Bringing It Together: Grade 2

An Example
Organizing Idea: Matter & Scientific Methods

Example “Mini Unit” Walk Through

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Land Acknowledgement

In the spirit of reconciliation, we want to acknowledge that this gathering is taking place on traditional lands across the province of Alberta, home to many diverse First Nations, Métis and Inuit peoples. We acknowledge that this land is a traditional meeting ground giving voice to its original peoples and the story of creation of this country in a way that history has forgotten.

Agenda For Session

1. Science Teaching Practices

2. Planning Process
   Curricular Expectations Connected To Resource

3. Walk Through Resource

4. Question & Answer

Resources you will receive at the end

1. Plan with Links
2. Student Graphic Organizers
3. Slides

**All resources will be translated into French & posted on ARPDC Site

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From Bouncing Balls To Bandages: Using Purpose to Choose Materials

UNIT OVERVIEW

This sample unit plan follows the four core teaching practices of the Ambitious Science Teaching Framework. This phenomena(observable event) based learning approach to science teaching, leverages students' existing personal experiences and current understanding about the physical world around them, to then revise their own explanations of specific, contextualised scientific phenomena over time. This approach to teaching science, allows students to use investigations, authentically, to build knowledge and make meaning of the various science ideas.

This sample unit centres on a familiar phenomenon (observable event) of "bouncy balls" and focuses on investigating the question "What *makes a bouncy ball so bouncy?*" Through this phenomenon based learning, students realise that different balls have different purposes. As well, through testing rubber, students describe the properties of materials required to make a bouncy ball. Students then apply their understanding to a different context to further test different materials in order to design a bandage for a company that fulfils properties of the material required that students identified (able to be shaped, strong, and absorbent).

The connection of the KUSPs in both organizing ideas of Matter and the Scientific Methods facilitates a context for students to test various materials for an authentic purpose.

As with all resources, teachers are free to modify and adapt to their particular teaching context.

Slides to Online Session

CURRICULAR CONNECTIONS

Organizing Idea: Matter
Learning Outcome: Students **investigate properties of materials** and **relate** them to a **purpose.**
Related KUSPs Taught and formatively assessed in this lesson series:

Knowledge	Understanding	Skills and Procedures
Properties of materials that can be tested include • if water is absorbed • if the material can be shaped (malleability) Various properties of materials can be measured, including length and weight (mass).	Materials have unique properties.	Test properties of various materials. Measure various materials using non-standard measurements.

Knowledge	Understanding	Skills and Procedures
Knowledge of the properties of materials and their purposes is important in many occupations and roles, such as • engineer • designer	The purpose of an object influences the choice of materials used to produce it. Some materials are more suitable than others for making a product for a specific purpose.	Compare the properties of materials to determine what material is best suited for a specific purpose. Explain the relationship between suitability of materials and purpose. Select a material and use it to create an item for a specific purpose. Discuss the choice of material based on availability and purpose.

Knowledge	Understanding	Skills and Procedures
Materials are used to make objects.	Materials can be combined in a variety of ways to make objects.	Identify the materials used to make various objects. Combine materials to create an object for a specific purpose.

*Note: not all KUSPs from the grade two organizing idea, matter, will be incorporated in this series of lessons.

Materials Required:

Bouncing Ball Student Handout For Each Student

Designing A Bandage Student Handout For each student

Teacher version of handout

What Makes a Bouncy Ball So Bouncy? Investigation
Basketball,Baseball,Ping pong ball,Tennis ball, Golf Ball, Marble, Soccer ball. Sponge ball (nerf) [set for groups to investigate]

Testing Materials (Bouncy Ball and Bandage)

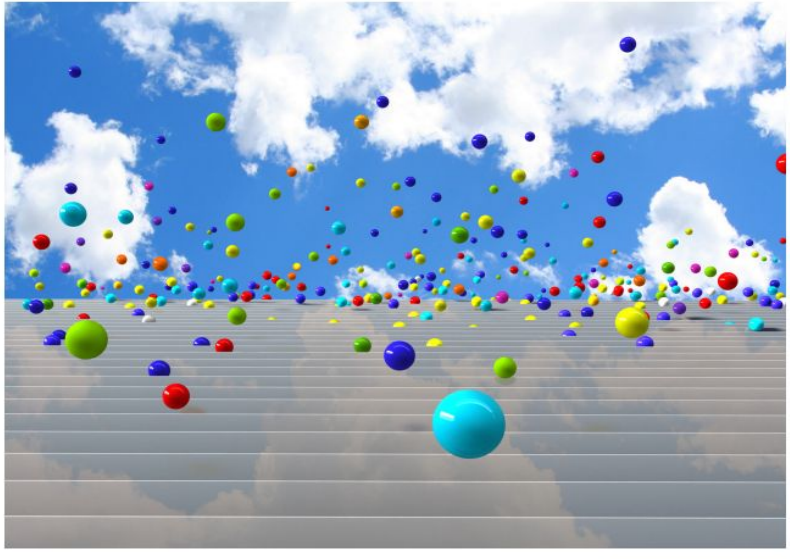
- ☐ Rubber band, yarn, plastic garbage bag, aluminum foil,wax paper, leather (Sham-Wow),Popsicle stick,Metal (spoon) Sandpaper, cardboard

Testing Material Optional Items if above is not available:

Cardboard	Plastic-covered	coffee stirrers	Wax paper	Paper towels
Cotton cloth	Wooden spoons	Feathers	Aluminum foil	Rubber bands
Cotton balls	Metal spoons	Pipe cleaners	Sponges	Craft stick
Paper cups	Rubber erasers	Smooth rock	Cheesecloth/gauze	Paper Bowls or plates
Plastic cups	Steel bolts	Course rocks	Yarn	
Plastic spoons	Steel washers	Sandpaper	Twizzlers	Marbles Index cards

Planning the Investigation: Student Graphic Organizer to Record

BOUNCING BALLS INVESTIGATION



STUDENT GRAPHIC ORGANIZER

Name:

INVESTIGATION

Purpose: What are we trying to find out?

Question: What question are we investigating?

Fair Test

What changes in our test?

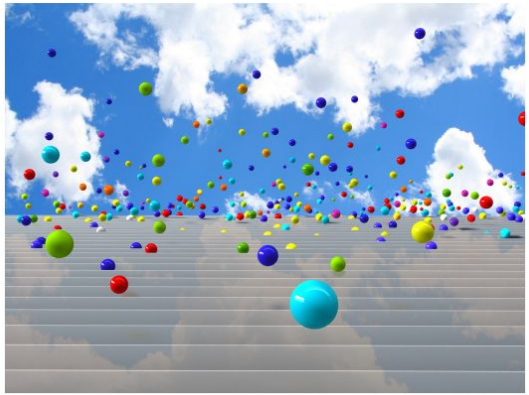
What are we measuring/observing?

What Stays the Same?

Teacher Reference With Sample Answers

BOUNCING BALLS INVESTIGATION

Teacher Reference



Example:
Answers May Vary

Purpose: What are we trying to find out?

OUt of all the balls, which one bounces the most.

Question: What question are we investigating?

~~What ball is the bounciest?~~

Fair Test

What changes in our test?	What are we measuring/observing?
The type of ball	Counting how many times the ball bounces

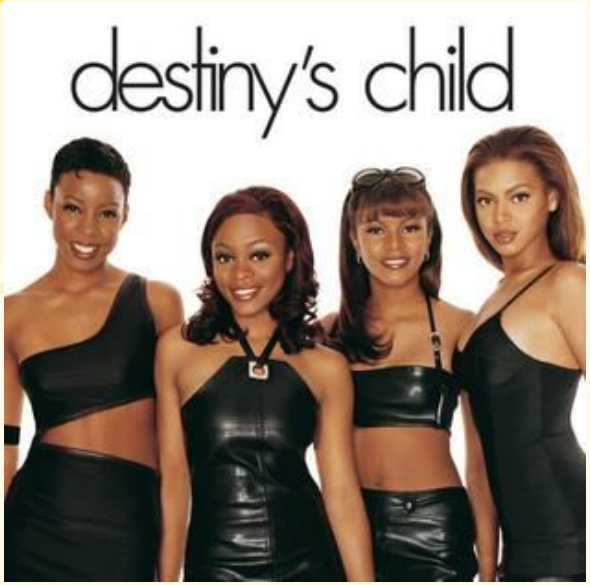
What Stays the Same?

Drop ball - not throw or push ball down	Height from where we drop the ball	Where we stand and floor

Lesson Layout

LEARNING DEVELOPMENT				
Estimated Time	Learning Goal based on curriculum expectations & engagements to develop student understanding.	**Inclusion of all Learners** How will all learners access the learning engagements? Teachers can adapt to their context Universal Design for Learning Principles:	**Assessment For Learning** Based on the curriculum, what do I need to **see or hear** from students that shows they are getting it?	**Resources**
Lesson 1 40 minutes	**Engage (Asking Questions): Elicit Student Ideas About Phenomenon:** The goal of this lesson is to provide a context for students to observe and develop questions to investigate how the purpose of an object determines the material used. • This may work best in the gymnasium or outside Instruction: **Present context use a red rubber ball or a small bouncy ball.** ➢ 5 minutes Tell students something similar to "I was out supervising at recess and noticed groups of students playing 4 squares on the Tarmac. I was watching the ball bounce and started to think 'what makes a ball so bouncy?' and 'Why do some balls bounce more than others?'" **Student Observations 10 minutes** ➢ Have students in small groups try to bounce different balls provided to them or watch as the balls are being bounced. ➢ Think-pair-share students share out observations with small groups - record student observations as they share all students to view	**Vocabulary:** ☐ Observation is noticing something using one of the 5 senses (grade 1) **Sentence Stems for Observations:** ☐ I noticed .... **Scientific Models** - some students may benefit from a few words that they can glue onto their pictures (ex. Ball, bounce, made of,....) **Sentence Stem for Model:** I think what makes the ball bounce is.... Because..	**Curricular Connection: Scientific Methods:** **Knowledge:** Investigations are conducted for purposes such as • answering questions • building knowledge • satisfying curiosity **Skills/Procedures:** Explore various purposes for conducting an investigation. Develop questions for the purpose of an investigation **Assessment Look Fors:** This is day 1 of being introduced to the phenomenon and the curricular expectations will be fully developed in day 2 Can the student ☐ Create questions ☐ Share ideas on their model (what ideas are they sharing? Do they mention what the ball is made of?	**Various types of balls** (basketball,ping pong ball, golf ball,,soccer ball, marble, red rubber ball, tennis balls, small bouncy balls) Science journals or paper to sketch models.

A lot Has Changed Since 1996....



Our science instruction & resources should reflect this

Science is a way of thinking much more than it is a body of knowledge.

~ Carl Sagan

Key Ideas For Planning

1. Use the learning outcomes and KUSPS to identify key concepts (Science OI & Scientific Methods)
2. Provide authentic context for students to investigate and connect to
3. Explore before explain in lesson development
4. Use talk and vocabulary to help students make meaning of science ideas (Explain Phase)
5. Triangulate evidence of student learning based on combination (knowledge & skills/procedures)

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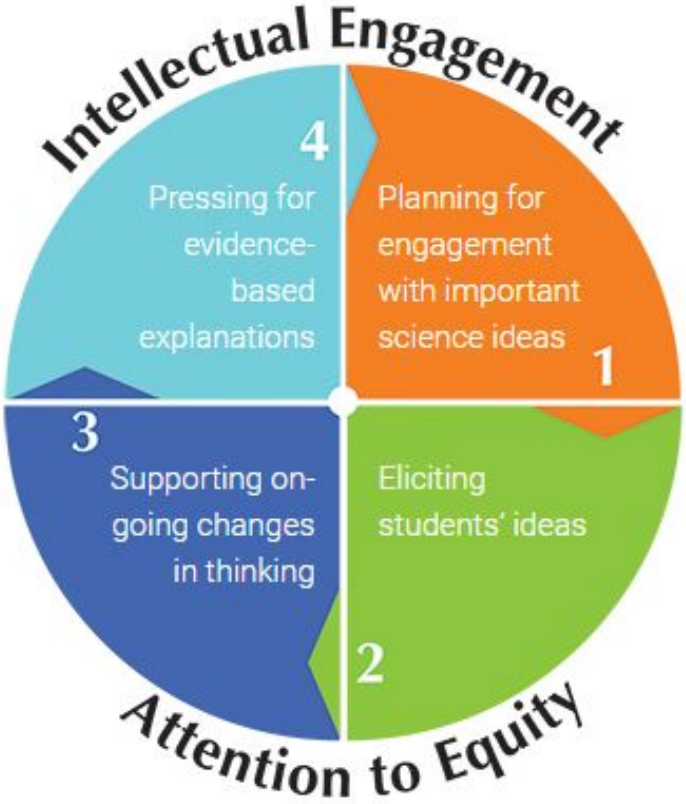
Bringing Science Instruction to the 21st Century

“Hands On” Only **Activity Based Learning**	**Sensemaking** **Phenomenon Based Learning**
Planning: Topic “What Activities Support this?”	Planning:Concepts “What are the Big Ideas?”
String of sometimes connected sometimes disconnected hands on activities ➢ Coverage ➢ Are students understanding the ideas?	**Authentic Science Investigation** ➢ Phenomenon connected to “Big Idea” that students trying to find out. ➢ Something students are familiar with ➢ Coherence from student perspective all “hands on”activities, videos and text are used to connect back to the phenomenon

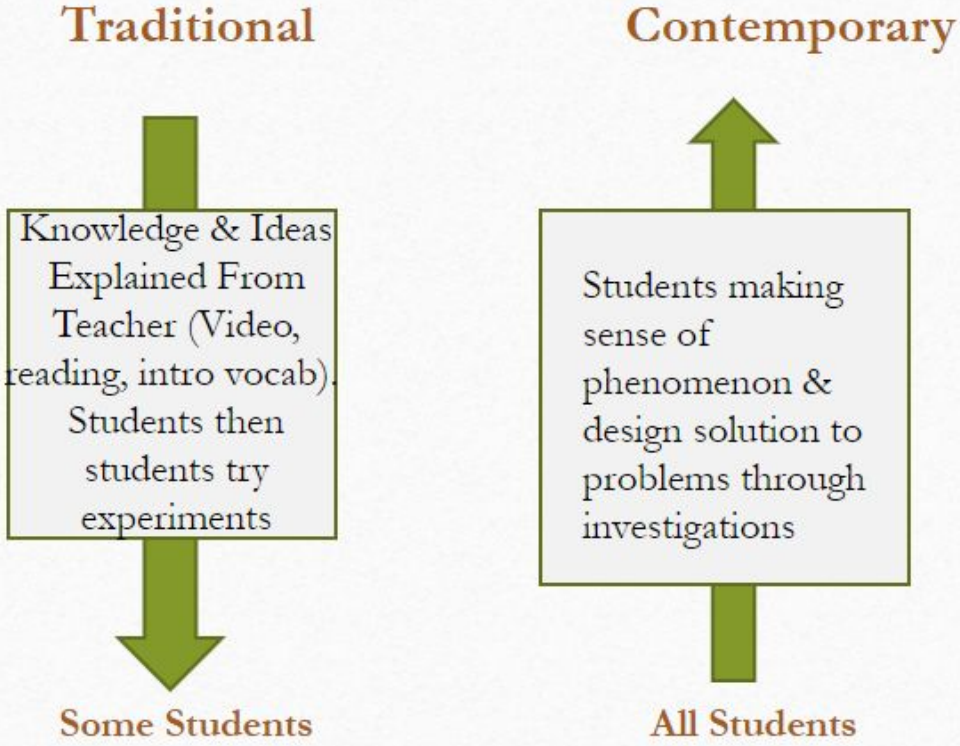
Evidence is used in grade 4 and above in primary use:
Support from data



Source: ambitiousscienceteachingorg

Science Instruction

All Outcomes, All Students



Lee, O (2020)

What is the difference between topic driven science & phenomenon based science instruction?

Erosion 	 What caused the Hoodoos near drumheller to form this way?
Night/Day Sky Science	  We take the bus to school the same time everyday. Why is it dark at 7:15 am in December and Light at 7:15 am in May?
Hearing & Sound	 How does the singers voice shatter the glass?

Making Meaning Journey (Beginning, Middle, End)

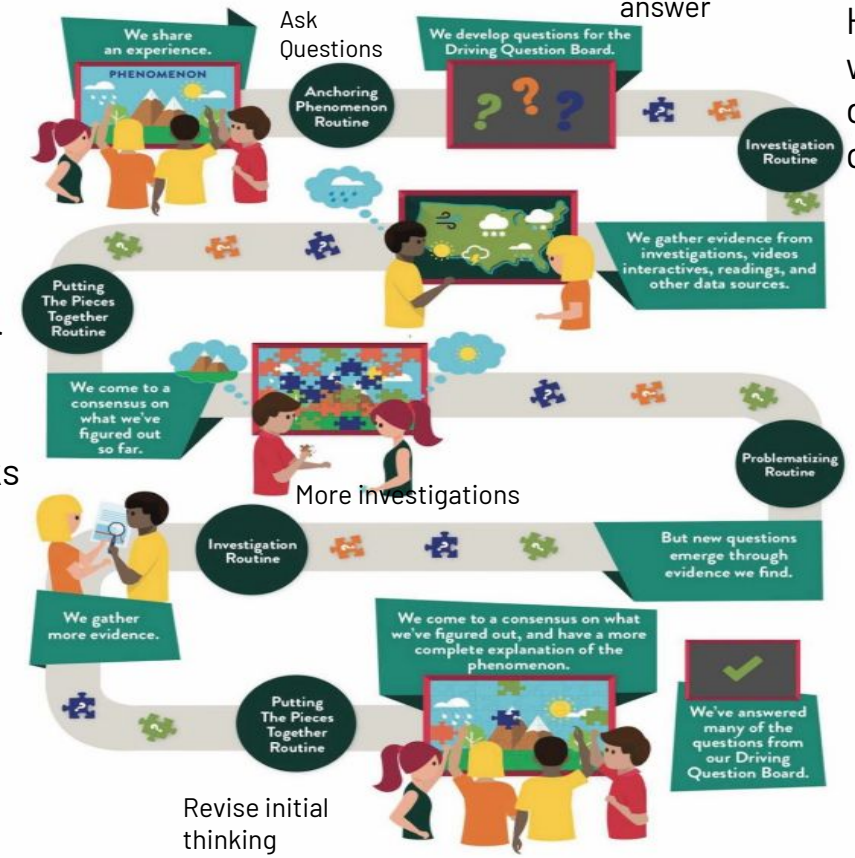
Observable event

Observe & Ask Questions

Question trying to answer

Hands on investigation with purpose to collect data to find answer to question

Try to find meaning and explain understanding so far
&
Look to text (videos and/or articles, books



More questions, and learning needed

OpenSci Ed (2020)

Revise initial thinking

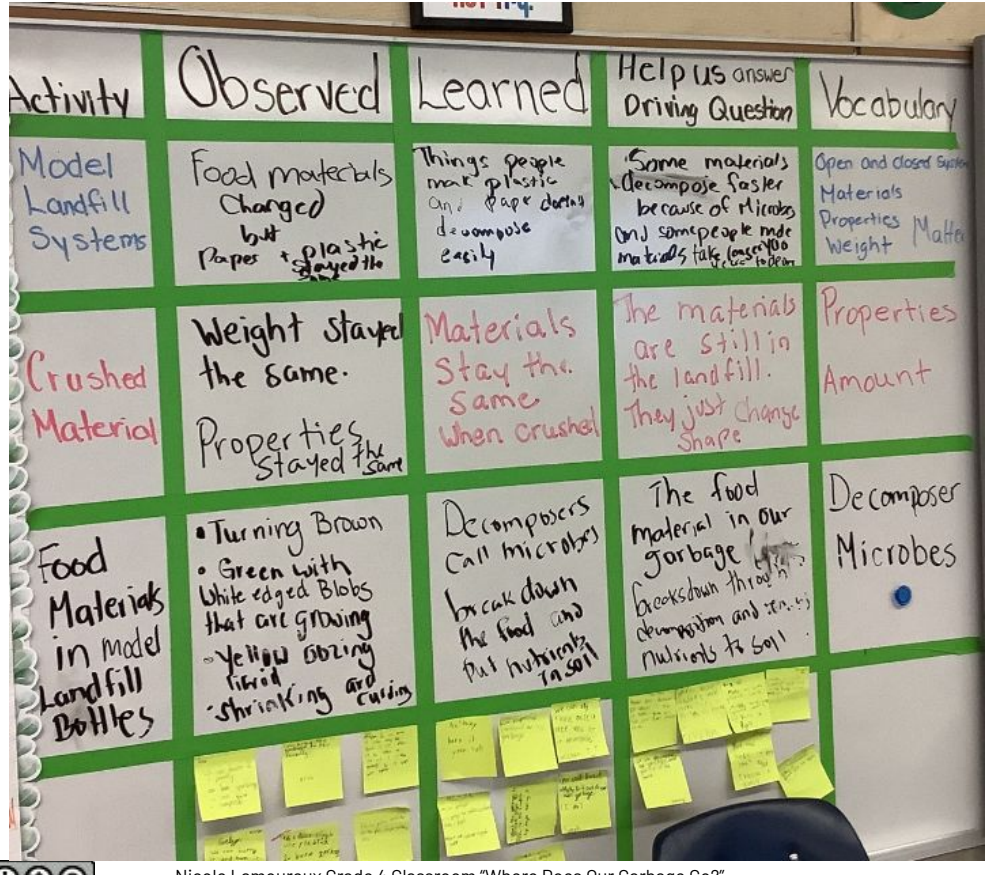
Answer the question

Learning Summary Tables

Phenomenon: *Present the phenomena to the class*			
Focus Question: *Write the focus question. This is what students are working to understand/answer.*			
Activity/ Investigation	**Observations** *(patterns, what happened?)*	**Why?** *(what do you think caused this?)*	**Clues** *(how does this help us understand the focus question/phenomenon)*
Answer Focus Question: *Use evidence gathered in table to develop a claim / explanation of phenomenon.*			

- Help students see purpose of smaller hands on investigations and connect back to solving phenomenon
- Reduces cognitive load as students can refer back to what they learned
- Should be worked on as an entire class & filled with student response

Examples

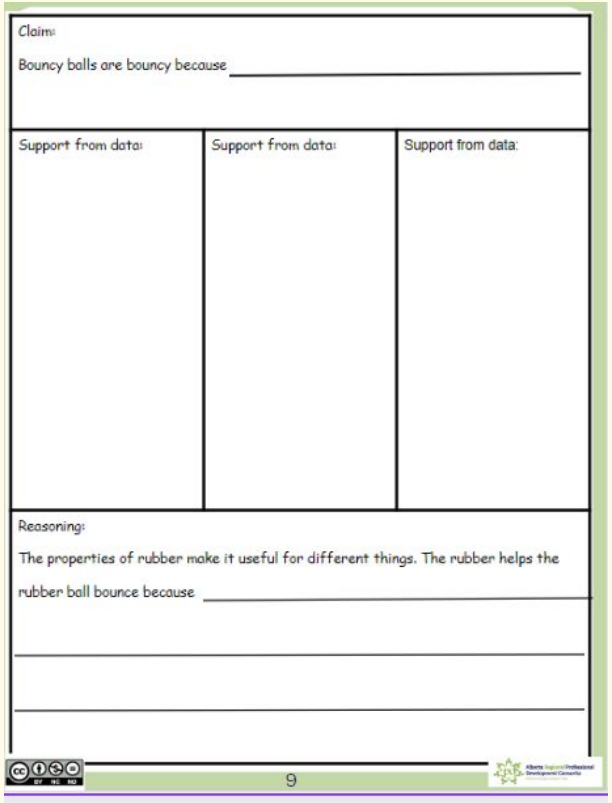


Nicole Lamoureux Grade 4 Classroom "Where Does Our Garbage Go?"

