

**Teacher/School:** Cathie Carpenter/ Valerie White, Central Elementary

**Unit Title:** Oobleck in Zero Gravity

**Grade Level:** 5th

**Subject/Topic:**

Implementing Science SSS in the 3-5 grade levels through inquiry-based learning.

**Time Needed:** 3-4 class periods

**Learning Objectives: What will students learn?**

What is essential for students to know or understand about the subject? What gravity is if students remembered one thing about this study, what would it be? The effects of zero gravity on the Oobleck, and what a colloid is.

**Sunshine State Standards:**

The Nature of Matter: SC.A. 1.2.4 (Physically combining substances)

Energy: SC.B. 1.2.2 (Heat effects viscosity)

The Nature of Science: SC.H. 1.2.1 (Keeping accurate records)

SC.H.I.2.2 (observe, record, analyze, communicate)

SC.H. 1.2.3 (Work collaboratively, justify conclusions)

SC.H. 1.2.4 (Compare and contrast observations)

SC.H. 3.2.2 (data is collected and interpreted to explain concept)

Reading Sunshine State Standards covered are:

LA.A. 1.2.3 (simple strategies to increase vocabulary)

LA.A. 2.2.1 (Determines main idea, identifies relevant details)

LA.A. 2.2.5 (organizes information for a variety of purposes)

LA.A. 2.2.7 (recognizes the use of comparison and contrast)

LA.A. 2.2.8 (use of reference materials to gather information for research project)

Writing Sunshine State Standards implemented during the recording of data, journal entries, and a follow-up writing are:

LA.B.I.2.1 (prepares for writing by recording thoughts)

LA.B. 1.2.3 (Produces a final document that has been edited)

LA.B. 2.2.1 (Writes notes, comments, and observations that reflect comprehension of content)

LA.B.2.2.4 (uses electronic technology including word processing)

LA.B. 2.2.5 (creates narratives in which details are in a logical order)

Math Sunshine State Standards covered are:

MA.B.2.2.1 (uses direct (measured) and indirect (not measured) measure to calculate and compare measurable characteristics)

MA.B. 2.2.2 (selects and uses appropriate standard units of measurement)

MA.B. 4.2.2 (selects and uses appropriate instruments to measure in real world situations)

This was a truly innovative way to tie all areas of the curriculum together and help students fall in love with science.

**Materials/Supplies:**

Holding tubs for water

Cornstarch

Food coloring Scissors

Newspaper

Plastic to protect work area

### **Instructional Procedures: What will the teacher be doing? What will the students be doing?**

Students will observe how the rate of flow (viscosity) changes in Oobleck when it is subjected to pressure and heat from their hands.

Students will become familiar with the three states of matter (solid, liquid and gas.)

Students will describe the physical characteristics of Oobleck and try comparing it to familiar textures/substances (e.g., beach, sand, etc.)

Students will observe the behavior of Oobleck

Students will be able to explain whether Oobleck is the result of a physical or a chemical change.

Students will be able to determine whether Oobleck is a mixture or a solution.

### **PROCEDURES:**

Teacher will introduce the concept of macromolecules

Teacher will facilitate a class discussion on the States of Matter

Students will discuss as a group the characteristics of Oobleck

1. To make Oobleck (cornstarch and water mixture) you will add approximately 1 - 2 ratio of water to cornstarch. Place the cornstarch in large mixing bowl, and then slowly add a little water at a time until the mixture becomes thick. Add a drop or two of food coloring. You will know when you have the right consistency (when the mixture looks like a liquid/shiny but it feels like a solid).
2. Students will observe and explore the physical characteristics of Oobleck. (Is it a mixture or a solution)?
3. Students will hold the Oobleck in their hands, let it now freely, then squeeze it and see what happens.
4. Students will describe and classify Oobleck as a solid, liquid, gas, or is it a combination of states?

Our lesson plan integrates language arts, math, and writing with a unique science concept. The hypothesis made by students was tested in "zero" gravity. Our topic is "What effect does gravity have on Oobleck?"

During the workshop, Implementing Science SSS in the 3-5 grade levels, Through Inquiry-Based Learning with Dr. Diana Wehrell-Grabowski, we were introduced to the use of colloids, or Oobleck, in the classroom. We shared this concept with our 5th graders. We began by introducing them to the literature portion of the unit by reading *Bartholomew and the Oobleck*, by Dr. Seuss, and *Oobleck What Do Scientists Do?* AGEMS publication. Students were then given a variety of solids and liquids, trying to recreate this substance. They recorded the results of each combination. Students then performed the creation of the desired colloid, using cornstarch and water, as we did during our summer institute training. Students used math skills to measure ingredients. Students were given the opportunity to "play" with the substance, recording their observations. We discussed the properties and related these to other, everyday substances: ketchup, paint, salad dressing, etc. This is an example of how students compare and contrast substances. Students then created a definition of a colloid based on their observations, using terms such as: liquid, solid, physical change, chemical change, mixture, solution, etc. Students were graded using a lab rubric. We then held a discussion addressing these questions: *Why do these things occur? What specifically causes these ingredients to act as they do? Why don't they form a solution like others do?* We discussed density, and the effect gravity has on density: the solid particles are denser than the liquid and therefore are pulled to the bottom of the mixture. We will discuss proof of this by using these examples: you have to shake ketchup and stir paint before using it. The project involved a cooperative learning situation between the teacher and the students. The students shared their learning experiences through journal writing, data collection, and oral discussion groups. The students were then given some background facts on colloids. The students predicted what they thought would happen to the Oobleck substance when gravity was removed. *What would it feel like? Would it separate?* These predictions were recorded in their journals. The experiment was then carried out by Mrs. Carpenter and Ms. White during the Zero G Experience. The teachers shared the results of the students'. Predictions and described the consistency of the Oobleck in "zero" gravity in detail. Students then took the observations made by their teachers and drew conclusions. This was then detailed in a narrative story.

## Lab Report: What effect does gravity have on colloids?

Teacher Name:

Student Name: \_\_\_\_\_

CATEGORY	4	3	2	1
Experimental Hypothesis	Hypothesized relationship between the variables and the predicted results is clear and reasonable based on what has	Hypothesized relationship between the variables and the predicted results is reasonable based on general knowledge	Hypothesized relationship between the variables and the predicted results has been stated, but appears to be based	No hypothesis has been stated
Variables	All variables are clearly described with all relevant details.	All variables are clearly described with most relevant details.	Most variables are clearly described with most relevant details.	Variables are not described OR the majority lack sufficient detail
Data	Professional looking and accurate representation of the data in tables and/or graphs. Graphs and tables are labeled and titled.	Accurate representation of the data in tables and/or graphs. Graphs and tables are labeled and titled.	Accurate representation of the data in written form, but no graphs or tables are presented.	Data are not shown OR are inaccurate.
Analysis	The relationship between the variables is discussed and trends/patterns logically analyzed. Predictions are made.	The relationship between the variables is discussed and trends/patterns logically analyzed	The relationship between the variables is discussed but no patterns, trends or predictions are made based on the data.	The relationship between the variables is not discussed.
Conclusion	Conclusion includes whether the findings, possible hypothesis, possible sources of error, and what was learned.	Conclusion includes whether the findings supported the hypothesis and what was learned from the experiment.	Conclusion includes what was learned from the experiment.	No conclusion was included in the report OR shows little effort and reflection.