

Up, Up and Away: Vinegar and Baking Soda Balloon

Students will evaluate the properties of matter to understand what they are and how they can be combined to form new substances. The students will investigate each property and record their data. They will then experiment with a vinegar and baking soda balloon to evaluate the creation of a new substance.



Grade Level: Third Grade



Subject: Science/Physical Science



Length of Time: 45 Minutes

Common Core Alignment

Common Core Framework Guiding Question(s): What are the properties of matter? Are the properties of matter constant? How are they effected when combined with other substances?

Standard

3.1 (e) Students know matter has three forms: solid, liquid, and gas.

3.1 (g) Students know that when two or more substances are combined, a new substance may be formed with properties that are different from those of the original materials.

Objectives & Outcomes

- Students will identify and describe the three properties of matter with a partner with 100% accuracy.
- Students will model the creation of a substances with properties that are different from those of the original materials by combining two substances with a partner with 95% accuracy.
- Students will describe the properties of the contributing substance and the property of the created substance independently with 100% accuracy.

Materials Needed

- | | |
|---------------------------|-------------------------------|
| • Investigation Worksheet | • Baking Soda |
| • Matter Manipulatives | • Funnel |
| • Matter Chatter Video | • Balloons |
| ○ Computer/Projector | • Measuring Cups/Spoons |
| • Plastic bottles | • KWL Chart |
| • Vinegar | • Scientific Method Worksheet |

Procedure (Next Page)

<i>Opening of Lesson</i>		
Anticipatory Set	(2 Minutes)	Begin by placing items representative of a property of matter at the center of each group table (pitcher of water, solid wood cube, Air Pump) for students to investigate. Encourage students to interact with the objects, make observations, and consider what they might learn.
	(2 Minutes)	Once students have investigated their substance, the teacher will identify and label the forms of matter represented at each table. The teacher will then ask the students to consider what they already know about the form of matter for their substance.
Think-Pair-Share	(2 Minutes)	Engage the students in a think-pair-share to discuss what they already know about the forms of matter and one thing they want to know. Explain to that students 1 and 4 will share with the class. The teacher will model a KWL chart using student contributions in the Google classroom. Students will fill out their own charts simultaneously. The teacher will use this data to create student groups for the following activities.
<i>Body of Lesson</i>		
	(10 Minutes)	The teacher will explain the next phase of the activity, model the steps, and write the procedure on the smartboard for students to see. Students will rotate through investigation station in three-minute intervals to examine and report on each form of matter. (See Matter Procedure in <i>Appendix C</i> and Investigation Worksheet <i>Appendix B</i>)
Technology Integration	(2 Minutes)	The teacher will play “Matter Chatter: Song for kids about solids, liquids and gases”. The class will discuss what they learned from the music video, and the teacher will model how students should update their KWL chart. Now that the students understand the major characteristics of each form of matter, the teacher will ask them to predict what they think will happen if they combine substances of different forms.
Guided Practice/Interactive Modeling	(5 Minutes)	The teacher will explain the next phase of the learning activity to students, including objectives and expectations. The students will write the <u>question</u> they will consider and their <u>hypothesis</u> on their Scientific Method Worksheet (See Appendix

		B) The teacher will model the steps of the vinegar and baking soda experiment for students (See Appendix C). The teacher will then assign students, by seat number, to obtain specific materials from the supply table.
Cooperative Learning	(10 Minutes)	Students will work with their partners complete the exercise and discuss the results.
Independent Practice	(10 Minutes)	Students will complete their scientific method worksheet by writing their observations and conclusions. This worksheet will be used as an assessment.
<i>Closing</i>	(2 Minutes)	To close the lesson, the teacher will hold a class discussion. The students will be asked to share what they learned. Students will lead the discussion, but the teacher will guide them to ensure consideration of 1) the forms of matter and 2) what happens when substances of different forms are combined. Finally, allow students to decompress about the learning process. Discuss what worked well for them, and what didn't.

Assessment & Evaluation

Students will be evaluated based on their participation in the forms of matter investigation and experiment. class discussions, and independent scientific method worksheets.

