


**Designing Home-Based Experiments
for Laboratory Classes**

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Science

- It is the study of facts.
- It is about discovering the world around us, of knowing things, and having new and wonderful idea.
- Scientific learning that takes place in classrooms alone is not true learning.
- Hands-on learning is very important for fostering scientific learning in early childhood: science lab experiments.

Laboratory Class

- Laboratories are an essential component of science courses.
- The laboratory is an exciting place where students investigate, analyze, and reflect. They test and apply theories and make abstract concepts concrete.
- Experimentation provides students with real-world contexts to apply scientific concepts, develop critical thinking skills, and engage in scientific processes.

Goals of Laboratory Class

- Develop intuition and deepen understanding of concepts.
- Apply concepts learned in class to new situations.
- Experience basic phenomena.
- Develop critical, quantitative thinking.
- Develop experimental and data analysis skills.
- Learn to use scientific apparatus.

[Science Teaching Reconsidered](#), National Academy Press, 1997

Goals of Laboratory Class

- Learn to estimate statistical errors and recognize systematic errors.
- Develop reporting skills (written and oral).
- Practice collaborative problem solving.
- Exercise curiosity and creativity by designing a procedure to test a hypothesis.
- Better appreciate the role of experimentation in science.
- Test important laws and rules.

[Science Teaching Reconsidered](#), National Academy Press, 1997

Laboratory Class Approach

- Expository** –Students follow prescribed directions to verify a preordained results. (traditional instruction or cookbook approach)
- Inquiry** – Students are provided with materials, information and a question to answer, but are given latitude tin how to go about designing the experiment or interpret the results which is not preordained (open-inquiry)

Laboratory Class Approach

- **Discovery** – The instructor has a particular outcome in mind and directs student towards that outcome, encouraging students to make predictions, formulate hypothesis and design and evaluate the experiment themselves. (guided-inquiry)
- **Problem Solving** – Students are given more ownership over the process of discovery while incorporating a greater dimension of teamwork and interdependence

COVID-19 Pandemic

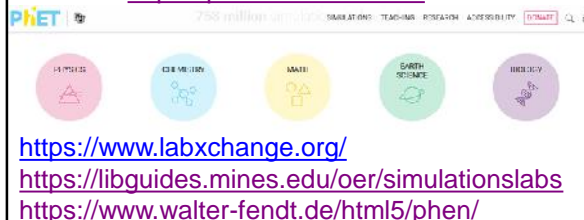
- Forced everyone to stay at home
- Shift to remote learning here in US
- Most schools closed in the Philippines
- Alternatives for lab experiments for those who did remote learning
 - Simulations
 - Lab Kits
 - Videos
 - No Lab

Online Class

Computer simulations provide alternatives to complex experiments that might be too large, expensive, or dangerous for physical manipulation or not feasible for a large number of students. **Lab kits**, in combination with household items, provide the means to conduct experiments at home on a smaller scale and without the need for expensive equipment

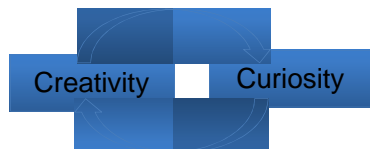
Online Resources

Science: <https://phet.colorado.edu/>



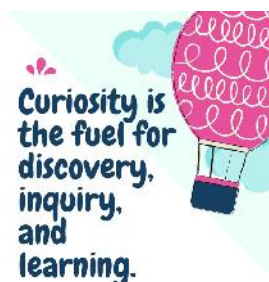
Laboratory Best Alternative

- Mimic commercial lab kits but use everyday household materials.
- By using these materials, teachers have to use their creativity and take advantage of students curiosity.
- Curiosity is the key to creativity.



Curiosity

- Make students curious.
- Curiosity makes learning more effective and enjoyable.
- Curiosity is just as important as intelligence in determining how well students do in school.



