Toys Matter

Structure and Properties of Matter

BOCES 4 Science

Teacher's Guide

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Written by teachers and administrators from public school districts within the borders of the NYS Midwest Joint Management Team in conjunction with the BOCES 4 Science Educators

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6/18

Foreword

BOCES 4 Science is a collaboration between four New York State BOCES (Board of Cooperative Educational Services). This collaborative of science educators came together to respond to the need for instructional resources based on the New York State pK-12 Science Learning Standards (NYSSLS). The research behind the Next Generation Science Standards (NGSS) and the NRC publication, A Framework for K-12 Science Education is the basis for the NYSSLS.

We believe that the future health and well-being of our world depends on scientifically literate people making informed decisions. The development of literacy in science begins at the earliest grades. Elementary children must have concrete experiences upon which to hook their understanding and new vocabulary – this is especially true in the discipline of science. We embrace the notion that students should experience phenomena and solve real problems to learn about the world. We strive to present lessons and materials that will make high quality science instruction available for all students through cost-effective resources for teachers.

Table of Contents

About this Unit

Overview

Toys Matter is a unit designed for 5th grade.

This unit explores the Structure and Properties of Matter. Students begin this unit by being welcomed to their first day at the toy company, Toys Matter. They are about to embark on an intensive training program to see if they have what it takes to be hired as Materials Engineers. Throughout the unit, students will complete a series of tasks in which they will explore and work with a large variety of materials. Their final test will be to use what they have learned to engineer a new toy.

Scheduling

This unit is scheduled to be in the classroom for 8 weeks. There are approximately 16 science instructional sessions in this unit, based on 30-40 minutes each. Adjust your schedule accordingly. Please return the unit promptly or to request an extension, call (585) 352-1140.

Materials to Obtain Locally

Some lessons require materials that are NOT supplied in the kit. These materials can be easily obtained by the teacher or the students. Materials that will need to be provided are indicated with an asterisk in the lesson materials list and are also listed below:

- Water (L1, L2, L3, L4, L5, L7, L9)
- Chart paper (L1, L4)
- Coloring tools (markers, crayons, and/or colored pencils) (L2, L4, L7)
- Colored newsprint (comics, etc) (L2)
- Cup/bottle with condensation (optional) (L2)
- 3 – 6 triple beam balances (L4, L6, L8, L9)
- Computers (L4)
- 30 calculators (L4)
- 15 rulers (optional) (L4)
- Ice cubes (L5, L8)
- Starburst and Jolly Rancher (optional) (L5)
- Dry fit shirt and cotton shirt (optional) (L5)
- 15 dirty pennies (L7)
- Paper (L7)
- Scissors (L7)
- Milk (optional) (L7)
- Balloon (optional) (L8)

Three Dimensions

Each of the BOCES 4 Science lessons includes at least one element from each of the three dimensions identified in the NYSSLS. The lesson page identifies the specific elements targeted; the NYSSLS topic page is included at the back of the Teacher's Guide.

Science and Engineering Practices (SEP) – these are the major practices that scientists employ as they investigate and build models of their understanding of the world. They also include key practices used by engineers as they design and build systems.

Disciplinary Core Ideas (DCI) – selected to represent four major domains: the physical sciences; the life sciences; the earth and space sciences: and engineering technology, and the applications of sciences.

Crosscutting Concepts (CCC) – these big ideas have application across all domains of science and provide one way of linking across the domains of the DCI's. In addition, they link to ideas that are parts of other elementary subjects.

NYSSLS Shifts in Instruction

It is the intention of BOCES 4 Science that this unit provides lessons that demonstrate the following shifts in instruction:

- **Explaining Phenomena or Designing Solutions to Problems:** The unit focuses on supporting students to make sense of a phenomenon or design solutions to a problem.
- **Three Dimensions:** The unit helps students develop and use multiple grade-appropriate elements of the SEPs, CCCs, and DCIs which are deliberately selected to make sense of phenomena or design a solution to a problem.
- **Integrating the Three Dimensions for Instruction and Assessment:** The unit will elicit student artifacts that show direct, observable evidence of three dimensional learning.
- **Relevance and Authenticity:** By taking advantage of student questions and experiences in the context of their homes, neighborhood and community, the lessons in this unit will motivate student sense-making or problem-solving.
- **Student Ideas:** This unit provides opportunities for students to express clarify, justify, interpret or represent their ideas and to respond to peer and teacher feedback.
- **Building on Students' Prior Knowledge:** Since student understanding grows over time, this unit identifies and builds on students' prior learning in three dimensions in such a way as it is explicit to both students and teachers.

