Strand: 8.1.4

Emphasis: Natural vs Synthetic

Anticipated Time Required (assuming 50 minute class periods): 9

- Learning Episode 1: 1 – 50 min class
- Learning Episode 2: 1 – 50 min classes
- Learning Episode 3: 2 – 50 min classes
- Learning Episode 4: 2 – 50 min classes
- Learning Episode 5: 5 – 50 min classes

Dominant CCC: Energy and Matter, Stability and Change

Dominant SEP: Obtain, Evaluate, and Communicate Information

Management Strategies to support equitable access to content:

During investigations, commit to checking written pre-work. This not only ensures that students are engaged in the cognitive work of the lab, but it gives teachers a chance to check in on teams of investigators, and ensure that each team member has equal access to the materials, and is equally invited to participate in every activity.

Shopping list:

- Learning Episode 1: prepared PEG, beaker, scissors, and syringe
- Learning Episode 2: none
- Learning Episode 3: none
- Learning Episode 4: milk, vinegar, baking soda, beakers, measuring cups, hot plates, gloves, goggles,
- Learning Episode 5: 1 cm 2 squares of 8 fabrics (examples: polyester, wool, silk, spandex, linen, cotton, vinyl, acrylic, rayon, acetate, nylon), alcohol burners, dissecting probe, beaker, goggles, bleach, test tubes, and rack

J. Dwyer
8.1.4 Synthetics versus Natural Materials Storyline

**Anchor Phenomenon:** This fluid behaves differently than a typical fluid (i.e. water).

**Student Performance Expectation:**

8.1.4: Obtain and evaluate information to describe how synthetic materials come from natural resources, what their functions are, and how society uses these new materials. Examples of new materials could include medicine, foods, building materials, plastics, and alternative fuels.


<table>
<thead>
<tr>
<th>Dominant DCI</th>
<th>Dominant CCC</th>
<th>Dominant SEP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Structure and properties of matter</td>
<td>Structure and function</td>
<td>Obtaining, evaluating, and communicating information</td>
</tr>
<tr>
<td>2. Chemical reactions produce new substances</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Management Strategies:**

**Science Experiences**

<table>
<thead>
<tr>
<th>CCC/SEP</th>
<th>What are students doing? (This should match your SEP!)</th>
<th>What specific understandings should students get from this experience?</th>
<th>New questions students have to propel us to the next science experience</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Students will observe the unique behaviors of a viscoelastic polymer fluid as the teacher demonstrates three different actions. Guiding their thought progressions will allow the class to build a comprehensive set of driving questions and identify potential uses of the fluid.</td>
<td>Through observing and identifying the fluid’s function from evidence, students will be able to ask driving questions about the fluid’s structure.</td>
<td>Why does the fluid tend to want to stay connected as a whole but does not exhibit frictional resistance (viscosity)?</td>
<td>Formative: Students generate questions.</td>
</tr>
<tr>
<td>2</td>
<td>CCC: Patterns</td>
<td>SEP: Construct an explanation</td>
<td>Timeframe: 1 50 min</td>
<td>Students will be given cards with chemical formulas/molecular models of simple molecules (monomers) and complex chains of molecules (polymers) in which they will have construct an explanation.</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>3</td>
<td>CCC: Structure and Function</td>
<td>SEP: Obtain, evaluate, and communicate information</td>
<td>Timeframe: 2x50 min</td>
<td>Students begin their introduction to “synthetics” vs “natural” by exploring different products in stores that contain natural and synthetic polymers.</td>
</tr>
<tr>
<td>4</td>
<td>CCC: Structure and Function</td>
<td>SEP: Plan and carry out investigations</td>
<td>Timeframe: 2-50 min class</td>
<td>Students begin their introduction to “synthetics” by continuing their investigation of the anchor phenomenon with different fluids. They can build on their initial questions, or resolve them, as they work through a lab of combining milk and vinegar to form plastic.</td>
</tr>
<tr>
<td>5</td>
<td>CCC: Structure and function</td>
<td>SEP: Plan and carrying out an investigation, Obtain, evaluate and communicate information</td>
<td>Timeframe: 5-50 min class</td>
<td>Students will be given a selection of synthetic and natural fibers from which they will test key properties, collect and analyze data, and prioritize its functions that could be useful in everyday products. They will prepare a report and present to the class their findings and research.</td>
</tr>
</tbody>
</table>
### 8.1.4 Learning Episode 1