Curiosity

Rick Warren, author of 'The Purpose Driven Life'

how we usually think about creativity

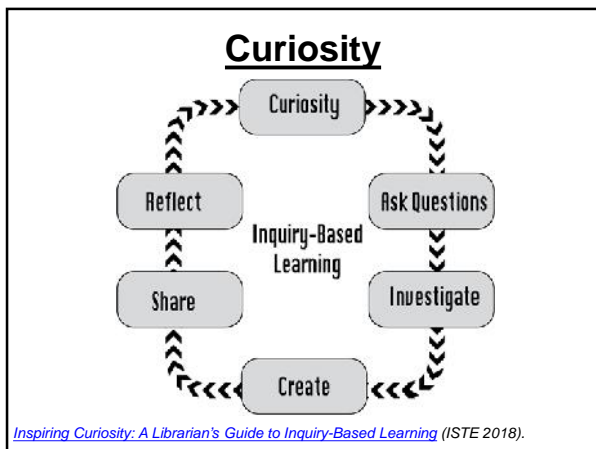
what creativity really is

<https://seewhathappensblog.com/2011/10/26/forget-creativity-lets-demand-curiosity/>

12 Benefits of Creativity

- 1 Creativity is multi-disciplinary
- 2 Creativity allows you to express yourself
- 3 Creativity promotes thinking and problem-solving
- 4 Creativity reduces stress and anxiety
- 5 Creativity allows you to enter your 'flow zone' and have fun!
- 6 Creativity gives you a sense of purpose
- 7 Creativity leads to feelings of accomplishment and pride
- 8 Creativity can link you to others with the same passion
- 9 Creativity improves your ability to focus
- 10 Creativity promotes risk-taking & iteration
- 11 Creativity is a pre-requisite for innovation
- 12 Creativity encourages us to be life-long learners

"Creativity now is as important in education as literacy and we should treat it with the same status."
- Ken Robinson



- ## Things to Consider
- Avoid adapting the traditional lab experiments directly to online environment
 - Think SAFE (Safety, Affordability, Feasibility, "Engageability")
 - Key to have a successful distance learning activity is its DESIGN.
 - Focus on learning objectives

Designing Home Experiments

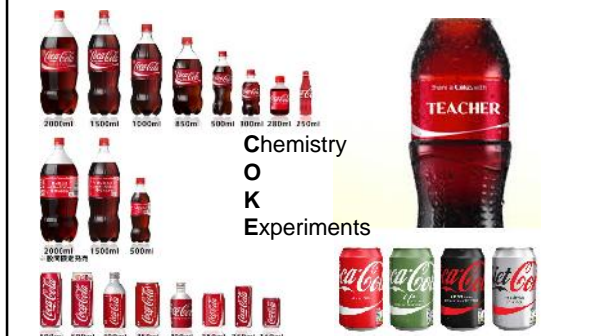
- Conceive: What do I wish to accomplish in this experiment/activity?
- Design: How I will accomplish the experiment?
- Implement: How it will done by the students?
- Operate: Does it work the way it was planned?

Designing Home Experiments

Chemical Reactions in Everyday Life

ThoughtCo.

