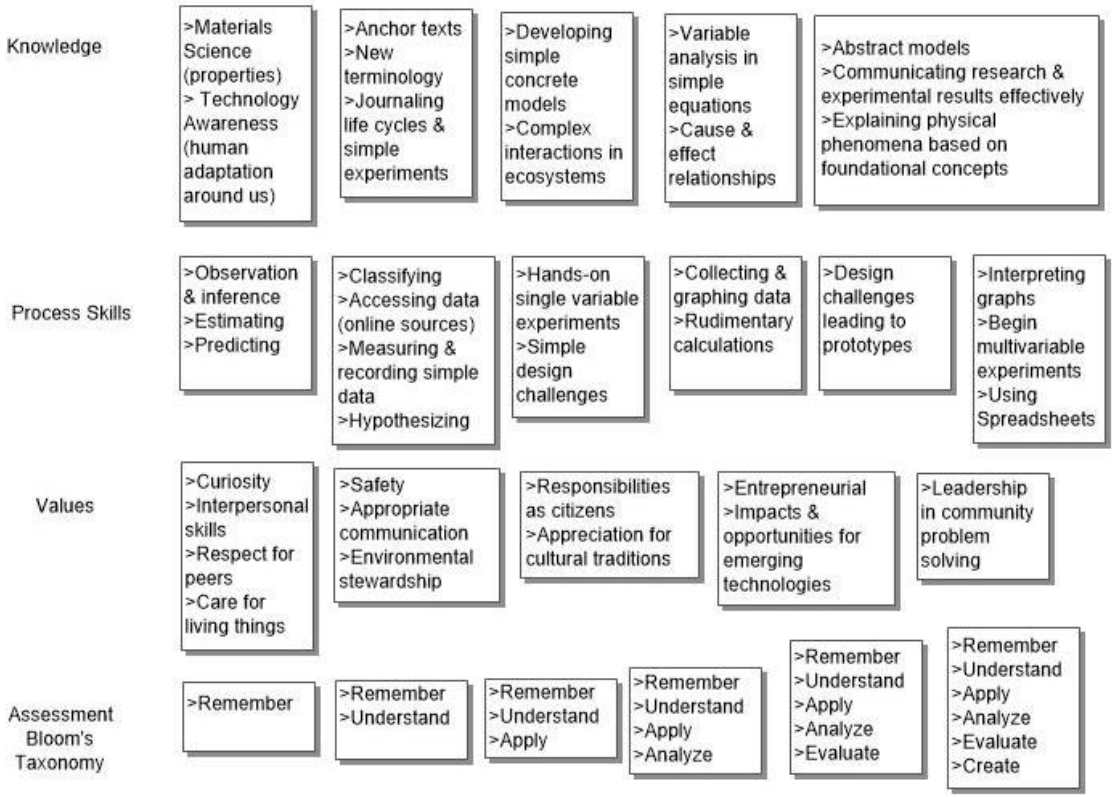
December 2023

OHCP Grade Two Science Curriculum

INTRODUCTION and OVERVIEW

Progression of Knowledge, Skills and Values Grades 1-6



Grade Level Expectations for Skills and Attitudes[1]

Summary of Skills to be Demonstrated by the end of Grade 2

In the development of inquiry, problem identification, design and solution, learners should demonstrate the following:

Curiosity	Find out information about objects, events and investigations on their own.
Inventiveness	Suggest new and innovative ways of approaching investigations.
Respect for evidence	Listen attentively to other pupils' presentations, results and explanations.
Persistence	Persist at tasks even though expected results are not materializing.
Respect for living things	Appreciate that all living things are important in their own way, and should be protected and respected.
Cooperation	Work alone and with others.
Concern for safety	Identify and observe safety instructions.

In the activities throughout Grade 2, learners are encouraged to develop the attitudes required for positively interacting with scientific and technological ideas and concepts. At the end of the Grade, these are some of the attitudes that should be evident.

Observing	Identify similarities and differences between objects and events
Measuring	Use simple measuring instruments supplied to investigate objects and events.
Manipulating	Set simple instruments and manipulate simple equipment.
Recording	Use pictures and charts to report results as well as simple tables.
Classifying	Group objects according to two (2) criteria.
Communicating	Use appropriate vocabulary, demonstrations, role play to report results.
Inferring	Notice and describe patterns in simple measurements and events.
Interpreting Data	Discuss what they deduce in response to questions.
Experimenting	Give suggestions as to the procedure to investigate to find answers to questions.
Predicting	Use information other than patterns to attempt predictions.
Problem Solving	Evaluate two different suggestions for solving every-day problems.
Designing	Select appropriate materials to construct models and gadgets.

[1] The skills and attitudes have been taken verbatim from the OECS Learning Standards

Structure and Properties of Matter

Purpose of the Subject: The study of science encompasses knowledge, processes and values. Scientifically literate persons will foster an attitude of caring not only for themselves, but as responsible citizens, for the world around them. Their decision making will be enhanced by a systematic study of the structure and behavior of the physical and natural world through observation and experiment. In learning science, students benefit from leveraging and evaluating available technological tools to study and therefore understand the world and their relationship to it.
Topic or Strand: Structure and Properties of Matter
Essential Learning Outcome (ELO-1): Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties. [*Clarification Statement: Observations could include colour, texture, hardness, and flexibility. Patterns could include the similar properties that different materials share.]*
Grade Level Guidelines: Refer to grade level expectations at the beginning of this curriculum document

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
Learners are expected to: **<u>Knowledge</u>** ● Define the terms: ○ Matter ○ Characteristics ○ Properties ○ Solid ○ Liquid ○ Gas ○ Materials ○ Properties ○ Texture ○ Hard/Soft ○ Flexible ○ Elastic ○ Rigid ○ Natural materials ○ Living	**New Vocabulary** Use the word property or characteristic in a sentence. E.g. A characteristic of frogs is their slimy skin! A property of glass is shininess. Give three examples of manmade objects. (*glass, pencil, eraser, bread, cars etc.*) Give three examples of living things. (*plants, animals, insects*) **Assessment for States of Matter 1:** Create a poster on the states of matter to be assessed by the following rubric:	**Lesson 1:** **Introduction to Matter** Students, here is the word for today's lesson, but oh no, the letters are all mixed up. Can you help me unscramble them to figure out the word? *(taterm = matter)* Students, where are we? *(We are in school/in our class/outside)* What do you see around us? *(furniture, my friends, trees, school garden)* What do I have in my hands? (Teacher may have an object such as, chalk/bottle of water/phone in his/her hands) What are we sitting/standing on? *(Chairs/pavement/grass)* Now, the word that we unscrambled is used to name all of those things we just mentioned. What was that word again? *(Matter)*

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
○ Manmade materials ● State that matter is composed of particles. ● Demonstrate they understand the properties of the states of matter. ● Demonstrate they understand the properties of the different types of materials (metal, paper, wood, plastic, fabric, etc). ● Compare solids, liquids and gases based on their properties. ● Distinguish between an object and the material it is made from. ● Determine the properties to be observed in the investigations. ● Distinguish between objects and the materials from which they are made (ST-2-PS-MM-1). ● Identify different materials such as wood, rubber, metal, plastic and list objects made from each (ST-2-PS-MM-2). ● Describe giving examples, the properties of solids and liquids (ST-2-PS-MM-5).	Identifies the three states of matter **(3 marks)** Identifies examples of each state of matter **(3 marks)** Highlights properties of the states of matter **(3 marks)** Creativity **(3 marks)** Discuss at least ONE of the ways in which gases, liquids and solids are different. Discuss at least ONE of the ways in which gases, liquids and solids are similar. **Assessment for States of Matter 2:** https://www.tutoringhour.com/worksheets/matter/identifying/	**Matter** *is anything that has mass and takes up space.* All of the things you identified have mass and take up space. As you can tell, matter can be found all around us. Let's watch a video about matter. https://www.youtube.com/watch?v=jmm1J2yI9tk (2:21 mins) Students while looking at the video *(0:08 - 0:36 mins)*, I want you to tell me: 1) What matter is made of? *(particles)* 2) What are the states of matter? *(solid, liquid, gas)* Let's continue watching the video *(0:37 - 2:09 mins)* and observe how the particles in the different states of matter behave. As you just learnt, the particles in each state of matter behave differently. Solids, liquids and gases look and behave the way they do because of how close or far their particles are from each other. Teacher demonstrates with fists that solids have close particles, liquid particles are further apart and that gas particles move around in the air (waving fists). Teacher then demonstrates with fists that heating up particles of matter makes them move and get farther apart. **Balloon Experiment & Roleplay Activity** Teacher places a balloon over the mouth of an empty glass soda bottle and heats the bottle with a candle. As the gas particles heat up, they expand and inflate the balloon. Let's roleplay what is happening inside the balloon.

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
• Identify examples of at least two solids and two liquids (ST-2-PS-MM-6). • Realise that some things are natural and some are human made (ST-2-TE-NT-1). • List some physical properties of matter (ST-3-PS-MM-1). • Match, with relevant examples, properties of materials which make them useful for specific purposes (ST-3-PS-MM-4). **<u>Skills</u>** • Observe the three states of matter • Identify the three states of matter and give examples of each. • Observe different types of materials • Identify the properties of different materials. • Compare different types of materials based on their observable properties. • Compare solids, liquids and gases based on their properties.	 **Assessment 3: Particle Arrangement and Movement in each State of Matter** Roleplay in groups the arrangement and movement of the particles in each state of matter. **Rubric** - **correct arrangement in each state (3 marks)** - **correct movement of particles in each state (3 marks)** **Assessment 4: Particle & States of Matter**	*Before: The gas inside the bottle is represented by the group of students being apart from each other. They should also be moving around freely.* *After heating: The gas particles move quickly from the bottle into the balloon. As such, the students should move more rapidly and spread even farther apart.* **Observing the Properties of Solids, Liquids and Gases Activity** Sing the "Little Scientist" Song (to the tune of "Bingo") *A little scientist am I* *I'll use my hands, my ears and eyes,* *Squeeze, move, feel it* *Push, press, pour it* *Lift, drop, hear it.* *The object I'll observe.* https://youtu.be/sRIyEhMjJcs lyrics by Juanita Hunte-King, music by Dellonte Boucher **Observing Solids Activity** Let's observe this group of objects using our eyes to look, fingers to feel and ears to listen. Objects: • pencil • chalk • crayon • building blocks

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
• Classify matter as solids, liquids and gases. • Classify materials based on observable properties. • Classify objects based on the materials they are made from. • Communicate the results from the various investigations to the class and teacher. • Plan investigations to describe and classify different kinds of materials. • Conduct investigations to classify materials by their observable properties. • Collect and analyse data gathered after observing different materials. • Collect and analyse data gathered after observing each state of matter. • Analyze and interpret data obtained from their observations to classify matter and materials. • Investigate the properties of various materials and match the properties to their use (ST-2-PS-MM-3).	**Complete the boxes to show the arrangement of the given particles.**  **Assessment for Properties of Materials** 1. Describe how a blind person might use their sense of touch and the properties of solids (roughness, smoothness, hard, soft) to get to school from their home. (e.g. the feel of the ground under their feet vs. pavement, stairs from home or into school being smooth, touching trees along the path, touching fences, the feel of doors and door knobs). 2. Have children draw a map of how a child could get to school and use touch to assist them if they were blind. In the map they could include items they could touch, hear and smell that might guide their journey to the destination. (e.g. teacher scaffolding questions: What does it feel like under their feet -gravel, sand etc. What does it feel like on their legs? – grass, branches?) ? Where do they turn, can they hear wind in special trees?, Are there smells associated with parts of the community? **Classification of Materials according to Properties Assessment**	• pebble • plant • nail Students, we use the words **characteristics** or **properties** when we are trying to identify what makes groups of objects similar. For example we might say " water and oil have the **property** or **characteristic** that they can be poured like a liquid." What are the **properties** or **characteristics** of the objects in the list above that make them similar? How does each object feel? Can each object be moved from one place to the next? Does each object need to be inside a container to be moved? Does each object change its shape when moved/placed in a container? What happens to each object when it is dropped? What do you hear when you tap it? Is each object squishy? What is the same about them? *Closure*: Let me summarize what you have said: • these objects are hard; • they don't change shape; • they can be measured; • they don't pour like a liquid- they remain the same as we move them We call matter with these characteristics or properties, **Solids.** Students, based on your observations, answer these TRUE or FALSE questions about the solids you observed:

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies

Attitudes/Values

- Develop curiosity by finding out about objects and materials around them.
- Appreciate that materials have similar and different properties.
- Develop inquiry through investigating materials and their properties.
- Show respect for evidence by using the results from the investigations to make classifications.
- Safety when conducting practical and group work, display sensitivity and offer assistance to peers who may have physical or learning challenges.
- Participate actively in classroom discussions.
- Show persistence in completing practical activities, especially those that may be challenging.
- Work collaboratively, cooperatively and respectfully with other members of their group in

Students conduct investigations on a plastic lid, a coin, and a metal key and use the observations made to group the objects in different ways according to their properties.

E.g. Complete the following table

Property	Coin	Key	Plastic Lid
Type of Material			
Stiffness			
Clangs			
Flexible			
Shiny/ Dull			
Shape			

Which of the three objects have similar characteristics and could be grouped together? Explain.

1) Some solids are hard. *(T)*
2) Solids take the shape of the container they are placed in. *(F)*

Based on what we would have observed, we now know that **solids tend to be hard and they do not take the shape of their container** because **solids have closely packed particles**.

Roleplay the Arrangement & Movement of Particles in a Solid

Retrieved from: https://commons.wikimedia.org/wiki/File:States_of_matter_En.svg

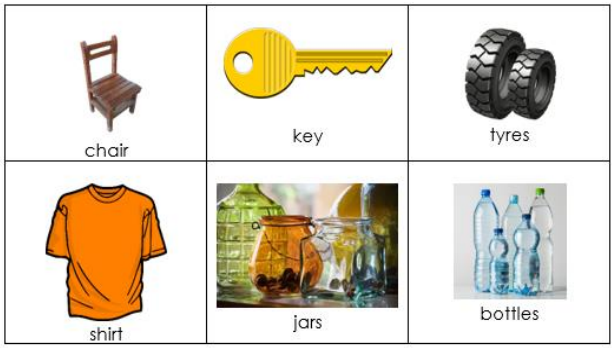
Students, look at the diagram above and arrange yourselves like the particles of a solid (*students should stand uniformly in rows and columns and wiggle in their spaces).*

Observing Liquids Activity

Let's observe this group of objects:

- oil
- milk
- water

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies

exploring and investigating different materials.
• Show sensitivity and demonstrate helpfulness when working with peers that may have learning or physical challenges as you undertake experimental work together.
• Stewardship/Respect for Living Things:
  ○ Take care not to damage objects (living and non-living things) when they are making observations about materials in the environment.
  ○ Use materials wisely.
• **Safety:**
  ○ Wear safety goggles when conducting certain experiments.
  ○ Be careful not to taste materials unless told to do so by the teacher.
  ○ Use safety protocols for collecting objects.
  ○ Wash hands after conducting certain activities, especially
	Grouped by shape: *The coin and lid are both round. The key is an irregular shape.*
	
	Grouped by stiffness: *The coin and key are both stiff. The lid is flexible.*
	
	Grouped by material: *The coin and key are both metal. The lid is plastic.*
	
	Assessment on Type of Materials
	
	 
	
	1) The _____ are made of glass. *(jars)*
	2) The _____ is made of wood. *(chair)*
	3) The _____ is made of metal. *(key)*
	4) The _____ are made of plastic. *(bottles)*
	5) The _____ are made of rubber. *(tyres)*
	6) The _____ is made of fabric. *(shirt)*
		• juice
		• alcohol
		
		How do they feel?
		How do they look?
		Can it be moved from one place to the next?
		Try to move each liquid into the empty containers (cup, beaker, bowl) provided. Does it need a container to be moved?
		Does it change its shape when moved/placed in a container?
		What shape do they take when they change containers?
		Can they be moved without the containers?
		What is the same about them?
		Closure: Let me summarize what you have said:
		• these objects are wet;
		• these objects can flow;
		• they change their shape depending on the container they are in;
		• they can be measured;
		• they can be moved in a container
		We call matter with these characteristics or properties, **Liquids.**
		
		Students, based on your observations, answer these TRUE or FALSE questions about the liquids:
		
		1) Liquids can be poured. *(T)*
		2) Liquids can be easily moved without a container. *(F)*
		3) Liquids take the shape of the container they are placed in. *(T)*

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
when playing with soil or materials collected outside the classroom. ● Realise that some things are natural and some are human made (ST-2-TE-NT-1).	 Retrieved and adapted from: https://images.app.goo.gl/96DrLoYxnGbCKkwj8 **Extension Question to Challenge Students**	Students based on what we would have observed we learnt that **liquids can be easily poured and they take the shape of their container** because **liquid particles are not so closely packed and can move around a little.** **Roleplay the Arrangement & Movement of Particles in a Liquid**  Students, look at the diagram above and arrange yourselves like the particles of a liquid *(students should be farther apart but not in a uniform way, they should move slowly around each other).* **Observing Gases Activity** Students are placed in one corner the class and asked to observe the teacher using these objects: ● Sprays perfume/deodorant in a corner of the class. Students, were you able to see the perfume? Can you smell it from your corner of the class? How are you able to smell it? ● Inflates a balloon. What do you see as the balloon is inflated? *(It is getting bigger.)* What is filling up the balloon? *(air/gas)* ● Deflates a balloon. Where did the air go when the balloon was deflated? *(Into the room)*