Assessment

Providing opportunities for assessment of learning and feedback to students is an important step in the educational process. This unit includes embedded formative assessments and a final summative assessment of learning. The teacher is encouraged to use a variety of informal or anecdotal assessment strategies as well, such as: portfolios of artifacts, "thumbs up" & "thumbs down", "ticket out the door", regular perusal of student science journals or having students keep an additional notebook to contain their reflections.

Additional Features of this Unit

The Toys Matter unit also includes Science Journal pages that are available online at the BOCES 4 Science website. (A web address and password are located within the science kit.)

Additional resources for the teacher, such as the specific assessments, ELA and/or ELL supports, direct links to videos or websites mentioned in the teacher's guide, etc. can also be found on the BOCES 4 Science website.

Features that Support 3-D Learning

Look for these features in the Teacher's Guide:

NYS pK – 12 Science Learning Standards within each lesson provide the teacher with specific information about the Performance Expectation and the 3-Dimensions that are targeted by the instruction in this lesson.

Performance Expectations:

K-2-ETS1-2 – Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Science and Engineering Practices

Developing and Using Models

- Develop a simple model based on evidence to represent a proposed object or tool.

Disciplinary Core Ideas

ETS1.B: Developing Possible Solutions

- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.

Crosscutting Concepts

Structure and Function

- The shape and stability of structures of natural and designed objects are related to their function(s).

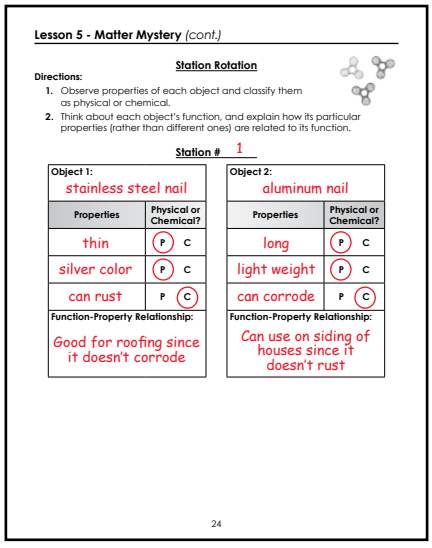
ELA/Math/Social Studies Connections:

ELA: 2R1

Math: NY-2.MD

Social Studies:

Throughout the Teacher's Guide, the 3-Dimensional Domains are color coded within the text so that teachers know to emphasize or explicitly point out to students this connection to either the **Science and Engineering Practices (SEPs)** and/or the **Crosscutting Concepts (CCCs)**. In addition, small boxes in the margin of the Procedure pages (see box in the green column to the right) serve as a visual reminder, as well.



Lesson 5 - Matter Mystery *(cont.)*

Station Rotation

Directions:

1. Observe properties of each object and classify them as physical or chemical.
2. Think about each object's function, and explain how its particular properties (rather than different ones) are related to its function.

Station # 1

Object 1: stainless steel nail	
Properties	Physical or Chemical?
thin	(P) C
silver color	(P) C
can rust	P (C)
Function-Property Relationship: Good for roofing since it doesn't corrode	

Object 2: aluminum nail	
Properties	Physical or Chemical?
long	(P) C
light weight	(P) C
can corrode	P (C)
Function-Property Relationship: Can use on siding of houses since it doesn't rust	

24

In addition, a small picture of the page(s) of the Student Science Journal (with answers) that students are using for each lesson has been included on the appropriate pages in the Teacher's Guide (see box to the right). This keeps the teacher from needing to go back and forth between various documents pertaining to a particular lesson.

CCC: Crosscutting Concept(s):

Cause and Effect:

Events have causes that generate observable patterns.