Or Document on Google Slide & Display as Needed

Investigation Title	What did we observe?	What did we learn?	How does this help us understand how the puppet show works?

Learning Summary Claim-Support-Reasoning



Claim:

Bouncy balls are bouncy because _____

Support from data:	Support from data:	Support from data:

Reasoning:

The properties of rubber make it useful for different things. The rubber helps the rubber ball bounce because _____

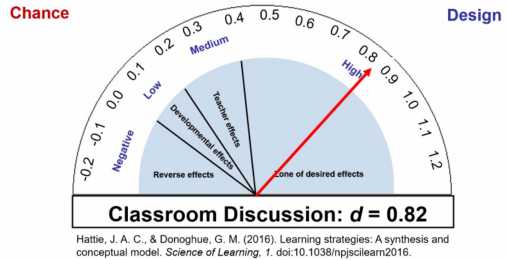
_____

_____

9

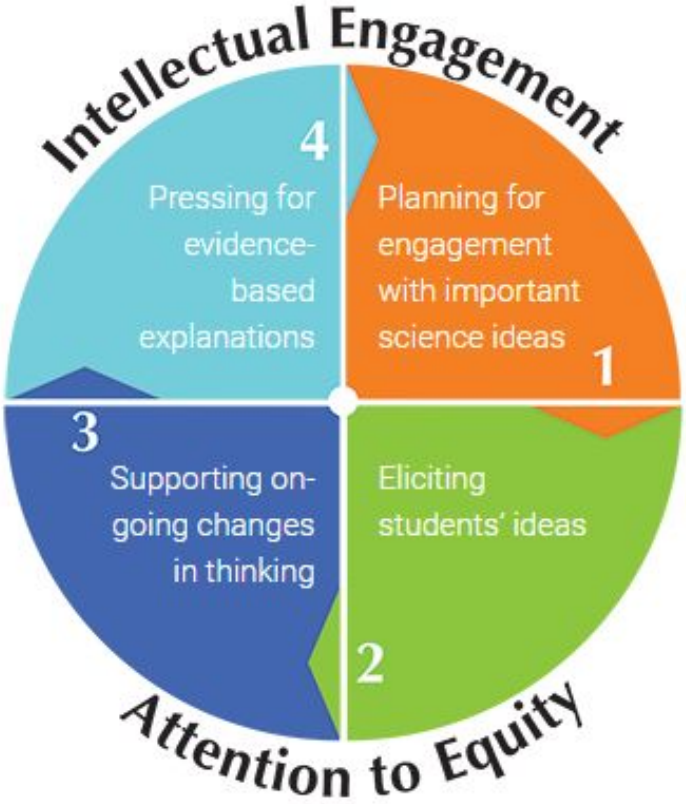
How Do I Fit This In?

ELAL is more than reading & writing & science builds background knowledge

Science Practice	ELAL Connection (Organizing Idea)
Science terms & Vocabulary (Glossaries, Frayer Model etc.)	Vocabulary (Tier 2 & 3 words)
Think-Pair-Share  Whole Class Discussions	Oral Language  Hattie, J. A. C., & Donoghue, G. M. (2016). Learning strategies: A synthesis and conceptual model. *Science of Learning, 1*. doi:10.1038/npjscilearn2016.
Viewing & Reading Text (video & non fiction text)	Comprehension Text Forms & Structures

Integrate aspects of ELAL
&
Time: Add 10-15 minutes to each lesson from ELAL time.

Evidence is used in grade 4 and above in primary use:
Support from data



Source: ambitiousscienceteachingorg

OpenSciEd

"The materials are a **huge equalizer** in the classroom, especially for students with special needs and English learners. Students are figuring things out and actually doing science rather than just being “told” about science."

Planning for engagement with important science ideas 1

Planning Process:

Unpack the Learning Outcomes & KUSPS To Examine Science Concepts (Science Ideas)

Bringing It Together:

Organizing Ideas: Matter & Scientific Methods

Learning Outcome: Matter (2M)

Students INVESTIGATE properties of materials and relate them to a purpose.

Learning Outcome: Scientific Methods

Students examine INVESTIGATION and explain how it is influenced by purpose

KNOWLEDGE	UNDERSTANDING	SKILLS & PROCEDURES
Properties of materials that can be tested include • if light passes through (transparency) • if water is absorbed • if the material can be shaped (malleability) • if light is reflected (reflection) Various properties of materials can be measured, including length and weight (mass).	Materials have unique properties.	Test properties of various materials. Measure various materials using non-standard measurements.

KNOWLEDGE	UNDERSTANDING	SKILLS & PROCEDURES
Knowledge of the properties of materials and their purposes is important in many occupations and roles, such as • carpenter • engineer • designer • Knowledge Keeper or Elder First Nations, Métis, and Inuit use of materials is informed by • traditional knowledge • time of year • availability • taking only what is needed • respect for the land	The purpose of an object influences the choice of materials used to produce it. Some materials are more suitable than others for making a product for a specific purpose.	Compare the properties of materials to determine what material is best suited for a specific purpose. Explain the relationship between suitability of materials and purpose. Select a material and use it to create an item for a specific purpose. Discuss the choice of material based on availability and purpose.

KNOWLEDGE	UNDERSTANDING	SKILLS & PROCEDURES
Materials are used to make objects.	Materials can be combined in a variety of ways to make objects.	Identify the materials used to make various objects. Combine materials to create an object for a specific purpose.

Consider the

Background Builder

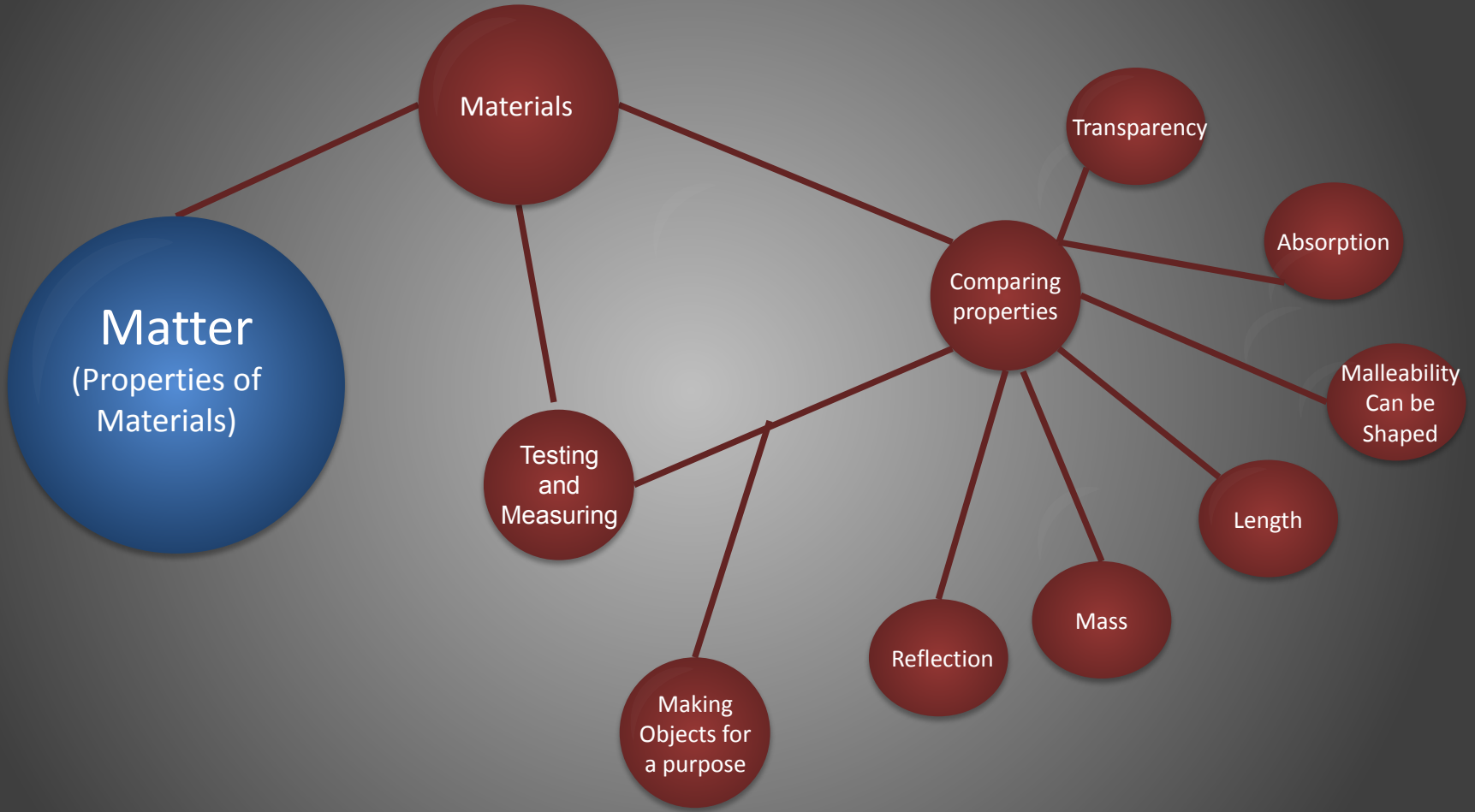
Properties

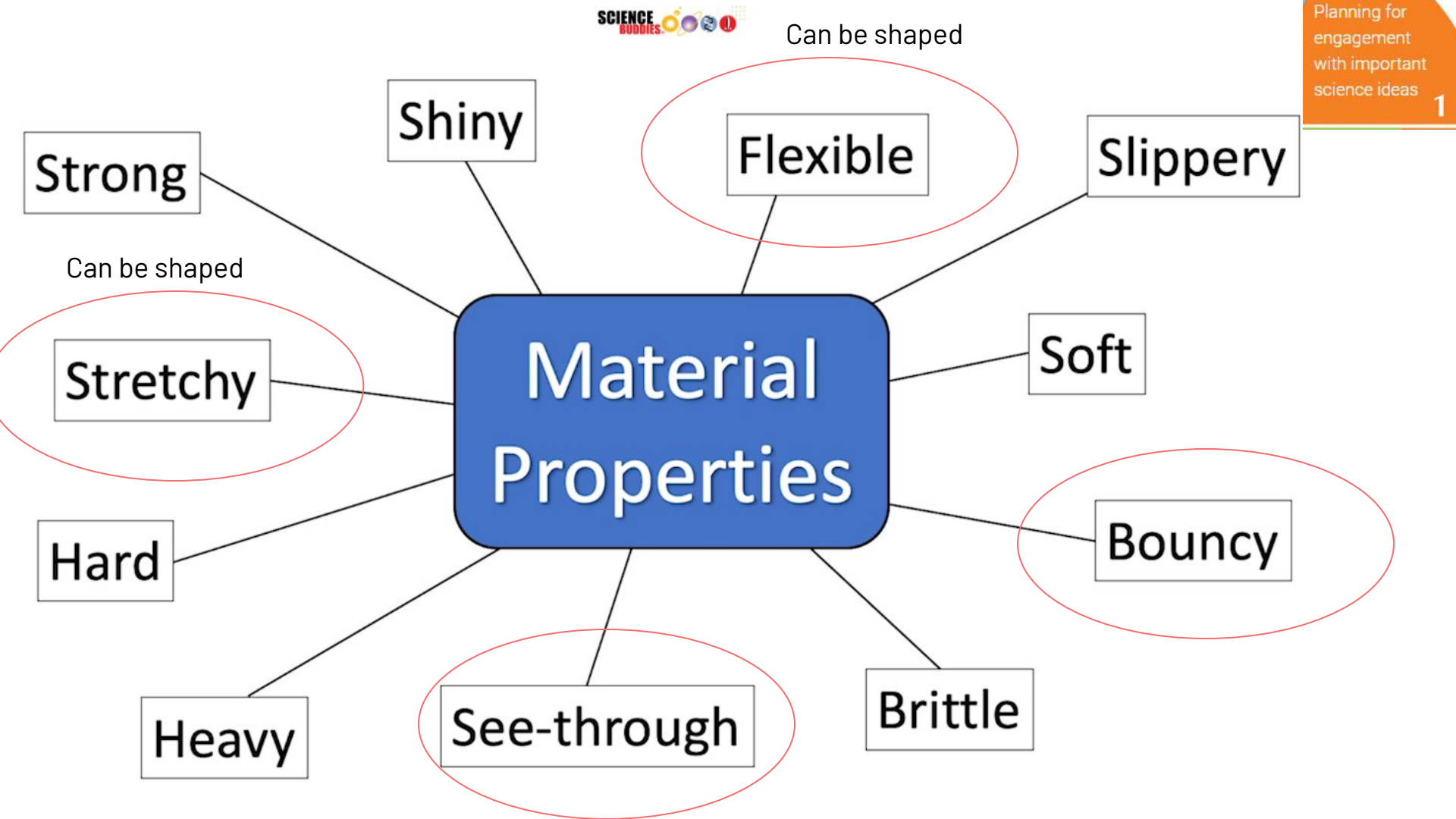
Characteristics or features of an object, material and matter that are observable, measurable or both in order to describe and understand it.

Teacher Background Matter: Properties

Properties of an Object (Gr.1)	Properties of Matter (Gr. 3 & Up)	Properties of Materials (Gr. 2)
Extensive Physical Property ❏ Dependent on sample size ❏ Useful to describe the object but not identify as it can change size & more objects can be made	Intensive Property ❏ Independent of sample size ❏ Generally is the quality or essence of the substance ❏ Useful in identifying unknown substances	Materials include **both** intensive and extensive physical properties ❏ The focus is on how these physical attributes make the material useful
<u>Example of Properties</u> **Weight** Mass Volume **Length** **Size**	<u>Example of properties</u> **Melting/boiling point** **Color** Odor Hardness **Density** Elasticity Luster **Malleability** Conductivity **States of Matter**	<u>Example of Properties</u> 1.**Transparent** 2. Waterproof 3. **Absorbent** 4. Strong/Weak 5. Insulator/ conductor 6. **Flexible/rigid**

Adams and Shannon (2017) p. 53


Matter
(Properties of Materials)
Materials
Testing and Measuring
Making Objects for a purpose
Comparing properties
Transparency
Absorption
Malleability Can be Shaped
Length
Mass
Reflection


Material Properties
Strong
Shiny
Can be shaped
Flexible
Slippery
Can be shaped
Stretchy
Soft
Hard
Bouncy
Heavy
See-through
Brittle

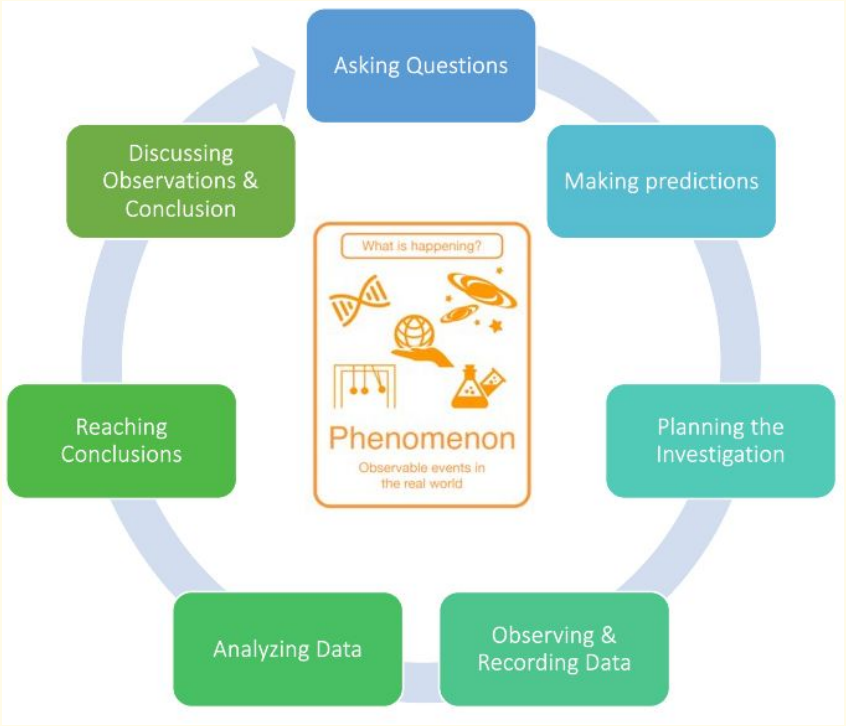
LEARNING OUTCOME

Students examine investigation and explain how it is influenced by purpose.

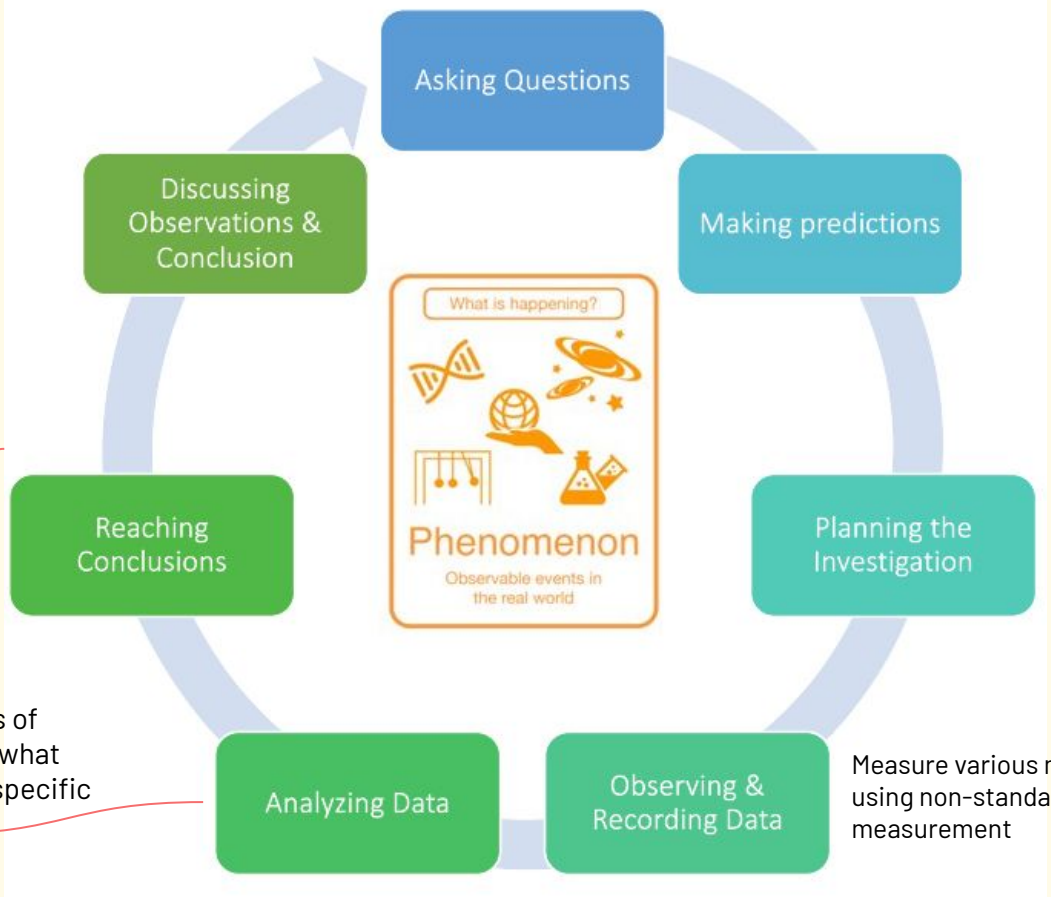
KNOWLEDGE	UNDERSTANDING	SKILLS & PROCEDURES
Investigations are conducted for purposes such as • answering questions • building knowledge • satisfying curiosity • problem solving Procedures scientists use to guide investigations include • asking questions • making predictions • planning the investigation • observing and recording data • analyzing data • reaching conclusions • discussing observations and conclusions	Investigations involve carrying out procedures for a purpose.	Explore various purposes for conducting an investigation. Describe procedures of an investigation. Develop questions for the purpose of an investigation.

KNOWLEDGE	UNDERSTANDING	SKILLS & PROCEDURES
Data should relate to the purpose of an investigation. Observations and data should be similar if the investigation is repeated. Repetition of an investigation includes performing the same procedures in the same way. Data collected by people performing the same investigation can be combined.	Investigations can involve comparing data.	Determine if observations relate to the purpose of the investigation. Collaborate to combine recorded data into a single list or chart. Compare observations and data with others.

Procedures For Investigations Grade 2-5



Matter Skills & Procedures



Testing Properties of Various Materials

Compare the properties of materials to determine what material is suited for a specific purpose

Measure various materials using non-standard units of measurement

Keeping the End In Mind Performance Task

Summative Assessment End In Mind: Performance Task

Situation: Company needs to find a suitable material for making bandages
Challenge: Find material that will make a good medical bandaid
Roles: Medical engineers testing various materials to design a medical bandaid
Audience: Company selecting the material
Product/Performance: Select and suggest material to design a medical bandaid

Driving Question: How can we find materials to help us design a medical bandaid?

Bandage connects to three properties: strength, flexibility (bendable) and absorbance. Students will test materials for the three different properties in order to select the best material to design a functional bandage.

