contributions.
- Scientific competitions should foster partnerships between students, the school and the science community.

What is wrong with this project?



What is wrong with this project?

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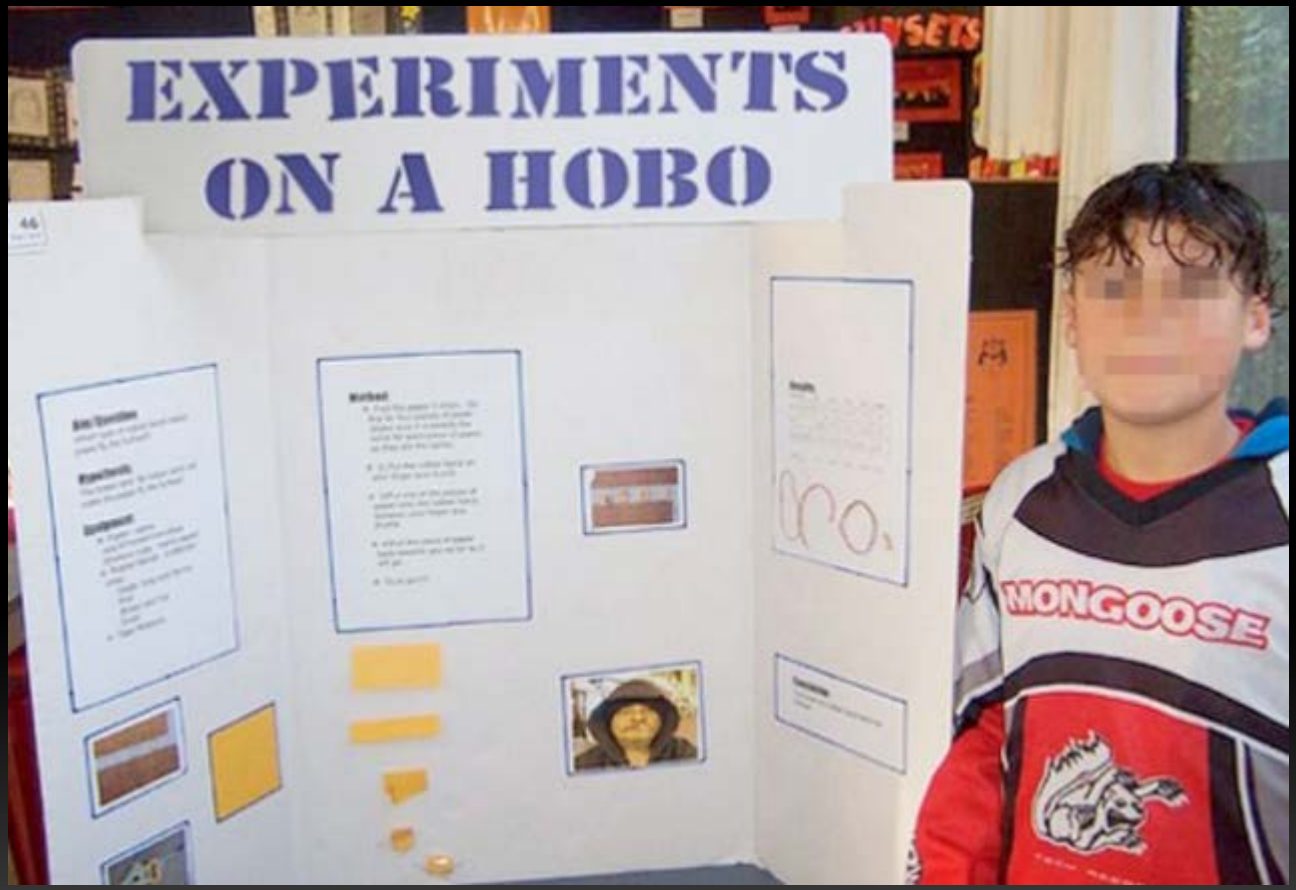

What is wrong with this project?