- The teacher will use the KWL chart as a formative assessment. If most of the students demonstrate a firm understanding of the forms of matter, the initial investigation may be reduced or removed from the lesson. The teacher will also use this information to form groups. Ideally, the groups will be heterogenous. However, if the **formative assessment** deems it necessary the teacher may form groups based on ability, and re-teach/reinforce concepts for select groups as necessary (See Modification and Differentiation for additional information).
- The teacher should be continuously taking anecdotal notes while observing.
- The scientific method worksheet will have a rubric for grading (See Appendix F) and allow for **summative assessment**.

Evaluation

- Success may look different for each student although they will be graded using the same rubric.
- Cooperation and willingness to collaborate with peers is an observation the teacher must make anecdotal notes of and add to the final evaluation the student receives.

Modification & Differentiation

- English Language Learners: This lesson can be modified for English Language Learners by allowing alternate responses. ELLs can draw a series of pictures with short captions or

even speak their responses into a recorder in lieu of providing a written response. Student groups can also be formed with the needs of ELL students in mind. Additionally, simplified written and verbal directions could be given to assist students in completing their KWL chart and Scientific Method Worksheet.

- Gifted Students: This lesson can be modified for gifted students by providing a modified procedure. Students can do the increased variables (room temperature vs. “ice bath” or warm water, lemon juice instead vs. vinegar, etc.). Students can then compare the effect of temperature on the reaction.
- Students with Special Needs: This lesson can be modified for students with special needs by simplifying the instructions and re-teaching the concepts. Additionally, these students can be given an alternate scientific method worksheet in which the question, hypothesis, materials, procedure are filled out and the observations spaces have yes or no questions.

Notes:

<i>Materials</i>	The materials used for the investigation (example of solid, liquid and gas) are tactile manipulatives to support kinesthetic and visual learning. Participating in the experiment, rather than observing a demonstration, will engage students in the lesson and promote active learning. The music video supports auditory learning and the use of multiple intelligences for students with auditory or musical learning styles. Finally, the worksheets promote verbal-linguistic skills and are necessary tools for formative and summative assessment.
<i>Classroom Arrangement and Grouping</i>	See Appendix A - The anticipated classroom arrangement is designed to support up to 24 students (although accommodations could be made if necessary). The desks should be arranged to create six groups of four. They should be arranged in a semi-circle with a large table in the center/front beneath the whiteboard/smartboard. The materials for the experiment will be clearly labeled and organized on the supply table, as will the manipulatives for student investigation on group tables. The teacher will need to measure supplies as needed to support the time parameters of this lesson. This seating arrangement will support student learning. Students desks are arranged so that students are facing members of their group at all times to promote discussion and collaboration. Group tables will be labeled by color, and each student will have an assigned number based of the location of their seat. Students will receive roles/responsibilities based on their seat number and table color. Additionally, there is board/supply visibility from each table grouping. Visibility is a crucial aspect for student learning, since

	<p>the teacher will model steps and directions from the board. From the center of the room, the teacher will be able to gauge the progress of each student group through the investigation and experiment. The teacher will be able to identify which groups need additional support/challenges as well as recognize any clarification that must be provided or adjustment that must be made. Grouping strategies will be determined based off the student's formative assessment. If the students demonstrate a median understanding the groups will be heterogenous. If there are extremes (significant number of students with insufficient understanding/significant number of students with proficient to advanced mastery) the groups will be based on ability. By determining grouping method post formative assessment the teacher will be able to identify and support the needs of the students.</p>
<i>Instructional Approach</i>	<p>This lesson is a blended style instructional approach. The teacher will show the students what they need to know by modeling steps, providing procedural guidelines and describing activities and objectives. However, the teacher will also act as a facilitator to promote self-learning and critical thinking by providing opportunities for collaboration (think-pair-share), reflection (KWL Chart) and whole class discussion.</p>
<i>Additional Notes</i>	<p>This lesson is dependent on student's familiarity with Google Classroom, web-based graphic organizers, and the scientific method. Teacher may need to modify lesson if students have not mastered preliminary skills and understanding. Student interactive worksheets will be on student desks at the start of the lesson, and there will be no need for the teacher or the students to distribute them during the activity.</p>

Appendix A

The following is a diagram of classroom arrangement and explanation of lesson flow, classroom management and supply organization to support student learning.