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
	Why does heat change the properties of objects? (*heat causes the particles to move and collide and get further apart so you can convert solids to liquids- example melting solid butter*)	Students, based on your observations, answer these TRUE or FALSE questions about the gases: 1. Gases take up all the space in a container. *(T)* 2. Gases do not change shape. *(F)* Gases have particles that spread really far apart and can move all around a container. That's why gases like a perfume/deodorant spray **can move all around the classroom even when it is applied in one corner of the room**. The particles even collide with each other to spread out even more. **Roleplay the Arrangement & Movement of Particles in a Gas**  Gas Students, look at the diagram above and arrange yourselves like the particles of a gas *(students should be very far apart but not in a uniform way, they should move quickly around the classroom).* Video/Song: Matter Chatter (song for kids about solids, liquids, and gases) - YouTube (3:14 mins)

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
		Lesson 2 **Activity introducing observable properties of materials.** ***Note to teacher:*** *The following is an introductory activity. Have students use their senses to bring an awareness to the observable properties of materials.* Students, here's an object. (Hold up either a rock, plastic toy, fruit or plush animal to students.) Can you describe the object? Record their responses on the board. These words that you have just used to describe your objects, such as, their colour, how they feel (***texture***), their size *(large/small)*, **hard**, soft, **flexible** *(can bend)*, **rigid** *(hard to bend)*, **elastic** *(can stretch and bounce back)*, warm and cold, etc are called **properties**. Now let's practice. Here is a bag of objects. Please take one object from the bag and describe it. **Note to teacher:** Before the students begin to describe their object, read the poem below entitled **"Fingers Tell".**

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
		Fingers Tell *What can your fingers* *See for you?* *Whether a surface* *Feels old or new?* *Is it bumpy, lumpy,* *Slippery, slick?* *Prickly, scratchy?* *Hard as brick?* *Spongy, rough?* *Softer than dough?* *Touch it!* *See if your fingers know.* Give students time to examine their object and sketch it. Write three properties about the object, using the list created earlier, as a guide. *(E.g. My object is big, green and rough)* Have a few students present their object to the class and share the properties of their object. **Note to teacher:** Collect the completed sheets from students and add it to their portfolio for assessment. **Lesson 3:** **Grouping objects/materials using their observable properties of materials.** ***Note to Teacher:*** *Take students on a field trip in and around the school. Prior to the lesson, ensure that the environment has matter in at least the solid and liquid states for the students to observe.* Students on your field trip, collect different kinds of objects. Ensure to follow the safety rules:

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
		Safety Rules for Activity 1) Listen to instructions. 2) Stay on designated paths and areas. 3) Wash hands after conducting activities, especially when handling soil or materials collected outside the classroom. 4) Be mindful to not taste materials unless told by the teacher. Working in your groups, select three (3) of the objects you have collected. Feel them, look at them, tap them, try to stretch them, pull them apart, bend them, etc. Name and describe the object using the Observation Card Template below:

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
		OBSERVATION CARD Name of Object: _____ *Expand template as needed* Did all your items you observed look or feel the same? *(No, some look/feel the same and some are different)* Not all materials are the same. They have **properties** about them that are the same and different.

	Yes	No
Is it hard?		
Is it bendy?		
Is it transparent (see-through)?		
Does it clang when tapped?		
Is it stretchy?		

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
		Students return the objects that you described to your collection. Now, working in your groups, look at your objects and come up with a way of sorting or classifying your objects based on any property you choose. Let's discuss. What property did you choose? Which items have that property? Which items were not selected and why? Now place your objects back in the pile and figure out a different way to classify or sort them. **Lesson 4: Exploring Different Materials** **Materials Mystery Box Activity** **Note to teacher:** Include in a box items made of one material only, e.g., wood, plastic, metal, rubber, paper, fabric, etc. Blindfold students, have them choose items from a box and describe each without looking at it or showing it to the class. The other students will then guess what it is based on the descriptions given. After guessing, each object is displayed and passed around the class for all students to make observations. "Students, can you tell me what this item is made of?" Teacher records and displays the information in the table below:

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies

Object	What is it made of?	Observations
Sock	Fabric	Soft, flexible
Eraser		
Building block		

Pass each item around the class to ensure that all make observations. Repeat the activity with the other items.

From the table, you would notice that these objects are made from different "things" (fabric, metal, plastic, etc). These things are called **materials**. *Materials are the things that objects are made of.*

E.g. Pencil is composed of the following materials: plastic/wood/metal, rubber and pencil lead.

Students describe how each material feels, looks, sounds when tapped, can it bend, stretch?, etc. Record the observations stated in the table above.

Classifying Materials Activity

Do all materials look and feel the same? *(No, not all materials are the same).*

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
		Materials have different properties and these properties can be used to classify or sort the materials. Students work in your groups to classify the objects provided based on the materials they are made from. Make certain to label each container according to properties. **Classification of Natural & Manmade Materials** Students, what does the word **living** mean to you? Give me some examples of living things (*my dog, bugs, humans, plants*). We sometimes say these things are from nature or **natural.** Have you heard the word **manmade**? If we break up that word in pieces MAN MADE we can see that something like a piece of glass is made by man (manmade). Students, there is another way we can classify objects. Take a look at these two groups of objects: Group A: leaves, wood, sticks, pebbles/stone, grass, river/pond water, bugs and other living creatures. Group B: plastics (cups, bottles, nylon), glass, paper and steel. Why is it that steel and bugs are not in the same group? *(one is living/ natural, one is manmade)* How can we tell that a material is natural or man made? What is the difference between natural and manmade materials? **Natural materials** come from nature and were not made by humans (e.g. stone, creatures, plants, water from river/pond, etc) whereas man made materials were made by humans (e.g. car, steel, plastics, glass, etc).

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
		Discuss what is different about the groups of objects? *(A is a group of natural materials and B is a group of man-made materials).*

Useful Content Knowledge for the Teacher about the Outcome*: (Links to professional sources that connect back to the Curriculum and Assessment Principles of Learning and Principles of Assessment)*
Useful book: "Change it: Solids, liquids & Gases" by Adrienne Mason

Inclusive Resources and Materials From Regional Specialists *Use of multisensory activities and materials to assist all learners. (texts, family & community knowledge and resources, contextually relevant professional web resources)*

Additional Resources:
Useful book: "It does Matter: Different States of Matter" available at

(https://www.amazon.com/dp/B01A2YJ7DY/ref=rdr_kindle_ext_tmb)

Matter Chatter (song for kids about solids, liquids, and gases)

https://www.youtube.com/watch?v=C33WdI64FiY

Video on particles and properties: https://www.youtube.com/watch?v=npv74D2MO6Q (3:49 min)

After heating: Students begin to move faster and farther apart.

Matter Song

(to the tune of "Farmer in the Dell")

There's matter over here
There's matter over there
Liquid, solid, or a gas,
There's matter everywhere.

A solid keeps its shape
It doesn't separate
What you see is what you get
A solid keeps its shape.

Gas is in the air
You can't see, but it's there
It flows and blows right through your nose
And fits in anywhere.

When you melt a solid down
A liquid can be found
It's wet and moves wherever there's room
And spills and splashes, too.

- Another activity for observing properties
  Ask children, how could a deaf person use vibration to judge whether objects were hard or soft? (e.g. two hard objects hit together would give a sharp sound and a fast vibration whereas a soft and hard object hit together would only generate a low vibration)- to demonstrate this the teacher could have the student close their eyes and hold a soft or hard ball and explain how it feels when something hits it gently.

Opportunities for Subject Integration: ***(How the inclusive learning strategies might be adapted and/or applied to include other subjects in the curriculum)***

Mathematics:

- Compare objects in terms of their sizes.
- Total number of items found in an area.

Social Studies:

The use of different colours/objects in different social/historical gatherings, for example certain colours at independence celebrations and objects in religious gatherings.

Language Arts:

- Communicating ideas through role play and drawing.
- Use a variety of adjectives to describe different objects.

TVET:

- The use of different types of materials to make different objects or structures.
- The use of different types of machines in different fields in TVET.
- Use of different types of materials in making local craft items.

Agriculture:

- Different materials are used.in the construction of certain structures in agriculture, such as greenhouses/ shadehouses.
- Tools used in agriculture are made from a variety of materials depending on their use.

Health:

- Certain colours may be calming/upsetting to a person.
- Certain colours help to keep a person cool/hot.
- Textures of different materials impact persons differently.
- Some people are colour blind.
- Some persons may not have full use of all of their senses and hence may not be able to describe objects adequately.

Elements from Local Culture:

- Volcanic materials: solids- ash, stones, boulders; liquid - the oozing lava, sulfur lake; gases - hot dense fumes from volcano, Sulphur is used to treat some skin ailments & hot water baths are constructed from hot springs.
- Local liquids (e.g. local beverages/juices/oils - malt, sorrel, lime, coconut water, ginger beer, coconut oil, castor oil, river water, streams, crater lakes, sulfur springs).
- Local gases- steam on a hot cup of tea, steam rising from hot asphalt after a rain, barbecue smoke, vehicle exhaust, gases at the sulfur springs, gases created by decaying sargassum seaweed.
- Local solids- limestone, ash, boulders, sand, charcoal, bells, metals.
- Colours- black funeral colours, national colours in flags.
- Materials- coconut husks, shells and fibers used in craft.
- Specific materials are used in different ceremonies.
- National colours, e.g. colours of the national flag/national wear.
- Different materials used to make local craft items.
- Use of different materials by indigenous group.

Resources for a learner who is struggling: ***(Links to earlier learning activities for similar knowledge, links to resources for special education needs)***

Read aloud books to support all students:

https://www.youtube.com/watch?v=Nfg7D5CeOZQ (2:12 mins)
https://www.youtube.com/watch?v=zamug7Fj7MM (6:24 mins)
https://www.youtube.com/watch?v=MmXKoMfy7Q8 (9:31 mins)

Resources for a learner who needs challenge: ***(Links to learning activities and resources in later grades)***

Simulations of states of matter: https://phet.colorado.edu/sims/html/states-of-matter-basics/latest/states-of-matter-basics_en.html
https://interactives.ck12.org/simulations/chemistry/states-of-matter/app/index.html?screen=sandbox

Strategies that Support the OECS Curriculum and Assessment Framework
Elements of the Essential Education Competencies that are addressed:

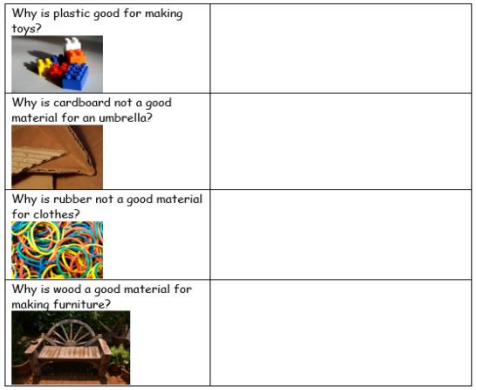
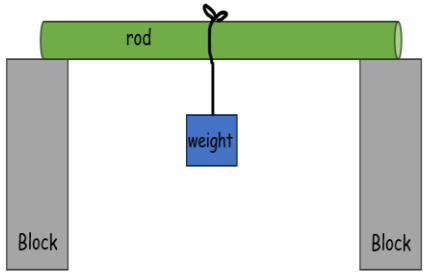
An educated person in the OECS will demonstrate they have:	**Where might this competency be promoted/developed in this learning outcome and associated lessons?**
Developed Citizenship Competencies	✓ Understand the importance of giving accurate descriptions of objects/materials/persons when asked to do so.

	✓ Classifying and observing certain patterns or colours. This is linked to cultural relevance and national pride. ✓ Understand the importance of certain colours or materials to certain groups in the society. ✓ Safety when conducting practical and group work, display sensitivity and offer assistance to peers who may have physical or learning challenges.
Developed Critical Thinking and Ethical Communication Competencies	Critically analyzing the information gathered on materials from investigations conducted. Communicates information on materials/ objects and how they can be classified truthfully. Developed critical thinking: Through exploring various objects and the materials from which they are made. Investigating that materials have similar and different properties Through using Inquiry. Showing respect for evidence by communicating the results from the investigations honestly and faithfully.
Developed Well-being Competencies	Certain colours/materials/objects could trigger negative/positive emotions. Safety when conducting practical and group work, display sensitivity and offer assistance to peers who may have physical or learning challenges. Adhering to Safety Protocols such as: ✓ Wear safety goggles when conducting certain experiments. ✓ Be careful not to taste materials unless told to do so by the teacher. ✓ Use safety protocols for collecting objects. ✓ Wash hands after conducting certain activities, especially when playing with soil or materials collected outside the classroom.
Developed Knowledge and Entrepreneurial Competencies	➢ Understand the properties of different materials around them and how these can be used to create new and safe products. ➢ Introduction to different types of materials used in products.

	➢ Identify the properties of different materials. ➢ Compare different types of materials based on their observable properties. ➢ Plan investigations to describe and classify different kinds of materials. ➢ Analyze and interpret data obtained from their observations to classify matter and materials.

Purpose of the Subject: The study of science encompasses knowledge, processes, and values. Scientifically literate persons will foster an attitude of caring not only for themselves, but as responsible citizens, for the world around them. Their decision making will be enhanced by a systematic study of the structure and behaviour of the physical and natural world through observation and experiment. In learning science, students benefit from leveraging and evaluating available technological tools to study and therefore understand the world and their relationship to it.
Topic or Strand: Structure and Properties of Matter
Essential Learning Outcome (ELO-2): Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose. *[Clarification Statement: Examples of properties could include, strength, flexibility, hardness, texture, and absorbency.] [Assessment Boundary: Assessment of quantitative measurements is limited to length.]*
Grade Level Guidelines: Refer to grade level expectations at the beginning of this curriculum document

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** • Give examples of how different materials (e.g. wood, cloth, plastics, clay, metal, etc) are commonly used. • Explain why certain materials are more suitable for specific purposes than others. • Demonstrate they understand the importance of testing different materials. • Compare the properties of different materials to determine suitability for intended purpose.	**Introductory Questions** Discuss the following: Why do you think frying pans are not made from plastic? *(plastic will melt on heating)* What is another material that you should not make pots from? *(wood, fabric, rubber)* Why are some materials better for certain purposes than others? (The properties of materials affect the purpose for which they are used) Answer the following questions based on your experience/knowledge from experiments	**In School Field Trip** Setup stations around the class/school displaying different occupations and the materials used in each. If possible, have persons displaying how they use the items. **Occupation** | **Main material Used** | **Object Made or Used** Carpenter Retrieved from: Carpenters Career Video - YouTube(1:27 mins) | Wood | Wooden Objects

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
• Account for the results obtained from the different tests. • State which properties of a material allow that material to be well suited for an intended use. • Use data to suggest reasons for the choice of material. • Investigate the properties of various materials and match the properties to the uses (ST-2-PS-MM-3). • Design and construct a simple object using chosen materials (ST-2-PS-MM-4). • Appreciate the advantages and disadvantages of using devices, tools and structures made by humans (ST-2-TE-UT-1). • Acknowledge that human-made things hold the potential to pollute the atmosphere and disrupt the environment (ST-2-TE-UT-2).	 **Activity Comparing Strengths of Rods Made from**  **Different Materials** **Image showing experimental setup** Materials: 1. 2 blocks to act as bases 2. Rods (plastic straw, paper straw, wooden dowel, metal rod) 3. Weights (E.g., 1g, 10 g, 20g, etc.)	Tailor Retrieved from: https://www.youtube.com/watch?v=8RZ-QD-rIz8 (1:33 mins) — Cloth — Shirts, Dresses Glass maker Retrieved from: Glass Blowers, Molders, Benders, and Finishers(1:19 mins) — Glass — Glassware Potter Retrieved from: https://youtube.com/shorts/pWWa1B9qAHk?feature=share (1:00 mins) — Clay — Ceramic Pots Welder Retrieved from: Welders Cutters Solderers and Brazers Career Video (1:56 mins) — Metal — Gates, Fence

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies

- Impact of Science and Technology may be positive or negative (ST-3-STSE-2).

Skills

- Analyse different materials to determine which materials have the properties that are best suited for an intended purpose.
- Investigate and compare the hardness, elasticity, absorbency, etc of different materials (wood, plastic, metal, clay, paper etc.).
- Plan and conduct different tests on a variety of materials.
- Predict the results of tests on different materials.
- Interpret data collected from experiments.
- Use data obtained from their experiments to select the materials best suited for a particular purpose.
- Measure the different materials and products.

Method:

1. Set up the experiment as shown above.
2. Attach one weight at a time to the rod until it either collapses or bends.
3. Record the maximum mass each rod can hold before bending or collapsing
4. Record the results in a table.

Results

Table Showing Maximum Masses Each Material can Hold

Material	Maximum Mass (g)
Plastic straw	
Paper straw	
Wooden skewer/dowel	
Metal Rod	

(1 mark per mass)

Discussion

Analyse the data as follows:

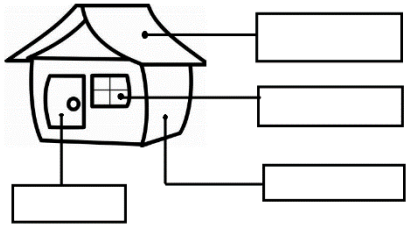
1. Which rod is the strongest? (1 mk) Explain your selection. (2 mks)
2. Discuss why some materials are better at bearing load than others. (2 mks)

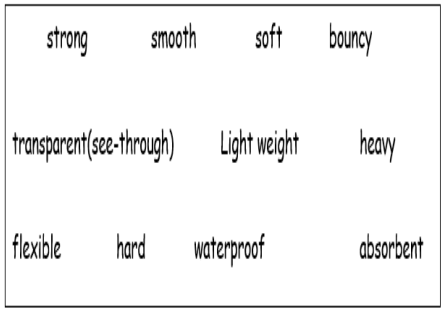
Cobbler https://youtu.be/ViQH9A9SWOA(3:11 min)	Leather	Shoes
Mat Weaver	Straw	Mats for household
Broom maker	Straw	Brooms for sweeping
Fisher	various	Fishing pots

Students, visit each station in your groups and collect a sample of the materials used in each occupation.