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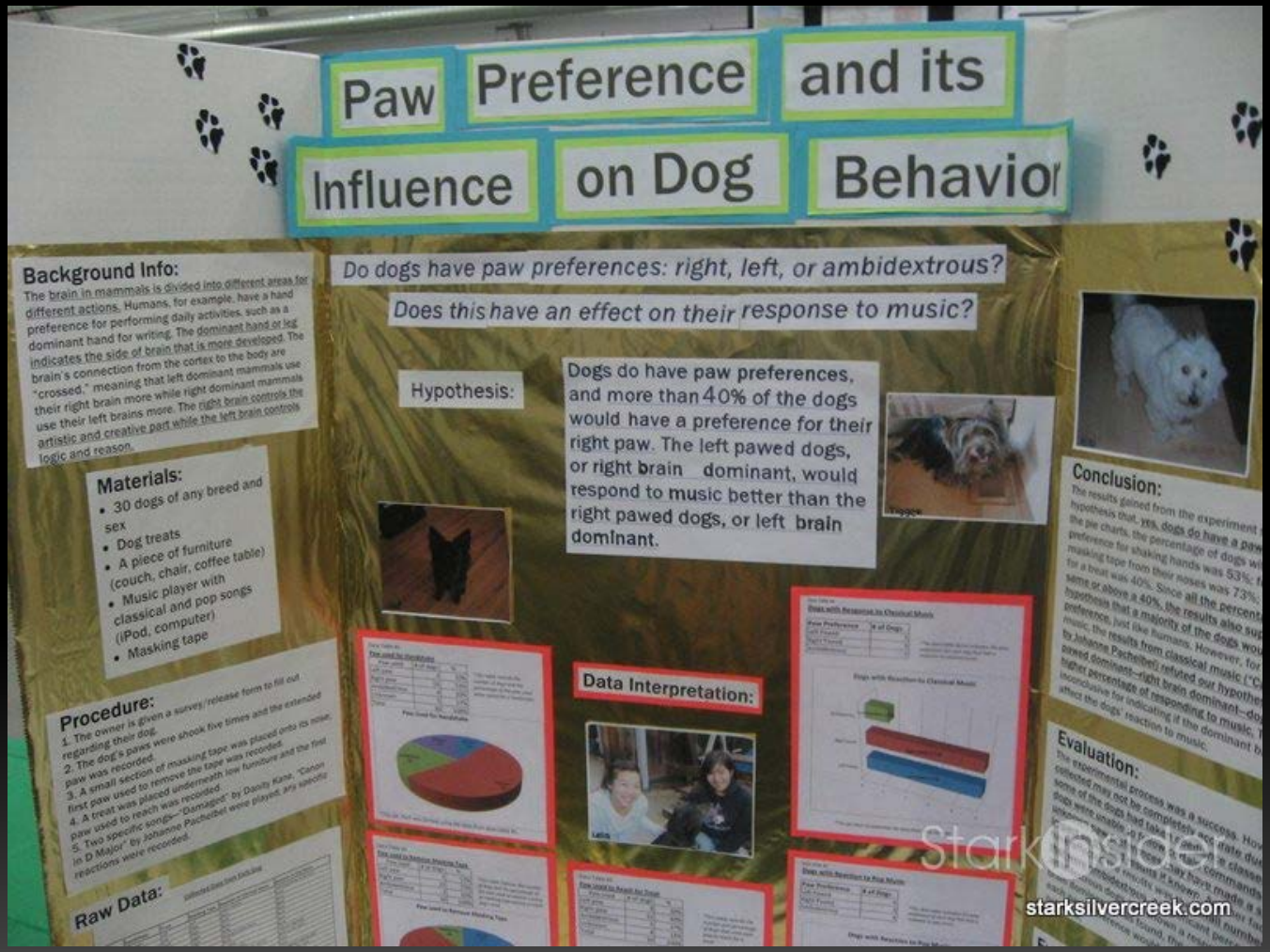


What is wrong with this project?

How do I support students from brainstorm to the final poster?

- Establish a timeline
- Check in often
- Be flexible and firm
- Winning isn't everything
- Read the rules

Establish a timeline – 3 month option

Date	Student Task
Week 1	Introduce project, pair students up and sign a contract
Week 2	Research the topic.
Week 3	Problem and hypothesis due. Approve the project
Week 4	Back to the library. Literature review due
Week 5	Materials and Methods due
Week 6-8	Students do research. Data in your journal!
Week 9	Conference with teacher. Work on charts, graphs, analysis
Week 10	Draft conclusion due. Write a paper!
Week 11	Draft paper due!
Week 12	Project board due!