New York State P-12 Science Learning Standards

Structure and Properties of Matter

Students who demonstrate understanding can:

5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen. [Clarification Statement: Examples of evidence supporting a model could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.] [Assessment Boundary: Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.]

5-PS1-2. Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances the total amount of matter is conserved. [Clarification Statement: Examples of reactions or changes could include phase changes, dissolving, and mixing that form new substances. Assume that reactions with any gas production are conducted in a closed system.] [Assessment Boundary: Assessment does not include distinguishing between mass and weight.]

5-PS1-3. Make observations and measurements to identify materials based on their properties. [Clarification Statement: Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property.] [Assessment Boundary: Assessment does not include density or distinguishing between mass and weight.]

5-PS1-4. Conduct an investigation to determine whether the mixing of two or more substances results in new substances. [Clarification Statement: Examples could include mixing baking soda and water compared to mixing baking soda and vinegar.]

The performance expectations above were developed using the following elements from the NRC document A Framework for K-12 Science Education:

Science and Engineering Practices

Developing and Using Models

Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.

- Develop a model to describe phenomena. (5-PS1-1)

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K– 2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.

- Conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (5-PS1-4)

Disciplinary Core Ideas

PS1.A: Structure and Properties of Matter

- Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects. (5-PS1-1)
- (NYSED) The total amount of matter is conserved when it changes form, even in transitions in which it seems to vanish. (5-PS1-2)
- Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) (5-PS1-3)

Crosscutting Concepts

Cause and Effect

- Cause and effect relationships are routinely identified, tested, and used to explain change. (5-PS1-4)

Scale, Proportion, and Quantity

- Natural objects exist from the very small to the immensely large. (5-PS1-1)
- Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. (5-PS1-2), (5PS1-3)

New York State P-12 Science Learning Standards

- Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (5-PS1-3)

Using Mathematics and Computational
Thinking Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions.

- Measure and graph quantities such as weight to address scientific and engineering questions and problems. (5-PS1-2)

PS1.B: Chemical Reactions

- When two or more different substances are mixed, a new substance with different properties may be formed. (5-PS1-4)
- No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Boundary: Mass and weight are not distinguished at this grade level.) (5-PS1-2)

Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Science assumes consistent patterns in natural systems. (5-PS1-2)

Connections to other DCIs in fifth grade: N/A

Articulation of DCIs across grade-levels: **2.PS1.A** *(5-PS1-1),(5-PS1-2),(5-PS1-3);* **2.PS1.B** *(5-PS1-2),(5-PS1-4);* **MS.PS1.A** *(5-PS1-1),(5-PS1-2),(5-PS1-3),(5-PS1-4);* **MS.PS1.B** *(5PS1-2),(5-PS1-4)*

Common Core State Standards Connections:

ELA/Literacy –

RI.5.7	Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-PS1-1)
W.5.7	Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (5-PS1-2),(5-PS1-3),(5-PS1-4)
W.5.8	Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (5-PS1-2),(5-PS1-3),(5-PS1-4)
W.5.9	Draw evidence from literary or informational texts to support analysis, reflection, and research. (5-PS1-2),(5-PS1-3),(5-PS1-4))

Mathematics –

MP.2	Reason abstractly and quantitatively. (5-PS1-1),(5-PS1-2),(5-PS1-3)
MP.4	Model with mathematics. (5-PS1-1),(5-PS1-2),(5-PS1-3)
MP.5	Use appropriate tools strategically. (5-PS1-2),(5-PS1-3)
5.NBT.A.1	Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. (5-PS1-1)
5.NF.B.7	Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. (5-PS1-1)
5.MD.A.1	Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real-world problems. (5-PS1-2)
5.MD.C.3	Recognize volume as an attribute of solid figures and understand concepts of volume measurement. (5-PS1-1)
5.MD.C.4	Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. (5-PS1-1)

*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea. The text in the "DisciplinaryCore Ideas" section is reproduced verbatim from A Framework for K-12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas unless it is preceded by (NYSED).

Lesson 1

Matter Matters

Vocabulary:
matter
property

Focus Question:
What observations and measurements can be made to identify materials based on their properties?

Lesson Synopsis

Learning Target(s):

I can identify the observable and measurable properties of materials.