Coca-Cola



Soaking in Coke



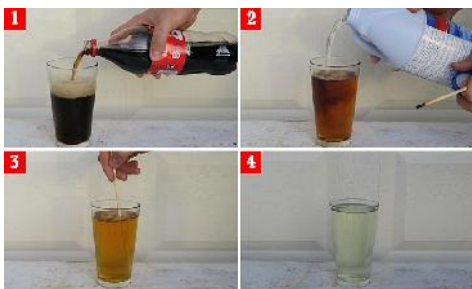
Evaporating Coke



Milk + Coke



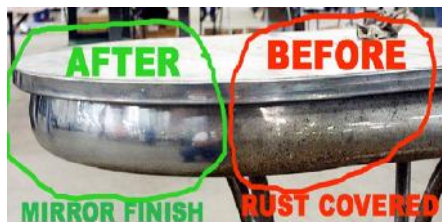
Bleach + Coke



Floating/Sinking Coke



Coke as Cleaning Agent



Mentos + Coke

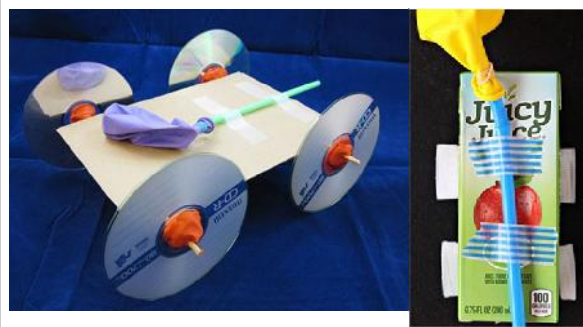


Balloons



<https://www.youtube.com/watch?v=X4vWDDmKOTM>

Balloons

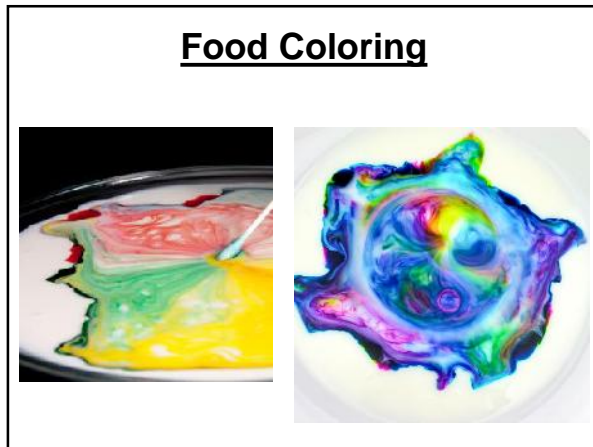
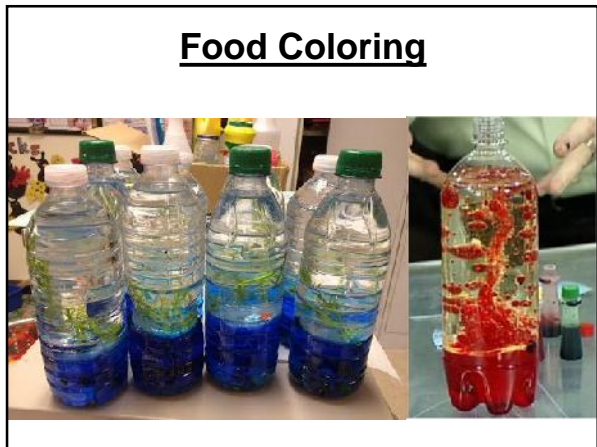
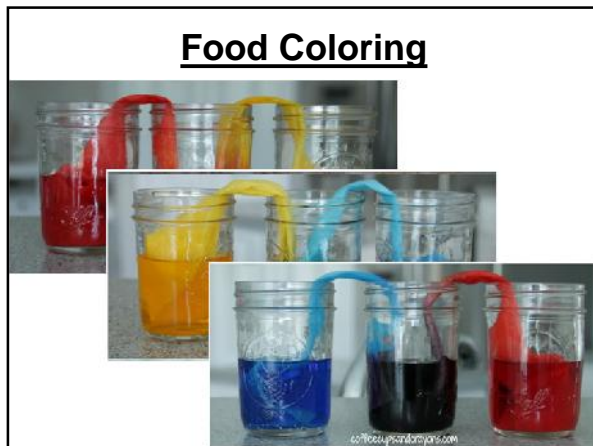
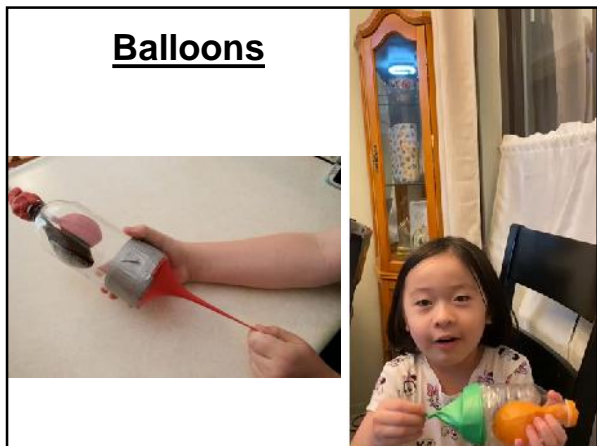