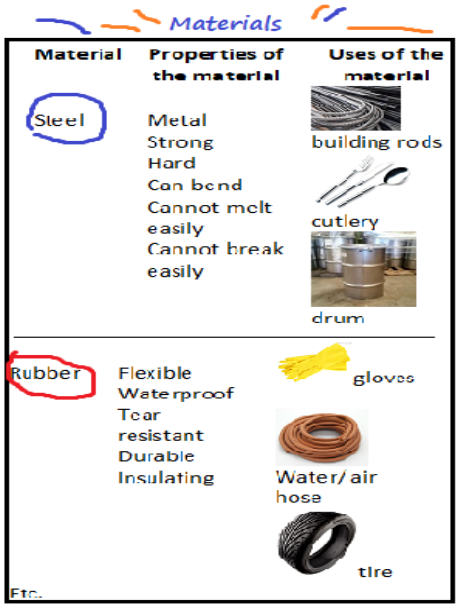
Collect a sample of the main material used from each station, observe the properties of each material, record observations and include some uses of each material in the table below:

Material	Properties of the material	Uses of the material
Wood	Hard, Strong cannot bend, cannot break easily, etc	Build roof, furniture, etc
Metal (e.g. steel)	Metal, strong, Hard, Not easily bent or broken	Gate, Fences Car bodies, Ships, etc.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
• Hypothesize which materials will give the best results when tested for a particular property. • Construct devices and models to test the suitability of materials. • Perform calculations using data collected. • Investigate different materials, their uses and properties. • Compile/analyze data gathered after conducting various tests on different materials. • Interpret data obtained from the various tests done on the materials. **Attitudes/Values** • Appreciate that the use of an object is related to the material from which it is made. • Persistence in experimenting. • Respect for Evidence. • Develop creative ways of testing the different materials.	Actively watch this video and then answer the following questions: Everyday Materials https://youtu.be/XnkQcP-RHCw(3:01) Give ONE common use of each material: • Wood • Glass • Metal • Plastic • Paper **Assessment on Suitability of Materials** Tim, the builder, needs to complete the roof, windows, doors and walls of the house below: 	**Co-operative Group Work:** Students, let's discuss some other ways each of these materials are used in daily life. E.g. Cloth isn't only used to make clothing it is also used to make curtains and kitchen towels. What else is cloth used to do? Why is cloth a good material to use for those purposes? **Investigating Plastic and Paper Straws** Students, have you noticed that plastic straws on juice boxes are being replaced with paper straws? Why do you think this is so? Do you think that paper straws are a suitable replacement for plastic straws? Let's investigate the effect of liquid on paper and plastic straws. Which of the two do you think will stand up better to the liquid? **Aim:** To investigate the effect of a liquid on paper and plastic straws. **Materials Needed:** 1. One paper straw and one plastic straw of same length and size 2. Water or beverage 3. Cup or beaker 4. Measuring cylinder Method:

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
• Work collaboratively & cooperatively to complete the experiments. • Participate actively in classroom discussions on the need for testing. • When conducting practical work, help those students who appear to be struggling. • Use materials wisely as different types of matter can have serious effects on living and non-living things. • Safety protocols. • When conducting practical and group work, display sensitivity and offer assistance to peers who may have physical or learning challenges. • Be aware that some students may have difficulty in lifting, pulling objects, etc. • When conducting the planned experiments, such as testing elastic bands, students should wear properly fitting goggles.	He has only the following materials available: Wood Plastic Metal Cloth Glass Rubber Paper Help Tim select the most appropriate materials to build the different parts of the house.  For each choice of material, select two words from the box above to describe the properties that make it suitable for that part of the house.	1. Observe the properties (texture, flexibility, appearance, etc) of each straw while in a dry state. Record the observations in a suitable table. 2. Add the paper straw and plastic straw to a vessel containing 250ml of water or beverage. 3. Leave both straws in the water/beverage for five minutes. 4. Remove both the straws and record observations in the table. TABLE SHOWING OBSERVATIONS MADE **Type of Straw** | **Observations of dry straw** | **Observations of straw after 5 minutes** **Plastic** | | **Paper** | | Were there any changes to the properties of the straws after being soaked in liquid for five minutes? *(Yes, the paper straw became soft and weaker while the plastic straw remained firm)* Why do you think the paper straw became soft? *(Paper is a material that absorbs water and plastics do not; plastics are stronger materials than paper)* Based on your results, is paper a good material for transporting liquids? Discuss. What are the benefits of using paper straws and reducing the use of plastic straws?

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
• Wash hands after collecting and interacting with different objects, especially those collected from outside. • Glass objects should be avoided with young children, but they could touch windows, drinking glasses made from glass, etc. • Special care should be taken when doing the following: ✓ When using objects that may have sharp edges. ✓ When using 'scratching' tools. ✓ When lifting heavy objects such as books.	**Mark scheme** ➢ The material for each is a possible option **(4 marks total, 1mk each)** ➢ The selected material is the most suitable for each part **(4 marks total, 1mk each)** ➢ Appropriate justification of selected materials **(8 marks total, 2 marks each)** **Exit Slip Assessment Activity** Choose one item from your classroom. What is it made of? Why do you think these materials were used? Draw and label the item and justify your answer in the space provided. **Note to teacher:** Use student's responses to create an anchor chart. Sample anchor chart:	And why are some beverage companies opting to use paper straws as opposed to plastic straws? Allow students to share what they know and then watch the following video: **"Why Plastic Straws Suck" Video** https://youtu.be/pdTBG929mgs(4:38 mins) There is a global problem of plastics getting into the environment and unlike paper, plastics take a really long time to decompose *(rot)*. Plastic garbage, like straws, bags, old nets, drinking cups and bottles can be harmful to the environment and to sea creatures if not properly disposed of.  Photo of a seal entangled in a plastic netting. Photo /retrieved from:

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Seal_entangled_in_plastic_netting.jpg (1366×969) (wikimedia.org) Paper straws are less harmful to the environment and sea creatures because when they are disposed of they decompose much faster than plastic straws. **Building Kites from Different Materials Activity** Under the supervision of the teacher/parent, students make kites using the materials of plastic, paper and fabric. **Materials needed:** 1. Sheets of paper, fabric and plastic all cut to the same dimensions (e.g. 8 ½ x 11) 2. Wooden skewer 3. String 4. Scissors 5. Tape See how to make a simple kite in the video below for ideas: **Video on How to Make a Simple Kite** https://youtu.be/XI_NiH1g0VQ(2:29 mins) The activity would be done to test the durability of the kites using the different materials. Which kite would last longer? Which one can withstand rain? Which kite flies highest? Which material do you think is best to make kites? Why? Did you have any difficulty with the construction of your kite? Students identify the materials from which objects are made and discuss why they think the maker selected that material to make it. What is the object? What is it used for? Examples of objects: clothing, shoes, pencil, bag, jars, glasses, cutlery,

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		windows and doors. This is so students can make connections with the uses of materials and their properties. **Investigating Absorbency of Different Textures of Paper** Test three (3) different types of paper (e.g. bristol board, printing paper, paper towel) to see which one absorbs the most water after 30 seconds. Before we begin the test, **hypothesise** *(make an educated guess)* which of the papers will be more absorbent. Method: 1. Cut the three papers, if needed, to ensure they are the same size. 2. Label each paper A, B and C respectively. 3. Label three beakers/cups - A, B and C. 4. Place 50 ml of water into each of the three beakers/cups. 5. Add paper A to the beaker labelled A. Leave for 30 seconds. After 30 seconds remove the paper and measure the amount of water remaining using a measuring cylinder. 6. Calculate the amount of water absorbed by subtracting the amount of water remaining in the beaker from 50 ml. 7. Record the results in a table.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies

Type of paper	Initial Volume of water (ml)	Final Volume of water (ml)	Volume of water absorbed (ml)
A	50		
B	50		
C	50		

8. Repeat steps 5-7 using the remaining papers.

Discussion
Which paper was the most absorbent?
Which was the least absorbent?
Which paper is better for cleaning liquid spills? Explain why?
How does the texture of the papers impact on absorbency?
Should paper towels be made from Bristol board? Why/Why not?

Testing Paper for Intended Purpose

What is the best paper for this demonstration of the magnitude of atmospheric pressure?

The teacher can do this as a demonstration using only a drinking glass, water and several samples of paper. Suggested to start with an index card and be sure to "overfill" the glass with water.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		(Screen captures from: https://www.youtube.com/watch?v=65T4ReLkjCg (0:45 mins)  Start with an index card or heavier paper and place the card on top of an overfilled glass of water (you should see a  meniscus).

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Now turn the glass and card upside down being careful to keep the card snug and flat against the glass.  **Tadaaa!** Try your different types of paper and see which one seems to work the best! This isn't really magic! It can easily be explained. There is atmospheric pressure all around us. It comes from all the gas particles in the atmosphere that are colliding above us. When we expand our chest and lungs we can feel the pressure from the outside. When we blow up a balloon, we can feel the pressure on our cheeks. That pressure all around us is large…large enough to hold up a little card on the bottom of a glass!

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Note: Atmospheric pressure is large enough to hold the card in place on much bigger containers of water. Just make sure your card is flat and your container is overfilled. Why not do an experiment with different size containers?

Useful Content Knowledge for the Teacher about the Outcome*: (Links to professional sources that connect back to the Curriculum and Assessment Principles of Learning and Principles of Assessment)*
Introductory Video about materials: https://www.youtube.com/watch?v=2td5mfgf1OI (2:55 mins)

Inclusive Resources and Materials From Regional Specialists *Use of multisensory activities and materials to assist all learners. (texts, family & community knowledge and resources, contextually relevant professional web resources)*
This ELO inherently has much experimental work. The teacher may decide to personally assist students with physical challenges or assign pairings of students. The experiments can also be done as teacher demonstrations with pause points to engage discussions with students.

Additional Resources:

Participating in Literature Walk: reading and discussing the stories about "The Three Little Pigs" and "The Three Little Wolves and The Big Bad Pig". Noting the types of materials that were used in the stories to build houses and other objects and suggesting reasons why the materials were appropriate or not.
Suggest to each group a task of making an object and ask the group to write a design brief where they: 1) make a drawing, 2) make a materials list & 3) explain why the material is best for the construction.
E.g. possible items: kite (consider Mashramani and kite flying), costumes & cultural celebrations, baskets, small bridge model, small box for toys, picture frame, basket, hot mat, animal cage, etc.

Opportunities for Subject Integration: ***(How the inclusive learning strategies might be adapted and/or applied to include other subjects in the curriculum)***
Mathematics:

- Use appropriate tools for measuring different materials.
- Display results in the form of tables or pictorial graphs.

- Using graphical displays (e.g., pictures, charts, grade-appropriate graphs) to represent their results from their experiments.

Social Studies:

- What are some careers that involve fabrication using different materials?

Language Arts:

- Share observations and ideas with other members of the class.
- Lead a class discussion about the properties of common objects using their senses.
- Students re-tell classic tales involving materials by changing certain details.

TVET:

- Material testing is done to ensure that the right materials are used in the construction industry.
- Some of the same tests that students will be undertaking are also done by scientists such as engineers on materials which are used in the TVET field.

Agriculture:

- Farmers benefit from the testing of natural materials such as soil.
- Sensory Indicator testing: (e.g. colour, aroma, taste, texture, etc.) of agriculture produce.

Health:

- Equipment in health have undergone many tests.
- Use materials/equipment as directed as many of the warnings are due to results from tests done on these materials/equipment.
- Many materials are combined to produce safety equipment for different uses.

Elements from Local Culture:

- ✓ Use of a variety of materials to make the same object e.g., wooden houses, thatch houses, wall houses, brooms for sweeping different areas, jewels, furniture, clothing, etc. for different uses.
- ✓ Use of bamboo as a support when making concrete houses.
- ✓ Choosing the right type of wood for making coals.

Resources for a learner who needs challenge: ***(Links to learning activities and resources in later grades)***

Research the past use of steel bolts for the keel of ships and the newer choices for the same application.
Research the use of balsa wood in the first airplanes.

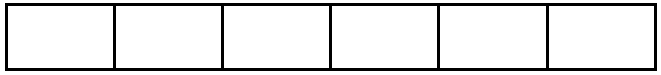
Strategies that Support the OECS Curriculum and Assessment Framework
Elements of the Essential Education Competencies that are addressed:

An educated person in the OECS will demonstrate they have::	Where might this competency be promoted/developed in this learning outcome and associated lessons?
Developed Citizenship Competencies	Respect certain rules concerning the use of certain objects or materials, such as the number of persons in an elevator, the use of seatbelts, exercise machines, rides at amusement parks, etc.
Developed Critical Thinking and Ethical Communication Competencies	• Determine the best use of these materials in different situations based on test results obtained from the literature or data collected personally. • Communicate information on the data collected from tests done on various materials and advise persons how to best use these materials truthfully.
Developed Well-being Competencies	• Understand the importance of wearing clothing appropriate for the weather. • Objects made of certain materials may not be suitable for certain conditions. For e.g., a paper bag is not suitable for carrying wet groceries. A paper bag is used to package hot bread since a plastic bag will fail. • Care has to be taken to protect oneself when certain tests are being done. • Robots can be constructed from the same materials for different purposes.
Developed Knowledge and Entrepreneurial Competencies	• Understand why objects they use are made from the materials they are made from and how best to care for them. • Use available data from various tests to decide the best materials for making various objects.

Purpose of the Subject: The study of science encompasses knowledge, processes and values. Scientifically literate persons will foster an attitude of caring not only for themselves, but as responsible citizens, for the world around them. Their decision making will be enhanced by a systematic study of the structure and behavior of the physical and natural world through observation and experiment. In learning science, students benefit from leveraging and evaluating available technological tools to study and therefore understand the world and their relationship to it.
Topic or Strand: Structure and Properties of Matter
Essential Learning Outcome (ELO-3): Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object. *[Clarification Statement: Examples of pieces could include building blocks, bricks or other assorted small objects.]*
Grade Level Guidelines: Refer to grade level expectations at the beginning of this curriculum document

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies:

Learners are expected to:
 	
Knowledge
• Define the terms:
  ○ Assemble
  ○ Disassemble
  ○ Reassemble
  ○ Structure
  ○ Components
 	
• Demonstrate an understanding that large objects/structures are made up of smaller parts/components/units.
 	
• Demonstrate an understanding that objects may be taken to pieces/
	Group Work Activity on Assembling and Disassembling a Structure
	
	Note to teacher: Below are two possible videos, select the more suitable video based on available resources:
	
	1. Video of How to Build a House using blocks of varying shapes and styles retrieved from: https://youtu.be/pX4ed3T4NXs (5.57 mins)
	
	or
	
	2. Video of How to Build a House using traditional building blocks retrieved from: https://youtu.be/1OYdGWosVGQ (6:42 mins)
	
	Part 1:
		Start with the analogy that letters make up words, words make up sentences, sentences make up paragraphs that make up books.
		
		Activity 1
		
		Students, here are 10 letters. I want you to use some or all of the letters to make one word of your choice. Write your word on the card provided and large enough that the class can see. Now hold up your word. Did you all write the same word? *(No)* As you can see, not all of you made the same word. Why didn't we all get the same word? (*because of the different possibility of combinations)*
		
		Activity 2: Building Block Activity
		
		Suggestion to teacher: be prepared to guide and support students in how to assemble

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies:
disassembled into their component parts. • Demonstrate an understanding that small pieces can be assembled to form larger structures. • Demonstrate an understanding that new objects can be formed from the pieces of a disassembled object/structure. • Explain how objects can be built up, torn down and reassembled using the same parts. • Account for any differences that they may observe between the disassembled object to the new object made from its pieces. • Account for the differences between the disassembled object and the new object made from its pieces. • Distinguish between the components of the disassembled object and the components of new objects. • State that matter is made up of combinations of smaller pieces (atoms) that can be combined in many different ways. **Skills** • Observe objects to determine the various parts they are made up of.	Students, watch this video on how to construct a model house using building blocks. Now use your building blocks to build a house. Your house does not have to be exactly the same but it must have walls, a window space, a door space and a roof. If possible, take a photo of the house you built and share it in the class chat/email/etc. Part 2: Disassemble the house and build one object that you pass one your way to school everyday. It could be a bridge; a tower; a vehicle, a church, etc. If possible, record a short video (1min) where you state the name of the model you built, tell us what you love about it and show us its features. Share the video with the teacher and classmates. Discuss with class how easy or difficult it was to assemble and disassemble the models. **Assessment 2** Build a structure using a colour scheme of your choosing. Shade each square below to show the colour scheme you wish to use. My colour scheme will be:  *(Students may work in groups or individually for this activity)*	building blocks or legos before starting the activity, if needed. Now here are ten blocks or legos: You have five minutes to **assemble** *(put together)* your choice of products. Did we get the same thing built? Can I take apart *(insert student's name and object)* (e.g. John's robot) and make *(insert student's name and object)* (e.g. Mary's house) with the same blocks? (*yes we can* **disassemble** *or take it apart*) Closure: So you're telling me that these same blocks can be used over and over to make different things? **Activity 3:** If I give you three sheets of newsprint, five strips of tape and ask you to build the tallest freestanding tower, What will group 1 build? What will group 2 build? What will group 3 build? Closure: Are you telling me that you will all build different towers to solve the same problem? You all have the same starting materials and you can make different products, but I could take them apart and make all new towers too! Is that right? *(yes)* Let's talk about examples in our world:

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies:
• Observe how an object made of a small set of pieces can be disassembled and made into a new object. • Manipulate an object made from a set of small pieces by disassembling it and assembling a new object. • Compare and contrast the characteristics of the original structure with the new structure made from the same materials in terms of its shape, properties, uses, etc. • Communicate to the class and teacher, the results from various investigations done on assembling, disassembling and reassembling different objects. • Interpret results obtained from various investigations done on assembling, disassembling and reassembling different objects. **Attitudes/Values** • Appreciate that some large objects are composed of smaller pieces which can be disassembled and then reassembled to make something new. • Appreciate that matter is composed of smaller particles called atoms, which	Discussion: comparing and contrasting the two structures based on properties such as the colour scheme used, the number and shape of blocks staying the same, however the shape of the structure and colour placement of the blocks may change. **Assessment 3- Group assessment of the building of a free standing tower and then a new object** **Materials:** • **3 sheets of newspaper** • **5 lengths of tape** **Instructions:** Assemble a free-standing tower using all of the materials provided. Take a picture of the tower and submit it to the teacher. Then disassemble the tower and use all of the same materials to assemble something new. Take a picture and submit it to the teacher. **Scaffolding Questions** • Was the tower completed? • Were all of the items given to students used up to make the tower? • A brief description of the tower given. • Was the tower dismantled? • Was a new object built? • Were all the pieces used to build the new object?	>Builders start with blocks, wood and nails and windows and doors and **assemble** all shapes of houses. >Moms and dads start with a refrigerator and cupboard of food and **assemble** so many different sandwiches (because our brothers and sisters like different combinations!) >Wheels and steel and glass are put together (**assembled)** to make so many different types of cars but they often start with the very same materials. Main Closure: Matter is very similar. It is made up of combinations of smaller pieces that can be combined in many different ways. We have very small building blocks of matter called **atoms.** Later you will learn how they can be put together in so many ways to make very helpful things for you and I to use. Students always remember the letters of the alphabet and how many words can be made from the same letters. In the same way, atoms can be assembled to make different types of matter.

