


**Home-Based Experiments and Demonstrations to Fulfill the Laboratory Class in Blended Learning**

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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 in 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/>

PHET | 758 million users | SIMULATIONS | TEACHER | RESEARCH | ACCESSIBILITY | 



<https://www.labxchange.org/>

<https://libguides.mines.edu/oer/simulationslabs>

<https://www.walter-fendt.de/html5/phen/>

### 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

how we usually think about creativity

what creativity really is

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

### 12 Benefits of Creativity

1. Creativity allows you to express yourself
2. Creativity is multi-disciplinary
3. Creativity reduces stress and anxiety
4. Creativity allows you to enter your 'HAPPY ZONE' and have fun!
5. Creativity promotes thinking outside the box and problem-solving
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

### Curiosity

*Inspiring Curiosity: A Librarian's Guide to Inquiry-Based Learning (ISTE 2018).*

### 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

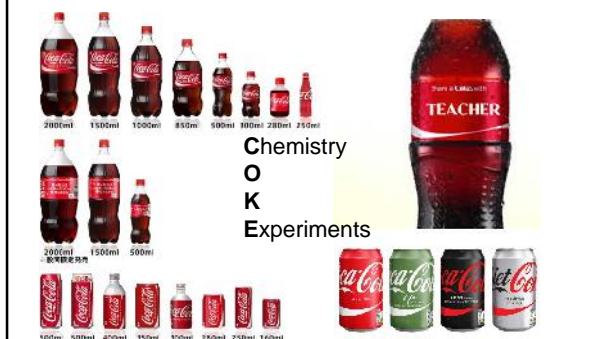
- Conceive: What do I wish to accomplish in this experiment/activity?
- Design: How I will accomplish the experiment?
- Implement: How it will done by the students?
- Operate: Does it work the way it was planned?