Balloons



Balloons

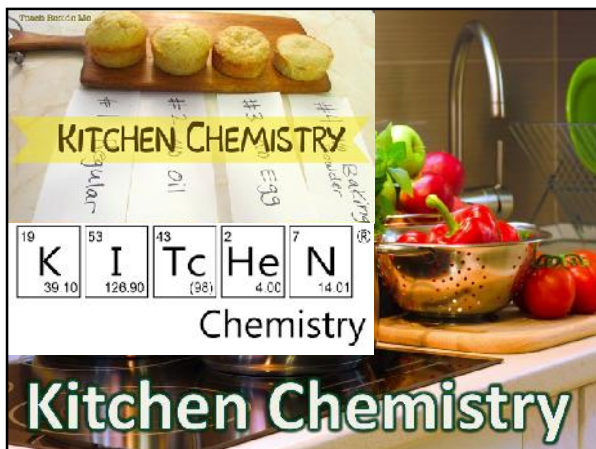




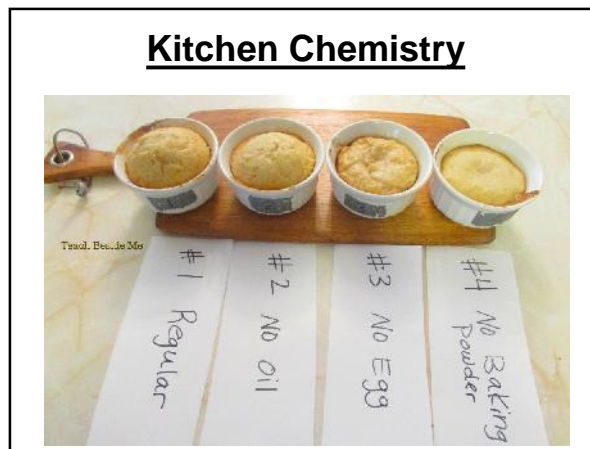
Skittles and M&M



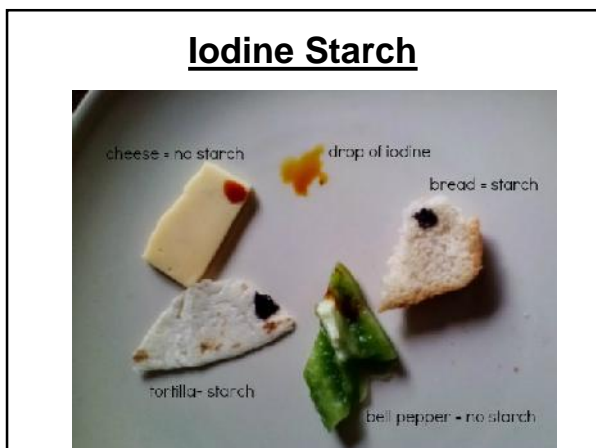
Rainbow



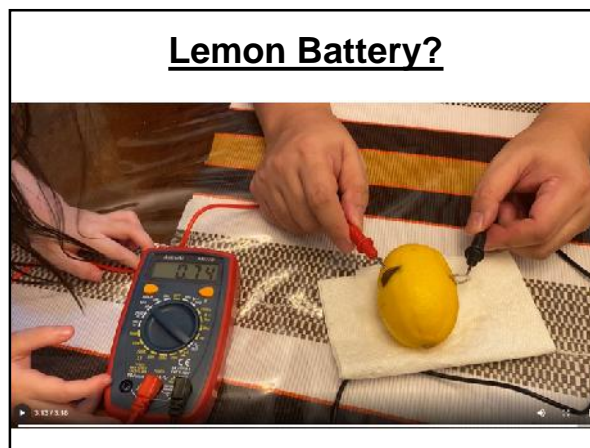
Kitchen Chemistry



Iodine Starch



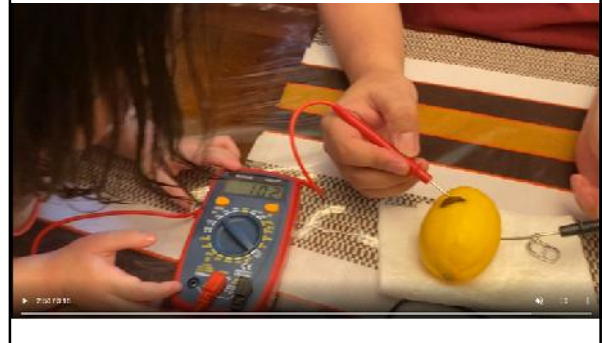
Lemon Battery?