Single Point Rubric

Grade 2 Single Point Rubric: Design A Bandage Performance Task

Science Methods **Learning Outcome:** Students examine investigation and explain how it is influenced by purpose. **Understanding** Investigations involve carrying out procedures for a purpose **Knowledge** demonstrated through **Skills and Procedures** ➢ Develop questions for the purpose of an investigation (Formative checklist) ➢ Describe procedures of (this) investigation ○ Ask Questions ○ Makes Predictions ○ Observes and records data ○ Analyze data ○ Make Conclusions (In this task students are making conclusions through demonstration when they select and combine materials)	**Organizing Idea: Matter** **Learning Outcome:** Students investigate properties of materials and relate them to a purpose. **Understanding** The purpose of an object influences the choice of materials used to produce it. Some materials are more suitable than others for making a product for a specific purpose. **Knowledge** demonstrated through **Skills & Procedures** ➢ Test properties of various materials ➢ Compare the properties of materials to determine what material is best suited for a specific purpose ➢ Explain the relationship between suitability of materials and purpose ➢ Select material and use it to create an item for a specific purpose ➢ Combine materials to create an object for a specific purpose
Student Name:	**Date:**

Grow	Met Criteria	Glow
	☐ Tests and compares the property of materials to find out if it can hold water (absorbency) ☐ Tests and compares for the property of materials if it can be shaped (malleability) *Note: Students are testing strength but will not be assessed because it is not a curricular expectation*	
	☐ Provides explanation (based on test results) for selecting material connected to the purpose. *Tell me what you found when you were testing and how does that help you decide which material you chose?*	
	☐ Choose and combine appropriate materials to create a bandage E.g.: Combine materials can be things to attach it,/ keep it in place, plastic to keep it dry, etc. ☐ The bandage is functional (achieves its purpose)	
	☐ Uses order and sequence to assist with describing the procedures of this investigation	

Formative Assessment "Assessment Look Fors"

GATHERING EVIDENCE OF LEARNING

Triangulation of assessment is a process by which an educator collects evidence about student learning.

OBSERVATIONS
- Checklists
- Anecdotal Records
- Pictures
- Videos

By using a variety of data to inform our assessment, we get a more **valid** and **reliable** idea of what the learner knows and what their next steps may be.

CONVERSATIONS
- Class meetings
- Student Conferences
- Small Group Instruction
- Peer Conversations
- Self-Assessments

PRODUCTS
- Projects
- Presentations
- Demonstrations
- Portfolios
- Tests/Quizzes
- Performances

Assessing Skills/Procedures

What do I want to **hear or see** from students that shows they met the skill/procedure?

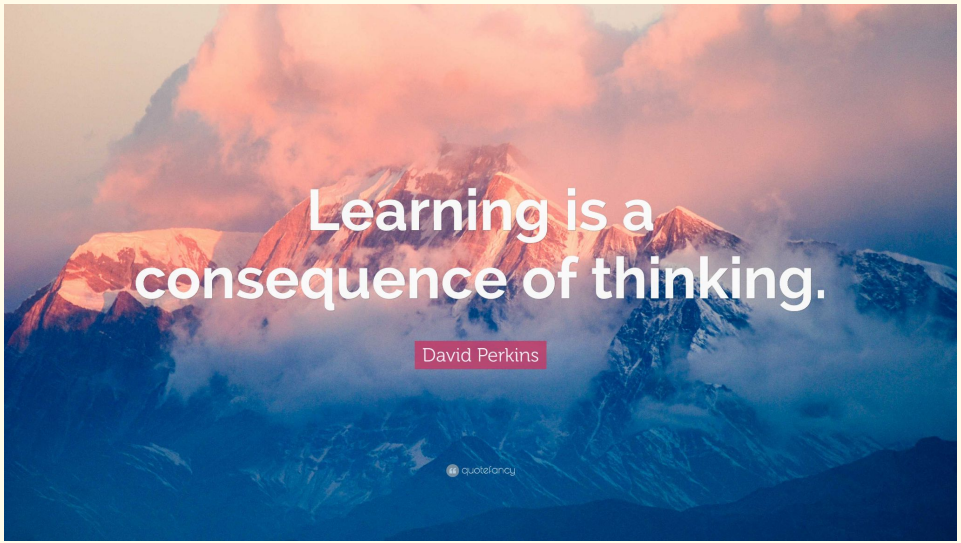
Grade 2 Matter Formative Assessment Checklist

File Edit View Insert Format Data Tools Extensions Help

Share

	A	B	C	D	E	F	G	H	I	J	K
1	Student Name	Activity/Date	Test Properties of various materials	Measure various materials using non-standard units	Compare the properties of materials of materials to determine what material is best suited for a specific purpose	Explain the relationship between suitabilityof materials and purpose	Identify materials used to make various objects	Sort various materials as being natural or processed	Collaborate to combine data on a single chart or table	Compare observations and data with others	Notes
2	Albert Einstein	Stretch of Rubber band 10/12/2023	Met	Met	Met	Not Taught ...	Not Taught yet	Not Taught yet	Met	Met	
3	Elon Musk	Stretch of Rubber band 10/12/2023	Met	Approaching	Not Yet	Not Taught ...	Not Taught yet	Not Taught yet	Met	Met	Elon struggled to line the tiles next to each other for the stretching of rubber bands. He was not able to use the measurable properties to compare the different materials. He compared his data with others but he requied prompting and guidance to check how to make his results similar to his groups
4	Robert Openheimer	Stretch of Rubber band 10/12/2023	Met	Met	Met	Not Taught ...	Not Taught yet	Not Taught yet	Met	Met	
5	Marie Curie	Stretch of Rubber band 10/12/2023	Met	Met	Met	Not Taught ...	Not Taught yet	Not Taught yet	Met	Met	
6	Jane Goodall	Stretch of Rubber band 10/12/2023	Met	Met	Met	Not Taught ...	Not Taught yet	Not Taught yet	Met	Met	
7	Myley Cyrus		Need To As...	Met	Need To Ass...	Not Taught ...	Not Taught yet	Not Taught yet	Need To As...	Need To Asses	
8	Bill Idol		Need To As...	Need To Asses	Need To Ass...	Not Taught ...	Not Taught yet	Not Taught yet	Need To As...	Need To Asses	
9	Axyl Rose		Need To As...	Need To Asses	Need To Ass...	Not Taught ...	Not Taught yet	Not Taught yet	Need To As...	Need To Asses	
10	Kurt Cobain		Need To As...	Need To Asses	Need To Ass...	Not Taught ...	Not Taught yet	Not Taught yet	Need To As...	Need To Asses	
11	Eddie Vedder		Need To As...	Need To Asses	Need To Ass...	Not Taught ...	Not Taught yet	Not Taught yet	Need To As...	Need To Asses	
12			Need To As...	Need To Asses	Need To Ass...	Not Taught ...	Not Taught yet	Not Taught yet	Need To As...	Need To Asses	
13			Need To As...	Need To Asses	Need To Asses	Not Taught ...	Not Taught yet	Not Taught yet	Need To As...	Need To Asses	
14			Need To As...	Need To Asses	Need To Asses	Not Taught ...	Not Taught yet	Not Taught yet	Need To As...	Need To Asses	
15			Need To As...	Need To Asses	Need To Asses	Not Taught ...	Not Taught yet	Not Taught yet	Need To As...	Need To Asses	
16			Need To As...	Need To Asses	Need To Asses	Not Taught ...	Not Taught yet	Not Taught yet	Need To As...	Need To Asses	
17			Need To As...	Need To Asses	Need To Asses	Not Taught ...	Not Taught yet	Not Taught yet	Need To As...	Need To Asses	
18			Need To As...	Need To Asses	Need To Asses	Not Taught ...	Not Taught yet	Not Taught yet	Need To As...	Need To Asses	
19			Need To As...	Need To Asses	Need To Asses	Not Taught ...	Not Taught yet	Not Taught yet	Need To As...	Need To Asses	
20			Need To As...	Need To Asses	Need To Asses	Not Taught ...	Not Taught yet	Not Taught yet	Need To As...	Need To Asses	
21			Need To As...	Need To Asses	Need To Asses	Not Taught ...	Not Taught yet	Not Taught yet	Need To As...	Need To Asses	

Making Meaning Lesson Development



How am I getting the students to think with and about the science ideas they are learning so that it builds on what they are learning and is coherent for them?

When doing hands on activities, are their minds engaged as well? (Science Methods)

How can I engage all learners?

David Perkins, Cognitive Psychologist

Instructional Strategies Make Meaning

1. Students draw /write to make meaning
2. Think-Pair-Share 
3. Thinking Routines
4. Include Vocabulary Development (Explain Phase)
   a. Glossary/Word Wall
   b. Frayer Model

Talking

0

for 30 seconds
for 1 minute

during class
before class

THINK

Ask students to respond to a question independently.

with pen and paper
or a laptop

in writing
as you doodle

turn to your neighbor
walk across the room

group size = 2
group size = 3 or 4

- PAIR -

Have students compare answers in small groups.

come to consensus
agree to disagree

explain your reasoning
share your opinion

with the whole class
with another group

verbally
in writing

SHARE

Ask students to share their work with the class.

via polling software
via whiteboard

class discussion
time for telling

@derekbruff

Strategically Use Gradual Release of Responsibility

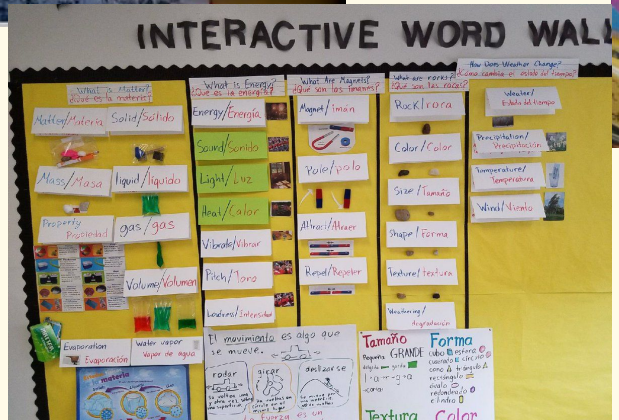
Model Thinking
I think

Guided Interactive
We think together

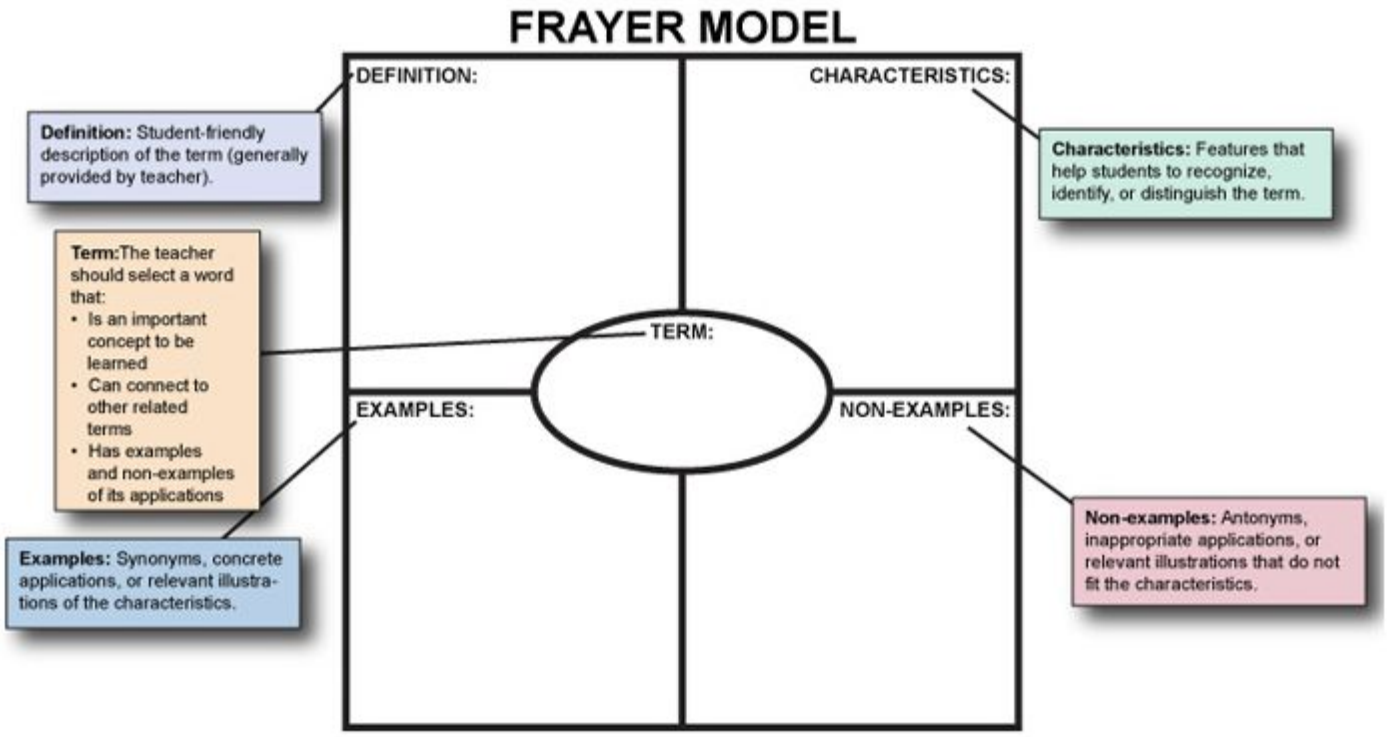
You think together

You think

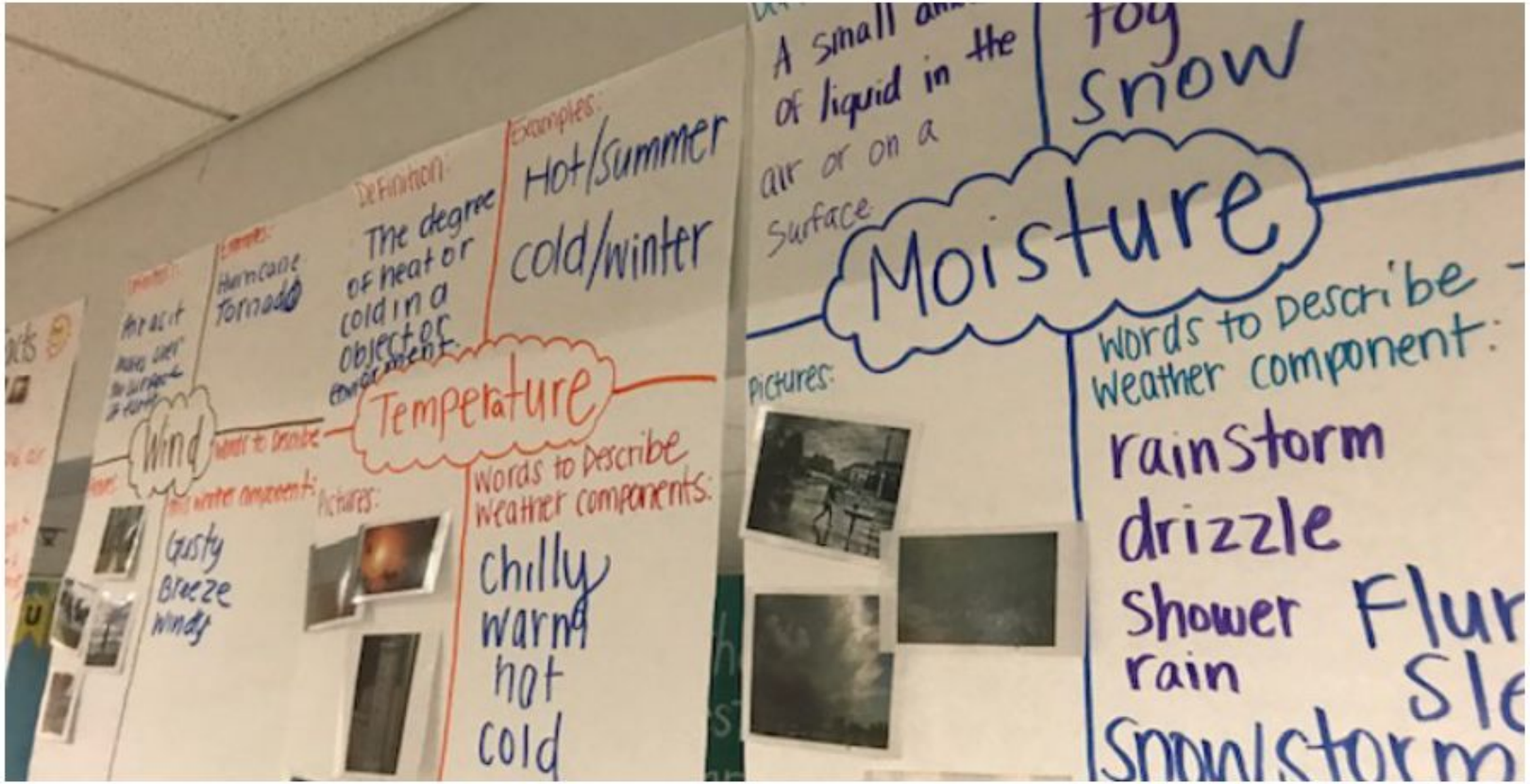
Science Word Walls



Vocabulary Strategies

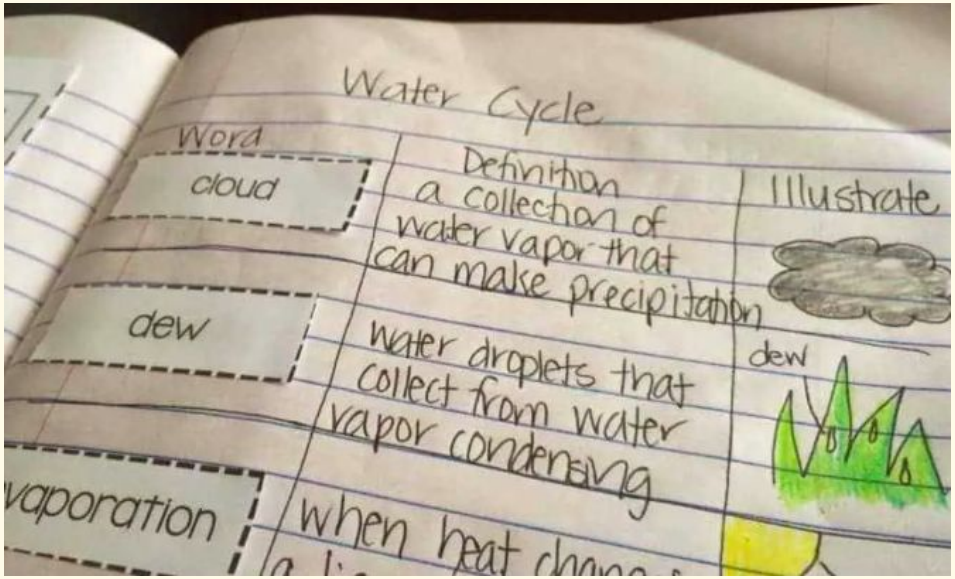


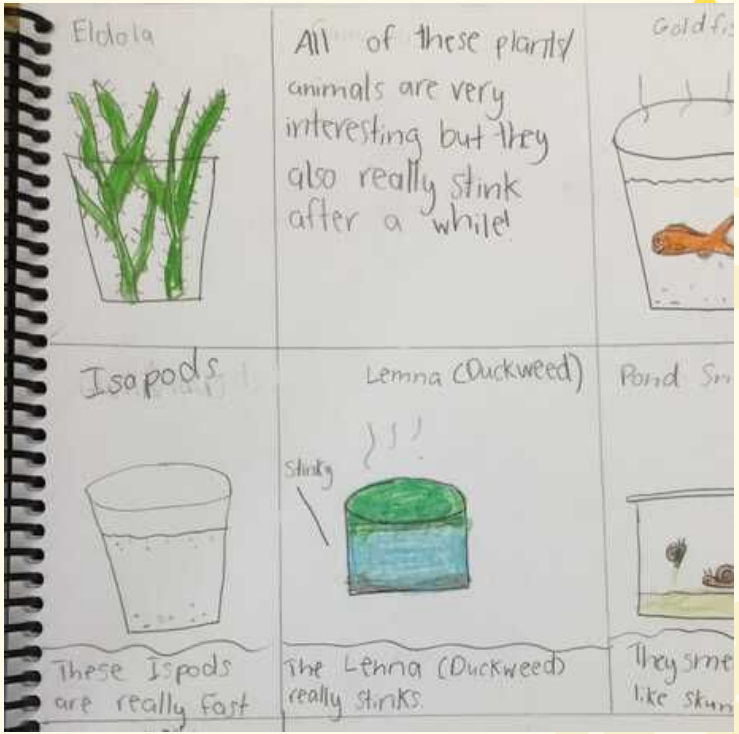
Example Frayer Model



Kindergarten anchor charts from the EL Education K-8 Language Arts unit on "Weather Wonders." (UP Academy Holland)

Primary Version Marzano 6 Steps





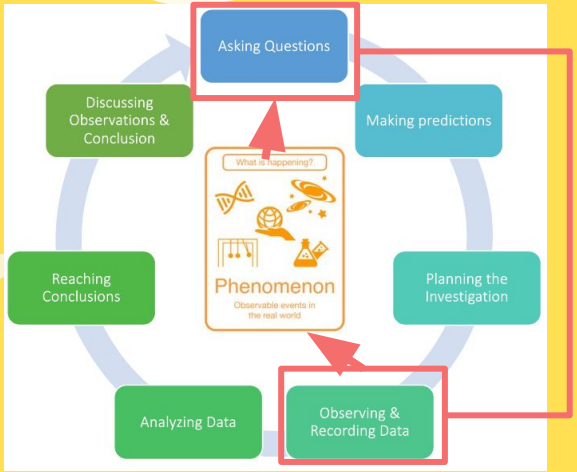
- Students put definition in own words very important!

Properties of Materials

Why are bouncy balls so bouncy?

Eliciting students' ideas

2



ENGAGE

Lesson 1

Providing Context: Observing a Phenomenon
Accessing prior knowledge pre-assessment

I was walking around during supervision and noticed children playing with balls. I wondered,
“What makes a ball so bouncy?”
“Why do some balls bounce more than others?”

