

Module 1: What Do You Know About...

The students will answer several prompts on a diagnostic assessment.

Module 2: Literature as Springboard Activity

The students will read aloud *Bartholomew and the Oobleck* by Dr. Seuss.

Module 3: Laboratory Investigation

Students will participate as small groups in a Lab Investigation to determine the properties of an unknown substance made of cornstarch, water and food coloring. The students will use all their senses except taste in order to determine its properties. After the students individually chart their observations, the groups will work to develop a hypothesis about the substance. They will then perform mini-experiments to prove or disprove their hypothesis about the substance.

Modules 4-5: Observation Write-Up

Students will individually develop the rough draft of an observation report that allows them to use the charts and tables from their lab investigation to interpret and construct explanations regarding the properties of the unknown substance. The draft will be submitted for peer and teacher review.

Module 6: Scientific Convention

Students will participate in a Scientific Convention to determine the truth about the substance and to state it as precisely as they can. Each group will come together to listen to their peers' experimental results and to critically discuss them. The goal is to determine the "Laws" of the substance. As the groups share the properties they discovered during the lab investigation, the class will determine if the property is true and valid or if there are any situations during which the property would not be true. Students will resolve disagreements by adding phrases, defining terms or experimenting further in order to arrive at the truth.

Module 7: Spacecraft Design

Students will apply their knowledge and understanding about the properties of the unknown substance as they design a spacecraft that would be able to successfully land on and take off manually from an ocean of the substance. The students will work in their groups to design a plan, considering the substance's properties. Using available materials and their own imagination, the students will construct a model based on their design plans.

Module 8: Creative Performance

Students will work individually or in a group to develop a performance project that creatively addresses the answers to the Essential Questions. They will use prior knowledge from previous science units; They will research Scientific laws. Finally, they will address school, community, regional or national current events related to laws, technology and science.

Culminating Activity

Students will share their spacecraft model, their creative performance and their understanding of laws, truths and technology to a group of students in another grade. The local community library will be contacted to see if the students' work could be placed on display for an additional authentic audience.

These tasks are designed to allow students to communicate their knowledge and understanding of the scientific method and of the properties of the substance, as well as their insights regarding the unit's essential questions in formal and creative ways.

ESSENTIAL QUESTIONS

1. Are laws always considered truths?
2. Are truths always considered laws?

Guiding Questions

1. What kind of matter is the substance?
2. In what ways does technology help us to arrive at truths?

FORMING A HYPOTHESIS
Student-Generated Samples for Lab Report

Model Format: **IF** (my action) **THEN** (Substances' reaction).

Student Samples:

1. **If** I hold it in my hand then it will melt because of body heat.
2. **If** I poke it then it would feel thick.
3. **If** I touch it then it will stick to me.
4. **If** I tilt the bowl then the substance will make a wave.
5. **If** I squeeze it then the liquid substance will come out.
6. **If** I put the substance on paper then it will dry.
7. **If** I add water to the substance then it will drip.
8. **If** I pick up the substance then it will crumble.
9. **If** I keep the substance on my hand then it will dry.

LAB REPORT CONCLUSION GUIDELINES

- 1. How well do your procedures and observations relate I to your hypothesis?**
- 2. Was your hypothesis proven to be true? Why or why not?**
- 3. From your experiment only, do you have evidence to support that the substance is a SOLID? a LIQUID? a GAS? Pick one and explain why.**

Teacher Reflection: Observation Write-Up

In order to facilitate the writing of the lab, we needed to have the students form a hypothesis. We gave the students the If then model to write their hypothesis. Marianne and I considered teaching "hypothesis" prior to the students experiencing the lab so that they could actually test their hypothesis, not knowing the outcome. It would have helped them form specific predictions. We were so taken with the initial observations of the substance, that we didn't realize the students had not formulated their initial hypothesis in a scientific manner. On the other hand, teaching the hypothesis after the initial observations was actually helpful for the students. Having the experience of the substance made it easier to formulate a hypothesis. In reality, I suppose that scientists observe an unknown substance for a period of time prior to specific testing.

Using the lab report rubric as a peer- and self-assessment tool allowed instruction and assessment to truly become "one." Marianne and I spent a lot of time going over the rubric. However, it was when the students began their writing that its purpose and power really came forward. Students began to see the connections between forming an hypothesis and having procedures and conclusions that specifically relate to the hypothesis.