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies:
act as building blocks for many other things. ● Show persistence in the assembling, disassembling and reassembling of different objects/structures. ● Use available evidence in determining how to assemble objects or assemble pieces to make new objects. ● Respect the environment and use resources wisely. ● When conducting practical work, help group members/ classmates who may have difficulty in manipulating different pieces. ● Develop interest and curiosity by conducting investigations to gather evidence. ● Use inquiry to investigate and solve problems related to assembling and disassembling of objects. ● Respect the evidence gathered through their investigations. ● Use their inventiveness to conceptualize and construct objects from small sets of pieces.	● Can the students give a brief description of the new object? ● Can the students give: ○ Two ways in which both the tower and new object are similar? ○ Two ways in which both the tower and new object are different? **Students' final challenge questions- Think Pair Share and report from the group** A. How are the blocks and the objects you built, similar to the letters of the alphabet and words and sentences we see in books? **(***we start with the same pieces and we can make many different things; with the alphabet we can make many different words and sentences***)** B. How is the matter around us similar to the object you built? (*we have so many different types of matter around us and they must all come from the same building blocks- starting materials)*	

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies:

• Follow all recommended safety protocols, including:
  ○ Wear safety goggles when conducting certain experiments.
  ○ Be careful when pulling objects apart or when putting pieces together to form new structures.
• Collaborate with classmates in assembling, disassembling and reassembling of different objects/structures.
• Participate actively in classroom discussions.		

Useful Content Knowledge for the Teacher about the Outcome*: (Links to professional sources that connect back to the Curriculum and Assessment Principles of Learning and Principles of Assessment)*

A great variety of objects are made by assembling a small number of pieces. Some objects are made by assembling different units/pieces, such as a pen, while others are made by assembling many of the same type of units/pieces, such as a fence. Many of these small units were themselves assembled from several materials. Some very good examples of this are the building of houses from blocks, which are made by combining sand and cement; matter which is made from atoms.

An object/structure made of parts can be taken apart or disassembled and the parts can be reassembled to form the original structure. In some instances, the parts can be rearranged to form new objects/structures. These new objects/structures may have different properties from the original structure/object. The new structure/object may be different in properties such as size and shape.

Each part of an object/structure has a purpose is the reason why something is made the way it is. Structures are built from a variety of materials that are suited for different purposes according to their properties such as their strength, flexibility, hardness, texture, resistance to heat, etc.

A variety of shapes can be identified in structures. These shapes include circles, arches, triangles, and rectangles. These shapes help to make the structures strong and functional.

Two objects or structures can have different characteristics even though they are made from the same set of parts.

Inclusive Resources and Materials From Regional Specialists *Use of multisensory activities and materials to assist all learners. (texts, family & community knowledge and resources, contextually relevant professional web resources)*

Building blocks
Newsprint
Tape

Additional Resources:

Access to watching video clips as a class

Opportunities for Subject Integration: ***(How the inclusive learning strategies might be adapted and/or applied to include other subjects in the curriculum)***

Mathematics:

- Use tools to measure the height and width of different structures.
- Count the number of pieces that make up a structure.
- Count the number of objects made from a given number of pieces.

Social Studies:

- Structures/objects used in different social gatherings or by different ethnic/religious groups that are made from many different parts.
- Structures/objects of historical/national importance.
- Many groups or institutions are made up of people with different roles (e.g., the family, church, government, etc).

Language Arts:

- Share observations and ideas with the class on the assembly, disassembly and reassembly of certain objects in the society such as tents.
- Lead a class discussion on the different parts that structures in the class/community are made from.

TVET:

- Many different small units, such as bricks, pieces of wood, etc. are used to make structures in many TVET fields.
- Different types of machines used in different areas, consist of smaller units assembled together.
- Use of different types of materials in constructing different structures.
- Many tools used in TVET have to be disassembled to be repaired.

Agriculture:

- Many different structures/equipment used in the agriculture industry, such as greenhouses, fences, hydroponic devices, etc. are made from many smaller components.
- Equipment used in agriculture have to assembled, disassembled and reassembled for use, repairs or transportation.

Health:

- Many objects that have been made to help in the diagnosis and treatment of health problems are made up of smaller units that can be disassembled and reassembled.
- Many types of medication come in packages assembled for their protection.
- Simple everyday objects that protect us from the weather are made from smaller components.

Elements from Local Culture:

- The design and components of different structures used by certain religious/ethnic groups.
- Objects such as blocks, fireside/coal pots, etc. that are built from local materials such as leaves and clay, sand, etc.
- The building of statues to commemorate certain important events.
- Artifacts of religious/historical importance, made of many different parts, help us to understand the tools and materials used by our ancestors.

Resources for a learner who is struggling: ***(Links to earlier learning activities for similar knowledge, links to resources for special education needs)***

Pictures/diagrams of different objects may be given to struggling learners to help students with the building of objects.

Resources for a learner who needs challenge: ***(Links to learning activities and resources in later grades)***

- Kits with more intricate pieces can be given to learners who need to be challenged.
- To challenge some learners, in activities where the class is given a certain number of pieces, they can be given additional pieces and asked to make more objects.

Strategies that Support the OECS Curriculum and Assessment Framework
Elements of the Essential Education Competencies that are addressed:

An educated person in the OECS will demonstrate they have:	**Where might this competency be promoted/developed in this learning outcome and associated lessons?**
Developed Citizenship Competencies	Use materials wisely when assembling smaller units to produce larger units. Repurpose materials that may be usually thrown out to make different objects. Apply safety protocols to protect oneself when one is involved in assembling, disassembling or reassembling materials.
Developed Critical Thinking and Ethical Communication Competencies	Able to advise persons on the best methods to safely and efficiently assemble, disassemble or reassemble materials, based on observations or available data.
Developed Well-being Competencies	Apply safety protocols to protect oneself when one is involved in assembling, disassembling or reassembling materials.
Developed Knowledge and Entrepreneurial Competencies	Able to advise persons on the best methods to safely and efficiently assemble, disassemble or reassemble materials.

	Make predictions on how the new products from reassembled units will look, perform, etc. Using one's knowledge of how smaller units with the appropriate tools to create large structures/objects. E.g. Safely assemble, disassemble and reassemble a variety of objects. Recycle items that are discarded to create new objects. Utilize materials resulting from disassembling different objects to make new objects.

Purpose of the Subject: The study of science encompasses knowledge, processes and values. Scientifically literate persons will foster an attitude of caring not only for themselves, but as responsible citizens, for the world around them. Their decision making will be enhanced by a systematic study of the structure and behavior of the physical and natural world through observation and experiment. In learning science, students benefit from leveraging and evaluating available technological tools to study and therefore understand the world and their relationship to it.
Topic or Strand: Structure and Properties of Matter
Essential Learning Outcome (ELO-4): Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot. *[Clarification Statement: Examples of reversible changes could include material such as water and butter at different temperatures. Examples of irreversible changes could include cooking an egg, freezing a plant leaf, and heating paper.]*
Grade Level Guidelines: Refer to grade level expectations at the beginning of this curriculum document.

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
Learners are expected to: **<u>Knowledge</u>** • Define the terms: o Wilt o Freeze o Kernel o Heating o Steam o Cooling o Reversible o Freezing o Melting • Compare substances before and after adding and/orremoving heat.	**Teacher to Make a Table of All New Words to Review** **The students will be asked to complete the following sentences with the correct word as the teacher reads the sentence** (*the teacher may choose to put the sentences on the board but be mindful of the learning styles and the level of reading in your class)***.** 1. After a very hot day, mother's favorite plant showed signs of blackened leaves and began to _____ (wilt). 2. When we put water in the cold part of the refrigerator, we expect it to _____ (freeze). 3. The opposite of heating is _____ (cooling) 4. Cooking an egg is an example of a _____(irreversible) change. 5. Accidently melting a crayon on the windowsill in the sun, is an example of a _____(reversible) change.	**Weather and the Danger to Plants** Farmers are always paying close attention to the weather. If their plants don't get rain or it is too hot, it may cause the leaves to **wilt** and dry up. In some parts of the world, the weather can suddenly turn cold and the leaves may **freeze** and again the plant may wilt and die. Students, look at this picture of a plant. Do you think if we add water and place this plant in the warm shade it will become green again**? (***no***,** *it looks too damaged***)**

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
• Account for why some processes are reversible and some are not. • Explain the effect of heating and cooling on substances. • Distinguish between a reversible and an irreversible change. • Become aware of the dangers of irreversible change for farming and the possible precautions a grower can take. • State that water can change from solid to liquid and from liquid to solid (ST-2-PS-MM-7). • Describe the conditions for state change of water (ST-2-PS-MM-8). • Identify with examples, physical change in everyday life E.g. water (ST-3-PS-MM-2). **Skills** • Practice the use of new vocabulary. • Observe the effect of adding and/ or removing heat from different substances.	**Recognizing Processes That Can Lead to Reversible and Irreversible Changes** Let us look at the following pictures. Can you identify _____? (a) cooling (b) melting (c) freezing (d) heating  Retrieved from: https://www.vectorstock.com/royalty-free-vector/empty-iron-frying-pan-on-high-heat-vector-28341376  Retrieved from: https://jamaicahospital.org/newsletter/tips-to-make-sure-the-ice-in-your-freezer-is-clean/	 **Retrieved from: https://www.evergreenti.com/how-do-you-tell-if-a-plant-is-dead/** It looks like the plant is dead. We can't change it back to a living plant. We would say that the change from a living plant to a dead plant is **irreversible.**

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
• Interpret the results of teacher demonstrations. Make hypothesis about findings. • Classify changes as reversible or irreversible. • Record their observations after heat is applied to different substances. • Communicate their ideas in discussions. • Predict the effects of heat on solids and liquids. **Attitudes/Values** • Demonstrate an awareness that irreversible changes in agriculture can be detrimental to humans. • Appreciate that reversible and irreversible changes from applying or removing heat takes place in our everyday life.	 Retrieved from: https://www.istockphoto.com/photo/preparing-food-gm464860664-58786602  Retrieved from: https://www.learningliftoff.com/are-sports-drinks-safe-for-kids/ **Before and After: Reversible or Irreversible?** Have students fill in the table after thinking about the following questions regarding these scenarios. They will engage in discussions with guided questions. Example: 1. Have the materials/ substances changed? 2. How have the materials/substances changed?	All over the world farmers watch their crops very carefully because they know that some damage is **irreversible.** Students, this is a picture of a banana plant (north of the Caribbean) that has suffered freezing damage that is irreversible. We know in Caribbean climates it is more likely plants like this will suffer from wind damage or lack of water. In each case the change is irreversible.  **Irreversible Changes** Students, today we are going to make popcorn. Before we begin, can anyone describe what we start with? (*yellowish shiny seed, not round*)

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
• Display Interest/Curiosity on the importance/use of heat in the home. • Engage in Inquiry to determine the effects of heat on substances. • Show respect for evidence collected from engaging in scientific inquiry. • Work cooperatively and collaboratively in groups. • Practice safety when applying heat to substances. • Display sensitivity and offer assistance to peers who may have physical or learning challenges when conducting practical and group work. • Participate actively in classroom discussions.	3. What was added to the materials/substances that changed? 4. Can you get the original materials/substances back? (could you change it back to its original state?) *Note: It is important that teachers distinguish between melted wax and burned wax. Melted wax when cooled gives you back the wax (reversible) whereas burned wax in a candle is a chemical change (irreversible) - the wax is the fuel that the wick draws towards the flame to burn. It is a common misconception that the wick is the only fuel except…where the wax go?*	Let us look at a piece of popcorn. We call it a **kernel** and it is a special type of seed. Let us draw a picture. If you know some words to help describe it, like color or size, lets label our picture of a kernel (*small, yellow, shiny)*  Retrieved from: https://en.wikipedia.org/wiki/Corn_kernel Students what do you think will happen when I put the kernels in a pan of hot oil (butter) and begin **heating** it? *(kernel explode)* If you have made popcorn before you know that the kernel changes. What will it look like after it is heated? (*puffy, fluffy, white*).

Before	After	Reversible or Irreversible?
Red & blue counters separated in rows	Red & blue counters mixed together in a cup	
A match & a piece of paper	A burned match and ashes from the burnt paper	
Wax & a hot bowl	Melted wax & a bowl	
Coins & a cup of sand separated	Coins & a cup of sand mixed together	
A raw egg & a hot frypan	A fried egg & a hot pan	
Flour, baking powder, sugar, salt	Baked cake	

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies

Candle wax & a match	Burned candle & a burned match	

Irreversible Changes in Our Communities

Local gardens and plants are important for feeding families and as a source of income for farmers.

Because lack or too much water and drastic changes in temperature can affect plants and cause **irreversible** damage the following task can act as an assignment in the community.

Students should be asked to approach family and local farmers to determine at least two ways that growers protect their plants against:

a) Changes in the amount of water available (too much or too little)
b) Changes in the amount of heat available (too hot or too cool)

(Examples they may determine: irrigation systems, covering plants , plants in the shade, providing drainage against flooding, protecting against erosion etc.)

Ok students, let us try heating the kernel. (if possible the teacher can make it in class otherwise a picture follows below)

Retrieved from: https://pixabay.com/photos/popcorn-movie-theater-meal-white-1198274/

Let us draw another picture of the kernel after it is heated. Add some label words to your picture that describe what it now looks like.

Note: Teacher may choose to use a T Diagram for the before and after of this process. See: a graphic organizer here: https://k12alliance.org/earlyimplementers/Grade2/mat/2.4.R2.pdf

Can you guess why the kernel changed to a fluffy piece of popcorn? It happens because there is small amount of water inside the kernel and when we heat the kernel to a high temperature, the water wants to escape so it breaks the shell of the kernel and makes a puffy piece of popcorn!

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
		That is why we see hot **steam** leave the kernel,; it is a different form of water. Especially in microwave popcorn we have to be very careful opening the bag as the steam (escaping water) can burn us! `` I have a question for you to think about students. >>>Can we get the popped corn back to its original form as a kernel of corn (a seed)? (*no*) We say that changing the corn from kernel to popped corn is an **irreversible** process. Other examples of irreversible changes. Ask students to watch for at least two other examples in the video. See: https://www.youtube.com/watch?v=bHlP1lRc0Tg (1:10 mins) **Reversible Processes** **Teacher Demonstration (as a prop, during the demonstration, show a container of frozen water and an identical container of liquid water)** Students if I put water in plastic container and place it in the freezer part of the refrigerator, I will be **cooling** it. What will it look like if I leave it in there overnight? (*it will be a block of ice*)

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
		If I take out the container of frozen ice and leave it on the tabletop, what will happen after a few hors? (*It will begin to melt*). And what will it look after a whole day? (*it will be a container of water again*). When the water changes from ice to liquid water we say that it is **melting**. See: Time lapse video of ice melting. https://www.youtube.com/watch?v=FYgiZ7KzgDk (0:44 mins) When a process gives us back what we started with, we say that it is **reversible.** Remember we couldn't get the popcorn kernel back again, the popping process was **irreversible**. Another demonstration: Salt Solution The teacher takes a handful of salt and shows it to children. They might also show an enlarged picture so that they can observe the crystalline structure. Now the teacher adds the salt to 20 mLs of water and stirs it until it dissolves. Students, how did the salt change? (*it disappeared into the water*). We call this salt and water combination a **solution.** Now students, I am going to pour this solution into a pan and heat up the pan. We can see that the water is bubbling and seems to be disappearing. I think it got lots of energy to jump into the air! Let us look at what is left in the pan.

