Removing Barriers to Learning Biology

Creating Simple Activities Supporting Complex Biology
&
Scientific Processes in Your Classroom

-Mr. Bob Roddie (Jury Canada, WWEST @ UBC Okanagan)

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IBO--Philippines

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LAND ACKNOWLEDGEMENT

The WWEST team respectfully acknowledges that our workspace at UBC Okanagan is situated on the traditional, ancestral, unceded territory of the Syilx Okanagan Nation, with programming that extends across traditional, ancestral, ceded and unceded territories of Indigenous peoples throughout British Columbia and the Yukon.

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WWEST ??

Natural Sciences and Engineering Research Council of Canada (NSERC)

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Chairs for Women in Science and Engineering (CWSE) BC/Yukon

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Westcoast Women in Engineering Science and Technology (WWEST) Program

The University of British Columbia Okanagan

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Faculty of Health and Social Development

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VISION

The **overall goal** of the BC and Yukon CWSE program is to:
support intersectionality and diversity, and to provide equitable and inclusive learning and working environments for underrepresented persons in science and engineering.

WWEST's **vision** is to:

increase diversity, and grow a collaborative community through the application of positive factors and forces, that excite women and underrepresented persons to pursue, and remain in, STEM careers.

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Goals of the session:

1. Create a learning community to explore different models to learning
2. Provide different activities that incorporate simple materials to investigate challenging topics
3. Help build excitement in creating next generation of young scientists

Who am I and my vision of Biology/Science Education:

1. Science is a verb
2. Students need to be engaged in learning
3. Understanding the big picture is vital (memorization ≠ learning)
4. A scientist tests, measures, and interprets results, students should be doing this too!

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Topics to be touched upon, using low-cost materials, and using the scientific method in your classes:

- DNA/Chromatin/Chromatids
- Mitosis/Meiosis: nuclear and cell division
- Enzymes: rates of reaction
- Creating Chemotherapy in your class
- The Power of Water: quantifying the H-bonds
- Quantifying Photosynthesis
- Ocean Acidification and Climate Change Chemistry
- Adding Mathematics Connections
- Creating the Next Generation of Scientists!

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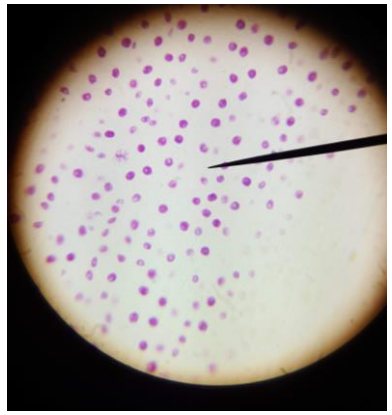
DNA Structures & Sock Mitosis/ Meiosis



Materials needed:

- Two cords that are the same/cables
- 6-8 pairs of socks
- Chopsticks

Visualizations using simple materials to explain nuclear/cell division. Reinforces learning and forces student to think about what is happening to visualize the chromosomal movement

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Enzyme Action: Toothpickase

Materials:

- Toothpicks
- Coloured Toothpicks
- Tape
- Ice Bath

Helps students see the role of enzymes play in reactions and how they can “visualize” key points:

- Active site(s)
- Effects on rate of reaction:
  - Concentration
  - Introduction of inhibitors
  - Temperature

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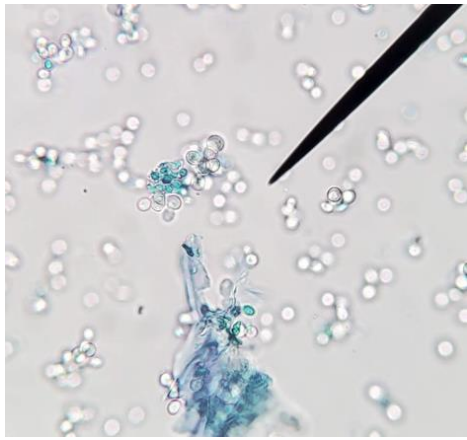
Chemotherapy in the classroom

Materials:

- Methylene Blue
- Yeast
- Microscope/slide/coverslip
- “Herbal Extract”
- Test tubes
- Sugar/glucose

Asking students to come up with a hypothetical chemotherapy therapy using home remedies.