Lesson 1 Setting the Context: Provide Observable Phenomenon

Partners: Verbally Observe & Describe Different Balls

Eliciting students' ideas

2


Ping pong ball


Tennis Ball


Soccer Ball


Basketball


Marble


Golf Ball


Sponge ball
Or nerf ball


Baseball
or softball


Bouncy ball

Students share Whole Class
Sample Responses: May Vary

Eliciting students' ideas

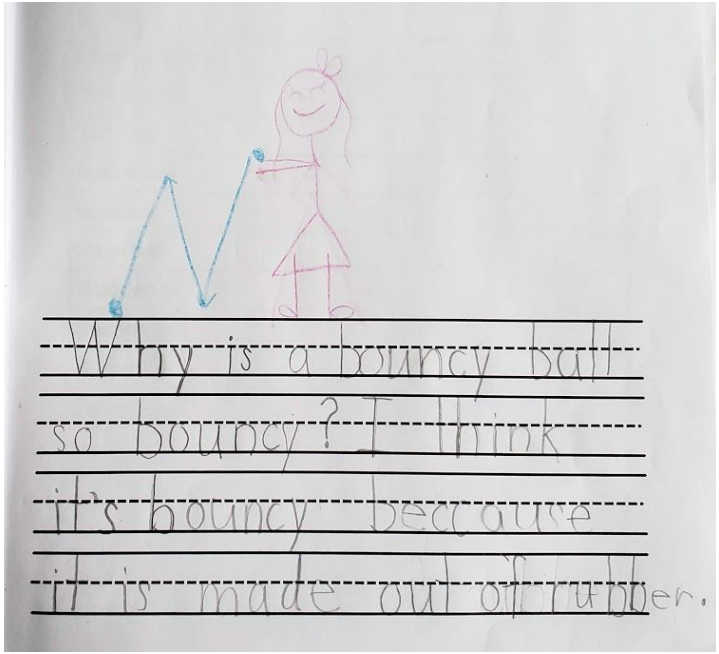
2

Encourage students to observe how different balls bounce but also describe: Color, texture, shape to carefully examine the different types of balls closely

Ball	Color	Shape	Texture	Bounciness
Tennis	Yellow and white	Round	Fuzzy, hairy, furry	Bouncy
Soccer	White and black	Round	Smooth	Not very bouncy

Public Record

Students use pictures and words to share initial ideas “What makes a ball so bouncy?”



Mitchell, A. and Lott, K. (2020). Start with Phenomenon Making It Bounce: Investigating Properties of Materials by Observing Balls, *Science and Children.* P. 58-63.

Students Generate Questions

Why are some balls bouncier than others?

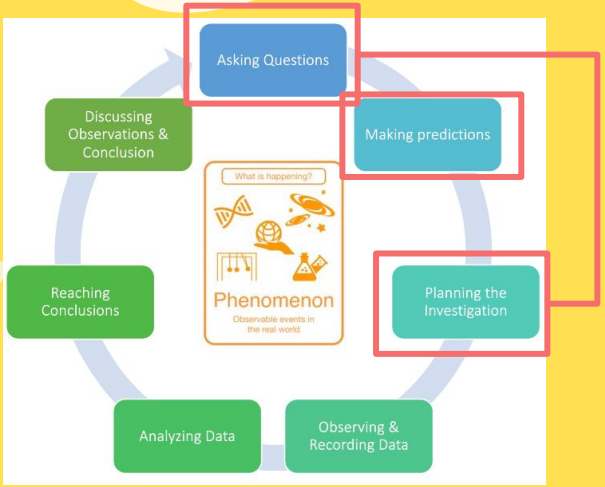
Why does a bouncy ball bounce but not a baseball?

What is the bounciest ball in the world?

Scientific Methods Skills/Procedures: Develop questions for the purpose of an investigation

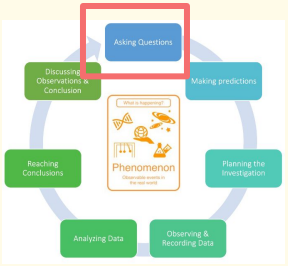
3 Supporting on-going changes in thinking

Lesson 2
Day 2-3



Students Guided to plan the Investigation

EXPLORE



3
Supporting on-going changes in thinking

Question Sort

Using questions from students other lesson.

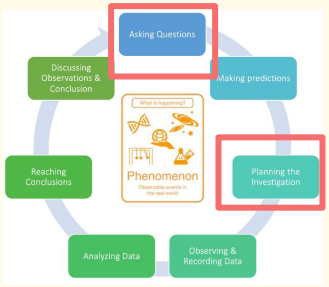
Can Investigate

Why are some balls more bouncy than others?

Not able to investigate

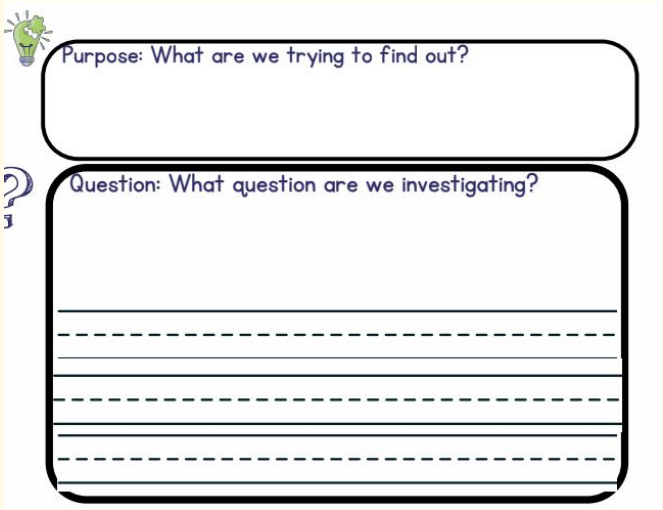
What is the bounciest ball in the world?

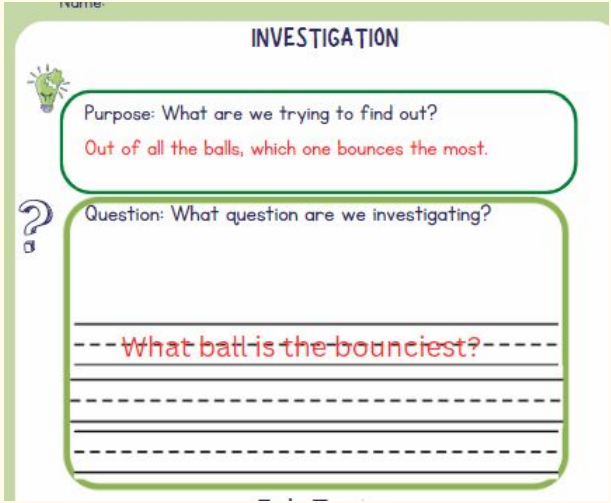
Science Methods Skill/Procedure: Develop questions for the purpose of an investigation



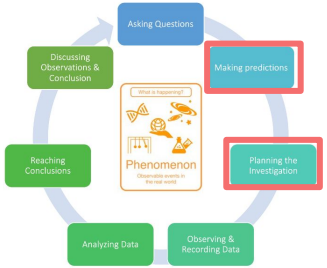
What are we trying to find out?

3 Supporting on-going changes in thinking





Science Methods Skill/Procedure: Develop questions for the purpose of an investigation



3 Supporting on-going changes in thinking

Pose Question to students	Student Response
1) What could we do or observe to find out the bounciness of each ball? 2) What could we count or measure to find out how bouncy they are?	 Think-Pair-Share I think we could count or measure the bounciness of the ball by….

Prompting questions:

- Do you think some balls will bounce more than others?
- How could we count or measure that?

Science Methods Skill/Procedure: Determine if observations relate to the purpose of the investigation.

Fair Test - To Ensure Repetition of Results

Guided Discussion:

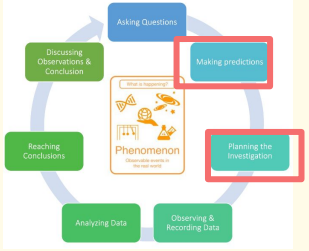
Ask students: "If you are observing and counting the number of times a ball bounces, should all groups have the same number of counts or really close to?

Tell students: When scientists do an investigation and other scientists do the exact same investigation the result (what they observe) should be the same. Fair Test That's why they write down what stays the same. Only 1 thing will change in the investigation.

Prompt student thinking with the following questions to Think-Pair-Share

➢	"If some groups bounced the ball on the carpet and others on the floor would we have similar results (same observations)?"
➢	"Would it be a fair test if we dropped one ball from shoulder height and another ball from the top of the stairs?"
➢	What if one group pushed the ball down and the others let it fall gently? (demonstrate if necessary)

Knowledge: Observations and data should be similar if the investigation is repeated
Repetition of an investigation includes performing the same procedures in the same way.

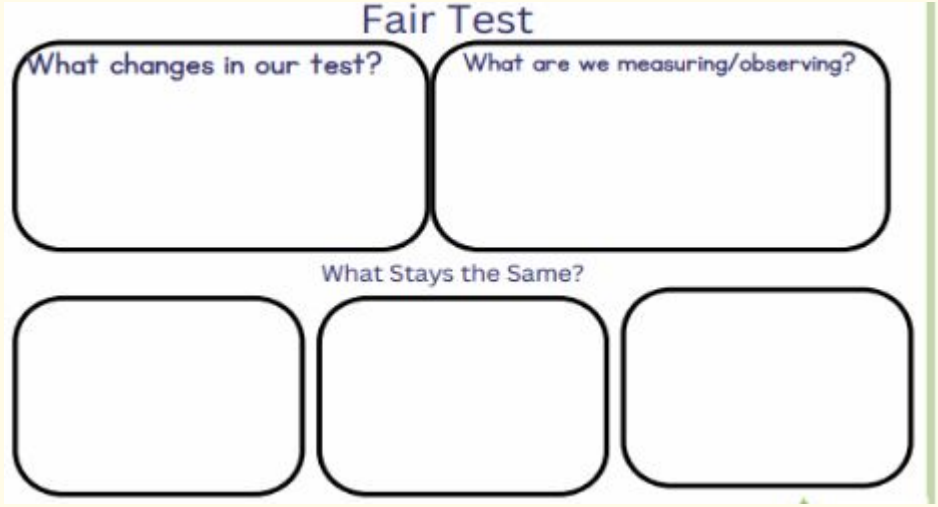


3 Supporting on-going changes in thinking

Guided Practice: Complete Fair Test Section

Think-Pair- Share
Each Section:

1) What are we observing?
2) What changes?
3) What stays the same?

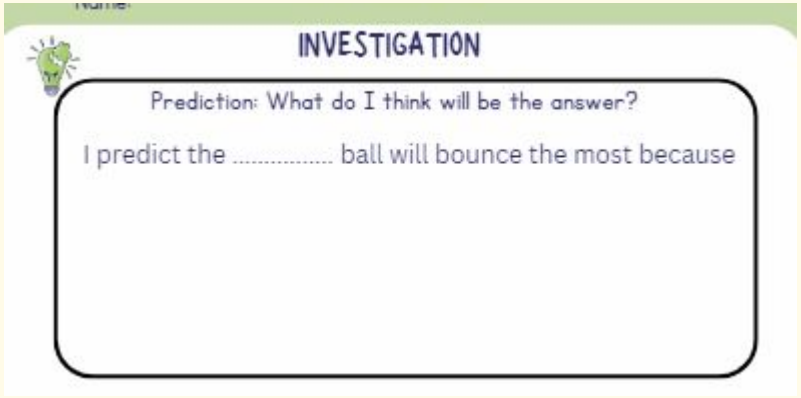


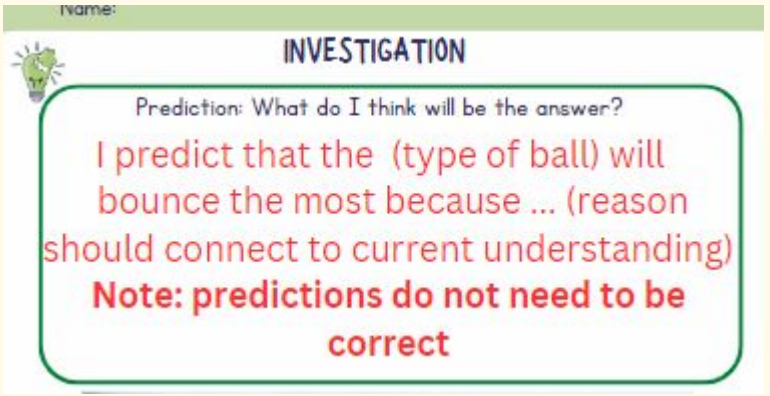
Scientific Methods Skills/Procedures: Determine if observations relate to the purpose of the investigation

3

Supporting on-going changes in thinking

Students Complete Predictions

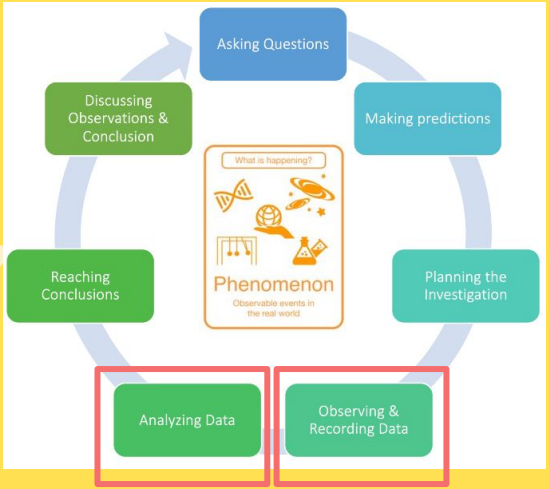




Provide sentence stems: I think the (type of ball) ball will bounce the most because.....

If speaking or writing the predictions.

3 Supporting on-going changes in thinking



Lesson 2

Bouncing Balls

Day 2 Explore: Perform the Investigation

EXPLORE

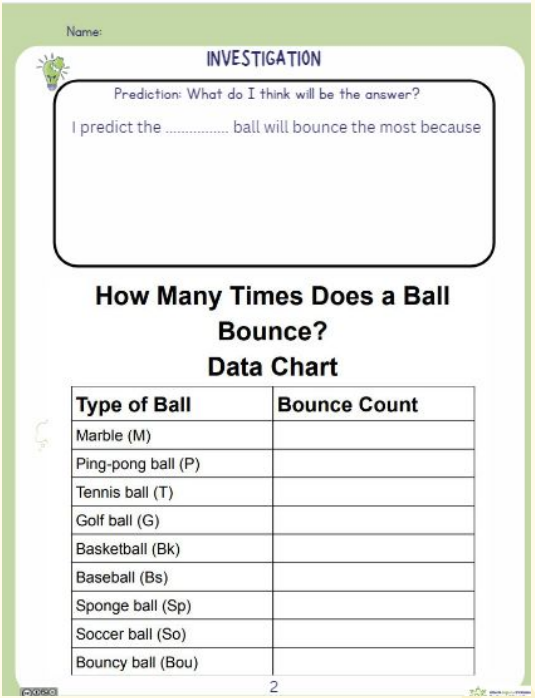
Quick Review of What They Are Doing

Teacher demo for students how to
drop the ball and not push down on it.

Students Provided with Same Balls As Lesson 1 To Conduct Investigation

Grouping Tip: Groups of 3

- Consider assigning roles
  - Ball dropper
  - Recorder
  - Counter



Name:

INVESTIGATION

Prediction: What do I think will be the answer?

I predict the ..... ball will bounce the most because

How Many Times Does a Ball Bounce?
Data Chart

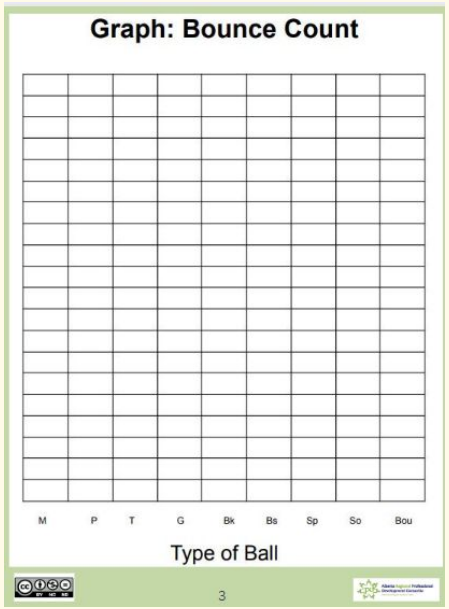
Type of Ball	Bounce Count
Marble (M)	
Ping-pong ball (P)	
Tennis ball (T)	
Golf ball (G)	
Basketball (Bk)	
Baseball (Bs)	
Sponge ball (Sp)	
Soccer ball (So)	
Bouncy ball (Bou)	

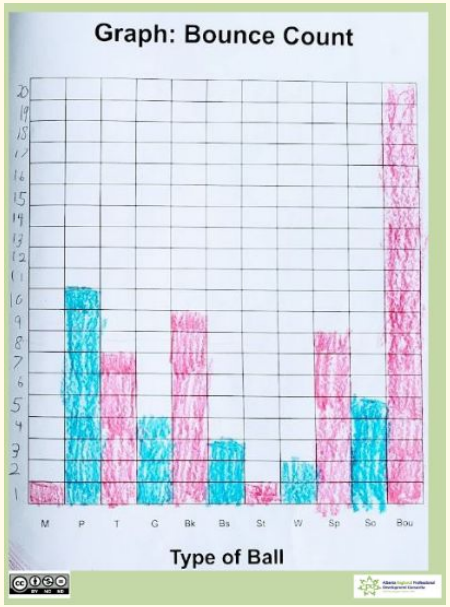
2

Mitchell, A. and Lott, K. (2020). Start with Phenomenon Making It Bounce: Investigating Properties of Materials by Observing Balls, *Science and Children*. P. 58-63.

Students Graph Results

3 Supporting on-going changes in thinking



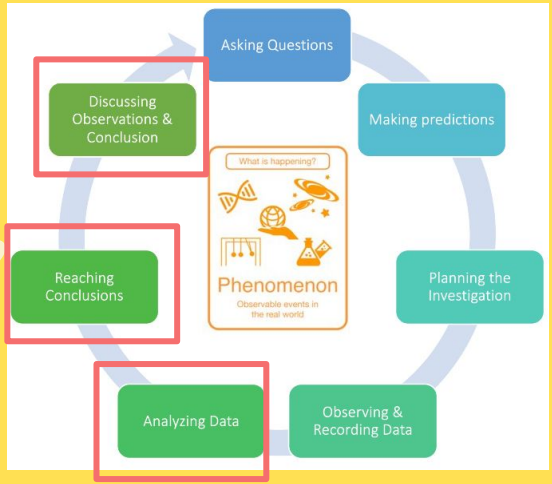


Math Statistics Skills/Procedures: Record data on a table
Construct graphs to represent data

Science Methods: Skills/Procedures: Compares observations and data with others

Mitchell, A. and Lott, K. (2020). Start with Phenomenon Making It Bounce: Investigating Properties of Materials by Observing Balls, *Science and Children*. P. 58-63.

3 Supporting on-going changes in thinking



EXPLAIN

Lesson 4

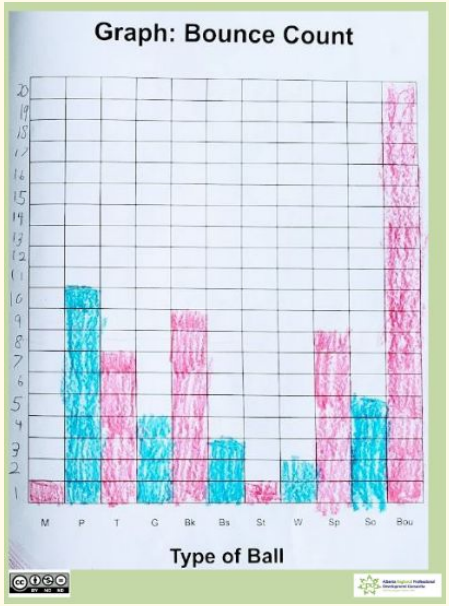
Gathering and Collecting Data

Analyze Data

3 Supporting on-going changes in thinking

Interpret Graph

Student Processing	Questions
 Think-Pair-Share	1. Which ball had the most bounce? 2. The least bounce? 3. Why do you think some balls bounce higher than others? (this is not from graph but will be worked on by students)



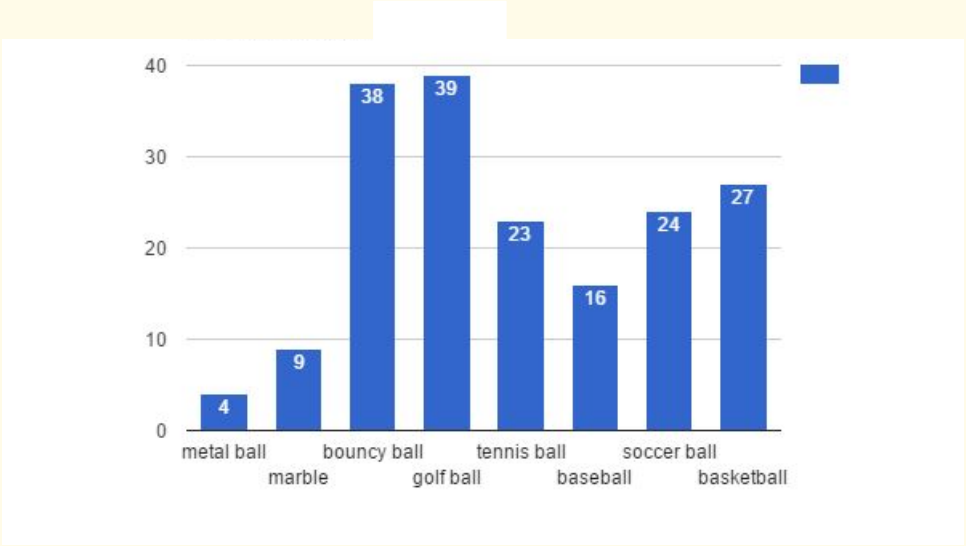
Math Statistics Skills/Procedures: Interpret graphs to answer questions

Mitchell, A. and Lott, K. (2020). Start with Phenomenon Making It Bounce: Investigating Properties of Materials by Observing Balls, *Science and Children.* P. 58-63.