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
		If we look closely, we can see those same salt crystals. We would say that this process is **reversible** because we got back exactly what we started with! **Crystals on A String** Note: a very popular science project involves making crystals on a string. Teachers may decide this would be an interesting activity for their students. See: Time lapse video of ice melting. https://www.youtube.com/watch?v=FYgiZ7KzgDk **Can Students Tell the Difference Between Reversible and Irreversible**: **Review Activities** • PowerPoint® to distinguish between reversible and irreversible changes. Retrieved from:https://www.slideshare.net/DrSarahAyoub/4-ppt-reversible-and-irreversible-change • Students will be given various claims about the effect of heat on a number of materials /substances. such as heating ice, melting butter, and melting chocolate. They will be asked to orally agree or disagree with each claim and provide evidence to support their position. Accompanying worksheet here: https://k12alliance.org/earlyimplementers/Grade2/mat/2.4.G1.pdf

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
		• This video reviews the processes of heating and cooling as they relate to reversible and irreversible processes. https://youtu.be/Djx8RrYhLh0 (6:46 mins)

Useful Content Knowledge for the Teacher about the Outcome*: (Links to professional sources that connect back to the Curriculum and Assessment Principles of Learning and Principles of Assessment)*

Definitions of Key Terms

- Heat is a form of energy.
- Heat flows from hot objects to cool objects.
- It flows because of a difference in temperature.
- The cool object absorbs the energy and becomes warmer.
- Cooling is a process of removing heat.
- It results in the objects having a lower temperature.
- A solid is an object or material that has a fixed shape and volume.
- This means that they do not change their shape to fill the container that they are placed in.
- Liquids do not have a fixed shape.
- They take the shape of the container that they are placed in.
- Gases do not have a fixed shape or volume.
- They take the shape of the container that they are placed in.
- Freezing is the process of a liquid turning to a solid- example liquid water to ice.
- Melting is the process where a solid becomes a liquid when heat is added- example butter melting when placed in a hot pan.
- Temperature is how hot or cold a substance or place is.

- Anything that can be changed back is called reversible.

- A reversible change happens when no new materials have been created.
- With reversible changes, there are no new materials added.
- Some examples of reversible changes include: ice changing to liquid water, a chocolate bar turning to liquid chocolate, a sheet of paper cut into small pieces.
- In each example, no new material/substance is made.
- Any object that cannot be changed to its original state is called irreversible change.
- Irreversible changes happen when a new substance or material is created.
- The original material or substance cannot be obtained from the new item.
- Some examples include: baking a cake, frying an egg, making jam, burning paper, making charcoal.
- When some materials are cooled they also go through reversible changes: ice to water, freezing melted chocolate.
- When heat is added to materials/objects, they can go through a reversible or irreversible change.
- Some substances expand (get bigger) when they are heated while others contract (get smaller).
- There may also be a change in the colour of the substance and the amount of the substance (volume).

- We must always ensure that we are safe when adding heat to any material.
- This should not be done without the help of an adult.
- Wear protective gear and maintain safe distances.
- Use the correct tools for working with heating appliances and handling hot items.
- DO NOT PLAY with FIRE!

Inclusive Resources and Materials From Regional Specialists *Use of multisensory activities and materials to assist all learners. (texts, family & community knowledge and resources, contextually relevant professional web resources)*

Popcorn, pot, oil or butter
Water, plastic glass or ice cube tray, access to refrigerator
Salt, water, pot or frypan

Additional Resources:

Worksheet Resources for Practice and Assessment in Distinguishing Reversible and Irreversible Processes

1. https://www.liveworksheets.com/al1169137gz
2. https://www.greatschools.org/library/cms/29/25629.pdf
3. https://www.k5learning.com/worksheets/science/grade-2-reversible-changes-a.pdf
4. https://www.liveworksheets.com/fi308683dq
5. https://www.liveworksheets.com/zn1466687gh

6. https://www.bbc.co.uk/bitesize/topics/zjty4wx/articles/zk9mt39

Examples distinguishing changes
https://www.embibe.com/exams/reversible-and-irreversible-changes/

Simulation on reversible and irreversible changes
https://www.sciencekids.co.nz/gamesactivities/reversiblechanges.html

Opportunities for Subject Integration: ***(How the inclusive learning strategies might be adapted and/or applied to include other subjects in the curriculum)***

Mathematics:

- Reading and writing time.
- Recording the time it will take for different substances to melt e.g. ice, popsicle, ice cream (comparing times/calculating difference/total time).

Social Studies:

- Respecting others' opinions when working in groups.
- Impacts of irreversible changes on agriculture.

Language Arts:

- Sequencing activities with pictures - Steps in preparing fried eggs, baking a cake (Writing steps explaining the process).
- Oral presentations explaining the changes depicted on charts or posters done by students in groups or individually.
- Reading and Comprehension .
- Cause and effect.

Agriculture:

- Dangers of irreversible changes.
- Identify the local materials used in manufacturing (cocoa, fruits, cassava, coconut, peppers).

Health: Safety at home -

- Identifying risks and hazards at home when heating or boiling substances/materials.
- Identifying personal safety measures that can be observed at home when cooking (boiling and heating materials/substances).
- Benefits/Advantages of cooking/ heating/ boiling.

Art and Craft:

- Drawing and designing charts/posters depicting examples of reversible and irreversible changes. Example water to ice.

Elements from Local Culture:

- Farming practices to protect plants form irreversible change
- making coconut oil
- baking local bread
- making charcoal
- farine and avocado pear
- bamboo bursting
- making jam with local fruits
- burning sugar to make colouring
- making chocolate
- curing of meats
- making ice lollies and icicles
- Making madungo bakes
- making baskets/hats from dried grass/plant parts or making ropes for vines
- Making local coconut sugar cakes, local leather from cow skin, roasting breadfruit, boiling arrowroot starch to use as a glue

Resources for a learner who is struggling: ***(Links to earlier learning activities for similar knowledge, links to resources for special education needs)***
https://www.k5learning.com/worksheets/science/grade-2-reversible-changes-a.pdf
https://www.liveworksheets.com/dh528302uv
https://www.liveworksheets.com/zn1466687gh

Resources for a learner who needs challenge: ***(Links to learning activities and resources in later grades)***

Story on Heating, Cooling and Changes
The students will read the story and discuss the changes described. The students will pick out the changes caused by cooling and heating and state whether they are reversible or irreversible. Link to a story: https://www.youtube.com/watch?v=U-IvdvYrdxM (3:35 mins)
The students can then be asked to write their own story that includes examples of reversible and irreversible changes:
https://www.greatschools.org/library/cms/12/25812.pdf

Complete a table with their own examples of reversible and irreversible changes that take place with materials around them (Five examples of each).

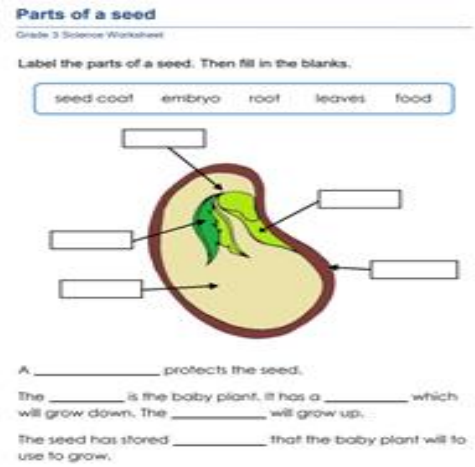
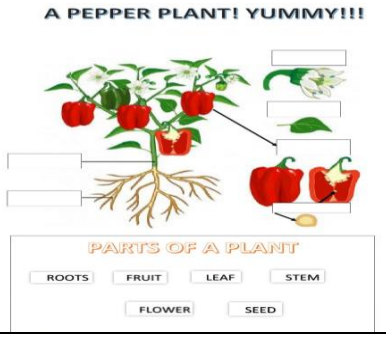
Strategies that Support the OECS Curriculum and Assessment Framework **Elements of the Essential Education Competencies that are addressed:**	
An educated person in the OECS will demonstrate they have::	**Where might this competency be promoted/developed in this learning outcome and associated lessons?**
Developed Citizenship Competencies	Making the connection between elements to local culture and the useful understanding of how those changes are important to our daily lives. Continue to produce some of our local items for consumption or sale (Preserve the rich history and culture of the region). Local precautions against irreversible damage in agriculture.
Developed Critical Thinking and Ethical Communication Competencies	Make inferences from data gathered during the experiments.
Developed Well-being Competencies	Ensuring safety when experimenting or investigating changes in materials.
Developed Knowledge and Entrepreneurial Competencies	Heating and cooling are used in transforming local materials in many production processes of our manufacturing industries. (jams, jellies, breads, juices, oils, cassava).

Interdependent Relationships in Ecosystems

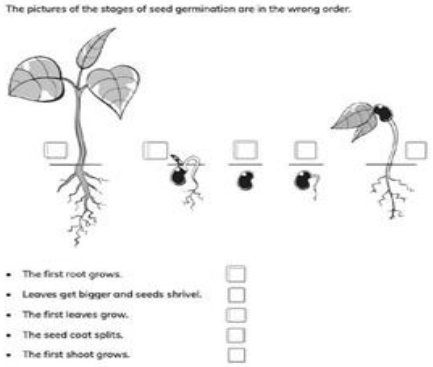
Purpose of the Subject: The study of science encompasses knowledge, processes and values. Scientifically literate persons will foster an attitude of caring not only for themselves, but as responsible citizens, for the world around them. Their decision making will be enhanced by a systematic study of the structure and behavior of the physical and natural world through observation and experiment. In learning science, students benefit from leveraging and evaluating available technological tools to study and therefore understand the world and their relationship to it.
Topic or Strand: Interdependent Relationships in Ecosystems
Essential Learning Outcome (ELO-1): Plan and conduct an investigation to determine if plants need sunlight and water to grow. [*Assessment Boundary: Assessment is limited to testing one variable at a time.]*
Grade Level Guidelines: Refer to grade level expectations at the beginning of this curriculum document.

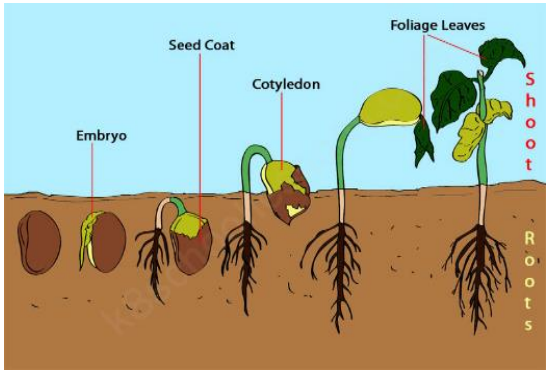
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **Knowledge** ● Define the terms: ○ Plant ○ Optimum ○ Leaf ○ Root ○ Flower ○ Stem ○ Seed ○ Embryo ○ Seed coat ○ Cotyledon ○ Function ○ Growth ○ Germination ○ Stages/Phases	**1. Naming the different parts of the seed** **Drawing/ labelling parts of a seed** **Worksheets**	**How Can We Grow the Healthiest Plant?** The farmer down the road wants to grow the tastiest beans in the community and needs to prepare them to sell at the market as quickly as possible. Our class is going to investigate plants and advise the farmer on the best approach to grow the beans! What do you need to grow as human? (*food, water, fresh air, sunshine*) Students you have seen many plants grown in pots and in fields so you can tell me what they need to grow also *(food-nutrients, water and/or rain, and sunshine).* In particular, the farmer is concerned with the "optimum" amount of water and sunlight. **Optimum** is a new word

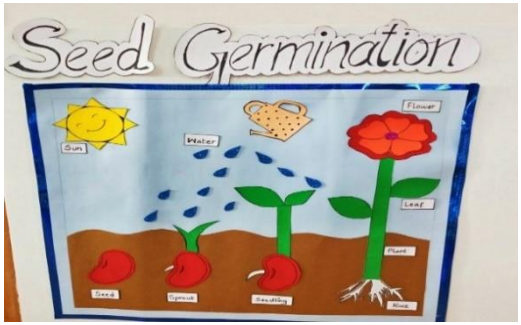
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
○ Controlled Experiment • Give examples of parts of plants that we eat. • Account for why it is important to know how to nurture the growth of plants. • Use humans as a comparison to plants in terms of fundamental needs (water, nutrition, fresh air). • Name the different parts of the seed (embryo, seed coat, cotyledon). • Explain the functions of the different parts of the seed. • Explain how to design a controlled experiment. • Explain why a controlled experiment is necessary.	https://www.liveworksheets.com/ag1485763mc  https://www.liveworksheets.com/qp1902867hd	that means the ***best***. Let me use it in a sentence for you so you understand it better. We are told that 6 -8 glasses of water is the optimum amount of water for a healthy diet. This means for good health, the ***best*** amount of water is 6-8 glasses. So we are going to help the farmer understand the optimum amount of water and sunlight Students. In order to design the best experiments to advise the farmer, we need to know much more about the parts of a plant and how growth actually happens. So let us do some background research. **Plants Parts We Eat** Fruits and vegetables are an important part of a healthy balanced diet. Farmers work very hard to grow plants that we can eat. What fruits and vegetables do you eat? (*make a list on the chalk board*). We sometimes eat different parts of a plant. A cabbage or lettuce plant provides us with a **leaf** to eat. A yam grows in the ground. It takes water and nutrients from the soil. The part of the yam in the soil that we eat is a **root**. A melon or mango plant develops a **flower** that grows into a fruit that we can eat. What part of a cane plant do we eat? If we squeeze the **stem** of that plant we can get sugar from it. Have you ever seen a sunflower? The center of the flower has many **seeds** that eventually dry out and fall to the ground to grow another plant. The birds and humans can eat these nutritious seeds.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
• Account for differences in the rate of growth of plants under varying conditions. • Identify and name different kinds of plants (ST-2-LS-DC-7). • List different uses of leaves in everyday life (ST-2-LS-DC-8). • Identify and appreciate caring for plants and animals and their environment (ST-2-LS-ECS-4). • Outline and explain the process of germination (ST-2-LS-ECS-7). • Identify and name the main conditions necessary for seed growth (ST-2-LS-ECS-8). • Name, draw and label the main external parts of a plant (ST-2-LS-SF-1).	**2. Parts of a seed and function of the parts**  Parts of a seed Grade 3 Science Worksheet Label the parts of a seed. Then fill in the blanks. seed coat embryo root leaves food A _____ protects the seed. The _____ is the baby plant. It has a _____ which will grow down. The _____ will grow up. The seed has stored _____ that the baby plant will to use to grow. **https://www.k5learning.com/worksheets/science/grade-3-plant-parts-c.pdf** **3. Conditions necessary for germination**	 Retrieved from: Microsoft® stock photos. **Reviewing the Parts of a Plant** Students, in order to grow plants for food, we need to understand the parts of a plant and how we can best help those parts to work together with the proper care to grow. Students look at the diagram of a plant **OR** Let's go outside to observe a plant *(Ensure the chosen plant has fruits)*.  A PEPPER PLANT! YUMMY!!! PARTS OF A PLANT ROOTS FRUIT LEAF STEM FLOWER SEED

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
• Describe the process of germination in plants, outlining the factors that are necessary for the process to occur (ST-3-LS-DC-7). • Describe the physical features of the parts of a plant, relating these features to their functions (ST-3-LS-SF-1). **Skills** • Compare the growth of plants under different conditions. • Construct drawings of the different seeds during the germination process. • Place the sequence of germination stages in the correct order. • Observe the different stages of plant growth.	Saying and dramatizing the poem "The Little Plant". **The Little Plant** **by Kate L. Brown** In the heart of a seed, Buried deep, so deep, A dear little plant Lay fast asleep! "Wake!" said the sunshine, "And creep to the light!" "Wake!" said the voice Of the raindrop bright. The little plant heard And it rose to see What the wonderful Outside world might be. **Answering questions based on poem** • Discussing and answering questions based on the poem using the jig-saw grouping (6 persons per group). • What is the poem about? • Where was the little plant sleeping? • What are two things the little plant needed to grow?	Link to plant diagram: https://www.liveworksheets.com/dp280500gh What is the name of the part of the plant that I will point out? The Teacher points to the different plant parts (*root, stem, leaf, flower, seed, fruit*). As I call your name you will come up and place the labels in the correct position on the chart or the live plant. Which part of this plant has **seeds**? (*the fruit*) Can you name some fruits that have seeds? *(Mango, apples, cherry, guava etc.)* **Function of the Parts of a Plant** Students we will learn much more about how a plant grows but let us talk about the way the parts of the plant work together. The **leaves** collect sunlight. The **roots** collect water and food from the soil. The **stem** helps move the water and food to the rest of the plant. The **seeds** can be spread out in different ways to grow new plants. Have you ever wondered what inside a seed looks like? Let's observe some seeds! **Identifying, Naming and Drawing the Parts of a Seed**

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
• Infer that sunlight and water are needed for plants to grow. • Measure plant growth over a period of time. • Communicate results of investigations in a variety of ways. • Predict the effect of sunlight and water on the growth rate of plants. • Construct simple diagrams and charts to present findings. • Calculate growth rate of plants under varying conditions. • Investigate whether sunlight and water are necessary for plant growth. • Graph data on plant growth.	• How was the little plant able to see the wonderful world outside the seed**?** • **How do you think the little plant felt? Give a reason for your answer.** **4. <u>Stages of germination</u>**  2 The pictures of the stages of seed germination are in the wrong order. • The first root grows. • Leaves get bigger and seeds shrivel. • The first leaves grow. • The seed coat splits. • The first shoot grows. <u>https://www.liveworksheets.com/hy2369022xx</u>	Students will be given a few beans to soak the day before in a plastic cup. Students go to the science corner and get the plastic cup with the beans that you soaked the day before. Take it back to your desk. In your groups remove the beans from the cup and place it on the tray in front of you. Each student takes one bean and places it on the tissue in front of you. Do you know the parts of a seed? Each bean will have three distinct parts: • The seed coat • The embryo • The cotyledon We will be examining bean seeds with our hand lens Observe as I demonstrate to you how to dissect a bean. 1. Remove the seed coat 2. Use a plastic knife or butter knife to separate the two halves of the bean. Use a magnifying glass to explore all the pieces of the beans up close. Draw and name the parts of the seeds. You may colour the parts of the seed. OR

