Science Encounters
Science Curriculum Project

October 25, 2019
Presenter: Ann Colvin
South Middlesex Opportunity Council

• SMOC’s mission is to improve the quality of life of low-income and disadvantaged individuals and families by advocating for their needs and rights; providing services; educating the community; building a community of support; participating in coalitions with other advocates and searching for new resources and partnerships.
Joan Brack Adult Learning Center

- Joan Brack Adult Learning Center (JBALC) at South Middlesex Opportunity Council (SMOC)
- Daytime ESL and GED classes for adults in Metrowest
- GED classes are 20 hours per week
- GED students may be:
  - Addressing basic needs
  - Motivated by external factors
Why Science Encounters?

- Prior curriculum focused on individual reading
What is Science Encounters?

- New curriculum centered around in-class lab activities
  - Students doing science
  - RLOs (Reusable Learning Objects)
  - ECRIF methodology
    - (Encounter, Clarify, Remember, Internalize, Fluently use)
Project Structure

• 12 Week Curriculum
  o 2 hour class, once per week
  o 10 students
  o Different science topic each week
  o Level: upper middle school

• Key Lesson Components
  o Content lesson with quick assessments built in
  o Lab activity
  o Journal (for lab reports and reflective writing)
Curriculum Topics

1. Cells
2. Genetics
3. Evolution
4. States of Matter
5. Physical Properties
6. Chemical Properties
7. Molecules & Compounds
8. Weather
9. Visible Light
10. Force
11. Energy Resources
12. Magnetic and Electrical Forces
Magnetic Forces

• The Earth has a magnetic field. Magnetic compasses point to the Earth’s magnetic north pole.
• The planetary and magnetic poles do not necessarily line up. In fact, the planet Uranus has a difference of about 60 degrees!
### Neutrons

- No electrical charge
- Located inside the nucleus
- Included in the atom's mass
- 1 neutron = 1 atomic mass unit (amu)
- May not always be the same as the number of protons.
Plant Cells

- Cell Membrane
- **Cell Wall**
- Nucleus
- Cytoplasm
- Mitochondrion
- Vacuoles
- **Chloroplast**
Quick Assessments

**Frequency Problem**

The speed of a wave on a rope is 50 cm/s and its wavelength is 10 cm. What is its frequency?

1) Write the formula
2) Substitute and solve

**Quick Sorting Activity**

Decide if each situation is an example of kinetic or potential energy.

<table>
<thead>
<tr>
<th>Situation</th>
<th>Potential</th>
<th>Kinetic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standing on the end of a diving board.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Falling from the top of a ladder.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A rubber band pulled back as far as it can go.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Lab Activities

**Scientific Method as a framework for ALL lab activities**

<table>
<thead>
<tr>
<th>Independent vs. Dependent Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Independent variable</strong> – changed by the scientist during the experiment</td>
</tr>
<tr>
<td><strong>Dependent variable</strong> – changes in response to the changing independent variable</td>
</tr>
</tbody>
</table>

---

**Using the Scientific Method to Investigate…**

**Research Question:** If we mix iron filings with glue, water, and borax...

Will the resulting substance be “magnetic”? 

![Image of materials](image.png) + ![Glue](image.png) + ![Borax](image.png) + ![Iron Filings](image.png) = ?
Lab Activities

Extracting DNA from Strawberries

“Disappearing” Glass Rod

Liquid or Solid?
Lab Activities

- Solar Powered Wind Bag
- Cloud in a Bottle
- Cell Pizza
- Making Observations
Lab Activities

Magnetic Slime

“Screaming” Balloons

Density Rainbow
Phenyldithiocarbamid/chemical PTC 2/29/19

Hypothesis
I do not believe I am a taster. I will not detect the chemical PTC from a piece of paper.

Experiment
I put a piece of paper in my mouth.

Observation & Collect Data
I could not taste PTC from the paper.
10 people tried & 4 people could taste it.
2 people could not.

Conclusion
I am not a taster. My conclusion was correctly predicted as stated in my hypothesis.
Student Successes

- Actively engaged with RLOs
- Used scientific method to complete labs
- Demonstrated understanding during in-class exercises, assessments, and practice tests
- All five students who took the science sub-test passed on the first attempt!
Student Enthusiasm

- Higher attendance
- Positive feedback
- Participation in labs even after passing the science sub-test
- “Attitudes towards science” survey

<table>
<thead>
<tr>
<th></th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neither Agree nor Disagree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Before pilot) School should have more science lessons each week.</td>
<td>0</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>(End of pilot) School should have more science lessons each week.</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Challenges

• Measurement: pre and post surveys were not collected from all the same students
• Continuity: uneven attendance hampered ability to include linked topics
• Excluded Topics: not all science topics lend themselves to hands-on lab work
• Test Prep: added lesson component
Beyond Science Encounters

- New students experiencing lab activities and RLOs
- ECRIF methodology being used across subjects
- Developed interactive lesson plans with group activities for social studies and math