3

Supporting on-going changes in thinking

Compile Data on Class Graph



Scientific Method Skills/Procedures: Compare observations and data with others
Collaborate to combine recorded data on a single list or chart

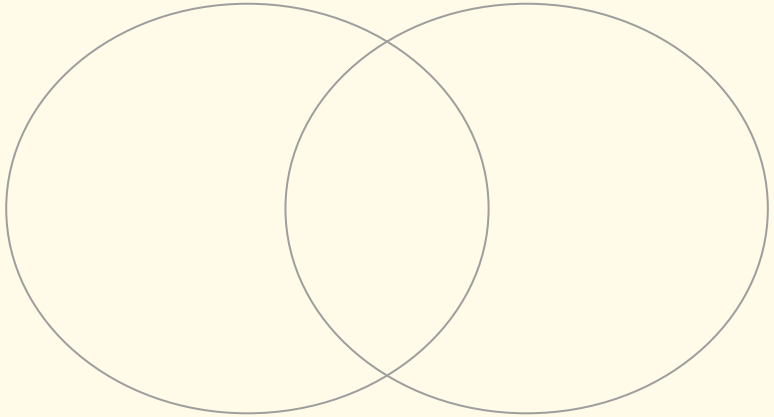
3 Supporting on-going changes in thinking

Analyze & Sort Data

*May need to guide class more depending on background with graphing

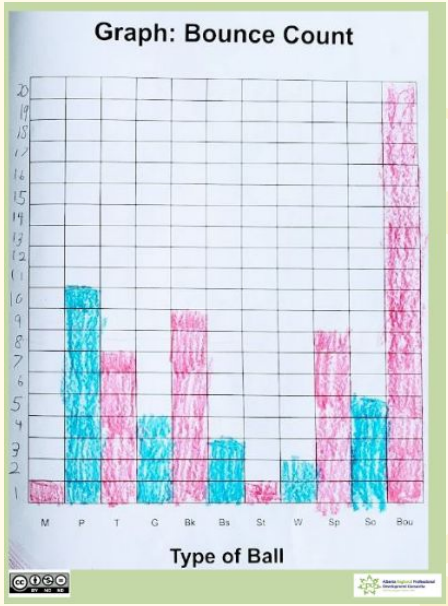
High bouncers

Low bouncers



Thinking: Why do some ball bounce higher than others?

I think ..... causes some balls to bounce higher than others because



Math Skills/Procedures: Interpret graphs to answer questions

3 Supporting on-going changes in thinking

Consolidate/Synthesize Learning

Class Discussion

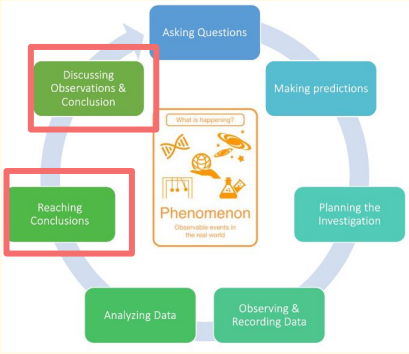
Student Think-pair-Share	Discussion Questions
	1. How would you describe the high bouncy balls? (texture etc) 2. Low bouncy balls? 3. What do you think causes some balls to bounce more than others?

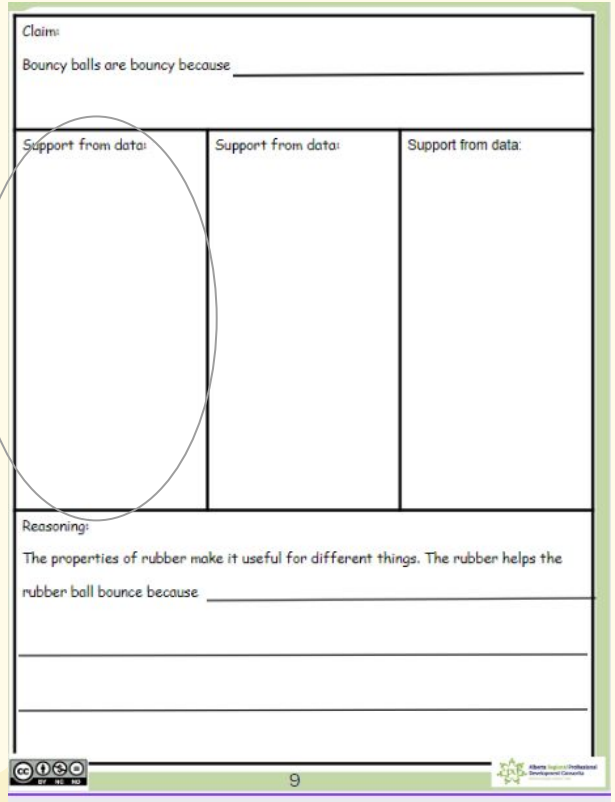
Science Matter Skills/Procedures: Identify the materials used to make various objects

3

Supporting on-going changes in thinking

Support From Data





Claim:

Bouncy balls are bouncy because _____

Support from data:	Support from data:	Support from data:

Reasoning:

The properties of rubber make it useful for different things. The rubber helps the rubber ball bounce because _____

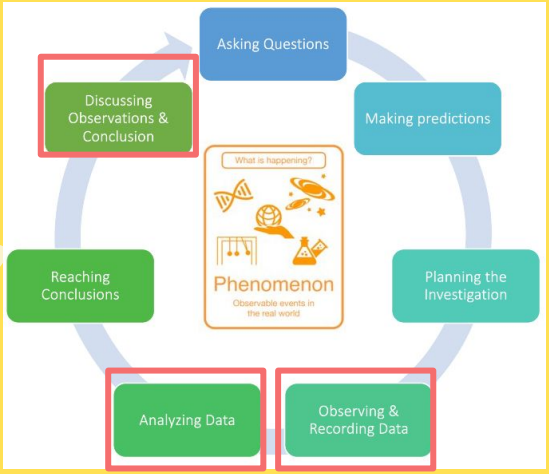
_____

_____

Last

Support from data:	Support from data:	Support from data:
Complete after Lesson 3 The graph showed the balls that bounced the most were made of the same material or rubber	Complete after Lesson 5	

3 Supporting on-going changes in thinking



Lesson 5

Collecting More Data

Observe inside of balls to determine the material

EXPLORE

Matter: Skills/Procedures: Identify the materials used to make various objects
Scientific Methods Skills/Procedures: Determine if the observations relate to the purpose of the investigation

Preparation Before

Options	Resources
1. Sampling cut 1 of each smaller balls in half (tennis, sponge, pingpong) ➢ Allow students to still make tangible observations (touch, see, smell, feel) ➢ Use video to demonstrate inside of larger balls & harder balls	Waterjet cutting balls  Soccer ball 1:05-1:48 seconds Lacrosse, golf, tennis ball 3:40-4:21 Basketball ball 4:42-5:51
2. Show video and pause to discuss inside	
3. Sampling of cutting all the balls in half for students to observe	Home Depot (saw) PVC Cutters

Introduce vocabulary: Word wall or glossary

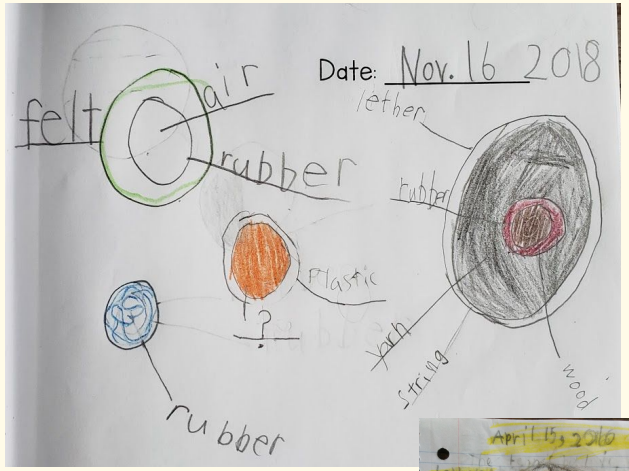
Material

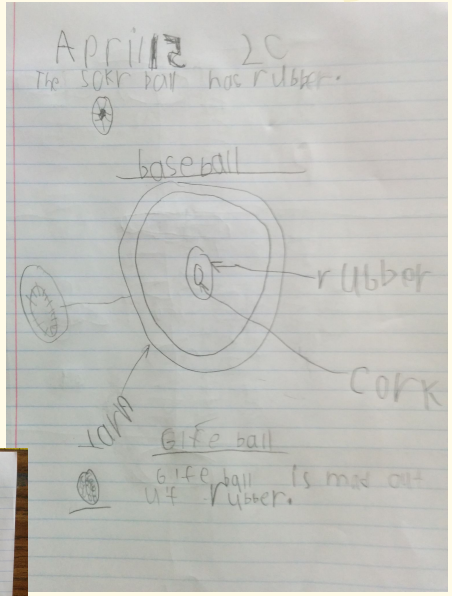
What an object is made of

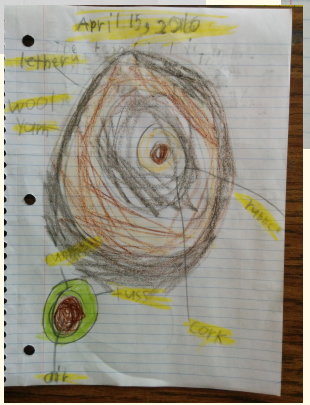
Make and Record Observations

3 Supporting on-going changes in thinking

What material are bouncy balls made of?







Provide word list/bank of material on board

Science Matter Skills/Procedures:
Identify an object that can be made from different materials

Mitchell, A. and Lott, K. (2020). Start with Phenomenon Making It Bounce: Investigating Properties of Materials by Observing Balls, *Science and Children*. P. 58-63.

Prompting Questions

3 Supporting on-going changes in thinking

What are the different balls made of?

What patterns do you notice when you compare the materials each ball is made of?

What materials are in balls that bounce high vs low?

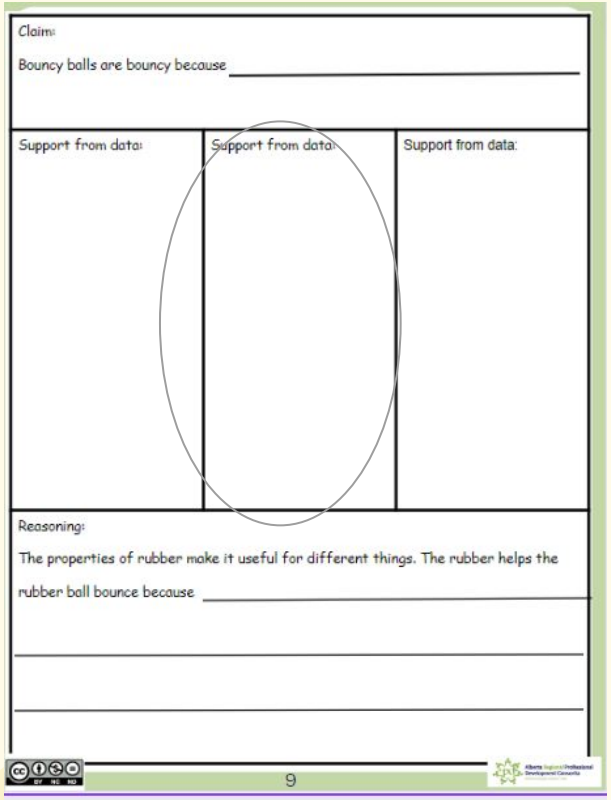
Why are different balls made of different materials?

What material is a bouncy ball made of? How would you describe it?

Public Record

Support From Data

3 Supporting on-going changes in thinking



Claim:

Bouncy balls are bouncy because _____

Support from data:	Support from data:	Support from data:

Reasoning:

The properties of rubber make it useful for different things. The rubber helps the rubber ball bounce because _____

9

Support from data:	Support from data:	Support from data:
Complete after Lesson 3 The graph showed the balls that bounced the most were made of the same material or rubber	Complete after Lesson 5 I observed the balls cut in half and the bouncy balls were made of rubber. or if they watched the video: The vidoe of the balls cut in half the bouncy balls are made of rubber	Complete after Lesson 7

3 Supporting on-going changes in thinking

EXPLAIN

Lesson 6

What are the properties of Rubber?

Read To Learn About Material Rubber and It's Property

Authoritative Explanation: Science Community

mprehension Skills/Procedures: Answering questions requiring literal recall and understanding of evidence, details or facts from texts.

cabulary Skills and Procedures: Examine the meaning of words from subject content areas

Properties of Materials

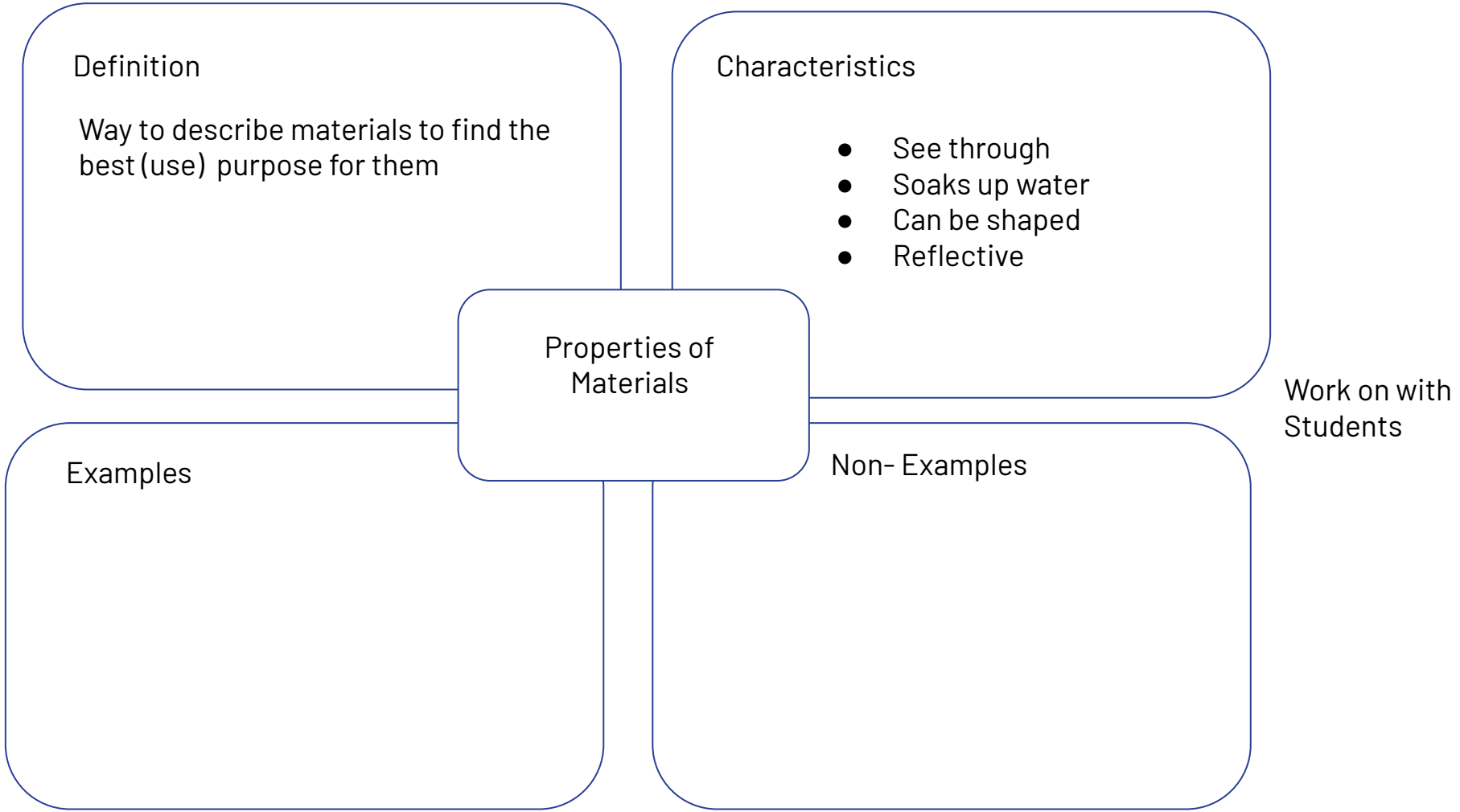
Different features (ways) to describe materials to find the best purpose (use) for them.

Water can be absorbed

Light passes through

Can be shaped

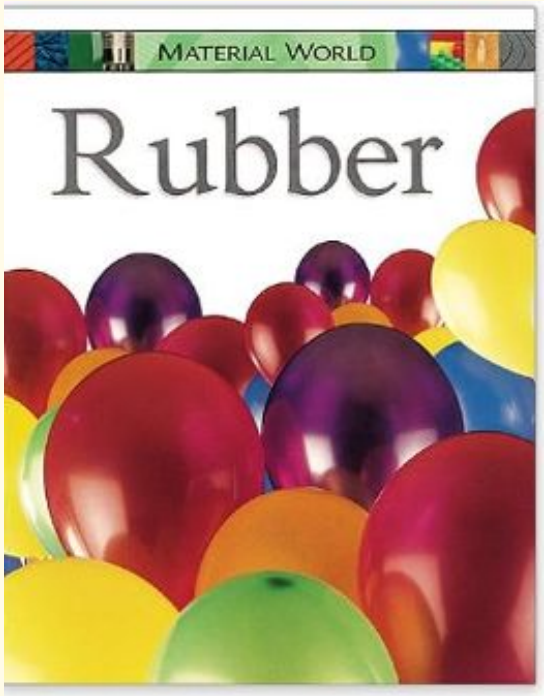
Reflection



Work on with Students

Recommended Books

Simple Text



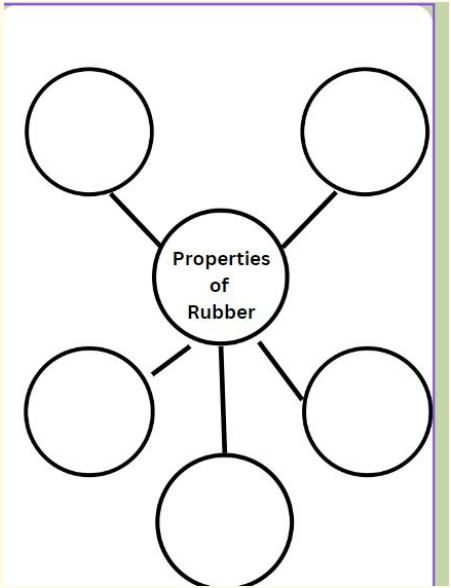
Amazon.ca or

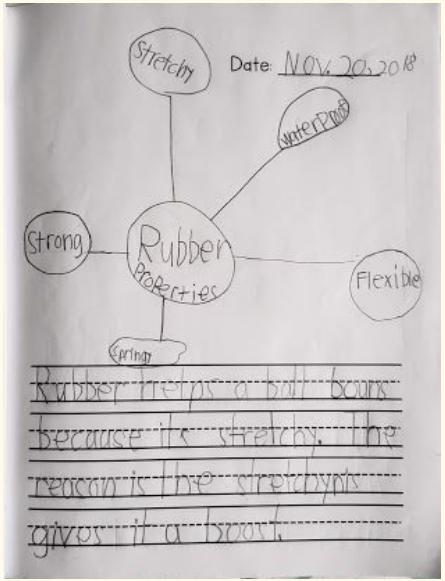
Amazon.com
Will deliver to
Canada

Teacher Reads Out loud

3 Supporting on-going changes in thinking

Students Make a Concept Map





ELAL Comprehension Skills/Procedures: Answering questions requiring literal recall and understanding of evidence, **details or facts from texts.**

Mitchell, A. and Lott, K. (2020). Start with Phenomenon Making It Bounce: Investigating Properties of Materials by Observing Balls, *Science and Children.* P. 58-63.

Questions For Discussion

Think-Pair-Share

What are the properties of rubber?

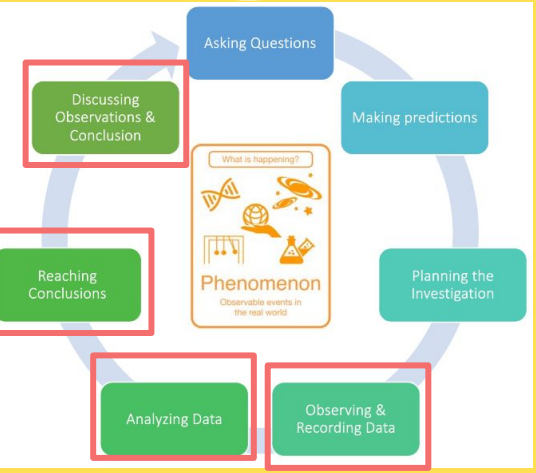
How do the properties of rubber make it useful for different things?

Which property of rubber is most important for making a ball bounce?

(Where does rubber come from?)

Science Matter Skills/ Procedures: Explain the relationship between suitability of materials and purpose
Understanding: Materials have unique properties

3 Supporting on-going changes in thinking



Lesson 7

How could we measure how stretchy rubber is?