How does it fit?

- Testing hypotheses and making predictions
- Measuring & microscope use
- Serial Dilutions
- Understanding cancer and treatment

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Power of Water/ Hydrogen Bonding!

<u>Materials needed:</u>

- Water
- Droppers
- Soap
- Coins
- Beaker/bowl for water

Using the cohesive and adhesive properties to measure quantity of water to look at the H-bonding of water and what happens when adding soap to these properties.

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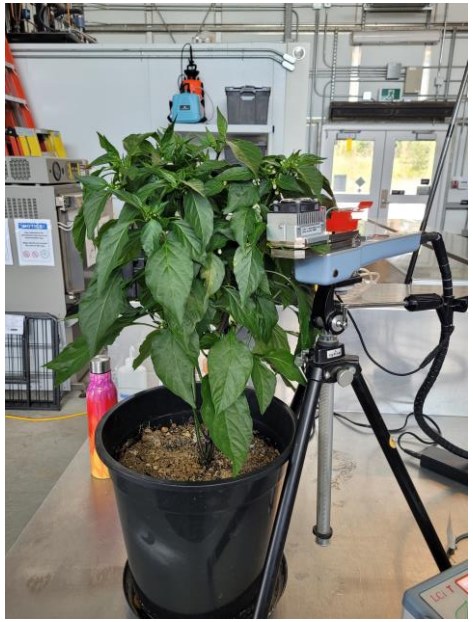
Cellular Processes: Photosynthesis

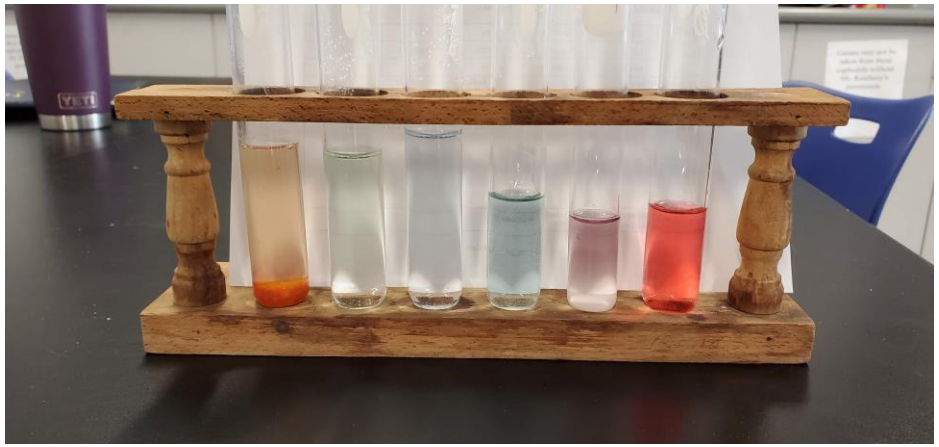


Materials:

- Simple Green Leaves
- Plastic straw or Hole punch
- Syringe
- Bright Light
- Sodium Hydrogen Carbonate solution

Using simple gas production procedure to help measure photosynthetic rate + encourage students to alter variables to test if the rates of photosynthesis change

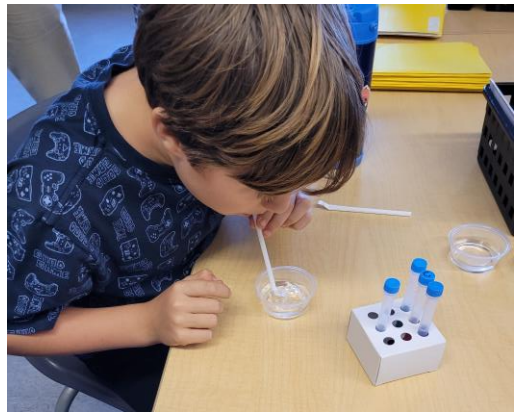
Ocean Acidification and Climate Chemistry



Materials needed:

- Red Cabbage Juice (indicator)
- Beakers
- Test tubes
- Acid—vinegar
- Base—baking soda
- Straw
- Water

Using simple demonstration allows you to effectively explain how ocean acidification happens, and link to the Carbon Cycle.



