**Lesson Overview**

| Activity | Time (number of class periods) | Focus |
| --- | --- | --- |
| 1 | 2(Intro + demo) | Introducing project Activity and scoping the problem* After introduction of task, brainstorm with students how to measure physical properties like transparency. \*Evaluate both qualitative and quantitative methods.
* \*Demonstrate use of light meter
* \*Introduce concept of transparency in relation to the amount of light blocked by the candy
 |
| 2 | 3(determine molecular formula of sugars + understand the different shaped molecules + how glucose can act as an interfering agent | Understanding the chemistry of sugars and the use of interfering agents* Have students look at the ingredients of the candy and use this to introduce sucrose and glucose and their molecular structures.
* \*Have students observe the physical properties of candy samples (e.g., transparency and hygroscopicity).
* Ask students why they think the physical properties of the candy they observed had different properties.
* Show students samples of amorphous candy with crystallization and without.
* \*Discuss how an interfering agent like glucose can prevent crystallization in amorphous candy.

<https://www.britannica.com/topic/crystalline-candy><https://www.ck12.org/c/physical-science/solid/lesson/Solids-MS-PS/>  |
| 3 | 1 | Research on hard clear candy and introduction to baker’s percentage* \*Review candy recipes researched by students. Ask students to look for ingredients common to the recipes (sucrose/sugar and glucose/light corn syrup).
* Discuss a way to compare recipes – introduce how CA students use baker’s percentage (CA teacher/students can explain and demonstrate their calculations).
* \*Help ICP students calculate the baker’s percentage of ingredients for one of the recipes together as a class
* Have students discuss the baker’s percentage of glucose/light corn syrup – remind students its potential as an interfering agent
 |
| 4 | 2(hypothesis on transparency + hypothesis on hygroscopicity) | Experimental design* Review with the class the meaning of independent and dependent variables
* Review the project task with the class
* \*Brainstorm with the students if they were to get optimal transparency, what would they change in the recipes?
* Remind students of their observation of the physical properties of candy. \*What physical properties of the candy would they measure as they change the recipes? (transparency using light meter and hygroscopity using hygrometer)
* Based on the discussion have students name the independent and dependent variables for the experiment.
* \*Work with students to develop working hypotheses.
* Have students decide on the baker’s percentage of interfering agent for the experiment (these decisions can be made with the CA students).
* \*Discuss with students how constants, reliability, and repeatability would apply to the experiment.
 |
| 5 | 1 | Practice use of equipment and prepare table for data* Let students practice the use of equipment with sample candy (light meter and hygrometer).
* \*Discuss with students ways to obtain precise and accurate measurements.
* (\*Alert students of expected changes in candy over time and determine the frequency of measurement)
* Help students create a table and work out the weight of the various ingredients according to the baker’s percentages they have chosen.
 |
| 6 | 2(weigh ingredients + conduct experiment) | Prepare for and conduct experiment* Have students weigh ingredients according to the baker’s percentage of interfering glucose they have decided upon.
* Go through candy making procedure.
* Review safety measures.
* Students make the candy together with the CA students [in CA kitchen]. The candy is poured onto silicone moulds.
 |
| 7 | Over days 2, 8, and 12 (students should predetermine the days for measurement) | Measurement of transparency and hygroscopicity (tackiness)* Have students observe changes to the candy over time and take multiple readings over the days of the week.
 |
| 8 | 4compile results and graph plotting + discovering trends in data + discuss limitations in findings + choose graphs based on scientific reasoning  | Making sense of data as a class* Have students compile results as a class.
* Brainstorm ways with students how to make sense of data e.g., explore ways to represent the data – Excel
* \*Have students explore for trends in transparency and hygroscopicity.
* \*Discuss issues like: outliers in the data, possible sources of error, and limitations of their findings.
* \*Have a discussion about the results and whether it was in line with their hypotheses.
* \*Based on the results have students choose a baker’s percentage as recommendation to the CA students.
* \*Use scientific reasoning to choose the graphs to be used as supporting evidences.
* \*Prepare recommendation presentation to CA.
 |

\*Students record their reflections on worksheets