Literature Review

- Must be completed *before* doing the research
- A source of inspiration for experimental design and refinement of the question
- An indicator of how original the topic is

How do I Write a Hypothesis

If _____, then _____

- statement in response to a scientific question that provides a tentative explanation that leads to an investigation and can be used to provide more information to either strengthen a theory or develop a new one.

Hypothesis

- Results always *support* hypotheses, never *prove*.
- Hypotheses are never a *sure thing*.
- Hypotheses are never *educated guesses*
  - Hypotheses are strongly developed predictions based on prior observation or scientific knowledge that if something is done, an expected result will occur (prior experiment)
  - Hypotheses rely on past evidence
  - Hypotheses require significant planning

What makes for a good research design?

- Experimental Design for Advanced Science Projects
  https://www.sciencebuddies.org/science-fair-projects/competitions/experimental-design-for-advanced-science-projects

Ethical Research

- **SRC** – Scientific Review Committee
  Reviews all projects involving
  - Vertebrate animals
  - Hazardous Materials
  - Biological agents

- **IRB** – Institutional Review Board
  Reviews all projects involving
  - Human subjects
  - *No permission forms… no admission!*

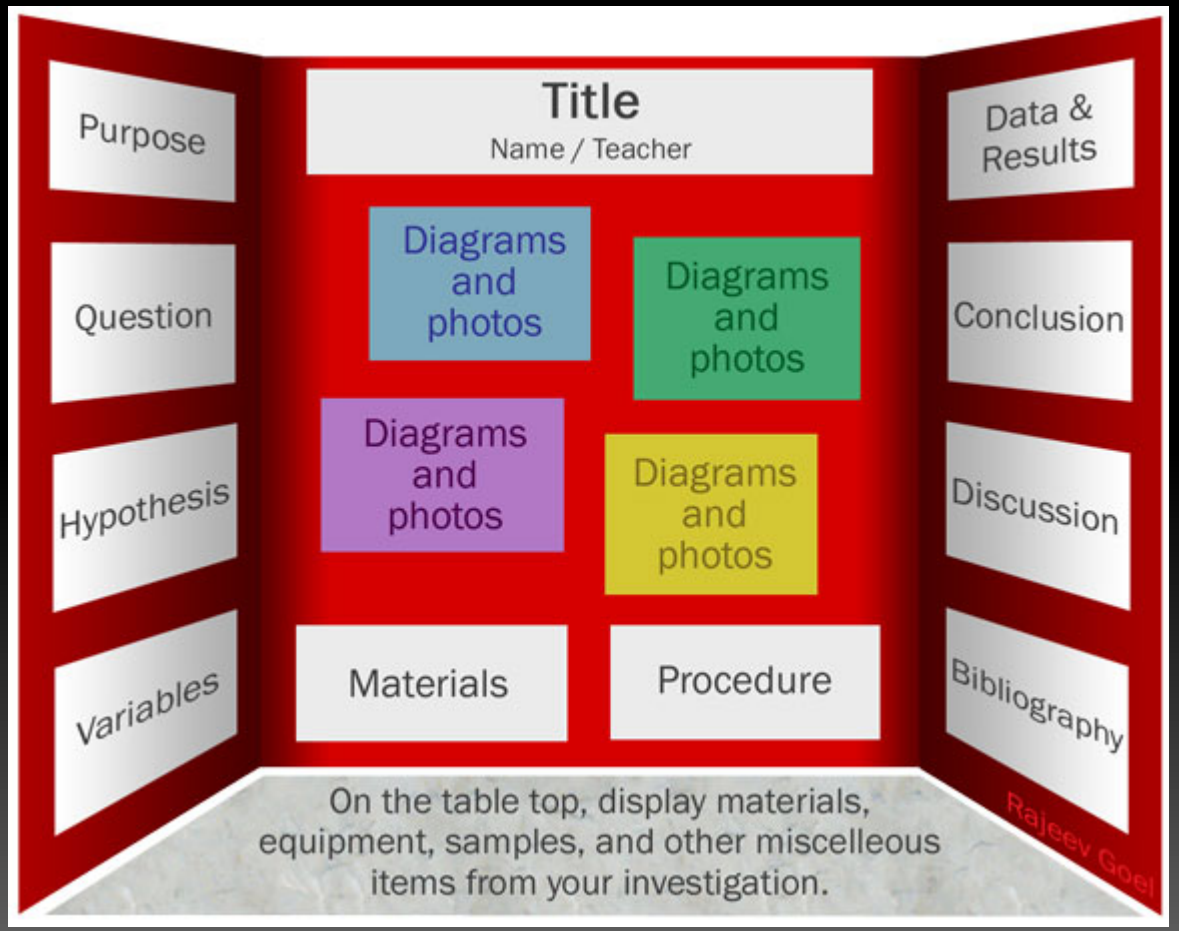
ISEF Paperwork

Required Forms

- 1 – Checklist for ADULT sponsor (teacher)
- 1A – STUDENT checklist (student)
- 1B – Approval Form (each student + parent)
- 1C - Regulated Research Institutional/Industrial Setting Form (other than home or school)

Display your work!

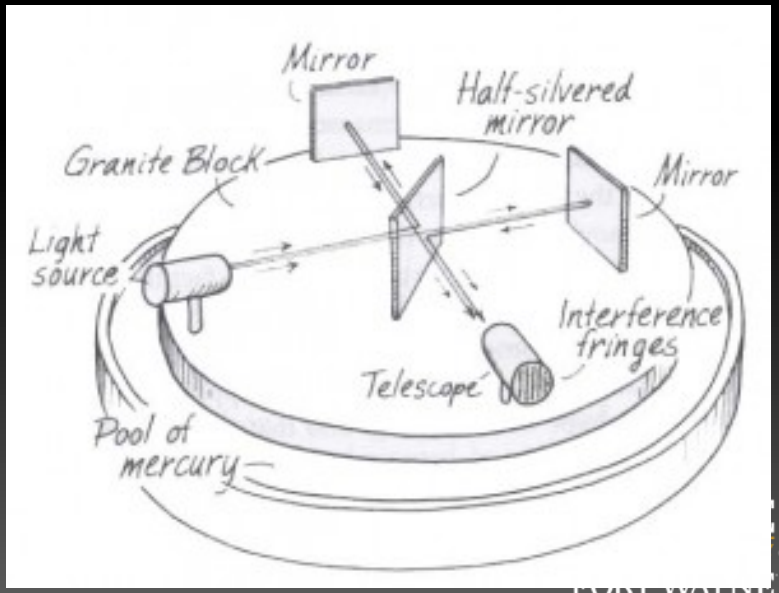
- The "easy" hard part



https://www.sciencebuddies.org/science-fair-projects/science-fair/science-fair-project-display-boards

What if the project bombs?

- Failure IS an option…
  and sometimes a success!



Other Competitions

- Junior Science and Humanities Symposium
  - https://www.jshs.org

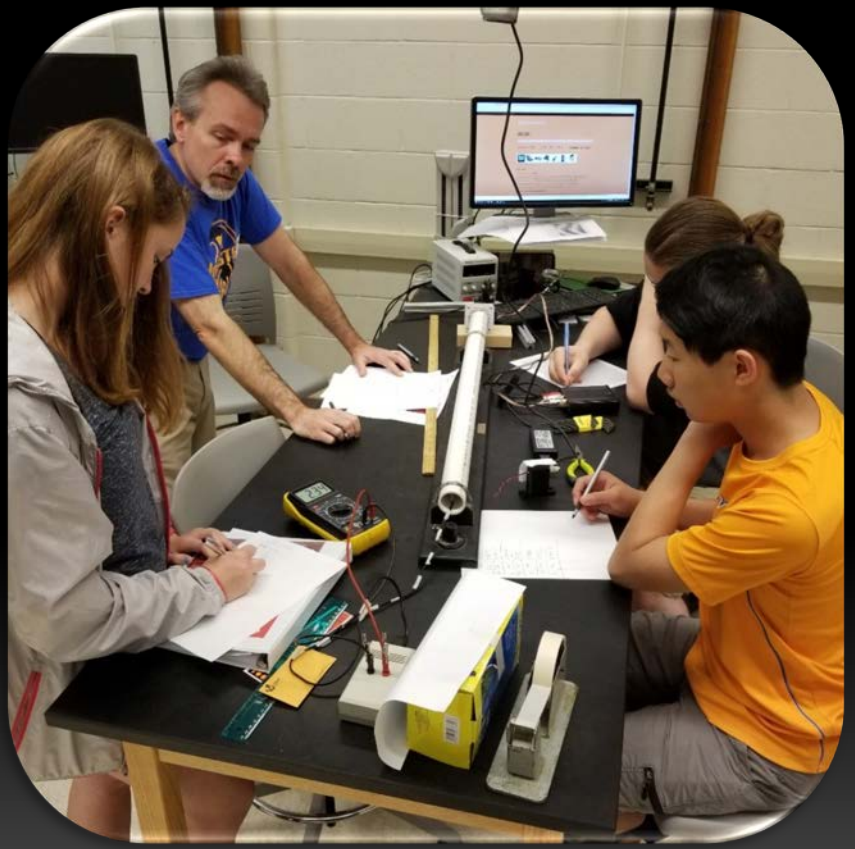
- US IYPT – physics competition
  - https://jkeohane.wordpress.com/usiypt-2019-problems/