One of my special education students, Rachel, was able to review a peer's lab report, using the rubric. She came to me and said that Joan wrote an hypothesis, but her procedure talked about something different. I asked her, "So what should Joan do?" Rachel thought for a moment then said with certainty, "Well, she either has to change her hypothesis or change her procedure so they match." This dialogue provided evidence for me that when given the opportunity and the proper scaffolding, students who have difficulty learning can achieve.

Criteria	Novice	Apprentice	Practitioner	Expert
<p>Communicates Information and Understanding</p> <ul style="list-style-type: none"> - Presentation of Lab - Supporting Details - Fact vs. Opinion - Properties of Substance 	<ul style="list-style-type: none"> - Needs to present the purpose, materials, procedures, observations and conclusion of the experiment. - Position needs to include details, explanations and examples that are relevant. It is not clear if the issues are understood. - Needs to be able to identify statements as either opinions or observable facts. - Does not understand the properties of the substance. 	<ul style="list-style-type: none"> - Presents the purpose, materials, procedures, observations but the conclusion of the experiment needs to be more logically connected to the hypothesis. - Position is general. Details and examples are limited, showing a minimal understanding of issues. - Confuses opinions with observable facts. - Shows a limited understanding of the substance's properties. 	<ul style="list-style-type: none"> - Presents the purpose, materials, procedures, observations and conclusion of the experiment. - Position is supported by relevant details, explanations and examples. Shows an understanding of issues. - Distinguishes between opinions and observable facts. - Explains the properties of the substance 	<ul style="list-style-type: none"> - Presents the purpose, materials, procedures, observations and conclusion of the experiment with convincing clarity and confidence. - Position is supported by accurate, relevant details, explanations and examples. Shows a significant level of insight and understanding of issues. - Effectively distinguishes between opinions and observable facts. - Demonstrates a thorough understanding of the substance's properties.
<p>Social Interaction</p> <ul style="list-style-type: none"> - Listening - Participation - Tone - Logic and Insight 	<ul style="list-style-type: none"> - Body and eyes are turned away from the speaker. Talks while someone else is speaking. - Does not offer ideas or concerns when asked to participate. - Expresses ideas with an impolite or ungracious tone. - Ideas and concerns are expressed but logic or purpose is difficult to follow. 	<ul style="list-style-type: none"> - Body is facing speaker but more direct eye contact needs to be evident. - Offers ideas or concerns only when asked to participate. - Expresses ideas in a shy quiet manner. - Ideas and concerns are expressed with a basic level of understanding. 	<ul style="list-style-type: none"> - Listens passively by looking at speaker. - Volunteers to express ideas and concerns. - Expresses ideas in a courteous and polite tone. - Ideas and concerns are expressed with logic and understanding. 	<ul style="list-style-type: none"> - Listens actively and attentively by looking at the speaker and using positive listening behaviors. - Actively involved in expressing ideas and concerns. - Expresses ideas with confidence in a courteous and polite tone. - Ideas and concerns are expressed with a significant level of insight and logic.

**Scientific Convention
Student-Generated Discussion Notes
Group A**

LIQUID cont.

I think it is a liquid because it **drips** like water.
The Oobleck was **wet** when it wasn't touching me.
I think it is a liquid because **when you add water it liquefies**.
I think it is a liquid because it **drips** like a liquid.

CONCLUSION: LIQUID PROPERTIES

runs through you finger	drips	sticky	gooey
returns to its shapes	takes the shape of where it's put		

COMPARISONS & DISCUSSIONS

Oobleck is like:

Cement:	a solid that pours; it drips through your hand but will dry up when the water evaporates it becomes a solid
Orange juice:	can be sticky like Oobleck
Ice cream	
Jello:	the top is like Oobleck
Uncooked pancake:	like the inside
Sand , sugar, salt:	drips? falls? pours? do they mean the same thing?

OTHER TESTS

Freeze Oobleck: If you freeze it you can find out if it is a solid. Solids don't freeze.

Heat Oobleck in the microwave
It depends on the experiment you *did* to say if it is a liquid or a solid.
There are too many variables to decide if it's a liquid or a solid.

OTHER MAJOR THOUGHTS

Sugar is a crystal. A crystal has a definite shape, and the size can vary. **This is a law and a truth.**

What does it mean to melt?
Solids can change shape if something acts upon it.
Dirt turns into mud when it rains, then when it dries it turns to dirt again.
Is it a solid? Is it a liquid? It's a **SLIQUID!**
Like baking a cake - A baking **MIX**