I can describe quantitative measures of properties.

I can describe qualitative observations of properties that can be used to identify materials.

Lesson Description:

This lesson introduces students to matter and its properties, which they will be studying throughout the unit. It does so by introducing the unit's storyline, a training program for Materials Engineers at the toy company, "Toys Matter." Students observe the characteristics of various toy balls and relate the properties of each material to its function. Finally, students will read about the career of a Materials Engineer and develop questions that can be answered throughout the unit.

Management

Materials

For the class:

- Stations T & F: magnet, ruler, measuring tape, magnet ball, golf ball, bouncy ball
- Stations O & U: measuring tape, bucket, beach ball, water ball, ping pong ball, water*
- Stations Y & N: double-pan balance and weights, ruler, spike ball, marble, stress ball
- 90 sticky notes
- Bilingual Glossary link (Teacher Resources online)
- Brown paper bag
- Property Wizard book (found online in Teacher Resources)
- Tennis ball
- Text to Speech Reader link (Teacher Resources online)
- Chart paper*
- Class copy of Student Science Journal p. 4*

For each student:

- Student Science Journal p. 3-5

*provided by teacher/student

Preparation:

1. Place tennis ball into brown paper bag.
2. Set up the following "TOY FUN" stations around your classroom:
    - Stations T & F: magnet, ruler, measuring tape, magnet ball, golf ball, bouncy ball
    - Stations O & U: measuring tape, bucket, beach ball, water ball, ping pong ball, water*
    - Stations Y & N: double-pan balance and weights, ruler, spike ball, marble, stress ball
3. Prepare a class copy of Student Science Journal page 4.
4. Create a T chart on a piece of chart paper. Label the left-hand side "Questions" and the right-hand side "Answered." Post the chart paper for use at the end of this lesson, and leave it posted throughout the remainder of the unit.

Teacher Background:

Matter is anything that has mass and volume. Mass is the amount of material in an object, and volume is the amount of space an object takes up. Matter can come in the solid, liquid, and gas phase. Energy, gravity, thoughts, and ideas are not matter.

While the NYSSLS Assessment Boundary states that students do not need to distinguish between mass and weight, it may be helpful to know that an object's mass, or amount of material, does not change, while an object's weight is a measure of the force exerted on it by gravity and can change (for instance, on the moon).

Matter can be identified by its properties. A **property** is a characteristic of a substance. Properties can be observed using your senses, and include, but are not limited to, color, shape, texture, etc. The function or job of an object is also one of its properties.

This lesson is meant to give students the big picture for the unit, as well as focus on macroscopic properties, before looking at how matter can be broken down into smaller particles in the lessons that follow.

Standards

Performance Expectations:

5-PS1-3 – Make observations and measurements to identify materials based on their properties. [Clarification Statement: Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property.] [Assessment Boundary: Assessment does not include density or distinguishing between mass and weight.]

Science and Engineering Practices

Planning and Carrying Out Investigations

- Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon.

Using Mathematics and Computational Thinking

- Describe, measure, estimate, and/or graph quantities such as area, volume, weight, and time to address scientific and engineering questions and problems.

Analyzing and Interpreting Data

- Represent data in tables and/or various graphical displays to reveal patterns that indicate relationships.

Disciplinary Core Ideas

PS1.A: Structure and Properties of Matter

- Measurements of a variety of properties can be used to identify materials.

Crosscutting Concepts

Patterns

- Similarities and differences in patterns can be used to sort, classify, communicate, and analyze simple rates of change for natural phenomena and designed products.

Structure and Function

- Substructures have shapes and parts that serve functions.

ELA/Math/Social Studies Connections:

ELA: 5SL1, 5L4

Math: MP5, MP7, NY-5.MD.3

Social Studies: F.1

Vocabulary:

- **matter** - anything that has mass and volume (takes up space)
- **property** - a characteristic of a substance; i.e. color, shape, texture, etc.