#### Student Science Performance

<table>
<thead>
<tr>
<th>Topic</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synthetics vs. Natural</td>
<td>Unique Behavior of a Polymer Fluid</td>
</tr>
</tbody>
</table>

#### Overarching Performance Expectations (Standard) from State Standards or NGSS:
Obtain and evaluate information to describe how synthetic materials come from natural resources, what their functions are, and how society uses these new materials. Examples of new materials could include medicine, foods, building materials, plastics, and alternative fuels.

#### Lesson Performance Expectations:
Through observing and identifying the fluid’s function from evidence, students will be able to ask driving questions about the fluid’s structure as an introduction to the properties of materials.

- **CCC:** Structure and function
- **SEP:** Asking questions

#### Students Will. . . To Construct Meaning

**Engage with a Phenomenon:**
3 unique behaviors of a polymer fluid

**Student Prompt:**
Examine the fluid with sense of sight and touch. (step 1)

- (Be careful not to get too much on your hand because it can take a while to get off.) Make notes on observation cards.

2. Observe what is happening. (step 2) The function is self-siphoning. Why do you think this material as able to self-siphon? Think about its molecules.
   - List evidence
   - Formulate questions

3. Now, start framing your observations in terms of structure and function. Observe what is happening. If the function is the way the materials is suctioned out of beaker, what about its structure that allows it to function this way?
   - List evidence
   - Formulate questions

4. Observe what is happening. The function is being cut in half with scissors; what about its structure that allows it to function this way?
   - List evidence
   - Formulate questions

#### Teacher Will. . . To Support Students

Pass out handout below.

1. Observations of Polyethylene Glycol (step 1)
   - What characteristics does this fluid exhibit?

2. Demonstrate Behavior 1 (or show a video) (step 2)
   - Pour liquid from a beaker and gradually tilt beaker upright and watch as liquid continues to move
   - Pour water from a beaker and gradually tilt upright to watch flow stop
   - [https://www.youtube.com/watch?v=g4od-h7VoRk](https://www.youtube.com/watch?v=g4od-h7VoRk)

3. Demonstrate Behavior 2 (or show a video)
   - Use a large syringe and begin to suction fluid from the beaker. Pull the syringe out the liquid and continue to suction upwards.
   - Use a large syringe and begin to suction water from the beaker. Pull the syringe out the liquid and watch the suctioning stop.
   - [https://www.youtube.com/watch?v=aY7xiGQ-7iw](https://www.youtube.com/watch?v=aY7xiGQ-7iw)

4. Demonstrate Behavior 3 (no video)
   - As fluid starts to flow from beaker have a student volunteer cut it with a pair of scissors
   - As water starts to flow from beaker have a student volunteer cut it with a pair of scissors

J. Dwyer
5. Review all of the evidence and participate in a class discussion about why the fluid behaved the way it did. (step 3)
   a. In the question box, pick your best question and refine it.
   b. Can you think of a use for this material, based on its function?
5. Help students generate questions based on evidence. (step 3)
   a. Make 2 columns on the board for evidence and questions
   b. Ask students what evidence they found
   c. Use that list to generate further questions. Ask students if they have a question that is different than the ones listed;
6. Write these questions down in a designated area so that they can become the driving questions for the storyline.

**Assessment of Student Learning**

*Formative*

Driving questions will indicate that students understanding of the unique behaviors and how they are related to structure and function.

*Example of an excellent question:*

   How does the fluid appear to be able to stay connected even though the angle of the beaker has come to a point that fluid should no longer escape?

*Example of a good question:*

   When the cup is rotated upright, what property makes the fluid still come out?