Part of Lesson	Table	Seat	Grouping	Task
<i>Introduction</i>	All	All	(1 &2), (3&4)	Think-Pair
	All	1,4	-----	Share
<i>Investigation</i>	Black	1-4	B,P,Y	Investigation station: Liquid
	Purple	1-4	B,P,Y	Investigation station: Gas
	Yellow	1-4	B,P,Y	Investigation station: Solid
	Red	1-4	R,G,B	Investigation station: Liquid
	Green	1-4	R,G,B	Investigation station: Gas
<i>Experiment</i>	Blue	1-4	R,G,B	Investigation station: Solid
	All	2	-----	Measuring supplies
	All	3	-----	Experiment Bucket (Vinegar, Baking Soda, Bottle, balloon)

Appendix B

The following are student interactive worksheets which are to be prepared, either on student desks or available in the Google classroom prior to the start of the lesson. Documents 2 and 3 may be printed double sided for convenience. The teacher will need to make any necessary accommodations for differentiation on the worksheets prior to the start of the lesson. These worksheets are also to be used for formative/summative assessment as indicated by the assessment portion of this plan.

Appendix Includes:

1. K.W.L. Template (Google Classroom)
2. Investigation Worksheet (Handout)
3. Scientific Method Worksheet (Handout)

Topic: _____ Name: _____

<p>K</p> <p>What I know</p>	
<p>W</p> <p>What I Wonder</p>	
<p>L</p> <p>What I Learned</p>	

Let's Investigate

Solids, Liquids & Gas

Name: _____

Follow the procedure below. Then mark the properties that apply with an "X" and the properties that don't with an "O".

Procedure:

1. Put the substance in the round container and then in the square container. Observe and record if the substance holds its shape.
2. Put the substance in the press. Observe and record how the press reacts.

Property	Solid	Liquid	Gas
Shape			
Space			

Notes:

Name _____

Date _____

The Scientific Method

Question

Hypothesis

Materials

-
-
-
-
-
-
-
-
-

Procedure

- 1.
- 2.
- 3.
- 4.
- 5.

Observations

Observations

Observations

Conclusion

Appendix C

The following are procedural steps for the investigation and experiment. The procedural steps for the investigation are printed on the student interactive worksheet (Appendix B) and should also be written and displayed on the smartboard. The procedural steps for the experiment should be written on the smart board and copied by the students onto their Scientific Method Worksheet. If necessary the teacher can modify this step by printing the procedural steps on an additional piece of paper, or in the Scientific Method Worksheet, to save time or provide differentiated instruction.

Investigation Procedure

Identifying the properties of solids, liquids, and gas

1. Put the substance in the round container and then in the square container. Observe and record if the substance holds its shape.
2. Put the substance in the press. Observe and record how the press reacts.

Experiment Procedure

Observing the effects of combining substances with different forms of matter

1. Obtain materials.
2. Practice placing the balloon's mouth on top of the open bottle top (Goal: Speed!).
3. Pour 3/4 cup of vinegar into the bottle.
4. Position funnel on top of the bottle.
5. Pour the tablespoon of baking soda into the funnel.
6. Take off the funnel and place the balloon mouth over the bottle opening. Hopefully all that practice from before helped out!
7. Make sure the balloon is centered and the mouth is pulled evenly down on the top of the bottle.
8. Gently shake the baking soda and vinegar mixture.
9. Observe results.

References

- Chemistry Border. (2018). Image retrieved from: <https://pageborders.org/download/chemistry-border/>
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- KWL Chart. (2018). Modified from chart retrieved from: <https://ecdn.teacherspayteachers.com/thumbitem/Student-KWL-Chart-1373930006/original-595724-1.jpg>
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