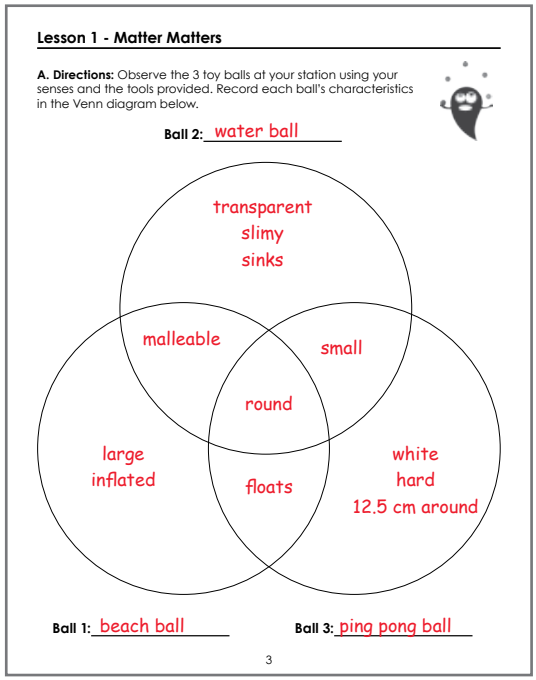
Misconceptions:

While students have learned about solids and liquids in kindergarten and 2nd grade, they may not yet know that matter can also be found in the gas phase. It may be difficult for students to understand that gases are matter because most gases cannot be seen. They may also not yet have a grasp of what is NOT matter, such as energy, gravity, thoughts, ideas, etc. Most students will not know what a Materials Engineer does until reading about this career at the end of this lesson. Students do not need to know that there is a difference between mass and weight and may use these terms interchangeably.

Procedure

Phenomenon: We can identify an object that we cannot see. How do we know what's inside of a bag if we can't see it? Which properties can we use? Matter matters. Toy balls function differently based on the properties of their materials.

1. Welcome students to their first day at the toy company, "Toys Matter." They are about to embark on an intensive training program to see if they have what it takes to be hired as Materials Engineers. Over the next few weeks, students will be trained using a series of tasks in which they will explore and work with a large variety of materials. Their final test will be to use what they have learned to engineer a new toy. Pass out Student Science Journals at this time.
2. Prior to the lesson, you should have placed a tennis ball into a brown paper bag. Ask for one student volunteer to reach into the bag without looking, then **describe** to his or her classmates what is inside (ex. round, furry, fits in my hand, etc). List the characteristics on the board. Allow students to guess the item that is being described. Once "tennis ball" has been guessed, take it out of the bag. Remind students that they learned in 2nd grade that the characteristics that were just described to them are called "**properties**," and ask the class to share some more properties of the tennis ball now that they can observe it themselves (ex. green, bouncy, etc). Add these new ideas to your list on the board.
3. Form 6 groups of 4 to 5 students each by counting off "T…O…Y…F… U…N…" (toy fun) and sending students to the station with the letter they each called out.
4. Students are to **observe** the 3 balls at their station using their senses and the **tools** provided (rulers, measuring tapes, balances, magnets, and/or buckets of water). Students should list the characteristics of each ball in the **3-way Venn diagram** on page 3 of their Student Science Journals.



SEP: Science and Engineering Practice(s):

Using Mathematics and Computational Thinking:

Describe, measure, estimate, and/or graph quantities such as area, volume, weight, and time to address scientific and engineering questions and problems.

Planning and Carrying Out Investigations:

Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon.

SEP: Science and Engineering Practice(s):

Analyzing and Interpreting Data:

Represent data in tables and/or various graphical displays to reveal patterns that indicate relationships.

CCC: Crosscutting Concept(s):

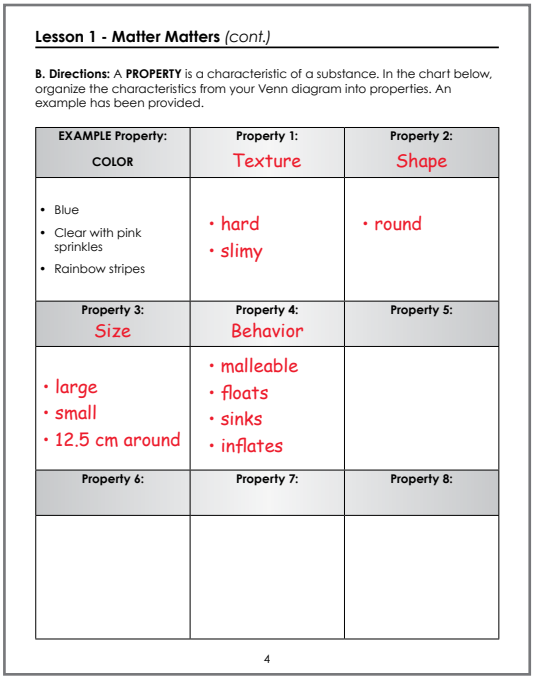
Patterns:

