Soystainable

Lesson 1: Making soy candles

The FDA does not require candle makers to list the ingredients of a candle, so a consumer really doesn't know what materials candles are made from unless it is listed on the label. The three major products used for candle making are soy, paraffin, and palm oil. Paraffin is a byproduct of petroleum, a non-renewable resource. According to a study by the South Carolina State University in 2009[3], the chemicals found in the fumes of paraffin candles are linked to cancer, birth defects, and such respiratory ailments as asthma. According to ehow[2], wax is extracted or refined from crude oil and boiled for purification. It may be mixed with stearin to help with hardening. When paraffin candles burn, they emit a black soot similar to the chemistry in diesel exhaust.

Palm oil comes from the palm tree which is a renewable resource. Palm oil is one of the most efficient oil-producing plants in the world. Plantations are profitable and provide people with jobs. When it comes to the world of sustainable agriculture, however, palm oil does not do very well. According to the RSPO[4] (Roundtable for Sustainable Palm Oil) only 19% of palm trees are grown outside of Malaysia and Indonesia, and those palm fields are causing mass destruction and deforestation.

1. Crall, Desi (2017). How to make soy wax from soybeans. Retrieved from

   https://www.ehow.com/how_4423083_make-soy-wax-from-soybeans.html October, 2019.

2. Harding, Deborah (n.d.) Facts on parafn wax. Retrieved from

   https://www.ehow.com/about_6068059_parafn-wax.html October, 2019.

3. Massoudi, R. (2009). Frequent use of certain candles produces unwanted chemicals. Retrieved from https://www.scsu.edu/news_article.aspx?news_id=832 October, 2019.

4. Roundtable on Sustainable Palm Oil https://www.rspo.org

For this lesson, students will create and test variables related to three different types of candle wax: soy, palm, and paraffin.

Sequence
Lesson 1 of 2 in Soy-Stainable

Time
Two 50 minute periods.

Grade Level
9-12

Materials
For groups of 6 you will need:

18 metal candle wick centering devices (you can instead use a popsicle stick with a hole in the middle.)
Soy wax (Golden wax 444 works well. 1.25 lbs needed to fill 8, 1.5 oz containers)
Palm wax (Starburst (glass glow) palm wax 2322A works well and is RSPO certified. Need 1.25 lbs to fill 8, 1.5 oz containers.)
Paraffin wax (IGI 4630 paraffex (Harmony Blend) works well. Need 1.25 lbs to fill 8, 1.5 oz containers)
Scissors or stainless steel wick trimmers
Scent (optional) - 1 oz per pound
18 wicks (for small containers, CD-10 works well)
18 equal glass or metal containers (the larger the container, the more wax needed)
candle thermometer
digital scale (both standard and metric scales)
6 rulers
6 ring stands
Lighter or matches
Oven glove
6 light meters
18 standard wick stickers
6 straws
3 melting pots (a presto style pot with a spout or candle pouring pot. If using a hot plate, you will need a pot of water to place your pot in rather than directly on the hot plate)

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Objectives/Target
Students will create three different types of candle using three different types of wax.

Students will test three different candles and record measurements related to: burn rate, flame height, and flame brightness.

Vocabulary
Paraffin, Palm Oil, Soy Wax, Burn Rate, Illuminance, Lumen,

Prior Knowledge
Lesson 1 of Soy-Stainable is accessible for students of all knowledge levels. Students are not required to have certain background knowledge in any specific content area in order to be engaged in the lesson. Teachers may wish to read through the background information with their students on the top of the lesson in order to instill the importance of completing the lesson.

5E Plan

Engage
Day 1: Engage your students by reading through the background information on the top of the lesson. Ask your students if they use candles for anything at home (for the scent, birthdays, emergencies, etc.). Show pictures of a palm oil plantation, or pictures of different types of candles. Ask students to make observations while you are discussing the pictures.

Explore
Day 1: Melt the wax and pour the molds for each candle. This can be done ahead of time by the teacher by following through the procedure on the teacher document. If done as a class, follow the procedure on the student document. Be sure to have all materials laid out and labeled correctly.

Day 2: Complete the experiments to measure variables and compare each candle based on burn rate, flame height, and flame brightness. Follow the directions on the Soy-Stainable student document to complete each experiment. Be sure to have all materials laid out and labeled correctly.

Explain
Have your students complete the graphs for each data table, as well as the reflection questions. As a class, discuss which candle wax allowed for the longest burn rate, the tallest flame, and the brightest flame. Discuss why each of these properties might be important for candle-making, or for the sustainability of candle-making.

Extend
Complete the extension piece on the Soy-Stainable teacher document. Have students investigate sustainable palm oil production and compare this process to soybean farming in both Brazil and the United States.

Evaluate
Ask guiding questions throughout the procedures to elicit student-to-content interaction and to asses student understanding.

Assess student responses on the reflection questions, being sure to determine that students have mastered the standard being addressed in the lesson.

Additional Resources
Many of the materials needed for this lesson are available from: https://thecandlemakersstore.com/