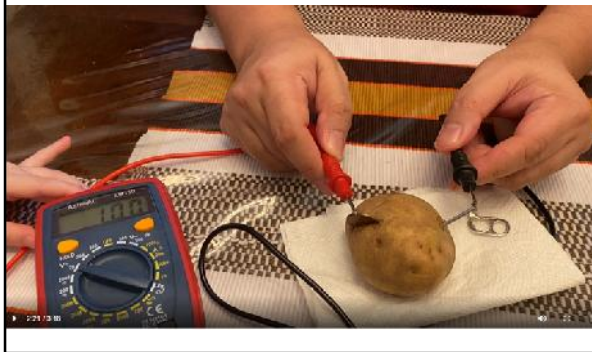
Potato Battery?



Lemon Battery?



Potato Battery?



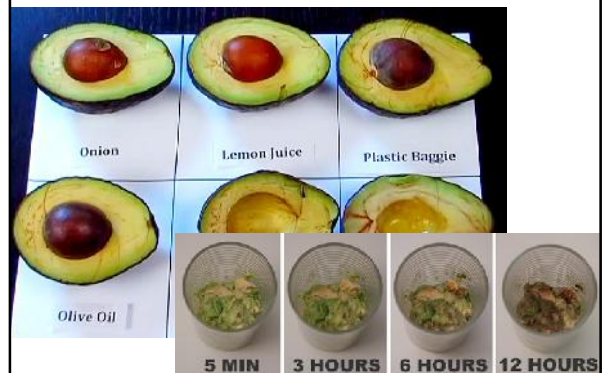
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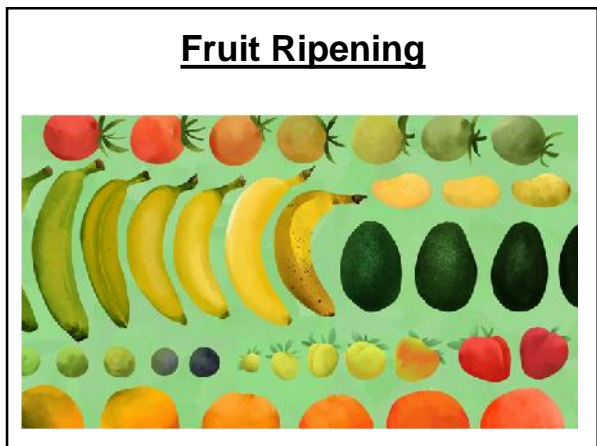
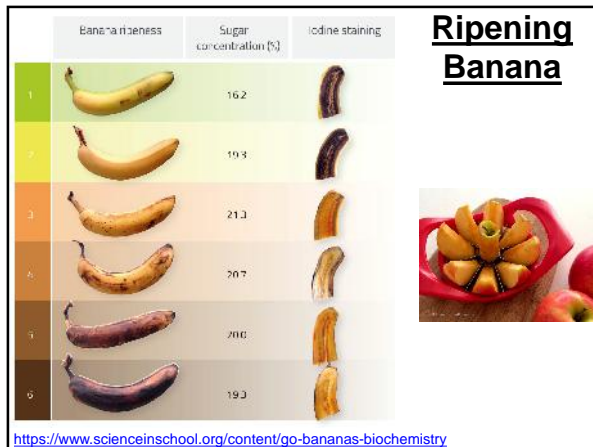
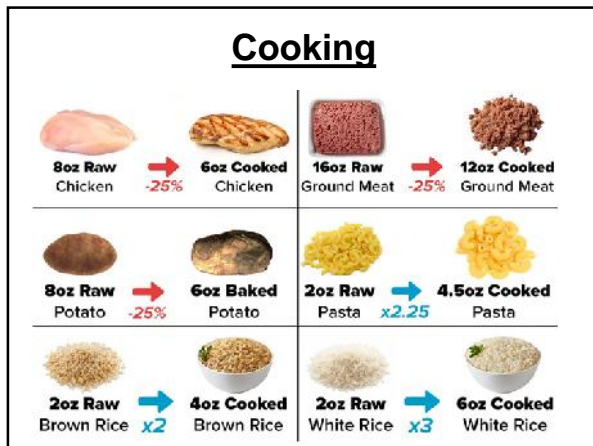
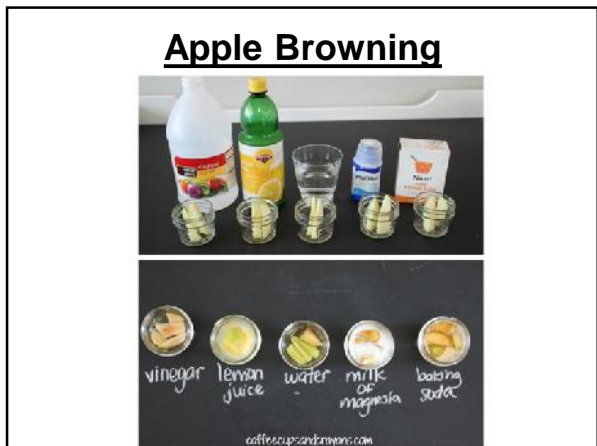