## Designing Home Experiments



## Coca-Cola



## Soaking in Coke



## Evaporating Coke

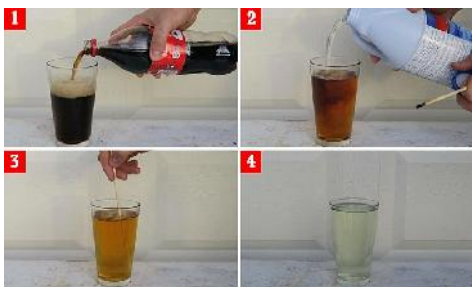


## Milk + Coke





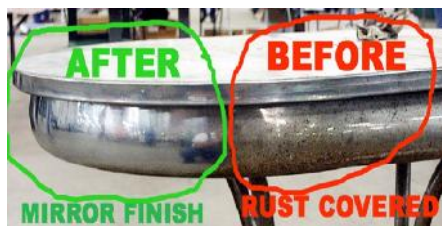
### Bleach + Coke



### Floating/Sinking Coke



### Coke as Cleaning Agent



### Mentos + Coke

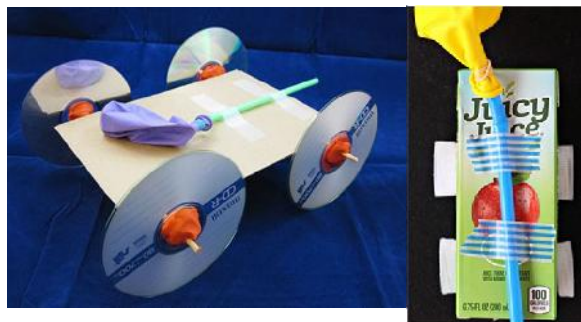


### Balloons



<https://www.youtube.com/watch?v=X4vWDDmkOTM>

### Balloons



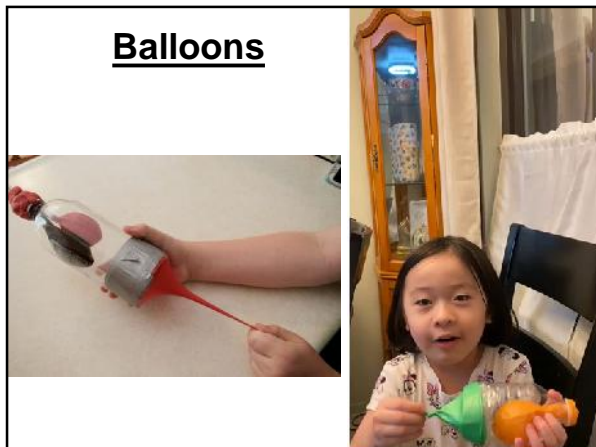
**Balloons**



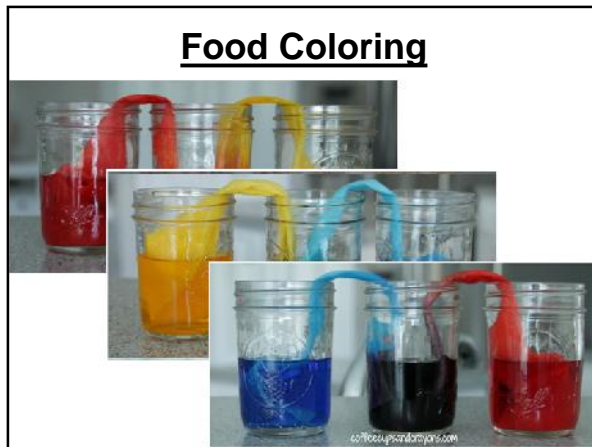
**Balloons**



**Balloons**



**Food Coloring**



**Food Coloring**



### Food Coloring



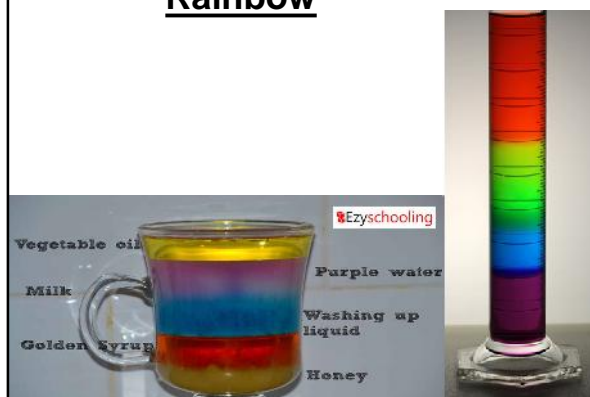
### Food Coloring



### Skittles and M&M



### Rainbow



**KITCHEN CHEMISTRY**

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Chemistry

**Kitchen Chemistry**

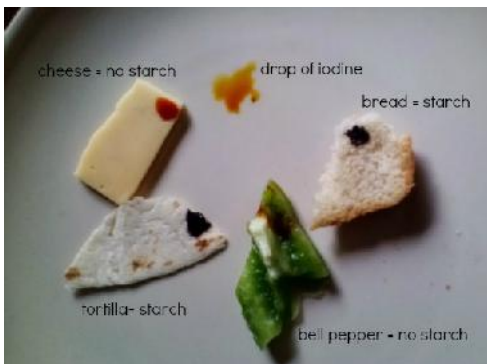
Handwritten labels for baking ingredients: #1 Regular, #2 No Oil, #3 No Egg, #4 No Baking powder.

### Kitchen Chemistry





### Iodine Starch



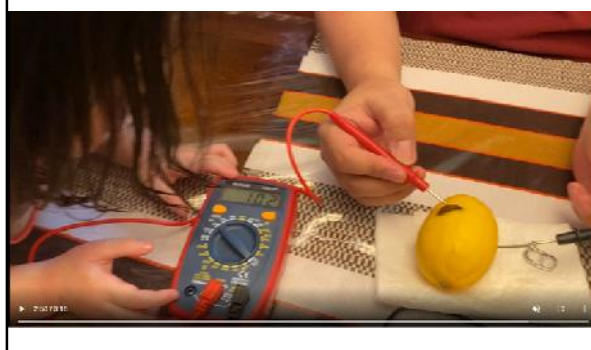
### Lemon Battery?



### Potato Battery?



### Lemon Battery?



### Potato Battery?



### Lemon Battery?

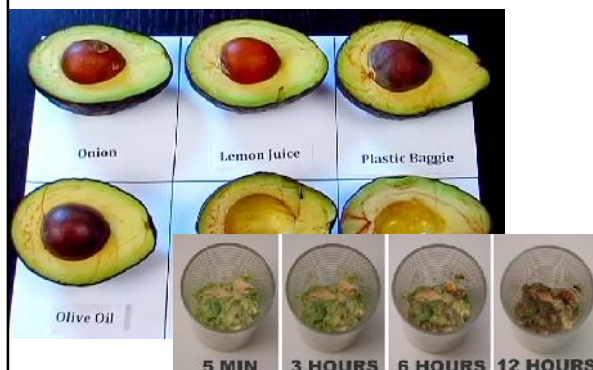




### Potato Battery?



### Avocado Browning



### Apple Browning



### Cooking

8oz Raw Chicken	→ -25%	6oz Cooked Chicken	16oz Raw Ground Meat	→ -25%	12oz Cooked Ground Meat
8oz Raw Potato	→ -25%	6oz Baked Potato	2oz Raw Pasta	→ x2.25	4.5oz Cooked Pasta
2oz Raw Brown Rice	→ x2	4oz Cooked Brown Rice	2oz Raw White Rice	→ x3	6oz Cooked White Rice

### Bigas to Kanin



### Ripening Banana

	Banana ripeness	Sugar concentration (%)	Iodine staining
1		16.2	
2		19.4	
3		21.1	
4		20.7	
5		20.0	
6		19.3	

<https://www.scienceinschool.org/content/go-bananas-biochemistry>

**Fruit Ripening**



**Carburo**



**Meat Tenderizer**



**Egg/Itlog**





**Seafoods**

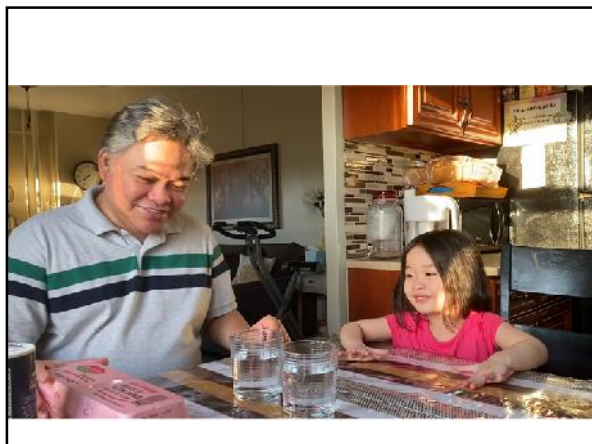


**Alternatives**

- 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.

— Phil Keoghian —

### RESOURCEFULNESS

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

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

— Terry Robbins, All Companies



## Acknowledgements

- UNIFFIED
- Everyone who attended the webinar