Similarities and differences in patterns can be used to sort, classify, communicate, and analyze simple rates of change for natural phenomena and designed products.

Structure and Function:

Substructures have shapes and parts that serve functions.

5. Once each group has completed their **observations** of the 3 balls at their station, they are to **organize** the characteristics into properties. For example, if they noted in their Venn diagram that one ball was blue, one ball was clear with pink sparkles, and one ball had rainbow stripes, they could **categorize** all of these characteristics under the property of "Color." Students are to complete this step using page 4 of their Student Science Journals.



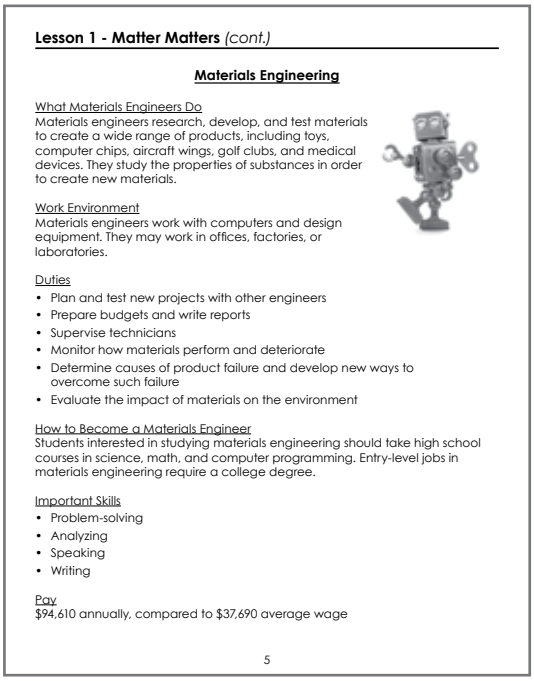
Lesson 1 - Matter Matters *(cont.)*

B. Directions: A **PROPERTY** is a characteristic of a substance. In the chart below, organize the characteristics from your Venn diagram into properties. An example has been provided.

EXAMPLE Property: COLOR	Property 1: Texture	Property 2: Shape
• Blue • Clear with pink sprinkles • Rainbow stripes	• hard • slimy	• round
Property 3: Size	**Property 4: Behavior**	**Property 5:**
• large • small • 12.5 cm around	• malleable • floats • sinks • inflates	
Property 6:	**Property 7:**	**Property 8:**

4

6. As a whole class, share out some of the properties and characteristics and list them on a class copy of Student Science Journal page 4. Note that although each group observed different balls, they often **classified** them using **similar** properties. Specifically elicit or point out the following properties:
    a. Mass (may be referred to as weight; observations may include heavy, light, etc)
    b. Volume (may be referred to as size; observations may include big, small, etc)
    c. Phase/State (solid, liquid, gas)
7. Explain that each of the balls is made of **matter**, and that the material that each ball is made of matters. In other words, each ball's properties relate to its **function**.
8. Finally, have each student choose a ball from this lesson to discuss with a partner. First, the older partner can explain how their ball's properties are important to its **function**, then the younger partner gets a chance to share.



Lesson 1 - Matter Matters *(cont.)*

Materials Engineering

What Materials Engineers Do
Materials engineers research, develop, and test materials to create a wide range of products, including toys, computer chips, aircraft wings, golf clubs, and medical devices. They study the properties of substances in order to create new materials.

Work Environment
Materials engineers work with computers and design equipment. They may work in offices, factories, or laboratories.