*Example of a poor question:*

   How does the fluid keep coming out?
### Strangest Fluid Ever!

**Step 1:**

(Gently feel with your fingertips and do not grab the substance.)

<table>
<thead>
<tr>
<th>What did you SEE?</th>
<th>What did you FEEL?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Step 2:**

(Watch, identify, come up with evidence and formulate questions..)

<table>
<thead>
<tr>
<th>Behavior 1</th>
<th>Behavior 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure</td>
<td>Structure</td>
</tr>
<tr>
<td>Function</td>
<td>Function</td>
</tr>
<tr>
<td>Evidence List</td>
<td>Questions</td>
</tr>
</tbody>
</table>

**Behavior 3**

<table>
<thead>
<tr>
<th>Structure</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evidence List</td>
<td>Questions</td>
</tr>
</tbody>
</table>

**Step 3:**

(Pick a question and refine it.)

Question for class:

**Step 4:**

(Pick a function. What could it be used for?)

What could be a use for this fluid?
8.1.4 Learning Episode 2

Student Science Performance

<table>
<thead>
<tr>
<th>Topic</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synthetics vs. Natural</td>
<td>Patterns in the formulas</td>
</tr>
</tbody>
</table>

**Overarching Performance Expectations (Standard) from State Standards or NGSS:**
Obtain and evaluate information to describe how synthetic materials come from natural resources, what their functions are, and how society uses these new materials. Examples of new materials could include medicine, foods, building materials, plastics, and alternative fuels.

**Lesson Performance Expectations:**
Students will identify patterns in common monomers and polymers, and use those patterns to construct and explanation of the relationship between the two.

- **CCC**: Patterns
- **SEP**: Construct an explanation

---

**Students Will . . . To Construct Meaning**

**Engage with a Phenomenon:**
Polymers are linked monomers.

**Student Prompt:**
Review - what were some of the properties you observed in the PEG yesterday?

2. Look over the cards with a partner
   - Notice there are three types of cards
     - chemical names
     - chemical formulas
     - structural formulas
   - Second, now try to make sure of the patterns, but DO NOT make inferences.
     - What evidence can you pull from the cards in order to help you infer in the next step.
   - Third, now put together some ideas on what you think you are looking at.
     - Use tools like categorizing and organizing.
     - Try to compare and contrast.
   - Last, can you develop an idea of what the fluid from the previous episode represented?

---

**Teacher Will . . . To Support Students**

1. Cut up the cards and shuffle them.
2. Pair up students and give them the handout plus a set of cards
   - There are chemical names, chemical formulas, and structural formulas
   - Identify the difference on the board
3. Have students fill out each box consecutively
4. Hold a group discussion in the end about what they found and how they connected to the anchor phenomenon
Assessment of Student Learning

Formative

The four boxes represent how students go from seeing patterns to constructing explanations. They should be able to proficiently move through each, starting with a basic understanding of simple vs. complex molecules to forming a connection between linked complex molecules that were in the anchor phenomenon.

Example of an excellent explanation:

1. I see C and H atoms in all chemical formulas, I see rings in a couple of them, name repeat with a prefix added to it. I sometimes see double lines between atoms on the small molecules and no double lines on the big molecules....
2. “ene” is in all names, lines between all atoms, small and large molecules; an “n’ appears at the end of a molecule...
3. I infer that some of these are repeats of each other but with more atoms. I infer that some of the little ones combined to make big ones, I infer that when “poly” is added to the word it means “more”
4. I think the difference between the water and liquid in the anchor phenomenon is that the liquid is connected somehow by all of these lines and extra atoms. It is a “poly” of something.
<table>
<thead>
<tr>
<th>Ethylene</th>
<th>Polyethylene</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propylene</td>
<td>Polypropylene</td>
</tr>
<tr>
<td>Styrene</td>
<td>Polystyrene</td>
</tr>
<tr>
<td>Methyl methacrylate</td>
<td>Polymethyl methacrylate</td>
</tr>
<tr>
<td>Ethylene oxide</td>
<td>Polyethylene oxide</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>$\text{C}_2\text{H}_4$</td>
<td>$(\text{C}_2\text{H}_4)_n$</td>
</tr>
<tr>
<td>$\text{C}_3\text{H}_6$</td>
<td>$(\text{C}_3\text{H}_6)_n$</td>
</tr>
<tr>
<td>$\text{C}_8\text{H}_8$</td>
<td>$(\text{C}_8\text{H}_8)_n$</td>
</tr>
<tr>
<td>$\text{C}_5\text{H}_8\text{O}_2$</td>
<td>$(\text{C}_5\text{O}_2\text{H}_8)_n$</td>
</tr>
<tr>
<td>$\text{C}_2\text{H}_4\text{O}$</td>
<td>$(\text{C}_2\text{H}_4\text{O})_n$</td>
</tr>
</tbody>
</table>
## Key