Testing Property of Stretchiness (can change shape)

EXPLORE

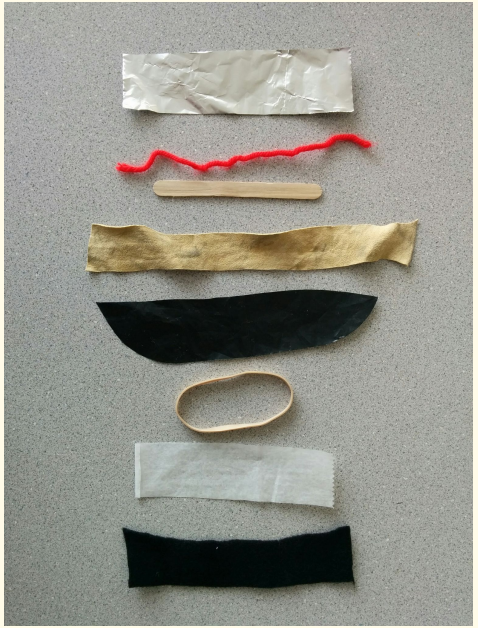
Science Matter: Knowledge - Properties of materials that can be tested include- if the material can be shaped
Science Matter: Skills/Procedures: Test properties of various materials,
Measure various materials using non-standard measurement,
Compare the properties of materials to determine what material is best suited for a specific purpose
Math Measurement Skills/Procedures: Measure length with non-standard units by tiling, iterating or using a self- created measuring tool

Testing The Stretchiness of Various Materials

Material	Length Before Stretching	Length After Stretching

Tiles or some kind of non-standard unit to measure before and after in partners

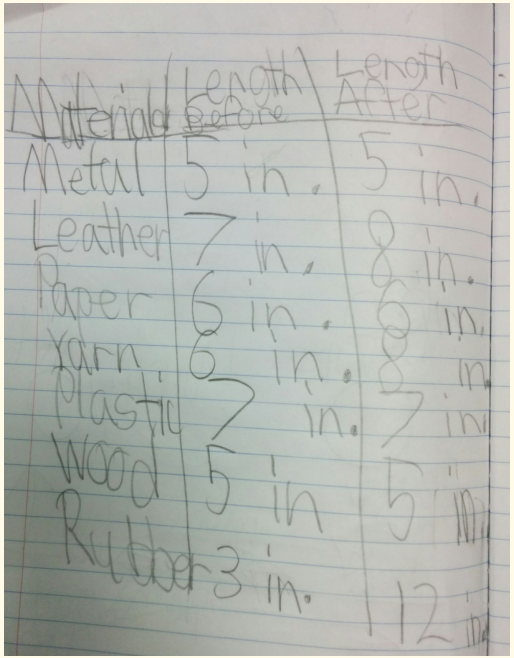
Same size strips

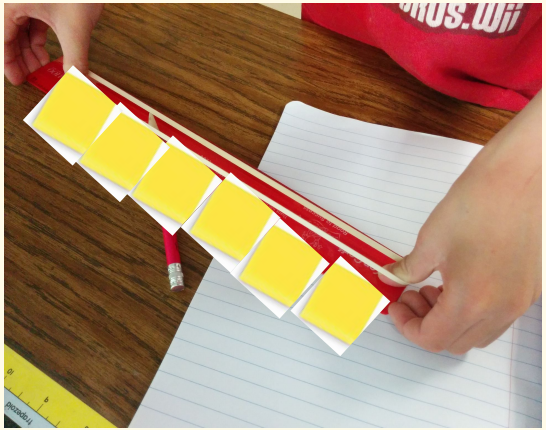


- ❏ Rubber band
- ❏ Yarn
- ❏ Popsicle stick
- ❏ Plastic
- ❏ Wax paper
- ❏ Leather (shamwow)
- ❏ Metal
- ❏ Sand paper
- ❏ cardboard

Teacher Demonstration First

Note: This is an example only, in Alberta's Science & Math curriculum grade 2 students use non-standard units

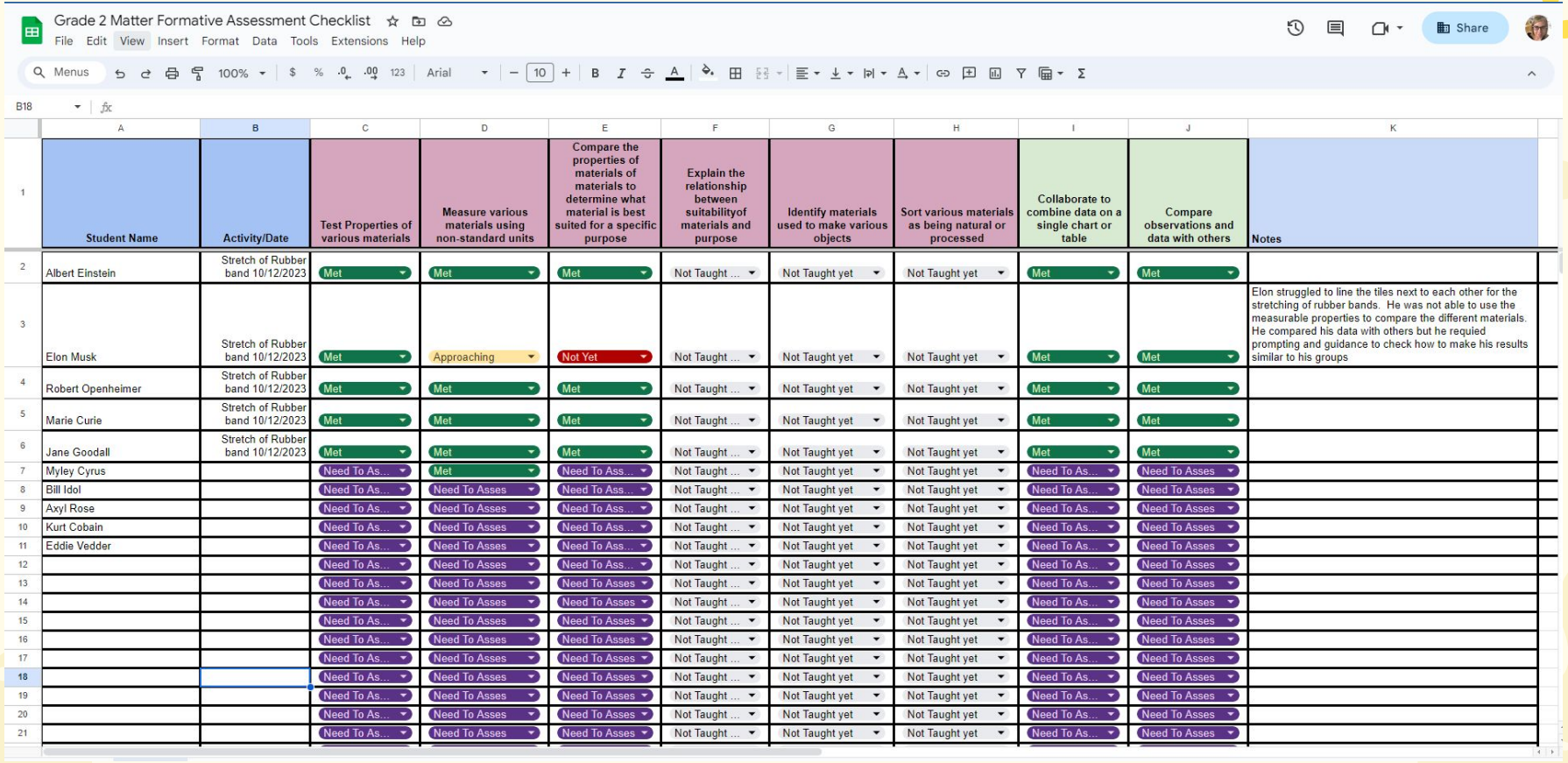




Science Matter Skills/Procedures:
Test properties of various materials
Measure various materials using non-standard units
Math Measurement Skills/Procedures:
Measure length with non-standard units by tiling, iterating or using self-created measuring tool
Compare and order measurements of different lengths measured with the same non-standard units and explain choice of unit

Mitchell, A. and Lott, K. (2020). Start with Phenomenon Making It Bounce: Investigating Properties of Materials by Observing Balls, *Science and Children.* P. 58-63.

Circulate and Observe Students



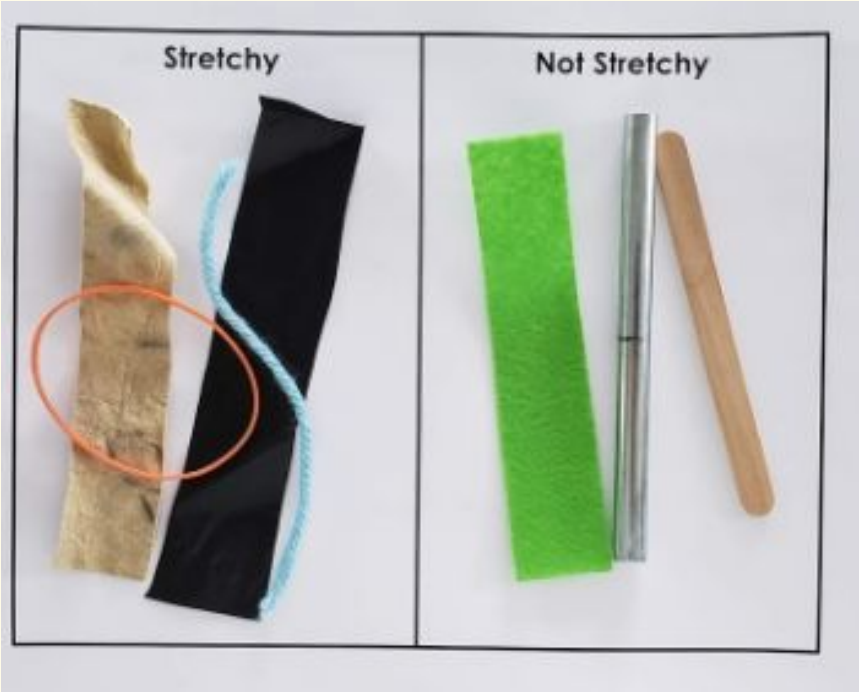
Grade 2 Matter Formative Assessment Checklist

File Edit View Insert Format Data Tools Extensions Help

Share

	A	B	C	D	E	F	G	H	I	J	K
1	Student Name	Activity/Date	Test Properties of various materials	Measure various materials using non-standard units	Compare the properties of materials of materials to determine what material is best suited for a specific purpose	Explain the relationship between suitabilityof materials and purpose	Identify materials used to make various objects	Sort various materials as being natural or processed	Collaborate to combine data on a single chart or table	Compare observations and data with others	Notes
2	Albert Einstein	Stretch of Rubber band 10/12/2023	Met	Met	Met	Not Taught ...	Not Taught yet	Not Taught yet	Met	Met	
3	Elon Musk	Stretch of Rubber band 10/12/2023	Met	Approaching	Not Yet	Not Taught ...	Not Taught yet	Not Taught yet	Met	Met	Elon struggled to line the tiles next to each other for the stretching of rubber bands. He was not able to use the measurable properties to compare the different materials. He compared his data with others but he requied prompting and guidance to check how to make his results similar to his groups
4	Robert Openheimer	Stretch of Rubber band 10/12/2023	Met	Met	Met	Not Taught ...	Not Taught yet	Not Taught yet	Met	Met	
5	Marie Curie	Stretch of Rubber band 10/12/2023	Met	Met	Met	Not Taught ...	Not Taught yet	Not Taught yet	Met	Met	
6	Jane Goodall	Stretch of Rubber band 10/12/2023	Met	Met	Met	Not Taught ...	Not Taught yet	Not Taught yet	Met	Met	
7	Myley Cyrus		Need To As...	Met	Need To Ass...	Not Taught ...	Not Taught yet	Not Taught yet	Need To As...	Need To Asses	
8	Bill Idol		Need To As...	Need To Asses	Need To Ass...	Not Taught ...	Not Taught yet	Not Taught yet	Need To As...	Need To Asses	
9	Axyl Rose		Need To As...	Need To Asses	Need To Ass...	Not Taught ...	Not Taught yet	Not Taught yet	Need To As...	Need To Asses	
10	Kurt Cobain		Need To As...	Need To Asses	Need To Ass...	Not Taught ...	Not Taught yet	Not Taught yet	Need To As...	Need To Asses	
11	Eddie Vedder		Need To As...	Need To Asses	Need To Ass...	Not Taught ...	Not Taught yet	Not Taught yet	Need To As...	Need To Asses	
12			Need To As...	Need To Asses	Need To Ass...	Not Taught ...	Not Taught yet	Not Taught yet	Need To As...	Need To Asses	
13			Need To As...	Need To Asses	Need To Asses	Not Taught ...	Not Taught yet	Not Taught yet	Need To As...	Need To Asses	
14			Need To As...	Need To Asses	Need To Asses	Not Taught ...	Not Taught yet	Not Taught yet	Need To As...	Need To Asses	
15			Need To As...	Need To Asses	Need To Asses	Not Taught ...	Not Taught yet	Not Taught yet	Need To As...	Need To Asses	
16			Need To As...	Need To Asses	Need To Asses	Not Taught ...	Not Taught yet	Not Taught yet	Need To As...	Need To Asses	
17			Need To As...	Need To Asses	Need To Asses	Not Taught ...	Not Taught yet	Not Taught yet	Need To As...	Need To Asses	
18			Need To As...	Need To Asses	Need To Asses	Not Taught ...	Not Taught yet	Not Taught yet	Need To As...	Need To Asses	
19			Need To As...	Need To Asses	Need To Asses	Not Taught ...	Not Taught yet	Not Taught yet	Need To As...	Need To Asses	
20			Need To As...	Need To Asses	Need To Asses	Not Taught ...	Not Taught yet	Not Taught yet	Need To As...	Need To Asses	
21			Need To As...	Need To Asses	Need To Asses	Not Taught ...	Not Taught yet	Not Taught yet	Need To As...	Need To Asses	

Sort Through The Data To Reach Conclusions



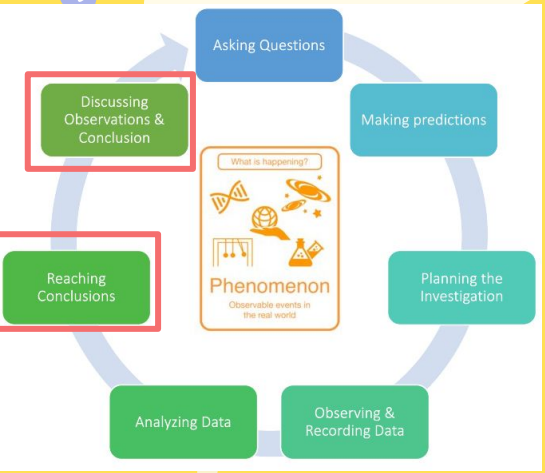
3 Supporting on-going changes in thinking

Do bouncy balls change shape?

Slow motion video (rubber changes shape but hard to tell that a ball does as well, this helps)

4

Pressing for evidence-based explanations



EXPLAIN

Lesson 8

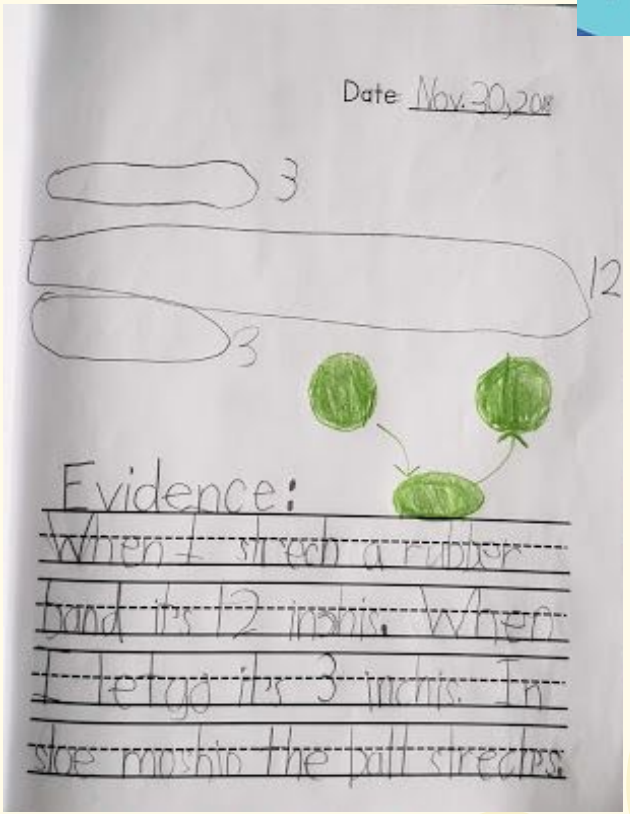
What makes bouncy balls so bouncy?

Explain: Students use data to make a conclusion

e Matter: Knowledge -
ies of materials that can be tested include- if the material can be shaped
e Matter: Skills/Procedures:
operties of various materials,
e various materials using non-standard measurement,
e the properties of materials to determine what material is best suited for a specific purpose
easurement: Measure length with non-standard units by tiling, iterating or using a self- created measuring tool

Support From Data

Support from data:	Support from data:	Support from data:
Complete after Lesson 3	Complete after Lesson 5	Complete after Lesson 7
The graph showed the balls that bounced the most were made of the same material or rubber	I observed the balls cut in half and the bouncy balls were made of rubber. or if they watched the video: The vidoe of the balls cut in half the bouncy balls are made of rubber	The stretch test of all materials rubber band stretched 12 tiles The other stretchy material only stretched 5 tiles longer



Mitchell, A. and Lott, K. (2020). Start with Phenomenon Making It Bounce: Investigating Properties of Materials by Observing Balls, *Science and Children*. P. 58-63.

Questions

How does a ball change shape as it bounces?

Draw a model to describe how the shape of a ball changes before, during, and after it bounces.

What property of rubber causes a ball to be so bouncy?

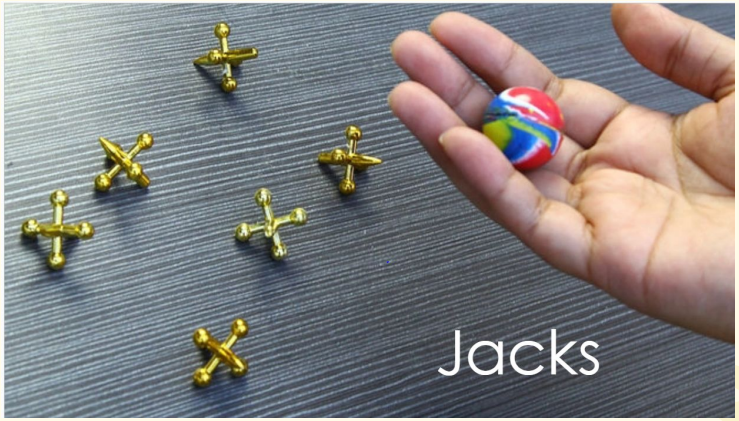
What data do we have to support that claim?

(Data is what we observed or measured.)

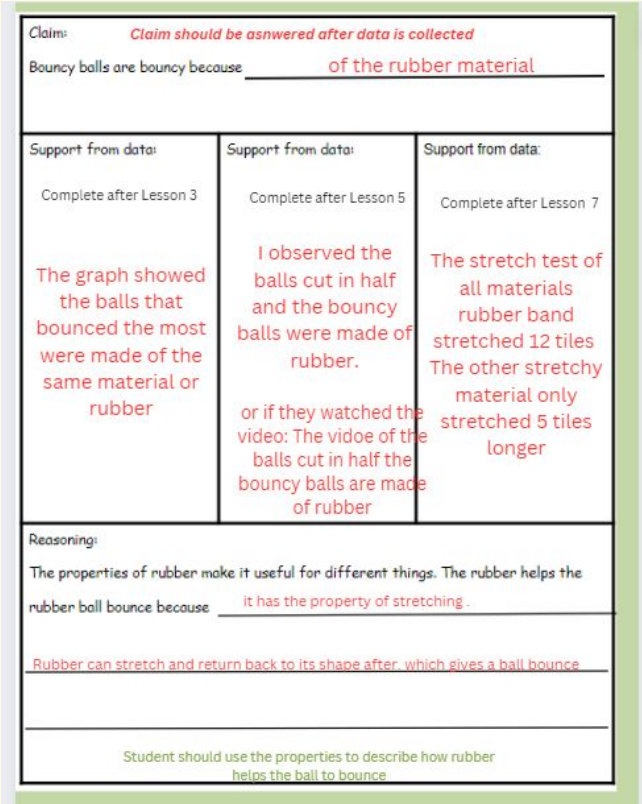

Baseball


Table Tennis


Marbles


Jacks

Use Data to Make A Conclusion: Claim Support, Reasoning



Claim: *Claim should be asnwered after data is collected*

Bouncy balls are bouncy because of the rubber material

Support from data:	Support from data:	Support from data:
Complete after Lesson 3	Complete after Lesson 5	Complete after Lesson 7
The graph showed the balls that bounced the most were made of the same material or rubber	I observed the balls cut in half and the bouncy balls were made of rubber. or if they watched the video: The vidoe of the balls cut in half the bouncy balls are made of rubber	The stretch test of all materials rubber band stretched 12 tiles The other stretchy material only stretched 5 tiles longer

Reasoning:

The properties of rubber make it useful for different things. The rubber helps the rubber ball bounce because it has the property of stretching .

Rubber can stretch and return back to its shape after, which gives a ball bounce

Student should use the properties to describe how rubber helps the ball to bounce

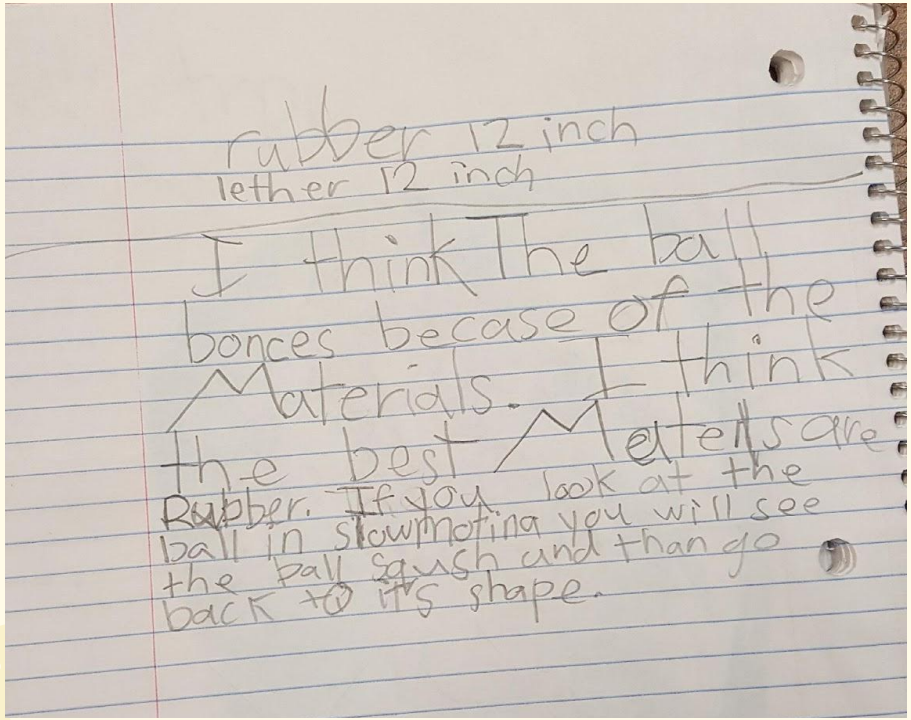
Claim: Answer to a question based on data

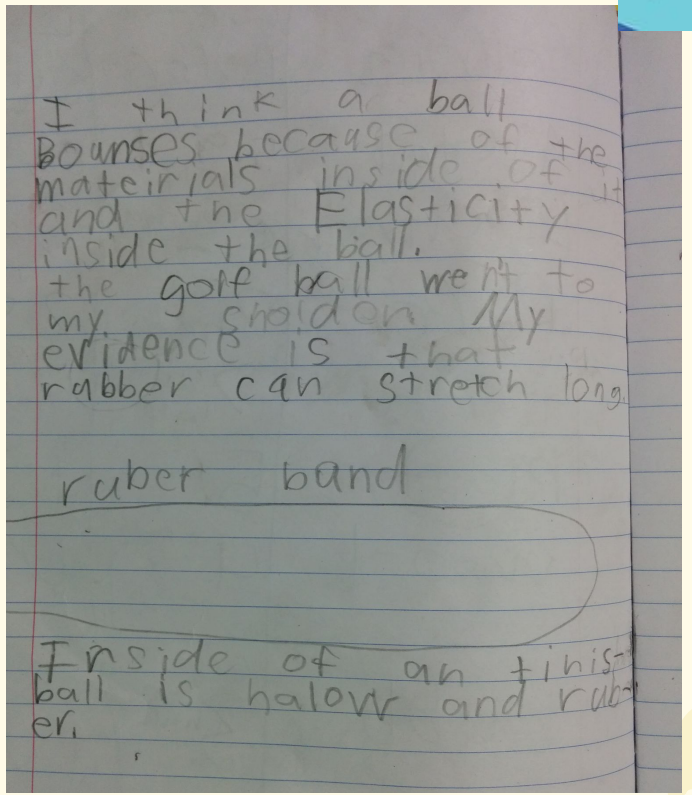
Reasoning: Explain the data using the science concepts vocabulary