Duties
- Plan and test new projects with other engineers
- Prepare budgets and write reports
- Supervise technicians
- Monitor how materials perform and deteriorate
- Determine causes of product failure and develop new ways to overcome such failure
- Evaluate the impact of materials on the environment

How to Become a Materials Engineer
Students interested in studying materials engineering should take high school courses in science, math, and computer programming. Entry-level jobs in materials engineering require a college degree.

Important Skills
- Problem-solving
- Analyzing
- Speaking
- Writing

Pay
$94,610 annually, compared to $37,690 average wage

5

Closing the Lesson

Direct students to actively read about Materials Engineers on page 5 of their Student Science Journals. Then, prompt them to write 3 questions about the reading/lesson on 3 separate sticky notes, and to post these notes in the "Questions" portion of the t-chart you created in advance.

Assessment

This lesson can be used to assess students' prior knowledge on structure and properties of matter. It will also be informative to look at the questions students develop on their sticky notes, and take opportunities as they present themselves throughout the unit to address these questions. Once a question has been addressed, it should be moved to the "Answered" side of the t-chart. Questions that remain at the end of the unit may be left posted as opportunities for further research.

A rubric has been included at the end of the Student Science Journal for self-reflection and/or peer/teacher evaluation following each lesson in preparation for the final performance assessment.

Connections

Differentiation:

The formation of homogeneous or heterogeneous groups will be an important decision in how you support students during this lesson. It may be beneficial to pre-teach vocabulary to students with special needs and/or English Language Learners. A link to a bilingual glossary has been included in the Teacher Resources online. All students should be taught to use active reading strategies (such as highlighting/underlining, making notes and questions in the margin, marking up diagrams, etc) throughout the school year. A link to a text to speech reading tool has also been included in the online Teacher Resources.

Cross-Discipline Extensions:

Math: You may wish to set up a center in your classroom with the measuring tools that will be used throughout this unit so that students may practice using them at other times outside of science class.

ELA: For students who are interested in researching more about careers as materials engineers, there are many websites available online.

Science: Properties will be revisited throughout the unit, specifically in Lesson 5. The following activities could be used to support student understanding of properties:

- Student Sort: Challenge students to silently sort themselves into groups based on different properties, such as eye color, birth month, first initial, number of siblings…
- Secret Property: Ask one student to leave the room, then sort students into groups based on an observable property, such as hair color or type of shoe. When the student returns to the classroom, challenge him or her to guess which property was used to sort the class. Another variation is for students to gather a collection of objects that share one property in common and challenge their classmates to guess the property they used.
- Feel It Bag: Place a mystery item into a paper bag. Allow one student to touch the item (without looking) and describe it to classmates. The object is for the other students to guess what the item is based on the properties being described.

- Property Wizard: Make this book (included in the online Teacher Resources) available for students to read. It gives instructions for a property game they can play. Please be aware, it is written at a 1st grade reading level, so it may be especially beneficial for use with students with special needs and/or English Language Learners.

Next Lesson Preparation

1. Secret Sand:
    a. Sand MUST be DRY! If the sand in your kit arrived damp, spread it out on a tray and leave it to dry.
    b. Add a small amount of Kool-Aid to your dry sand to make "Secret Sand." Do not add too much – you do not want the sand to appear colored, the goal is that it still looks like sand. (If the sand is damp, the color will spread). Please note that the sand may take on a fruity scent, which is okay.
    c. Fill 12 – 15 cups ¼ full of Secret Sand. Place on trays to set up at student desks.
    d. Fill 12 – 15 cups ½ full of water. Do not pass these cups out until directed to do so in the Procedure.
2. "CLOSE" Activities – set up 5 stations (with 3 sets at each) from which students can take the following materials:
    - C: 3 boxes of pepper with iron filings, 3 magnets
    - L: 3 pocket scopes, 12 – 15 small pieces of colored newsprint (comics, etc)*
    - O: 12 – 15 pea-sized balls of floam, 3 pairs of safety scissors*
    - S: 12 – 15 sugar cubes, 3 plastic containers with lids, 3 plastic spoons, water*
    - E: 3 syringes, 3 pieces of plastic tubing
3. Set up tray for discussion with rock, wooden block, road salt, and cup/bottle with condensation.