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
• Interpret data tables and graphs with data on plant growth. **Attitudes/Values** • Be aware that farming is an important means to secure our food and this is a vital industry for our countries. • Appreciate that sunlight and water are conditions necessary for plant growth. • Display Interest/Curiosity for what is needed for plants to grow well. • Develop a positive attitude for engaging in inquiry. • Demonstrate respect for evidence by conducting experiments in a systematic and timely manner.	 Retrieved from: https://k8schoollessons.com/germination/ 5. Students will create a poster illustrating seed germination. This will be graded using a R***ubric***. Factual Information 5 marks Neatness of Presentation 5 marks Correct Spelling and Grammar 5 marks Sample:	Today we will use playdough to help us identify the parts of a seed. We will use different colour playdough to make each part  You will see these parts in other seeds apart from the bean seed. For review the teacher may use the following video of the parts of the seed**.** https://www.youtube.com/watch?v=qZ49t8S2dWo (0:52 mins) For our next class you will bring in different seeds that we can observe to identify their parts such as mango, grapefruit, tamarind and avocado. **Functions of the different parts of a seed** The seed has different parts. These parts are very important to the seed. We say that each part of a seed has a **function.** Think about your teeth. They are used for

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
• Work collaboratively & cooperatively to carry out scientific investigations. • Show respect for living things by caring plants around. • Display sensitivity and offer assistance to peers who may have physical or learning challenges when conducting practical and group work. • Participate actively in classroom discussions.	 **The Plant's Need for Sunshine and Water** Students we have done experiments that show that sunshine and water are important to plant growth. In fact, we have done controlled experiments to determine the optimum amount of sunshine and water for plant growth. I have a few questions I need you to answer for me about your experience doing this science. In groups (think, pair, share) I want you to think back to our experiments and 1) tell me what is meant by a controlled experiment? (*one variable changes, all others remain the same; e.g., same seed, same water, same pot, same measure-change sunshine)* 2) tell me what is meant by the word optimum and use it in a sentence as you explain it	chewing. We would say that chewing is a purpose or **function** of your teeth**.** In the same way, each part of the seed has a function. Do you remember the parts of the seed? **Let us watch a video to observe the different parts of a seed.** Each part of a seed has a function. As you watch this video, I want you to pay attention to the function of each part of the seed. Write down a word or two that helps you remember the function of the coat: the embryo: the cotyledon (*put these three words on the chalkboard).* **Video parts of a seed and functions of each part** https://www.youtube.com/watch?v=2mYdqm1ePz8 (1:27 mins) Let's discuss what you noticed and review the function of the seed parts. What is the function of the seed coat? **The seed coat is the protective coat of a seed. It covers the inside part of a seed.)** What is the function of the embryo? **(To ensure that the plant has everything it needs. It senses whether the right conditions needed for growth are available.)** What is the function of the cotyledons? **(It is the place which stores food for the developing seedling.)**

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	(*optimum means best- the optimum glasses of water for a balanced diet is 6-8 per day*). 3) tell me how you might design a controlled experiment to see what types of soil are best for growing bean plants (*3 types of soil, same seed at the same depth, same amount of water, same amount of sunshine, same measure of growth*).	**<u>Stages of Germination</u>** In order to grow from a seed to a plant, a special set of conditions are needed that allow the seed to start. This beginning of the seed growth is called **germination.** Students, tell me some different seeds you would have seen before (*house plants, garden plants etc.*). Sometimes seeds look like little pebbles and we might think they are actually not alive but something magical happens when we put them in soil and provide heat and water. They begin a series of steps that allow them to become a living plant. (Note: opportunity to briefly talk about living and non-living things here). Have you seen a plant grow from a seed? (***Yes/no***) Was it a complete plant from the start? (***No***) What came out first from the seed? How did it grow? As you watch this video students, consider the different steps of germination. Sometimes we call steps **stages** or **phases**. An example of those words in a sentence. From childhood to becoming an adult we go through different stages or phases. We start as a baby, then become a toddler, a young child, a teenager, young adult and adult) These are all stages or phases of our development as humans. I will stop the video at different places so you can draw a picture of the stage or phase in your journal. See: <u>https://www.youtube.com/watch?v=w77zPAtVTuI</u> (3:09 mins)

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		 Day 2  Day 7  Day 10  Day 23  Day 25

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Let us now review what you saw. We can grow our own bean and use our journals to track the phases. We will observe **germination** in a bean plant. We will need: (a) a cup (transparent or translucent) (b) some beans (c) tissue (d) water **Effect of Water on Plant Growth** Students will be engaged in a controlled experiment: The same seeds will be added to 5 of the same containers at the same depth in the same soil. The containers will then all be placed in a location with the same amount of sunlight each day. The first container will have 5 mL of water added each day. The successive containers will have 10, 20, 25 & 30 mLs added each day. The plant growth will be measured using a cm ruler along the stem. Students will record the length of the stem in their notebooks along with a drawn picture and a description of the plant after 1 week, 2 weeks, 3 weeks & 4 weeks. With the teacher's help, the plant growth will be plotted in a graph of length (cm) versus time (weeks) for each volume of water. Students will report after 4 weeks which amount of water seems to be the optimum amount for plant growth.

<table>
<tr><th>Specific Curriculum Outcomes</th><th>Inclusive Assessment Strategies</th><th>Inclusive Learning Strategies</th></tr>
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Teacher Notes:

- the teacher could also decide to measure the width of a leaf rather than the height as long as the same measure is used for all plants.
- for reliability, the student group measures could be averaged so that through the class you wee getting multiple trials; a standard approach to science experiments.
- The teacher could use the averaging of group results to make a cumulative class graph to interpret.
- The table below could be used for a class record or for individual groups.

Table for the Experiment

<table>
<tr><td rowspan="2">Water volume added (mL)</td><td colspan="4">Measure of Stem at each week (cm)</td></tr>
<tr><td>1</td><td>2</td><td>3</td><td>4</td></tr>
<tr><td>5</td><td></td><td></td><td></td><td></td></tr>
<tr><td>10</td><td></td><td></td><td></td><td></td></tr>
<tr><td>20</td><td></td><td></td><td></td><td></td></tr>
<tr><td>25</td><td></td><td></td><td></td><td></td></tr>
<tr><td>30</td><td></td><td></td><td></td><td></td></tr>
</table>

Teacher Notes:

- **It is most important that the teacher discuss with students a systematic interpretation of the data table.**

</td></tr>
</table>

<table>
<tr><th>Specific Curriculum Outcomes</th><th>Inclusive Assessment Strategies</th><th>Inclusive Learning Strategies</th></tr>
<tr><td></td><td></td><td>

- **The teacher may decide to do all the graphing (as a class activity) and explain how the graphs give us the optimum values.**

The Effect of Sunlight on Plant Growth

Students will be engaged in a controlled experiment: The same seeds will be added to 5 of the same containers at the same depth in the same soil. The containers will have 20 mL of water added each day for 4 weeks. The containers will then all be placed in a location with sunlight for 30 min, 60 min, 90 min, 120 min & 150 min respectively. The plant growth will be measured using a cm ruler along the stem. Students will record the length of the stem in their notebooks along with a drawn picture and a description of the plant after 1 week, 2 weeks, 3 weeks & 4 weeks. With the teacher's help, the plant growth will be plotted in a graph of length (cm) versus time (weeks) for each amount of sunlight. Students will report after 4 weeks which amount of sunlight seems to be the **optimum** amount for plant growth.

Table for the Experiment

<table>
<tr><td rowspan="2">Time in the Sunlight (mins)</td><td colspan="4">Measure of Stem at each week (cm)</td></tr>
<tr><td>1</td><td>2</td><td>3</td><td>4</td></tr>
<tr><td>30</td><td></td><td></td><td></td><td></td></tr>
<tr><td>60</td><td></td><td></td><td></td><td></td></tr>
<tr><td>90</td><td></td><td></td><td></td><td></td></tr>
<tr><td>120</td><td></td><td></td><td></td><td></td></tr>
<tr><td>150</td><td></td><td></td><td></td><td></td></tr>
</table>

</td></tr>
</table>

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Teacher Notes: • It is most important that the teacher discuss with students a systematic interpretation of the data table. • The teacher may decide to do all the graphing (as a class activity) and explain how the graphs give us the optimum values. *Closure*: So students, as a class, what have we learned from our experiments that we can report to the farmer to help them with growing the best beans the fastest? • The best (optimum) amount of water to add to our plants is _____ mL • The best (optimum) amount of sunlight for our plants is _____mins. **Extension Experiment: What About Adding Other Liquids to Plants?** If time permits, the teacher may decide to explore the effect of adding other liquids to plants in a controlled experiment. ***This could be a simulation of pollutants that prevent plants from growing properly***. 1. Label five containers "water/control", "milk", "juice", "Cola" and "sports drink". 2. Fill each container with the same amount of soil. 3. Plant the same seeds in each.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		4. Measure out equal volumes of water, milk, juice, Cola and the Sports drink and pour on each plant based on the correct label. 5. Place the plants in a warm sunny place outdoors or on a windowsill. 6. Repeat step 5 every other day. 7. Record the growth of the plant by measuring the stem. Retrieved from : https://www.education.com/science-fair/article/watering-plants/#:~:text=Experimental%20Procedure%3A&text=Fill%20the%20containers%20with%20potting,in%20the%20%E2%80%9CMilk%E2%80%9D%20container.

Height (cm)	water	milk	juice	Cola	Sports drink
Day 1					
Day 2					
Day 3					
Day 4					

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Closure So students, what have learned about the effect of adding other liquids to plants to promote growth? Which of the liquids made the plant grow the most? _____ Which of the liquids made the plant grow the least? _____ **Gardening in the Community: Visit to a School Garden** Visit to the school or community garden for a presentation by the caretaker on caring for plants. **A Review Song: A Tiny Seed Was Sleeping** https://www.youtube.com/watch?v=IAzo7ZgipH0 (2:32 mns) (can be sang as a class or in groups e'g boys and girls)

Useful Content Knowledge for the Teacher about the Outcome*: (Links to professional sources that connect back to the Curriculum and Assessment Principles of Learning and Principles of Assessment)*

Definitions of key terms

1. **Plant - living things that make their own food.**
2. **Growth - an increase in size. Living things, like plants, grow in many different ways.**
3. **Germination - the process by which seeds begin to grow into plants.**
4. **Photosynthesis - this is the process through which green plants use sunlight to make food.**
5. **Seed - it is a part of the plant that can make another similar plant.**
6. **Embryo - a young developing plant inside of the seed.**
7. **Seed coat - the seed coat is the protective coat of a seed. It covers the inside part of a seed.**
8. **Cotyledon - this is the leaf within the embryo of a seed. It is the place which stores food for the developing seedling.**

Plants grow under many different conditions. Plants are living things that make their own food. Plants have roots, a stem, branches and leaves. Plants use a process called photosynthesis to turn sunlight or light energy into food. This happens in their leaves. They use this food to grow.

The seed is very important in the growth of plants. It has three main parts. They are the seed coat, the embryo, and the cotyledon.

Plants grow under different conditions however, most plants need light energy, which they get from the sun, water and minerals. All of those make it possible for them to make their own food.
Most plants grow from a seed.
Inside the seed is an embryo.
This is the part from which a young plant develops/grows.
The seed absorbs water and eventually the seed coat bursts open.
Roots begin to grow downwards to make the plant more stable.
The shoot grows above the ground and straightens up towards the light.

Some plants can grow without light, but for a short period of time.
Those plants can begin growing without light but will die if they get no light at all after some time.

Inclusive Resources and Materials From Regional Specialists *Use of multisensory activities and materials to assist all learners. (texts, family & community knowledge and resources, contextually relevant professional web resources)*

If a sandwich bag and a wet paper towel are taped to the back of this house with a window, students can watch their inserted bean sprout grow on the classroom wall.

Retrieved from: https://www.teacherspayteachers.com/Product/My-Little-Sprout-House-Printable-1218023

Watch it Grow: Backyard Life Cycles by Barbara Reid (Scholastic Books)

Additional Resources:
Video illustrating parts of a seed, function of various parts of a seed, conditions required for germination and the stages of germination
https://www.youtube.com/watch?v=TE6xptjgNR0 (5:04 mins)
Seed Germination
https://www.youtube.com/watch?v=dxtbSGyhxQ4(7:05 mins)
Germination Content and Quiz
https://k8schoollessons.com/germination/
The Lucky Seed Story and Activities
https://www.e-thaksalawa.moe.gov.lk/moodle/pluginfile.php/31285/mod_resource/content/1/The%20lucky%20seed%20-%20Story.pdf
https://learnenglishkids.britishcouncil.org/listen-watch/short-stories/lucky-seed

Listen to a read aloud from the book entitled We Plant a Seed.

https://www.youtube.com/watch?v=zxl6Kiy7NPI (3:23 mins)

Sprouting seeds and transplanting
https://www.youtube.com/watch?v=zEOfdGaO5r8 (3:07 mins)

Opportunities for Subject Integration: ***(How the inclusive learning strategies might be adapted and/or applied to include other subjects in the curriculum)***

Mathematics:

- Finding the difference in length (shoot) of two plants (measurement).
- Seriation : Placing things in order (the sequence of germination).
- Constructing various graphs such as bar graphs and pictographs depicting plant growth.
- Calculating the number of days seed(s) took to grow.

Social Studies:

- Identifying plants found in their community and country.

- Why is farming important to our community?
- How does runoff from fertilizers affect our waterways?
- (Industries) Tracing a product to its original source example: sugar is made from sugar cane, tomato paste from tomatoes etc.

Language Arts:

- Sequencing-
  Students will arrange pictures and sentences in the correct order to show plant growth from a seed to an adult plant.
  https://www.liveworksheets.com/dy2123352fv.
  Matching pictures depicting the stages of germination to correct sentences and vice versa.
- Imagining being a seed and describing what is happening to you as you grow into a young plant.

TVET:
Agriculture

- Technology - The use of the greenhouse to help plants grow.
- The uses of plants.
- Identifying and naming different seeds. Identifying and stating various products made from these seeds. Example coconuts (oil, soap)

Health:

- Healthy eating habits. The importance of plants in our diet.
- Identifying various nutritious dishes that can be made using plants/seeds.

Elements from Local Culture:

- The best time of the year to grow certain plants (dry or wet season).
- The moon is monitored to know when to grow certain crops.
- Foods grown locally are better than imported ones because they are more natural.
- Some plants grow well in swampy areas (e.g. watercress/dasheen/eddoes) while some require less water to grow (e.g. cacti).
- (Some plants grow tall/short, short plants can grow long/leggy if they do not get enough light) too much water can make some plants not sweet (eg. if waxapple/waterapple gets too much it is not as sweet, as when it bears fruit in dry season).

Resources for a learner who is struggling: ***(Links to earlier learning activities for similar knowledge, links to resources for special education needs)***
https://www.liveworksheets.com/gy453207hl
https://leara-elearning.com/projects/nutrien/survivor_soak/

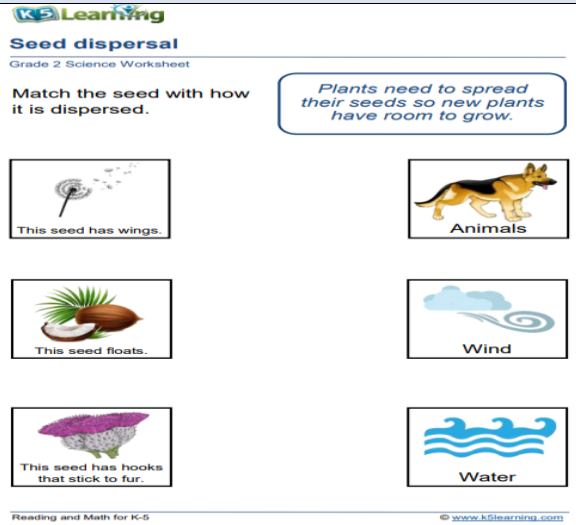
Resources for a learner who needs challenge: ***(Links to learning activities and resources in later grades)*** **https://www.liveworksheets.com/rt990342cx** **https://www.liveworksheets.com/vg2700975st**
Strategies that Support the OECS Curriculum and Assessment Framework **Elements of the Essential Education Competencies that are addressed**

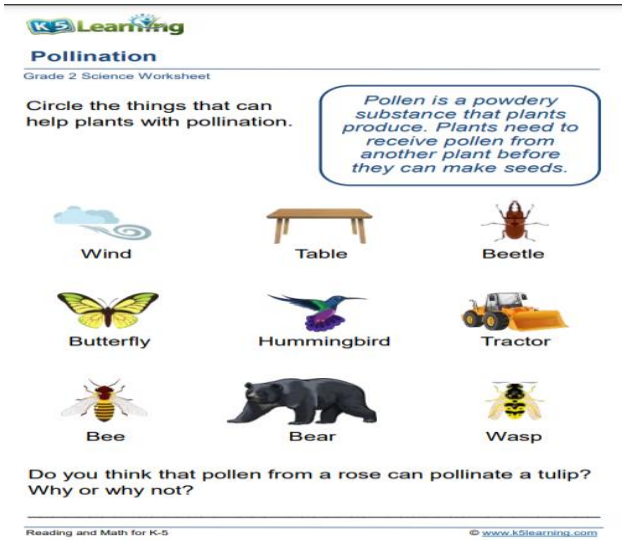
An educated person in the OECS will demonstrate they have::	**Where might this competency be promoted/developed in this learning outcome and associated lessons?**
Developed Citizenship Competencies	Knowledge of what is needed for plants to grow will contribute to a society where its citizens show more appreciation for growing food, providing assistance to farmers and preserving and protecting soil to aid in effective food production.
Developed Critical Thinking and Ethical Communication Competencies	Offer responses for questions that require critical thinking at the Grade Two level: "what do you think will happen?", "What if the plant got no sunlight, would it still grow?"
Developed Well-being Competencies	Eating foods from a variety of sources understanding that they all provide different nutrients needed by the body.
Developed Knowledge and Entrepreneurial Competencies	Understand the value of farmers in a society. Aspire to participate in food production on any level.