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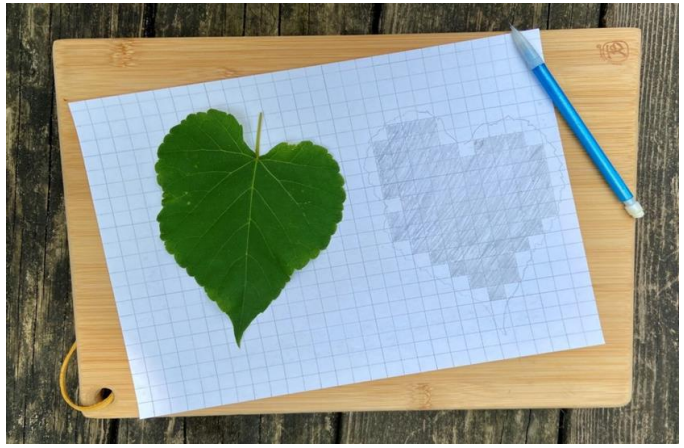
Introducing More Math in Biology Classes



Materials needed:

- Pencil or popsicle stick
- Graph paper
- Leaves or other things to measure
- Trees
- Metrestick

Sometimes it is good to link other curriculum with Biology Concepts. Some ideas to integrate some simple math include:

- Trigonometry and Similar Triangles
- Surface Area measurements

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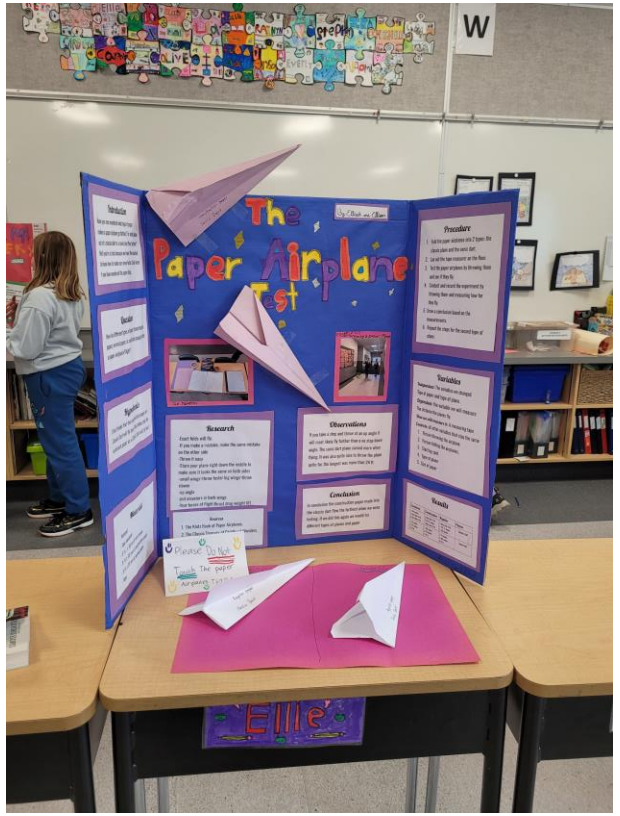
Creating the Next Generation of Scientists

- How many independent projects do your students do?
- How many times do your students get to ask a question, formulate a hypothesis/prediction, test using a procedure, collect data, and then defend their answers?



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QUESTIONS ?

Please ask away—use this to support your Biology Teaching Journey!

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Thank You...

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