<table>
<thead>
<tr>
<th>Monomer</th>
<th>Monomer Name</th>
<th>Polymer</th>
<th>Polymer Name</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Ethylene" /></td>
<td>ethylene</td>
<td><img src="image" alt="Polyethylene" /></td>
<td>poly(ethylene)</td>
</tr>
<tr>
<td><img src="image" alt="Propylene" /></td>
<td>propylene</td>
<td><img src="image" alt="Polypropylene" /></td>
<td>poly(propylene)</td>
</tr>
<tr>
<td><img src="image" alt="Styrene" /></td>
<td>styrene</td>
<td><img src="image" alt="Poly(styrene)" /></td>
<td>poly(styrene)</td>
</tr>
<tr>
<td><img src="image" alt="Methyl Methacrylate" /></td>
<td>methyl methacrylate</td>
<td><img src="image" alt="Polymethylmethacrylate" /></td>
<td>poly(methyl methacrylate)</td>
</tr>
<tr>
<td><img src="image" alt="Ethylene Oxide" /></td>
<td>ethylene oxide</td>
<td><img src="image" alt="Polyethylene oxide" /></td>
<td>poly(ethylene oxide)</td>
</tr>
</tbody>
</table>

Patterns That I Noticed

Evidence from Patterns

Inferences That I Can Make

Connections Formed

(How does it relate to the Anchor Phenomenon?)
### Student Science Performance

<table>
<thead>
<tr>
<th>Topic:</th>
<th>Synthetics vs. Natural</th>
<th>Title:</th>
<th>Natural vs. Synthetic Polymers</th>
</tr>
</thead>
</table>

#### Overarching Performance Expectations (Standard) from State Standards or NGSS:
Obtain and evaluate information to describe how synthetic materials come from natural resources, what their functions are, and how society uses these new materials. Examples of new materials could include medicine, foods, building materials, plastics, and alternative fuels.

#### Lesson Performance Expectations:
Students will obtain, evaluate, and communicate information about polymers further and understand that there are natural (nature formed) and synthetic (man-made) polymers, and that those polymer’s structure relates to their potential functions.

- **CCC**: Structure and function
- **SEP**: Obtain, evaluate, and communicate information

#### Students Will. . . To Construct Meaning

*Engage with a Phenomenon:*
*Nature-made and man-made polymers have unique properties.*

**Student Prompt:**
**Review:**  What is the difference between a monomer and a polymer?

1. **Read through the handout and try to think about what the three polymers look like based on their description. Use circles for atoms and do not label C, H, or O**
   - a. **Linear**
   - b. **Branched**
   - c. **Cross-linked**

2. **Correct the molecule to match the teacher’s model and identify the properties of each polymer**

3. **Identify how this polymer could fit into an everyday use. If it is rigid does that mean that it makes up something hard like a plastic toy?**

4. **Read through each section. Take notes on main ideas and finish each section with a statement that explains your understanding of that section. You MUST include evidence from your notes.**

#### Teacher Will. . . To Support Students

1. **Students will be given a handout and in their notebooks, asked to try to make a model of what polymers look like.**
   - a. **Model the three types**

2. **Show the students the accurate models and have them redraw if necessary. Tell them to look at each polymer’s properties.**

3. **Next, have them identify what function that property could serve if used in a product. They can name a type of product or generalize.**

4. **Tell students that they will explore a website about polymers, and use it to complete a graphic organizer.**

---

J. Dwyer
Assessment of Student Learning

Formative

Example of excellent explanation:

Students will have each section fully completed with information from the website. There are multiple choices and explorations the students can chose from.