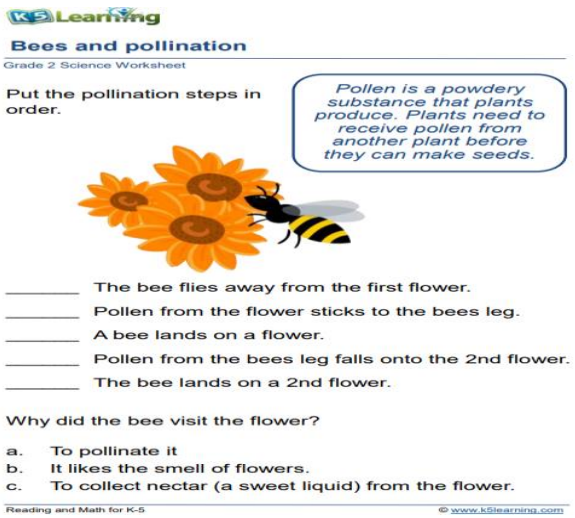
Purpose of the Subject: The study of science encompasses knowledge, processes and values. Scientifically literate persons will foster an attitude of caring not only for themselves, but as responsible citizens, for the world around them. Their decision making will be enhanced by a systematic study of the structure and behavior of the physical and natural world through observation and experiment. In learning science, students benefit from leveraging and evaluating available technological tools to study and therefore understand the world and their relationship to it.
Topic or Strand: Interdependent Relationships in Ecosystems
Essential Learning Outcome (ELO 2): Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants. Make observations of plants and animals to compare the diversity of life in different habitats. [*Clarification Statement: Emphasis is on the diversity of living things in each of a variety of different habitats.*] [*Assessment Boundary: Assessment does not include specific animal and plant names in specific habitats.*]
Grade Level Guidelines: Refer to grade level expectations at the beginning of this curriculum document

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
Learners are expected to: **<u>Knowledge</u>** ● Define the terms: ○ Dispersal: (in plants) moving seeds around. ○ Pollination: to give (a plant) pollen from another plant of the same kind so that seeds will be produced. ○ Structure: (seeds) the different parts of a seed. Each part	**Classifying Seed Dispersal** Students will collect or use a variety of pictures of different seeds. They will complete a table by ticking the way the seed is dispersed. The feature(s) the seeds have in order to disperse this way will be discussed by teacher and students. Example the seed has hooks that can stick to fur. Sample (drawing) / Method of Dispersal Seed / Wind / Water / Animals (empty rows)	**How Did Those Plants Get There?** The majority of plants can't move from where they are planted once they start growing, yet we see plants almost everywhere. So let us think about the situation in the pictures below; If there were no people around, would there be any trees growing in that area? Why? How do they get there? Please give me some of your ideas students? (*wind, animals, humans)* 

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
has a different function (job). (flower) the different parts of a flower. Each part has a different function. ○ Function: the particular job or purpose of something. ○ Diversity: being different or having a variety of something. ○ Habitat: The place where living things naturally live and grow. ○ Environment: Everything around us; our surroundings. This includes the living and nonliving things around us (air, soil, water, plants, animals).	Students will design a booklet showing the different types of seed dispersal. Booklet will include pictures showing examples of seeds that are dispersed by the wind, water, and animals. **Field Trip- Examples in Nature of Seed Dispersal** On a field trip, students record the different animals that they see and present that information on a class chart. Students can draw pictures of the animals. **Teacher Note:** Students can also draw pictographs to report their observations. Pictures can also be used in cases where they are unable to go on the field. This will be placed according to the habitat. (field, garden and rainforest) Students will record the animals and plants that they see in the habitat and discuss how the animals help in seed dispersal and pollination. They will finally create a collage of the habitat (three in total) and present to the class as a group. **Seed Dispersal Gallery** **Students will also participate in a seed dispersal gallery walk. Students will display their seed dispersal diagrams/ collages displayed neatly on their desks and walk around the room to see how others represented information on their diagrams.** **Practice Worksheets on Ways Seeds are Dispersed.** https://www.k5learning.com/worksheets/science/grade-2-seed-dispersal-a.pdf	**Retrieved from:** **https://www.devex.com/news/australian-aid-s-plans-to-revive-global-coconut-conservation-92935**  **Retrieved from:** **https://www.pxfuel.com/en/free-photo-xaauw** Now we are going to discuss what you know about seeds and fruits as a class or in pairs. Example: The parts of the seed, what is found inside the seed. We are going to use the seeds that you collected from the fruits that you ate at break today. Let us compare them.

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
○ Evaporation: Water changing from the liquid to the gas state. ○ Silt ○ Loam ○ Sand ○ Clay ○ Chalk ○ Invasive species • Discuss how those fruit trees grow. How can seeds make new plants other than placing it in the soil? • Compare the different forms of seed dispersal by animals. (videos, real life). • Show your finished model that mimics the functions of an animal in dispersing seeds or pollinating plants. • Explain simply: seed dispersal. • Demonstrate they understand that there are different forms of seed dispersal by animals. • Identify the parts of the flower that aid in pollination (petals, stamen, pistil, pollen).	 **Design a flower for insect pollination**, what would it look like? Why?  Students can draw or use materials to design a flower. Retrieved from https://www.tigandpeach.com/news/ms-laurens-pollen-collector-project	(Students will be given extra samples e.g. orange, mango, watermelon, plums, cucumber).  Retrieved from https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcTEJRfF-ag_vuzvJSr6XFt55MbApTR0KtEyLg&usqp=CAU 

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
• Give general characteristics of soil types. • Account for how invasive plant species might impact habitat. • Identify the role of each part of a flower and compare the external parts of different flowers (ST-2-LS-SF-2). • Define propagation of a seed (ST-3-LS-DC-2). • Outline two natural methods of propagation in flowering plants, giving local examples (ST-3-LS-DC-4). • Describe and explain methods of vegetative propagation (ST-3-LS-DC-5). • Identify and describe use of seeds as a means of reproducing different plants (ST-3-LS-DC-6). • Identify and describe the various agents of pollination-wind water, animals etc (ST-5-LS-DC-5). **Skills**	Scoring Rubric Explanation of Design - 5 Marks Creativity - 3 marks Neatness - 2 marks **Labelling the parts of a flower** Using a chart with a flower. Students will label the parts of a flower by placing the names written on flash cards next to the correct part of the flower. Teacher will use a checklist. Also students will complete a live worksheet. https://www.liveworksheets.com/cq573239en Pollination Worksheets 1. https://www.k5learning.com/worksheets/science/grade-2-pollination-a.pdf  	Retrieved from: https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcSS9bsS1jtnwCTj1L66LUDhi9JrfXWCZprhVg&usqp=CAU  Retrieved from https://www.indiamart.com/proddetail/rijkzwaan-mini-cucumber-seeds-9838494788.html  Retrieved from https://en.wikipedia.org/wiki/Cucumber

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
• Observe different habitats and record the types of animals and plants that live there. • Infer how animals and plants within different habitats are adapted for seed dispersal and pollination. • Classify seeds based on the type of dispersal (wind, animal, water). • Collect data from videos (using a table) on how seeds are dispersed in the environment. • Communicate their findings about seed dispersal and pollination using oral presentations, tables and charts. • Construct a design for a model to show dispersal of seeds by animals. • Calculate the number of seeds. dispersed by animals, wind and water. • Construct a pictograph using the information gathered. • Interpret data presented in pictographs and charts.	2. https://www.k5learning.com/worksheets/science/grade-2-pollination-b.pdf  K5 Learning Bees and pollination Grade 2 Science Worksheet Put the pollination steps in order. *Pollen is a powdery substance that plants produce. Plants need to receive pollen from another plant before they can make seeds.* _____ The bee flies away from the first flower. _____ Pollen from the flower sticks to the bees leg. _____ A bee lands on a flower. _____ Pollen from the bees leg falls onto the 2nd flower. _____ The bee lands on a 2nd flower. Why did the bee visit the flower? a. To pollinate it b. It likes the smell of flowers. c. To collect nectar (a sweet liquid) from the flower. Reading and Math for K-5 © www.k5learning.com **What is so Unusual About This Coffee**? Students should research the dispersion of seeds that lead to these unique coffees. Return to class with an answer to why these coffees are so expensive? Kopi Luwak Black Ivory **Invasive Plants** If the internet is available to students, groups of three, should be tasked with presenting to the class a description and	 Retrieved from https://www.bulgarian-nuts.com/product/watermelon-seeds/  Retrieved from https://www.thespruce.com/how-to-grow-watermelons-1403491

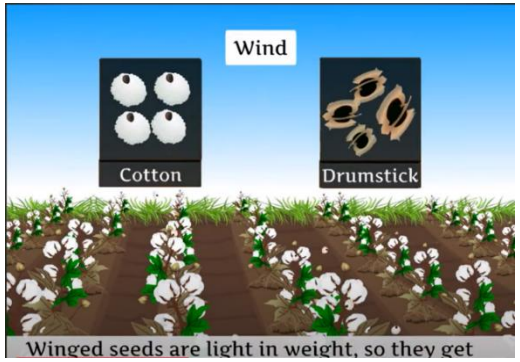
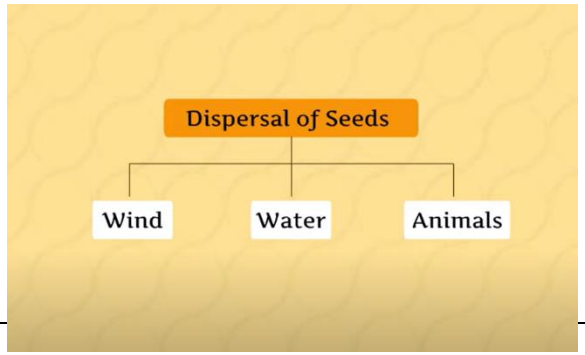
Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
• Conduct an experiment to determine how much water is absorbed by different types of soil. **<u>Attitudes/Values</u>** • Appreciate the importance of seed dispersal for the survival of plants. • Create solutions to mitigate the impacts of invasive species of plants. • Recognise the role of animals in the survival of different plant species through seed dispersal. • Inquiry into soil absorption gives information for farming • Inventiveness - Create a model to show how animals disperse seeds. • Collaboration & Cooperation - Work collaboratively with their peers to create a model for the type of dispersal selected. • Stewardship/Respect for Living Things.	explanation for at least two invasive plant species in the Caribbean. They must also speculate how the species might impact the ecosystem of the Caribbean. For research purposes, they may refer to the following websites: <u>https://caribbeaninvasives.org/index.php/2022/09/23/be-on-the-lookout-invasive-plants/</u> <u>https://www.cabi.org/Uploads/isc/Caribbeaniscnewsmarch2016.pdf</u>	 Retrieved from <u>https://minnetonkaorchards.com/how-to-grow-orange-tree-from-seed/</u> 

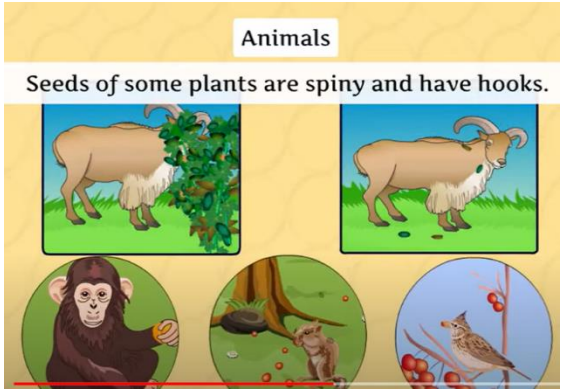
Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
• Safety as the soil experiment is undertaken. • Display sensitivity and offer assistance to peers who may have physical or learning challenges when conducting practical and group work. • Participate actively in classroom discussions.		Retrieved from: https://tanrosie.wordpress.com/2013/02/22/grenada-food-report-part-iii/orange-tree-grenada-2/  **Retrieved from** http://grenadaguide.blogspot.com/2011/09/spondias-dulcis-june-plum-jew-plum-de**w.html**

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
		 **Retrieved from:** https://i.etsystatic.com/21038542/r/il/7a1cfb/1993581520/il_340x270.1993581520_efnx.jpg **Matching the Seed to the Plant** I know many of you must have eaten these plants before. Can you remember what the seeds looked like when you took the plant apart? If you were a farmer and you had a bag of seeds that got mixed up…could you separate them out correctly? Some seeds are small, some are flat, some have different shapes and colors. **Seed Dispersal** Just like people travel to visit new places or see their family, seeds travel too. They travel for different reasons and unlike us, they do not need a suitcase. Why do seeds travel? Plants make seeds and those seeds have one simple job: to make a new plant. Plants want their seeds to

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
		spread out and see the world, not just drop to the ground and grow at their feed. What do you notice stuck to your clothes when you are out playing in the field or in a place where the grass is quite tall? *(seeds)* Some seeds which have hooks or spines. These hooks attach the seed to the animal's fur or feathers - or, in the case of humans, to clothes.  Retrieved from: https://www.ajc.com/lifestyles/environment/plants-must-spread-their-ripe-seeds/tTerWmg101NeGy6mNPeBAL/ These are all seeds. Do all seeds look the same? *(no)* Can you name two seeds that look different? How are they different? (*some are sticky and some are not, some are light and some are heavy, some are big and some are small)* Why do you think the seed sticks to your clothes? (*they have hooks or spines*) This is one way plants **disperse** their seeds.

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
		Disperse is a new word. What do you think it means? Disperse – to spread over a wide area Synonyms for disperse – spread, scatter, distribute. When the seeds have grown, the plant needs to disperse them so that they can grow into new plants. The seeds need to be dispersed away from the parent plant so that the new plant has all the different things that it needs to grow. Can you think of other ways seeds are spread or dispersed? Do plants get help in dispersing their seeds? Students will discuss in groups and write down ways they think plants disperse their seeds. (*human's clothes, animal fur, wind, streams, packing of vegetables for transport*) Let us view a video that shows us how seeds are dispersed and the features that help them do so. **As you watch the video,** I want you to pick out at least three ways seeds are dispersed. Draw a picture in your journal of each so you can easily remember this important process. **Dispersal of Seeds Video https://www.youtube.com/watch?v=ZRHcKEGNyVY (1:53 mins)**

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
		Clips from the video:   

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
		  Look at this plant students. It seems like it would be easy for the wind to blow these seeds. 

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
		Retrieved from https://www.ethnoplants.com/gb/interesting-plant-seeds/152-miscanthus-sinensis-elephant-grass-maiden-seeds.html **Animals that facilitate dispersal of seeds or pollination in plants** Can you identify animals that aid in seed dispersal or pollination in plants? Have you seen any seeds on these animals? Let us look at some pictures. Discuss with your partner the activity taking place in each picture. How does this activity help in the dispersal of seeds or pollination in plants?  Retrieved from http://lifewithdogsandcats.com/life-with-dogs-and-cats/burrs-in-dogs-fur/#sthash.GRJTb7Pz.dpbs

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
		 Retrieved from http://blog.nwf.org/wp-content/blogs.dir/11/files/2015/01/Squirrel_Flickr_TomGill.jpg  Retrieved from https://www.birdscaribbean.org/2017/12/forest-restoration-in-the-dominican-republic-how-i-got-the-birds-to-work-for-me/ Now let us view this video to review ways animals help disperse seeds. As you watch the video, draw a picture in your journal of at least

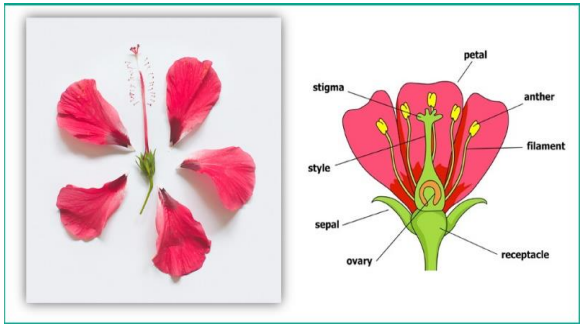
Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
		two animals and the way they help disperse seeds. video on ways animals disperse seeds. https://www.youtube.com/watch?v=GGZHBBOU2yE (2:06 mins) Using the following checklist (pictures) **classify** and group the method that each of the animals uses to disperse seeds. (**Teacher note**: you are looking for a classification such as: ● burying ● pass in their droppings ● carrying in their fur/hair)  Retrieved from: https://www.birminghamtimes.com/wp-content/uploads/2022/01/feat_24ff2e39-ea25-40f6-ab91-f74bb0d7c9d7.jpg

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
		 Retrieved from: https://aroundthekampfire.com/wp-content/uploads/2022/01/animal-dispersing-seeds-through-attachment.png  Retrieved from: https://en.wikipedia.org/wiki/File:Epizoochory_-_black_Labrador_with_hooked_Geum_fruits_in_his_fur.jpg 

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
		Retrieved from: https://www.howitworksdaily.com/wp-content/uploads/2018/12/WOA64.seeds_.alyKNDP5518633520969498500 8-450x300.jpg **What Happens After Dispersal?** A seed can fall on different types of soil and this can affect the likelihood that the seed will grow. Where might seeds fall that wouldn't promote growth (*hard packed clay, sand, gravel, rocks).* Why would these be poor places to grow plants from seeds? (*difficult to get roots down, difficulty finding water source*) We know that water is important for plant growth. Different soils have different properties. Because the sun shines on soils it can give the water molecules enough energy to go from liquid to gas (water vapor). We call that **evaporation**. It should make sense to us that soils that hold more water are going to support plant growth. Let us do a little experiment (**teacher demo**) to see which soils will hold the most water. We are going to put six common types of soil in funnels and measure how much of the initial water (100 mL) passes through the same quantity of soil. **Soil types:** If possible, the teacher should bring in as many samples as possible or comparison. Sand: small particles Clay: heavier soil high in nutrients Loam: mixture of clay, sand and peat