Other Project Ideas - Citizen Science

- Biology
  - Cornell Ornithology http://www.birds.cornell.edu/citsci/
  - Project WILD http://www.projectwild.org/
  - Frog Watch https://www.aza.org/frogwatch/
  - Monarch butterflies http://www.learner.org/jnorth/monarch/
- Earth and Environmental Science
  - USGS http://txpub.usgs.gov/myscience/
  - GLOBE http://www.globe.gov/
  - EPA: MyEnvironment http://www.epa.gov/myenvironment/
  - Green Map http://www.greenmap.org/
- Astronomy
  - AAVSO http://www.aavso.org/
  - GLOBE at night http://www.globeatnight.org/
  - Galaxy Zoo http://www.galaxyzoo.org/
  - Planet Hunters http://www.planethunters.org/
  - The Noon Day project http://www.ciese.org/curriculum/noonday/

PhysFESTT Planning

9:45AM

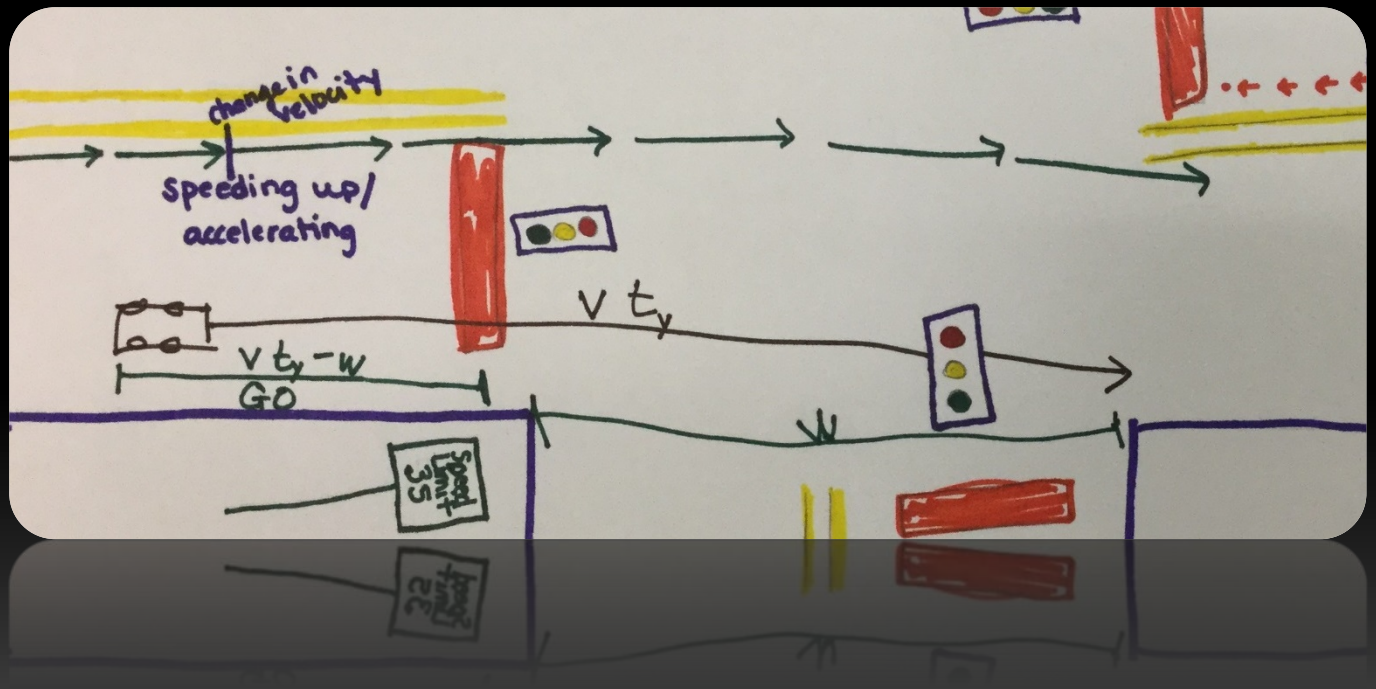


Applied Physics Workshop

PURDUE UNIVERSITY FORT WAYNE

Modeling Traffic Intersections

11:00AM



LUNCH!!!

12:00

Teacher Lesson Planning