1. Natural vs. Synthetic
   a. students will have selected 4 polymers and explained thoroughly
   b. Ex: proteins found in shark cartilage and enzymes are extremely versatile and can create many different chemical reactions. There are so many possibilities for proteins and are made from amino acids.

   ![Polymers](image1.png)

   c.

2. Where are polymers found
   a. students will have selected 4 stores and identified 2 polymers per store
   b. Ex. Mt. Sopris Outdoor Trading Post, polyurethane which is a synthetic.
   c. Single most versatile polymer there is making everything from fibers to adhesives. because of its elastic properties. It is called an elastomer.

   ![Polymers](image2.png)

   d.
Polymer are **long chain molecules** made from smaller units called **monomers**.

The simplest polymer is **polythene**.

This is made by the process called **polymerization**, whereby a monomer double bond is opened out to make a polymer, with side bonds.

Polymer chain molecules fall into **three** distinct types:

- **Linear** - have flexibility  
  (molecules slide past one another)

- **Branched** - increased rigidity, lower density, m.p. & strength  
  (molecules cannot easily pack together)

- **Cross-Linked** - very rigid  
  (no molecular sliding)
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  (molecules cannot easily pack together)

- **Cross-Linked** - very rigid
  (no molecular sliding)

What is a polymer?

http://www.pslc.ws/macrog/kidsmac/basics.htm

Read over this page. Does it confirm your understanding of what polymers are?

<table>
<thead>
<tr>
<th>Explain what a polymer is in your own words:</th>
<th>Go to the bottom of the page and make a virtual polymer. When finished draw your polymer.</th>
</tr>
</thead>
</table>

Natural vs. Synthetic

Visit the website on Natural polymers:
http://www.pslc.ws/macrog/kidsmac/natural.htm

What is a natural polymer?

Identify 4 different natural polymers and describe/draw them. Explain what properties make each one unique.

Visit the website on Synthetic polymers:
http://www.pslc.ws/macrog/kidsmac/synth.htm

What is synthetic polymer?

Identify 4 different synthetic polymers and describe/draw them. Explain what properties make each one unique.
Where are polymers?

http://www.pslc.ws/macrog/kidsmac/kfloor1.htm

In this section you are going to explore the mall and identify what types of polymers are in different shops.

Instructions:

1. Pick one shop and locate two polymers (Do not duplicate polymers from shop to shop. Find a shop with a unique polymer.)
2. Of the eight polymers you are describing – two have to be natural.
3. What products are they in?
4. State how their properties suits a function of the product.
### Student Science Performance

<table>
<thead>
<tr>
<th>Topic: Synthetics vs. Natural</th>
<th>Title: Making plastic</th>
</tr>
</thead>
</table>

#### Overarching Performance Expectations (Standard) from State Standards or NGSS:
Obtain and evaluate information to describe how synthetic materials come from natural resources, what their functions are, and how society uses these new materials. Examples of new materials could include medicine, foods, building materials, plastics, and alternative fuels.