4

Pressing for evidence-based explanations

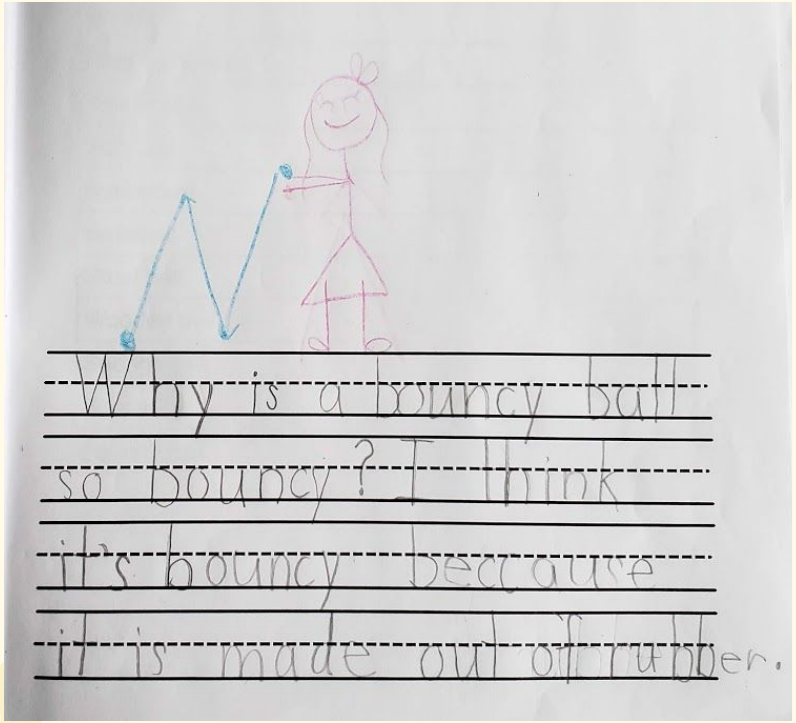
Exemplar

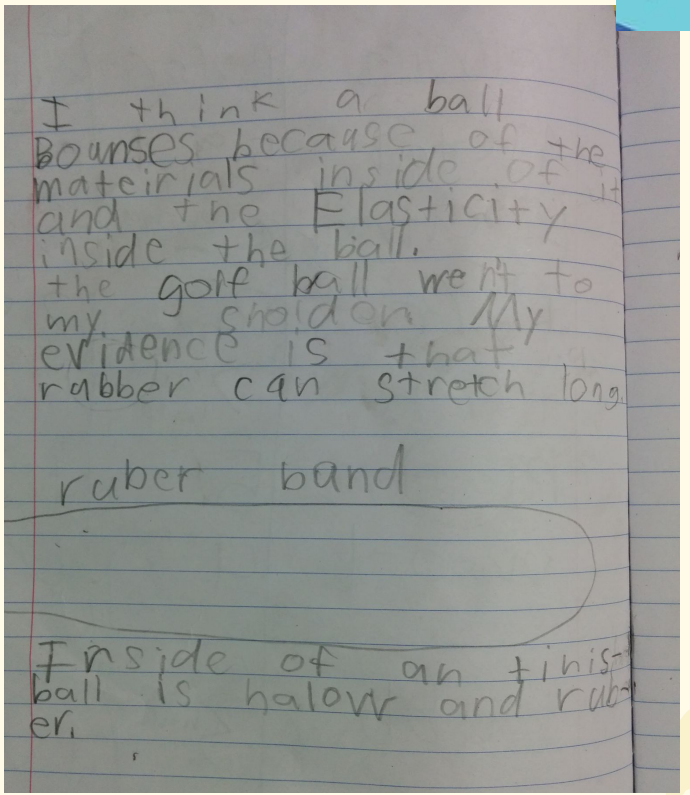




Mitchell, A. and Lott, K. (2020). Start with Phenomenon Making It Bounce: Investigating Properties of Materials by Observing Balls, *Science and Children*. P. 58-63.

Notice Change in Thinking





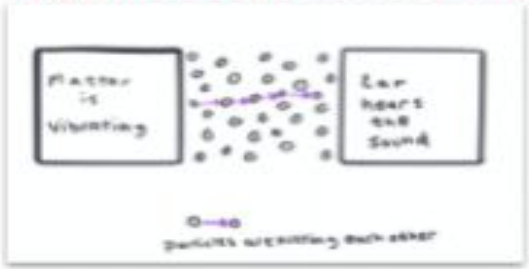
Mitchell, A. and Lott, K. (2020). Start with Phenomenon Making It Bounce: Investigating Properties of Materials by Observing Balls, *Science and Children*. P. 58-63.

Students' Writing and Drawing Over Time

- During a science unit, students' science ideas, language and representations (e.g. drawings) are mutually supportive of each other and become increasingly more sophisticated over time (Lee & Stephens, 2020).

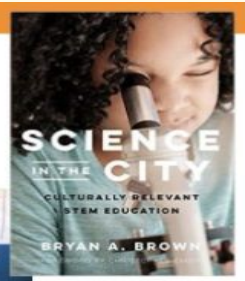
When I hear music, the sound travels from the speaker or the drum to my ear. I think it travels in waves.	*Sound needs a medium. It can not travel in nothing. Sound travels when particles hit each other. The bumping is sound.*	*When an object vibrates, it makes sound. The sound is produced by particles that are bunched together and spread apart in bands as they move through a medium.*

Increasingly more sophisticated language

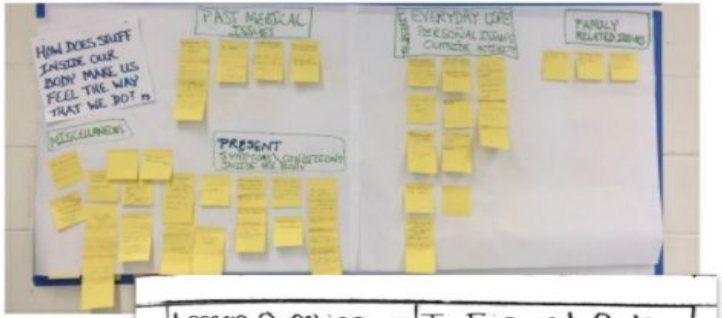


Increasingly more sophisticated representations

Initial & Ongoing Writing and Drawing



- "All students know things. However, they may not express their knowledge in academic language." (Brown, p. 43)
- "Teachers can no longer expect students to be able to offer a correct answer and rich arguments on the first try. Instead, effective science teaching would allow students to engage in multiple explanations with an assumption that if they continue to explain and revise their ideas, they will talk (and *write*) their way toward fluency and scientific accuracy." (Brown, p. 144)



Lesson Question	I Figured Out
L3	the bath bomb
What is in a bath bomb?	is a chemical made thing produced with natural things is a mixture

Writing and Drawing for Sensemaking

OpenSciEd

Less of a Focus on	More of a Focus on
Writing/drawing only for students to show what they know	Writing/drawing for students to figure things out - building understandings of phenomena and science ideas
Writing/drawing for recall, fact recitation, copying down notes or images, or procedure writing	Writing/drawing to make sense of investigations, readings, and experiences; to synthesize learning; to communicate to others
Decontextualized science vocabulary work	Using science vocabulary when students need it and building off of their resources and language repertoires
Privileging final form only - reports, written arguments, final models, etc	Prioritizing multiple different forms of writing/drawing across the unit
Writing/drawing for a "general" single audience (i.e. teacher)	Writing/drawing for different audiences (myself, others) for different pieces with different purposes
Single, disconnected writing/drawing tasks	Writing/drawing as a continuing practice

Elaborate:

Apply to New Context (Transfer of Learning)

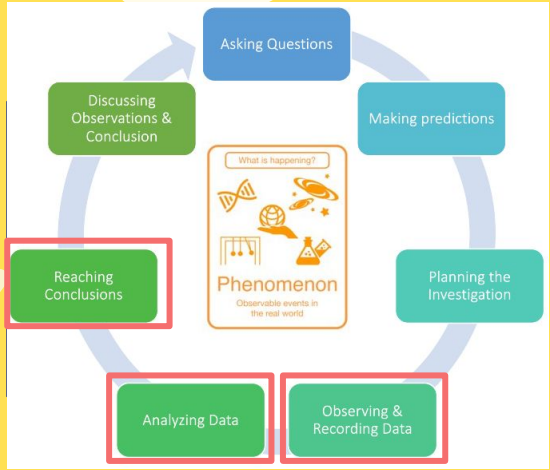
1. Some materials are more suitable than others for making a product for a specific purpose

2. Materials can be combined in a variety of ways to make objects.

Performance Task

4

Pressing for evidence-based explanations



Lesson 9

P

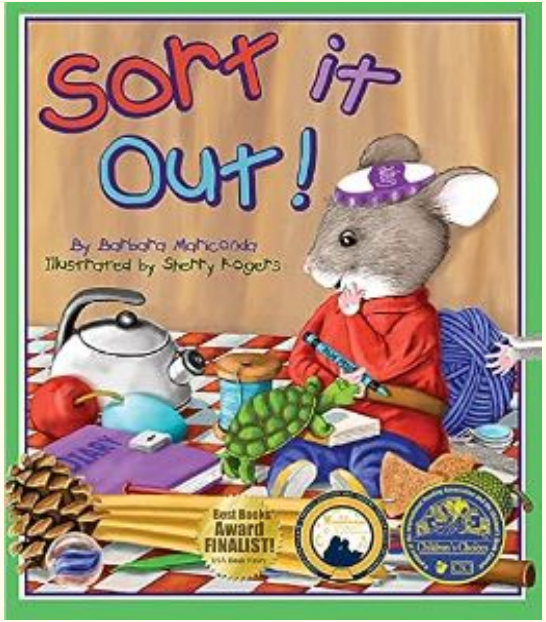
Matter: Skills/Procedures: Identify the materials used to make various objects
Scientific Methods Skills/Procedures: Determine if the observations relate to the purpose of the investigation

Sorting Objects

Provide objects for students to sort based on different properties of their choosing

Read Sort It Out!

Re-sort and label sort

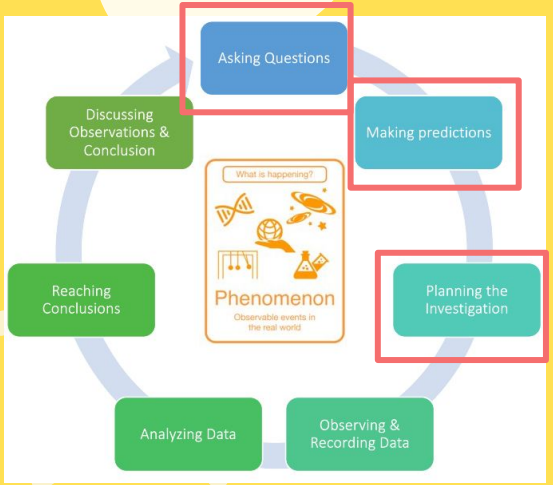


Day 2 Watch Video

Re-sort by physical properties of objects after

Connect-Extend-Challenge

Connect What did I already know?	Extend What is new that I learned?	Challenge Questions
Prior to watching video and reading. Students tell you what they know about actions and changes to objects write in this section. Read or play video. Pause and put a check mark asking if this is new or they already knew this	New information is a different color. This section when you pause video or reading at certain points ask students "What is the new information we learned? Add in this column	Students can brainstorm questions or write on a sticky (some may need scribe)



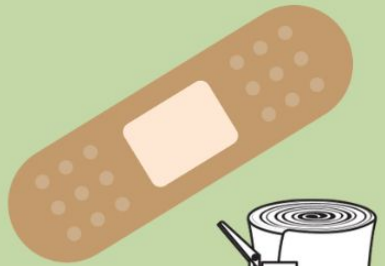
Lesson 10

Planning the Investigation

Matter: Skills/Procedures: Identify the materials used to make various objects
Scientific Methods Skills/ Procedures: Determine if the observations relate to the purpose of the investigation

Performance Task

Designing A Bandage



Name:

Test on doll or stuffie

Material Scientists and Engineer

New objects are developed all the time to make our lives easier. Technology helps to give us new objects like computers, smart phones and video games.

New objects need materials that will help to make the object function (work well). Material scientists and engineers, test materials to give suggestions for the best materials that will meet the need of the object.

As Material engineers you have been asked by the bandage company to test different materials to suggest the best one to make a new type of bandage.

Think about what you know about bandages.

1. What do they need to do well?
2. How do we use them and what type of material will help with that?
3. What properties should the material have?

You will test different materials and select the best one to design a bandage that works and can be used..

Science Matter Knowledge: Knowledge of the properties of materials and their purposes is important to many **occupations** and roles **<u>such as</u> engineer**

End in Mind: Single Point Rubric

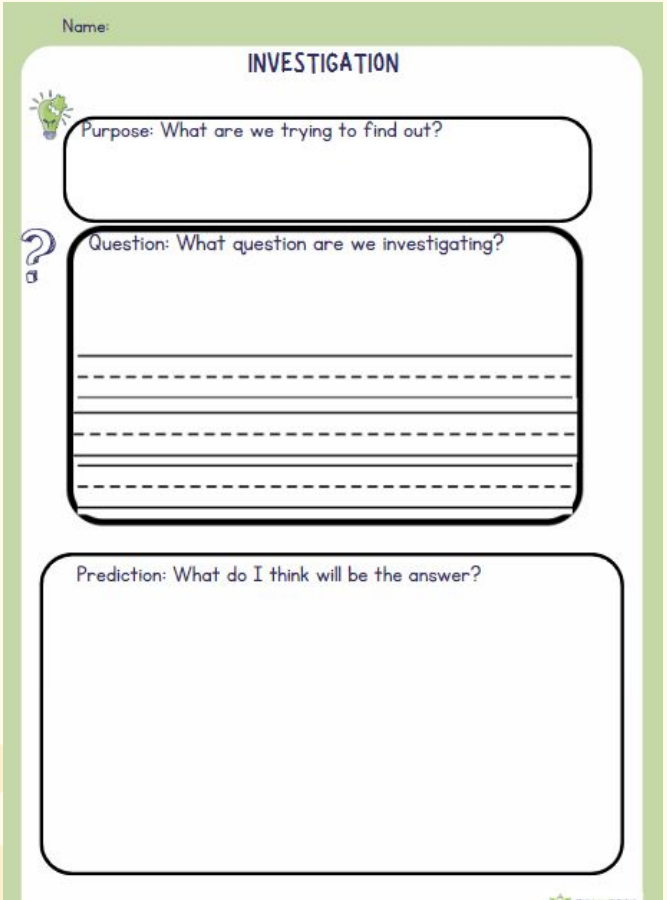
Grade 2 Single Point Rubric: Design A Bandage Performance Task

Science Methods **Learning Outcome:** Students examine investigation and explain how it is influenced by purpose. **Understanding**: Investigations involve carrying out procedures for a purpose **Knowledge** demonstrated through **Skills and Procedures** ➢ Describe procedures of (this) investigation ○ Ask Questions ○ Makes Predictions ○ Observes and records data ○ Analyze data ○ Make Conclusions (In this task students are making conclusions through demonstration when they select and combine materials)	**Organizing Idea: Matter** **Learning Outcome:** Students investigate properties of materials and relate them to a purpose. **Understanding** The purpose of an object influences the choice of materials used to produce it. Some materials are more suitable than others for making a product for a specific purpose. **Knowledge** demonstrated through **Skills & Procedures**: ➢ Test properties of various materials ➢ Compare the properties of materials to determine what material is best suited for a specific purpose ➢ Explain the relationship between suitability of materials and purpose ➢ Select material and use it to create an item for a specific purpose ➢ Combine materials to create an object for a specific purpose
Student Name:	Date:

Grow	Met Criteria	Glow
	Test properties of various materials ☐ Tests and compares the property of materials to find out if it can hold water (absorbency) ☐ Tests and compares for the property of materials if it can be shaped (malleability) *Note: Students are testing strength but will not be assessed because it is not a curricular expectation*	
	Select material and use it to create an item for a specific purpose. Explain the relationship between the suitability of materials and purpose ☐ Provides explanation (based on test results) for selecting material connected to the purpose. *Tell me what you found when you were testing and how does that help you decide which material you chose?*	
	Combine materials to create an object for a specific purpose ☐ Choose and combine appropriate materials to create a bandage E.g.: Combine materials can be things to attach it,/ keep it in place, plastic to keep it dry, etc. ☐ The bandage is functional (achieves its purpose)	
	Describes procedures of (this) investigation ☐ Uses order and sequence to assist with describing the procedures of this investigation	

Alberta Regional Professional Development Consortia

Planning the Investigation


Name:

INVESTIGATION

Purpose: What are we trying to find out?

Question: What question are we investigating?

Prediction: What do I think will be the answer?

Teacher decision based on formative assessment:

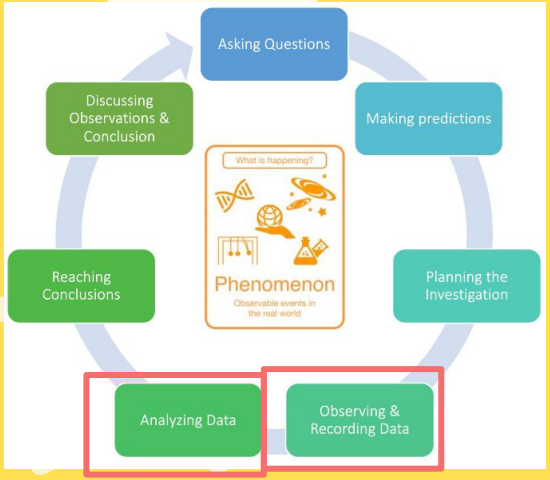
- ❏ Does the whole class need more guided practice with developing questions based on purpose?
- ❏ Are students ready to complete this part with partners?

Discuss with Students Criteria for a Good Bandage

1. What does a bandage need to do to work well?
2. What makes a good bandage?
3. Based on what a bandage needs to do, what properties should we look for when choosing the best materials for a bandage?

Potential Answers

a. *Protect*
b. *Soak up liquid*
c. *Stay on your body*
d. *Move with you (flexible)*



Lesson 11

Testing Materials

Matter Skills/Procedures:
Test properties of different materials (Can soak up water, Can be shaped)
Identify the materials used to make various objects
Scientific Methods Skills/Procedures:
Determine if the observations relate to the purpose of the investigation
Compare observations and data with others

Teacher Decision

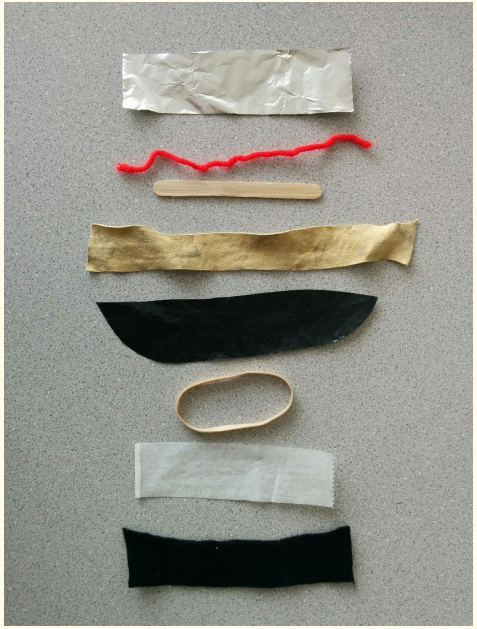
1. Spend a day testing for each property.
    a. Ex: Day 1 Absorbency test
    b. Day 2 Can be shaped (bent, twisted)
    c. Day 3 Strength test

2. Station rotations but ensure that students know and have the teacher demonstrate how to perform each test.

Absorbency Test

Pipette

Complete as group or in partners through discussion



Name: **TESTING ABSORBENCY**

Name_____

Material tested	Did it soak up water?	How many drops of water did it take?	Properties Observed ✓ Soaked up water (absorbent) X Did not soak up water (non-absorbent)
Yarn	Yes/No		
Leather	Yes/No		
Gauze	Yes/No		
Wax Paper	Yes/No		
Rubber band	Yes/No		
Plastic Bag	Yes/No		
Popsicle stick	Yes/No		
Sandpaper	Yes/No		
Sponge	Yes/No		
cardboard	Yes/No		

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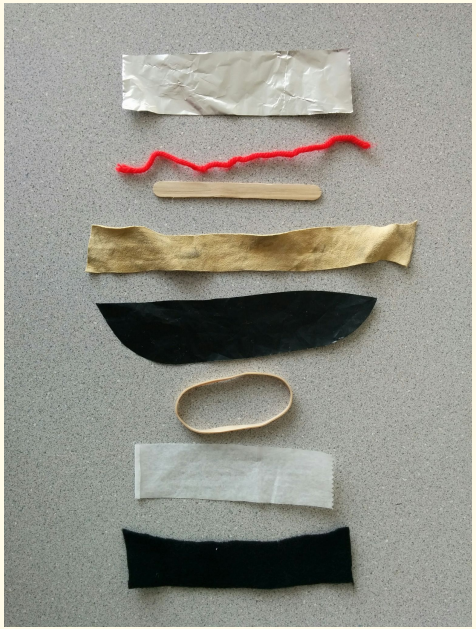
Can be shaped?



Name: **TESTING MATERIALS**

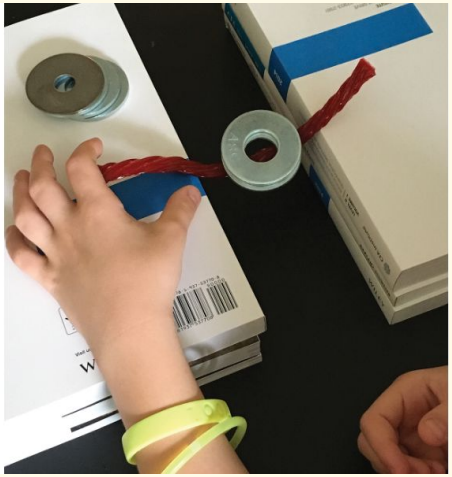
Can the material be shaped?