Potato Battery?



Avocado Browning





Cebu Delicacies



Meat Tenderizer



Egg/Itlog





Seafoods

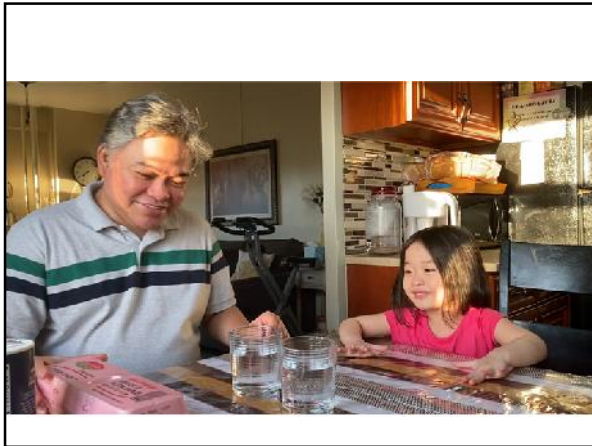


Alternatives

- If materials cannot be supplied, teachers can perform the experiments, video it and show to the students.
- Better, just look for the videos in YouTube.
- You can look on other sites where the videos are available.
- To economize data plan (Internet use) make/find videos that are short.

Websites

- [Filipino Science Hub](#) 
- Pueblo Science 
- YouTube Channel: Craft for Kids, Raising da Vinci, MaxHax, Go Experimental, Malmesbury Education
- My personal webpage:
<https://projectchemunity.weebly.com/>



Final Thoughts

I do believe that out of adversity comes incredible resourcefulness.

— *Piia Keegian* —

RESOURCEFULNESS

Start where you are.
Use what you have.
Do what you can.

“It’s not resources but resourcefulness that ultimately makes the difference.”

— *Tommy Robbins, AR Companies*



Acknowledgements

- Dr. Edwin Pilapil
- Everyone who attended the webinar