#### Lesson Performance Expectations:
Students will conduct an investigation making a plastic, a polymer, from milk, a natural source.
- **CCC:** Structure and function
- **SEP:** Plan and conduct and investigation

### Students Will... To Construct Meaning

**Engage with a Phenomenon:**
*We can make plastic out of milk.*

**Student prompt:**
Where does plastic come from? If you don’t know, make 2 different hypothesis.

1. Your task today; apply all that you've learned about polymers to build a plastic.

2. Write down initial test in notebook
   - a. Write down a question (about turning milk into a polymer)
   - b. Write down a hypothesis (about the process described on the website)
   - c. Write down materials (as listed on website)
   - d. Write down steps (as listed on website)

3. Perform test
   - a. Record results

4. Now develop a new test by changing a variable (do not modify the heat)
   - a. Figure out which variable to change and rewrite the test in your notebook.
   - b. All variable changes need to be approved by the teacher before you begin the test

### Teacher Will... To Support Students

1. Tell the students that they have to come up with a plan to make plastic from milk.
   - a. Assign students into pairs
   - b. Have them explore the following website together:

2. In their notebooks have write up the test that is mentioned and then find a specific variable to change.

3. Make plastic
   - a. Due to the fact that they are heating a substance, watch students carefully and assist when needed

4. Read over the new test and approve or reject the new variable
   - a. If they need help, coach them through idea such as changing the type of acid (as suggested), changing the concentrations, changing or modifying the steps involved.
   - b. Do not let them alter the heat

J. Dwyer
5. Perform the test
   a. Record the results
   b. How did your variable change affect the result of it becoming a polymer (strengthen, decrease, or no change)

6. As a final step, if you will modify your original version of the test by modify the heat applied
   a. Figure out how you are modifying the heat and rewrite the experiment in your notebook

7. Perform the test
   a. Record the results
   b. How did changing the heat affect the result of it becoming a polymer (strengthen, decrease, or no change)

8. Now that you are done, write a conclusion specifically stating what worked the best and why evidence helped you come to that conclusion.

Assessment of Student Learning

Formative
An example of an excellent student conclusion will include that it was the presence of heat energy that made a chemical reaction between the acid and the proteins that made the polymer more elastic or strong. The evidence in terms of elasticity and strength will prove that they understand it is the combination of chemicals and a chemical reaction that produce the long-chained molecule.
### Overarching Performance Expectations (Standard) from State Standards or NGSS:

8.1.4 Obtain and evaluate information to describe how synthetic materials come from natural resources, what their functions are, and how society uses these new materials. Examples of new materials could include medicine, foods, building materials, plastics, and alternative fuels.

### Lesson Performance Expectations:

Students will plan an investigation to test the structure and function of different synthetic materials.

**CCC:** Structure and Function  
**SEP:** Plan and Conduct an Investigation; Obtain, evaluate, and communicate information

---

### Students Will. . . To Construct Meaning

**Engage with a Phenomenon:**  
**Different materials have different testable properties.**

**Student prompt:**

What is the relationship between the way a material’s molecules are shaped (structure) and the properties it has (function)?

1. Students should review the website and identify in their notebooks that there are multiple ways to test materials.  
   - [http://www.pslc.ws/macrog/kidsmac/property.htm](http://www.pslc.ws/macrog/kidsmac/property.htm)

2. Review the handout and follow the instructions each day.
   a. Day 1: research and data table
   b. Day 2: perform tests
   c. Day 3-4: research a fabric and prepare a report
   d. Day 5: present to class

### Teacher Will. . . To Support Students

At this point students should see the difference between simple molecule and complex chains, that some are natural and some are man-made, and that each one has its own properties that suit a function of the product it is used for.

1. Have them review the website before they begin and identify that due to the vast amounts of natural or synthetic materials, there are multiple test necessary to determine what is most effective.

2. Give students the handout and have them read the instructions mapping out a plan. Assign students into pairs of 2 and let them begin. Make sure to closely monitor students along each step of the way.
   a. Provide various types of fabrics. You should have at least 10 (4 of which are natural): polyester, wool, silk, spandex, linen, cotton, vinyl, acrylic, rayon, acetate, nylon, etc.