1:00PM

Student Rocketry Challenge

1:00PM

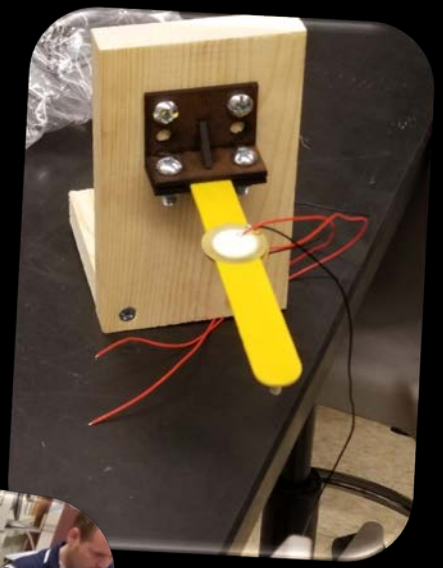
Lessons

- What physics concepts were involved in
  - NMR?
  - AFM?
  - Spectroscopy?
  - Interferometry?
  - Acoustic Levitation?

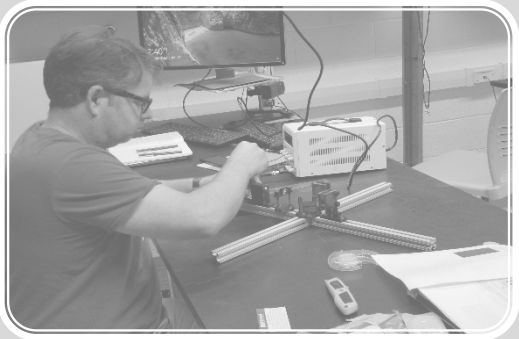
(5 mins - WB)

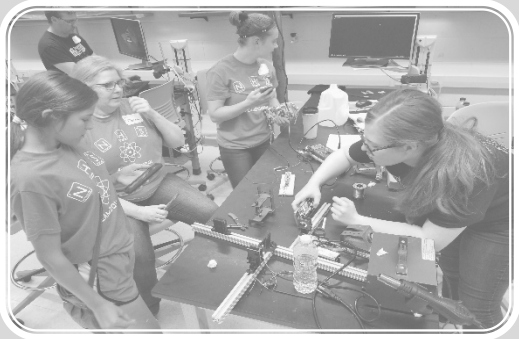
How do these apparatus fit into the curriculum?

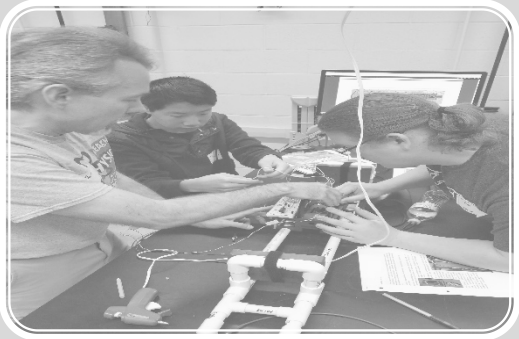
- ICP
- Physics 1
- Physics 2
- AP Physics C



Where do you go from here?







Demos

- for class
- for PhysFESTT

Lessons

- for class

Long-term Experiments

- for science fairs
- for publication

Teacher Share Out

3:30PM

The Physics Community

- American Association of Physics Teachers (AAPT)

  - The Physics Front
  - Listservs
  - IN-AAPT
- American Institute of Physics (AIP)
  - Career Resources

Teacher Resources

- OpenStax – online textbooks
  - https://openstax.org/subjects/science


Thank you!!!