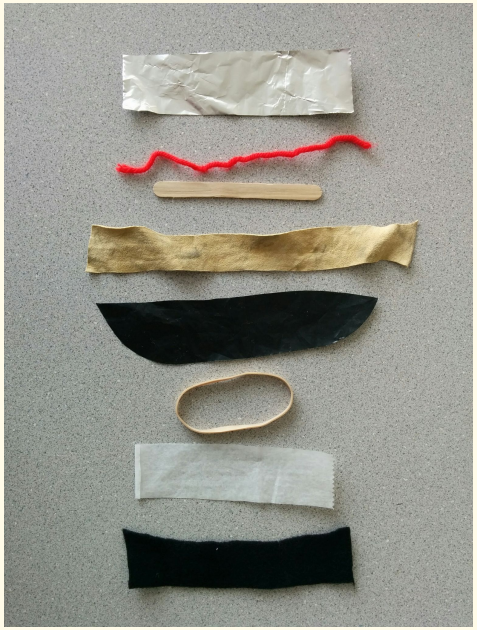
Name_____

Material tested	Does it bend?			Does it twist?		Properties based on Observation. ✓ Can be shaped. X Not be shaped
Yarn	Yes	No		Yes	No	
Leather	Yes	No		Yes	No	
Gauze	Yes	No		Yes	No	
Wax Paper	Yes	No		Yes	No	
Rubber band	Yes	No		Yes	No	
Plastic Bag	Yes	No		Yes	No	
Popsicle stick	Yes	No		Yes	No	
Sandpaper	Yes	No		Yes	No	
Sponge	Yes	No		Yes	No	
cardboard	Yes	No		Yes	No	

Thornburgh, W., McFadden, J. and Robinson,B. (2020). The Sixth E: Incorporating engineering in the 5E learning cycle on matter. *Science and Children.* National Science Teaching Association. (Volume 57 Issue 6) P. 51-57

Strength Test





Name: TESTING MATERIALS

How strong is the material?

Name_____

Material tested	Amount of Washers	Properties Observed Strong or Weak
Yarn		
Leather		
Gauze		
Wax Paper		
Rubber band		
Plastic Bag		
Popsicle stick		
Sandpaper		
Sponge		
cardboard		

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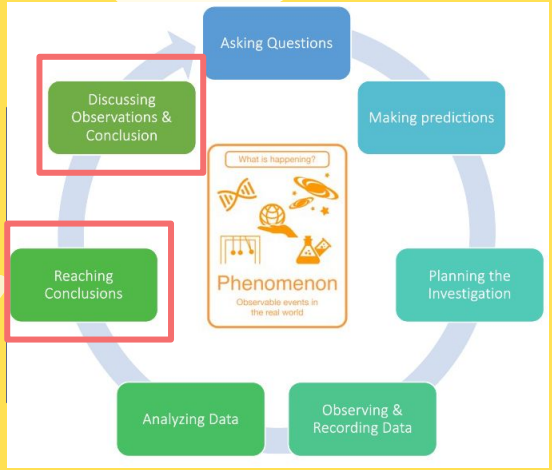


Lesson 12

Explain and Plan the Design

Matter Skills/Procedures: Identify the materials used to make various objects
Scientific Methods:
Determine if the observations relate to the purpose of the investigation

Co-Construct Criteria with Students

Prompting questions:

1. When planning to design your bandage, what should you use to help you choose the best material?

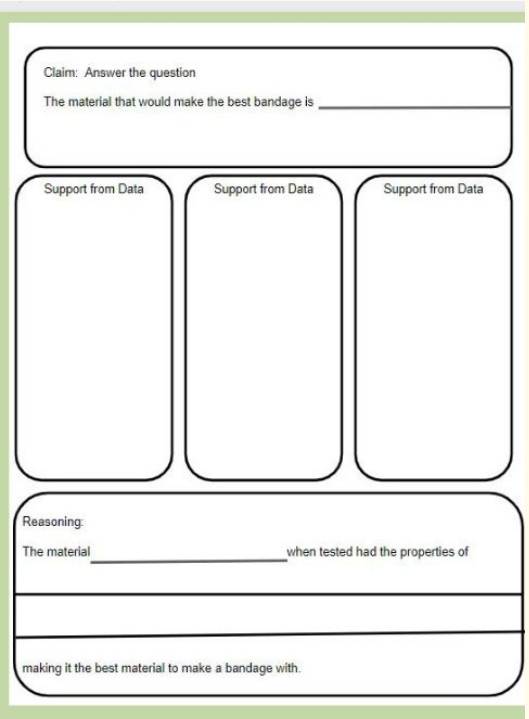
Potential Responses

    a. *Look at the data from the tests we did*
        i. *Soaks up liquid the best*
        ii. *Can be shaped*
        iii. *Strong* (Note: this is not part of the assessment)
2. When planning and thinking about choosing materials to put the bandage together what should you think of including for materials?

Potential Responses

    i. Attaching to body part (arm of stuffie)
    ii. It works when

Review results from Data to Select Material



Claim: Answer the question

The material that would make the best bandage is _____

Support from Data

Support from Data

Support from Data

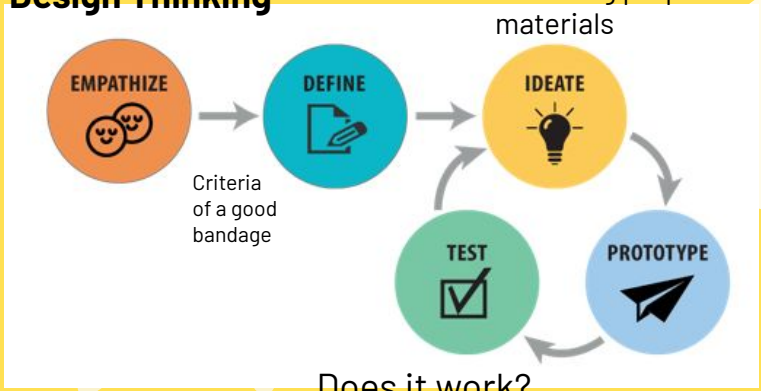
Reasoning:

The material _____ when tested had the properties of

making it the best material to make a bandage with.

Design the bandage. Label the material used and explain why this material is a good choice for a bandage.

Design Thinking



Plan based on results of testing properties of materials

Criteria of a good bandage

Does it work?

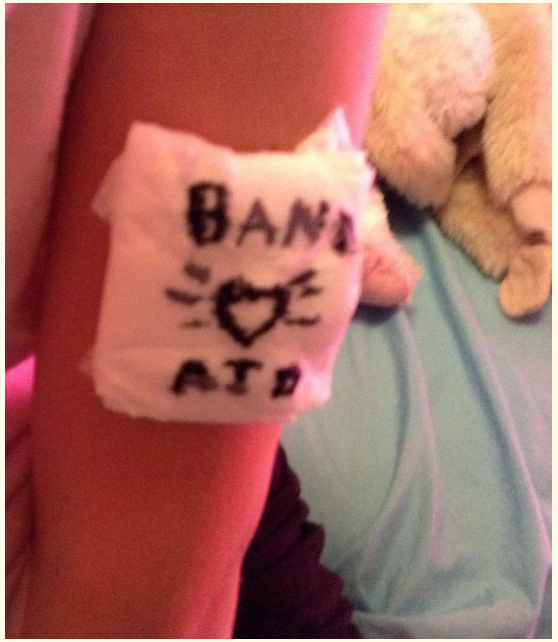
Design Bandage

Lesson 13

Design the bandage

Matter: Skills/Procedures: Identify the materials used to make various objects
Scientific Methods: Determine if the observations relate to the purpose of the investigation

Example



Key Ideas For Planning

1. Use the learning outcomes and KUSPS to identify key concepts. Connect this to foundational ideas in science

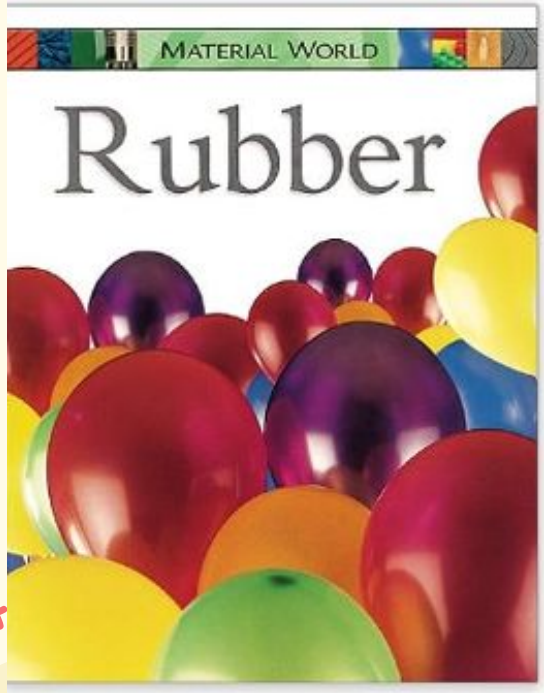
2. Provide authentic context for students to investigate and connect to

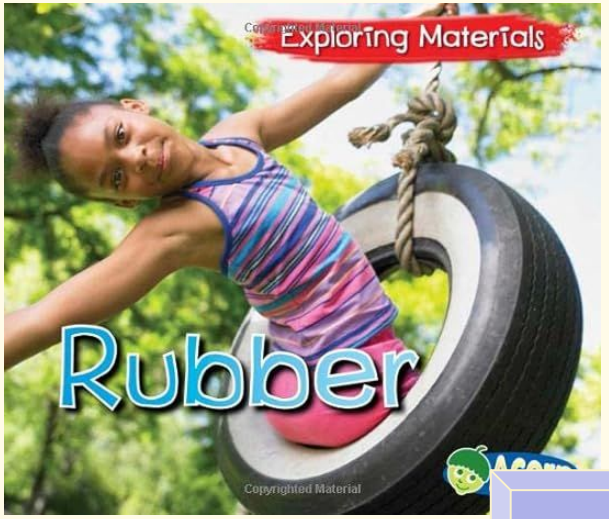
3. Explore before explain in lesson development to allow all learners to build context first to connect science ideas with

4. Use talk and vocabulary to help students make meaning of science ideas in lesson development

5. Triangulate evidence of student learning

Thank You -Raffle to Win





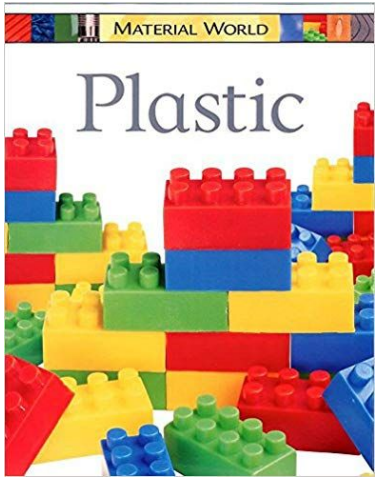
Thank you for joining the session live!

1. Choose a number between 1-100.
2. Enter the number in the chat
3. Closest Number wins

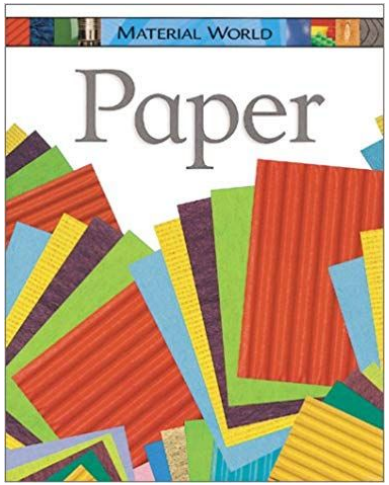
3

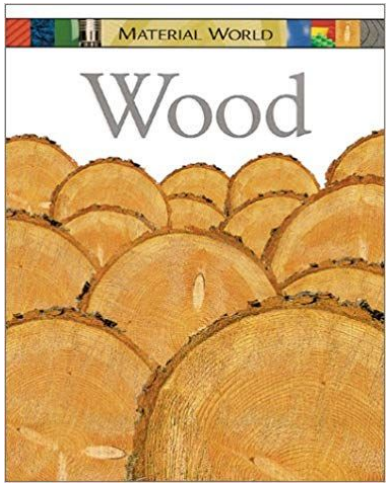
Additional Resources

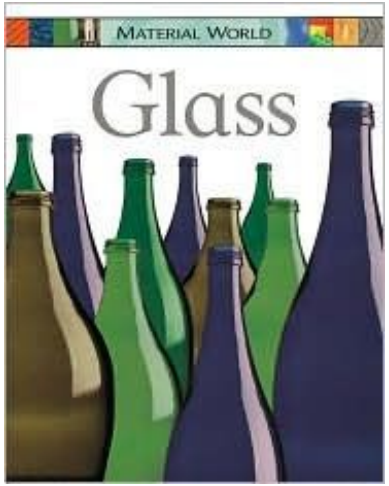
- Books
- Sports Vocabulary

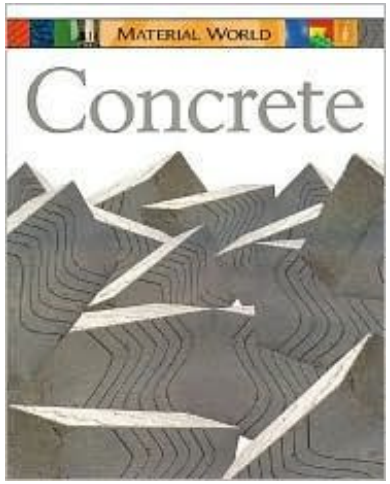

MATERIAL WORLD
Plastic

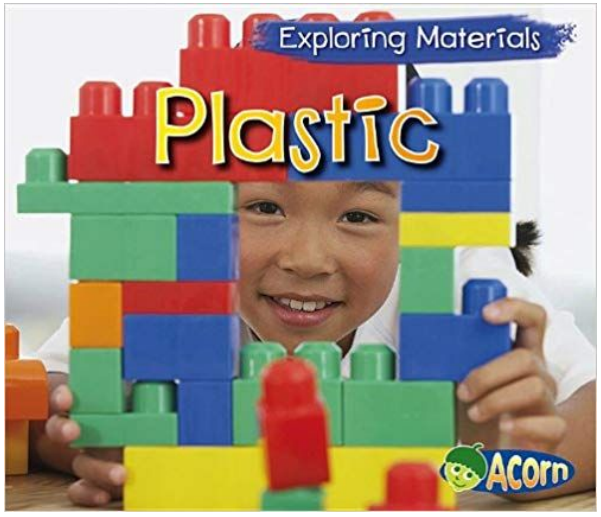

MATERIAL WORLD
Metal

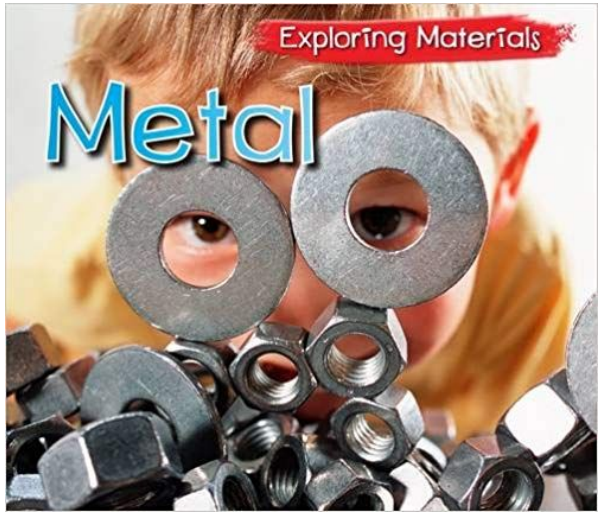

MATERIAL WORLD
Paper

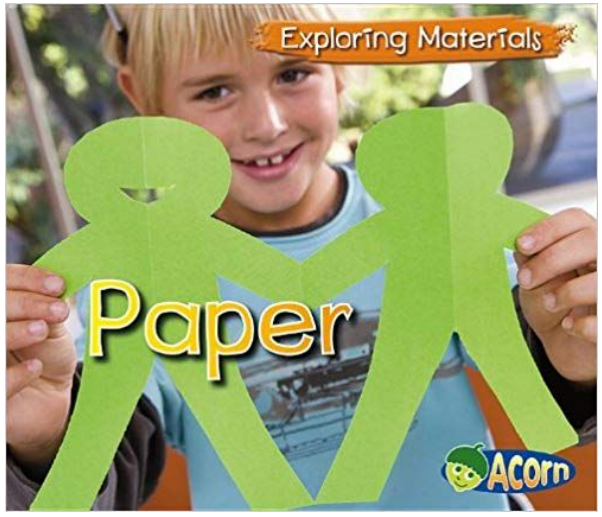

MATERIAL WORLD
Wood

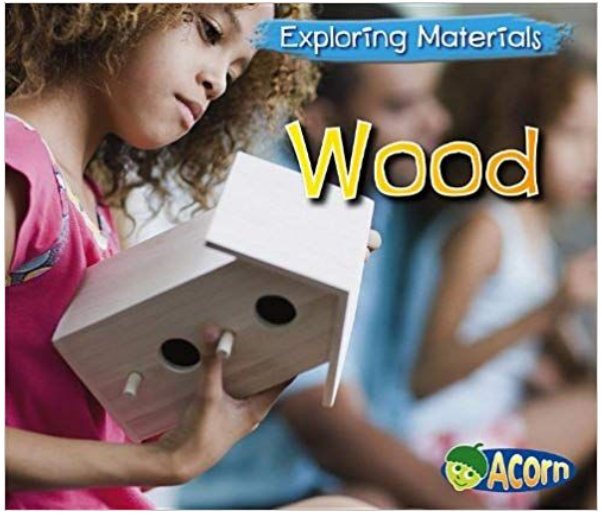

MATERIAL WORLD
Glass

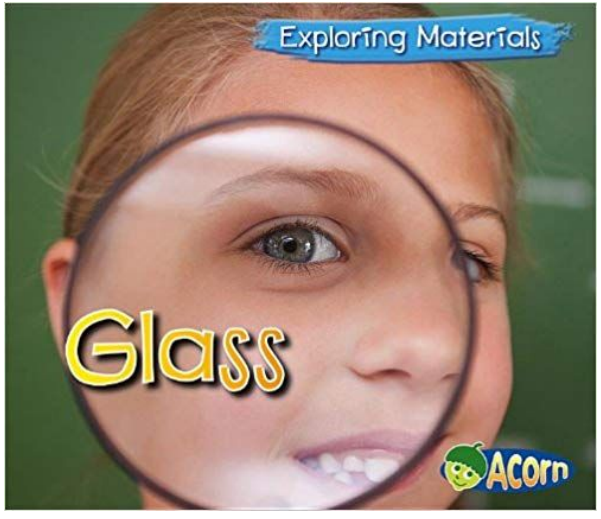

MATERIAL WORLD
Concrete


Exploring Materials
Plastic
Acorn


Exploring Materials
Metal


Exploring Materials
Paper
Acorn


Exploring Materials
Wood
Acorn


Exploring Materials
Glass
Acorn


Exploring Materials
Rubber
Acorn

Baseball

Tennis

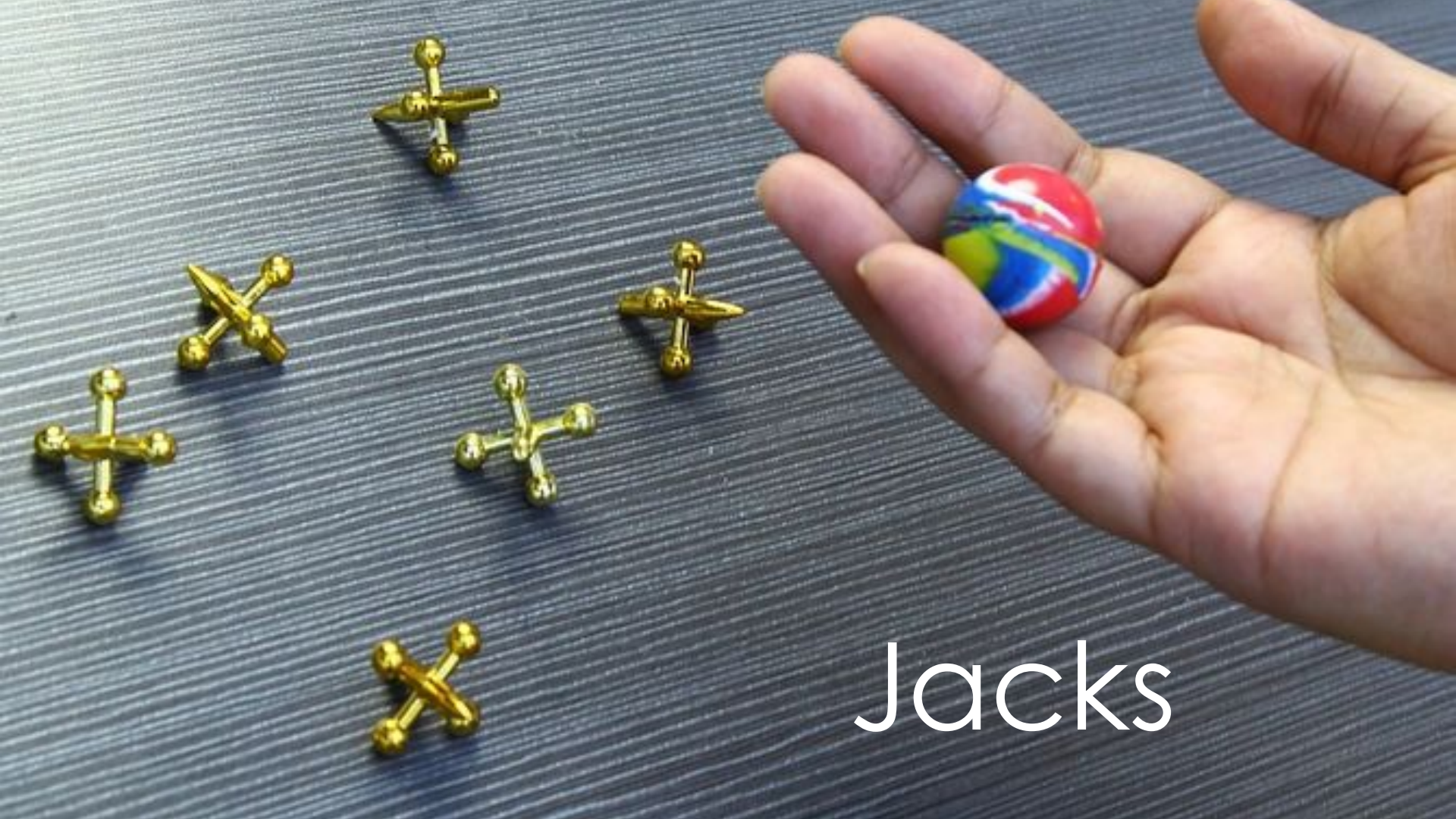
Table Tennis

Golf


Soccer

Basketball


Marbles


Jacks

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