---

### Assessment of Student Learning

**Summative**

Due to the wide variety of results, please use the scoring guide at the end to make sure students were proficient in their understanding that different properties of synthetic and natural materials can provide different functions.
Natural vs. Synthetic Day 1:

1. Working in your group and using library resources, computers or other materials, research the following questions:
   
a. What fabrics are clothes made from?
   
b. What are the fabrics made from?
   
c. Which fabrics are natural (made from plants or animals) and which are synthetic (made from chemicals)?
   
d. Are certain types of fabrics more likely to be used in specific types of clothing? (ex: Are pajamas more likely to be made from a certain type of fabric?)

2. Make a data table for your group to summarize the information.

HOMEWORK: Check the labels on 15 different articles of clothing that you have at home. Use a variety of clothing types. Write the information down and bring it back to school to complete your data table.

Natural vs. Synthetic Day 2:

Use your homework to finish your data table from day

1. Then complete the following laboratory assignment in class:

   Purpose: To test for similarities and differences between natural and synthetic fabrics.

   Materials: 1 cm 2 squares of 8 fabrics, alcohol burners, dissecting probe, beaker, goggles, bleach, test tubes, and rack

   Prediction: Which fabrics will burn quickest?

   Procedure:

   1. Describe the fabrics' color, feel, stretch ability and/or thickness. Record your data in the description section of the table.

   2. Test the water absorption rate by placing a drop of water on each fabric sample. Time how long it takes for the water to sink in.

   3. In a test tube, add some bleach to the fabric your teacher assigns your group. Label it and let it sit overnight. Our fabric is______________________________.

   4. Time how long it takes a piece of fabric to burn. Put on your goggles. Place a piece of fabric on the tip of the probe. Start timing and hold it over the burner flame until it starts to burn. Take it out of the flame and let it finish burning. Hold it over a beaker of water in case it falls off the probe. Stop timing when the flame goes out. Record your observations in the table below.
Name of Fabric | Description | Reaction to Bleach | Water Absorption Time | Burn Time
--- | --- | --- | --- | ---

Analysis

1. Which fabrics would be safe to bleach? unsafe?
2. Which fabrics were stretchiest, natural or synthetic?
3. Why would stretchy fabric make good clothing?
4. Which absorbed water faster, natural or synthetic?
5. When would you want clothing to absorb water?
6. What type fabric burned fastest?
7. What was the main difference between how natural and synthetic fabrics burn?
8. What are advantages of synthetic fibers?
9. What are disadvantages of synthetic fibers?
10. Which type of fabric would you use for children's clothing? Why?

Conclusion:

Natural vs. Synthetic Day 3 and 4:

Working with your group, compare how one specific type of clothing has changed with the invention of synthetic fabrics. (ex.: coats, pajamas, swim suits) Prepare a group report that includes the types of fabrics the item was made from in the past and how new materials are used in it today. Compare and contrast the effectiveness of the garment with the new materials compared to its previous effectiveness. Use resources provided by your teacher as well as interviews with people who remember the older types of clothing. You may make drawings or use pictures for your report. Make a prediction about the future of this clothing item. What might it be made of in the future? What could a fabric with different properties do for it?
Natural vs. Synthetic Day 5:

Report to the class on your findings. Each member of your group must have a part. Be prepared to answer questions. You will be evaluated using the scoring guide below.

Scoring Guide:

Title of Task: Natural vs. Synthetic

Student Name(s): ____________________________________________________

<table>
<thead>
<tr>
<th>The student should be able to</th>
<th>Where to find evidence</th>
<th>E</th>
<th>G</th>
<th>NI</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accurately complete data table with at least 6 fabrics</td>
<td>Data Table</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group fabrics correctly according to type (natural or synthetic)</td>
<td>Data Table</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complete homework</td>
<td>Homework Report</td>
<td></td>
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<tr>
<td>Work safely with group to complete lab</td>
<td>Teacher Observations</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Correctly interpret lab data</td>
<td>Lab Report</td>
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<tr>
<td>Participate in group report</td>
<td>Oral Report</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

E=Excellent
G=Good
NI=Needs Improvement

Adapted in whole or in part from: https://www.slcschools.org/departments/curriculum/science/Grade-7-to-8/Grade-8/documents/Natural-vs-synthetic.pdf