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
		Chalk: limestone and basic so not good for acid-loving plants Silt: fine particles with more nutrients than sand (Teacher note: Extended definitions and properties here: https://www.boughton.co.uk/products/topsoils/soil-types/ https://www.gardenersworld.com/plants/find-out-your-soil-type/  Retrieved from: https://suffahschool.hounslow.sch.uk/testing-soil-permeability/ Closure: So students, which of the soils retained the water the best in our experiment? **What Happens When Seeds get Transported to New Locations?** Transportation technology has made it possible for us to travel around the world but it has also

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
		made it possible for cars, boats, airplanes, trains to transport seeds. When a seed grows into a plant in another **habitat or environment,** it can cause problems. We call these plants, **invasive species** because they are invading a place they have never been before. Can you guess what the problem might be? (get student feedback and then elaborate) Teacher should engage discussion about impacts: • overgrown in sensitive areas, • choke out other plants, • affect food sources of animals, • affect water supply, • upset food web. **Pollination of Flowers: An Important Step in Propagating the Production of Seeds** In order to understand how flowers can work with animals like bees to promote the production of more seeds, we need to first look at the parts of a flower. We are going on some field trips in the environment/school garden/plant shop/orchard where you will observe and collect a variety of flowers e.g. hibiscus, buttercups etc. (Remember, you can go on your own field trip in your neighbourhood.) When we return you will work in pairs to examine (dissect) flower specimens and identify

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
		floral parts with teacher's guidance (NB. *Allow learners to remove floral parts starting with the outermost sepals*). Using a hand lens to observe, describe and draw parts of the flower in a science journal. **Naming Parts of the Flower. Video Resource** You will view a video to help you with naming the parts of the flower and explaining pollination. I will play it three times. So pay attention. As you watch it you are going to write or draw the parts that you see and we will talk about what you have recorded. https://www.youtube.com/watch?v=djPVgip_bdU (3:55 min.)  Retrieved from: https://petrosains.com.my/discover-stem/hibiscus-flower/

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
		Pollination of Flowers You will listen to audio recording of book "Flowers are calling" by Rita Gray which is based on pollination (https://youtu.be/3_5nhQqWihw (11.35 mins) Afterwards you will talk about the story and answer questions e.g. Name some animals that visit flowers. Why do these animals visit the flowers? We will then look at two important words that will come out of the story (**pollination and pollinators**). This next video will help you with listing animal pollinators. After the story, you will draw your favourite animal pollinator and we will share with your classmates. Book entitled "Animal Pollinators" by Jennifer Boothroyd Read aloud here: https://www.youtube.com/watch?v=bYRDGGVte90 (2:34 mins) **Animals and plants are dependent on each other within their habitat** Let's think about how plants make seeds. Pollen (male part) from one flower falls into another flower (female part) which allows it to create fruits and seeds.

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
		There are many ways for plants to be pollinated: wind, insects, animals and sometimes even humans play a role. Animals are the main way of pollination and have body parts that help plants reproduce. BEES have hairs all over their bodies that help collect and deposit pollen as they travel from one flower to another. Watch some bees in action as they pollinate. https://www.youtube.com/watch?v=J7q9Kn1rhRc (1:39 mins) Create your own Bee and flower using the activity below. https://assets-global.website-files.com/5adf752e38b7222e27f146ee/5e7bd7811c6d605dd64d4450_Oakland%20Zoo%202nd%20Grade%20Activity_%20Pollination.pdf Creating animals that pollinate plants In groups to use materials from the environment to create an animal that disperse seeds e.g. bird (humming bird), cat, bee, butterfly. Pollen on one plant spreads by "taking a ride" to another plant. How can the animal that you created help to spread pollen?

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
		Scoring Rubric Creativity 5 marks Neatness 2 marks Explanation 5 marks

Useful Content Knowledge for the Teacher about the Outcome*: (Links to professional sources that connect back to the Curriculum and Assessment Principles of Learning and Principles of Assessment)*

Seed dispersal is the means by which a plant ensures its seeds are spread as far as possible from the parent plant.
This gives the seeds a great chance to germinate.
Plants disperse their seeds to ensure their survival.
This helps to increase the number of plants in forested areas.
It also helps to increase the food supply for animals including birds.
This is also a good way to spread medicinal plants to other areas.

When plants grow too closely together, they have to compete for light, water and nutrients from the soil.
Seed dispersal allows plants to spread out from a wide area and avoid competing with one another for the same resources.
Seeds are dispersed in three main ways: by animals, through wind, by water.
Animals disperse seeds by burying them, excreting them or carrying them in their fur.
Seeds are dispersed in different ways based on their specific features.
Seeds dispersed by wind are light and usually have hooks which cause them to stick to clothing and animals' hair/fur.
Seeds that are buried and excreted are usually sources of food.

Animals that carry seeds on their bodies include: sheep, goats, dogs. These seeds have hooks that attach to the animals' hair or fur and are then carried to another place to grow.

Birds, bats, chimpanzees and bears disperse seeds through their dropping. Seeds do not digest when eaten by those animals so they pass it in their droppings which allow the seed to germinate elsewhere.

Squirrels eat seeds but they also bury them. This is another way of dispersing seeds. They are transported from their location to be buried. These animals later uncover those seeds when they need food. Some of those seeds, however, grow and become new plants.

When a mongoose goes through the bushes small seeds stick to its hair and in that way the seeds move from one place to another. The same thing happens with dogs and birds.

Pollination is the transfer of pollen to the female part of the flower.

Many different animals pollinate flowers such as bees, butterflies, ants, beetles, lizards, bats, hummingbirds and small mammals.

Inclusive Resources and Materials From Regional Specialists *Use of multisensory activities and materials to assist all learners. (texts, family & community knowledge and resources, contextually relevant professional web resources)*
Paper, glue, tape etc. for making models.
Use of video and audio resources for understanding dispersal.

Additional Resources:
Link to pictures of plants from the Caribbean:
https://www.saintlucianplants.com/endemics.html
Seed Dispersal
https://www.youtube.com/watch?v=aC3pQ9RU9YA(1:08)
https://blog.growingwithscience.com/tag/seed-dispersal-activities/
Song How Seeds Move
https://www.youtube.com/watch?v=3CCOWHa-qfc(4:25)
A Seed's Journey
https://fliphtml5.com/yykeg/vumd/basic

Opportunities for Subject Integration: ***(How the inclusive learning strategies might be adapted and/or applied to include other subjects in the curriculum)***

Mathematics:

- Collect data from videos (using a table) on how seeds are dispersed in the environment.
- Calculate the number of seeds dispersed by animals, wind and water.
- Construct a pictograph showing the different ways seeds are dispersed and the number of seeds that are dispersed through each way.

Social Studies:

- Identify areas where it is possible to find evidence of seed dispersal from animals (geography of places - school environment and home community).
- Concern for impact of invasive species.
- How to protect the environment from pollutants to encourage pollination.

Language Arts:

- Write legibly and speak clearly and fluently to explain how animals disperse seeds.
- Write a short imaginative story on an animal pollinator e.g. My Life as a Bee.
- Write a short imaginative story about a seed's adventure (The journey of the seed going through seed dispersal.)

TVET:

- Create the models to show how different animals disperse seeds.

Agriculture:

- The importance of seed dispersal and pollination to habitats and our survival.
- The importance of animals (animal pollinators) that help with seed dispersal and pollination in the environment.

Art:

- Design a model for animals dispersing seeds in the environment.

Elements from Local Culture:

- Walking around in the bushes around the school near the school and on the way home.
- Mongoose moving around from one area to another foraging.
- Pollination by local honey bees, seed dispersal by local fruit eating bats/birds/lizards(reptiles).
- Grass burrs getting stuck to clothing while walking through grass.
- Coconuts getting transported by water, many coconut trees grow on beaches / compare animals in these habitats: beach, farm lands, forest, river, pond, grassy areas.
- Plants/plant parts used local cuisine that could be affected if their pollinators are affected.
- Forest management practices/activities can impact seed dispersal or pollinators.

Resources for a learner who is struggling: ***(Links to earlier learning activities for similar knowledge, links to resources for special education needs)***

Parts of the flower using craft materials
https://www.teach-me-mommy.com/parts-of-a-flower-craft/

Resources for a learner who needs challenge: ***(Links to learning activities and resources in later grades)***
Seed Dispersal Reading and Comprehension
https://worksheetplace.com/mf_pdf/Seed-dispersal-info.pdf

Creating animals that disperse seeds.
https://teaching.betterlesson.com/lesson/634057/creating-animals-that-disperse-see

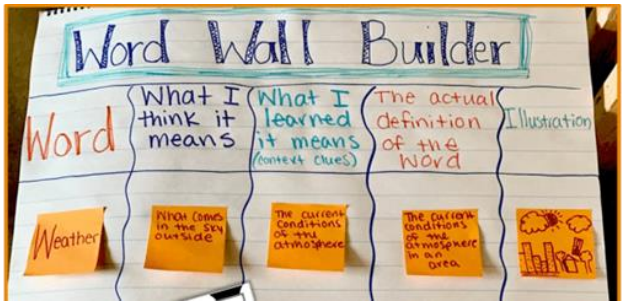
Strategies that Support the OECS Curriculum and Assessment Framework
Elements of the Essential Education Competencies that are addressed:

An educated person in the OECS will demonstrate they have::	**Where might this competency be promoted/developed in this learning outcome and associated lessons?**
Developed Citizenship Competencies	Students will learn to value the role of animals in seed dispersal which links directly to plants growing to provide for some of our basic needs.
Developed Critical Thinking and Ethical Communication Competencies	In planning and designing the model for seed dispersal, students will need to be critical thinkers to best utilise the resources available to them.
Developed Well-being Competencies	Help with growing local fruit bearing trees (burying) that have nutritional benefits.
Developed Knowledge and Entrepreneurial Competencies	Collect and sell seeds that make fruit bearing trees. Sell fruits from trees that they grow. Plant medicinal shrubs from seeds.

Earth Systems: Processes That Shape The Earth

Purpose of the Subject: The study of science encompasses knowledge, processes and values. Scientifically literate persons will foster an attitude of caring not only for themselves but as responsible citizens for the world around them. Their decision-making will be enhanced by a systematic study of the structure and behaviour of the physical and natural world through observation and experiment. In learning science, students benefit from leveraging and evaluating available technological tools to study and therefore understand the world and their relationship to it.
Topic or Strand: Earth Systems: Processes That Shape The Earth
Essential Learning Outcome (ELO-1): Use information from several sources to provide evidence that Earth events can occur quickly or slowly. *[Clarification Statement: Examples of events and timescales could include volcanic explosions and earthquakes, which happen quickly and erosion of rocks, which occurs slowly.] [Assessment Boundary:Assessment does not include quantitative measurements of timescales.]*
Grade Level Guidelines: Refer to grade level expectations at the beginning of this curriculum document

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies

Learners are expected to:
 	
<u>Knowledge</u>
 	
• Define the following terms:
  ○ Volcano
  ○ Lava
  ○ Soil
  ○ Erupt and eruption
  ○ Earth Events
  ○ Quake
  ○ Earthquake
	Word Wall Builder to Practice New Words
	
	 
	Retrieved from: https://teachersworkstation.com/2021/09/28/week-7-science-lessons-
	
	Game -Base Learning and Definitions
		Examples of Processes: Volcanoes
		Students, I want to show you a picture.
		Do you know what this is? We call it a **volcano.** It looks like a big mountain but there seems to be something bright at the top?
		
		 
		Retrieved from: https://www.youtube.com/watch?v=EmJv_eOfrDc

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
○ Erosion ● Using examples, demonstrate an understanding of the difference between fast and slow earth events. ● Define the term soil erosion, listing types of soil erosion, and ways and means of preventing it (ST-5-ESS-ER-1). ● Describe an earthquake as a natural occurrence and explain what causes it, (ST-5-LS-ECS-15)* describe formation in simple terms. ● Identify volcanic activity as a natural process and explain how volcanoes are formed, as well as the impact on the environment. (ST-5-LS-ECS-16) *describe formation in simple terms. **Skills** ● Use new vocabulary to describe your observations.	The teacher gives the students the following words on cards: Volcano/Lava/Soil/Earthquake/Erosion The teacher reads to students a simple definition based on the discussion they had in class. The student holds up the word that matches that definition. (e.g. a tall hill that erupts or explodes with fire and smoke - volcano). If the teacher has access to technology, they can use an interactive game called Kahoot® to pose a similar matching activity. See game information here: https://kahoot.it/?pin=8061856&refer_method=link **Distinguishing Fast and Slow Earth Events** Students, I want to ask you some questions about what we discussed today and we are going to put our new words in these special circles. 1. When we think about volcanos erupting, is that a fast or slow event? (*fast*) Let us add ***eruption*** to our circles. 2. If the volcano erupts over and over for many years, it adds new rock over top of old rock and makes new **soil.** Is that a fast or slow event? (*slow).* Let us add soil to our circles. 3. Is an earthquake a slow or fast event? (*fast*) 4. When the ocean gets very high due to a storm or **earthquake,** it tends to wash away our beach. Is that a fast or slow event? (fast)	Students have you heard the word volcano before? Can you tell me what you know about volcano's (*explosions, fire, tall hills*). Did you know that we have volcanos in the Caribbean? Recently, a volcano erupted in Saint Vincent and the Grenadines. But volcanoes have been happening all around the world for a very long time. Let me show you a video clip and another picture of some volcanoes. As you look at these, I want you to think of three words that help you to describe that volcano (*fire, smoke, danger, escape*). Can you also draw me a picture that shows what you saw? See 5 Eruptions here: https://www.youtube.com/watch?v=EmJv_eOfrDc (15:18 mins) The teacher may choose to use shorter portions of the video to allow for student observations of the features.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
• Draw pictures that demonstrate you understand features of a volcano. • Compare and contrast slow and fast earth events. • Problem solve around preparation to be safe for predictable events. • Interpret video information and pictures. • Communicate ideas about observation of erosion. • With the assistance of the teacher, construct models. **Attitudes/Values** • Appreciate the role of natural processes in shaping the earth. • Compassion for those experiencing hardship due	5. If the water in a stream runs over rocks for many years and makes them smooth, we call that **erosion**. Is that a fast or slow event? (*slow*) **Journaling Student Understanding** Create a picture book showing examples of fast and slow earth events. (At least one accurate picture for each fast and slow event will earn students full marks for this assessment) Partial marks can be attained for pictures that are unclear as to which event is occurring. **Thinking About Preparing for Fast Events Extension Activities** 1) Students can each bring in one item to be placed in a classroom emergency supply kit. They should be able to explain how that item will be useful during or after a fast earth event. 2) Individuals or groups can draw posters depicting key safety practices for the different fast earth events. For example, DROP, COVER, HOLD in the event of an earthquake. Suggested Rubric: Neatness 5 marks Discernible Drawing 5 marks Creativity 5 marks Clear Messaging 5 marks	 Retrieved from: https://www.youtube.com/watch?v=RB27L0FY6E4 Let me ask you some questions students. You can see fire but also there looks to be something running out of the volcano. The volcano is so hot that it melts the rock inside, and it flows over the edge. We call that liquid rock **lava** and it is very hot! After a while these volcanoes sometimes get quiet again and all that hot lava cools down and forms rocks once again. This can happen over and over so the rock can spread out and harden and make new **soil.** We know from the news about the volcano in SVG that it happened *very quickly*, people had to leave their villages right away because of the danger and new rocks were formed across that part of the island. We also know that the same volcano

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
to a dangerous earth event. If able, assist those that have been victims of an earth event. • Persistence at completing tasks and activities. • Interest/Curiosity- Find out more about different naturally occurring events and objects on their own. • Respect for Evidence- Explain and listen to other students' results and explanation. • Collaboration & Cooperation- Share ideas with others. • Stewardship/Respect for Living Things- Show sensitivity to living things in the environment. • Apply safety practices during fast earth events such as earthquakes, hurricanes, etc.	Students can research a list of current/extinct volcanoes in the member states of the Caribbean and create a map showing their location. The following website on Eastern Caribbean Volcanoes may be useful: https://www.youtube.com/watch?v=k2201xKMFx4&t=78s (5:41 mins)	exploded; lets use a new word- the volcano **erupted,** many years ago also. This means that over a long time, the cooling lava can keep making new rocks over and over - that would be a ***slow*** process. We refer to the volcano erupting as an earth **event.** This is something special that happened. Other examples of events are storms and hurricanes. Later we will add to this list. *Note: As an extension activity, students may have the manual dexterity to help the teacher make a model of a volcano.* *Instructions follow:* (220) How to make working Model of volcano/Volcano Eruption/DIY Volcano with tissue paper/Kansal Creation - YouTube (4.05 mins) *Note: To simulate the lava flow the teacher may choose to make a working model with vinegar and baking soda* **Examples of Processes: Earthquakes** I want to teach you a new word **quake.** It means to shake! Let say it "quake means to shake". Did you know that the earth sometimes shakes. We call those **earthquakes**. When the earth shakes, it happens quickly and it makes cracks in the ground! Let me show you a picture.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
. • When conducting practical and group work, display sensitivity and offer assistance to peers who may have physical or learning challenges. • Participate actively in classroom discussions.		 Retrieved from: https://www.youtube.com/watch?v=NH4zekbIU0w (12:20 mins) *(the teacher may wish to emphasize the dangers of earthquakes and make a model of items on a table, as buildings and then have children shake it to simulate the instability).* When these earthquakes happen, they cause waves in the oceans to get very high, very quickly and this can wash our beach sand and trees away. Just like bad storms, the high water over a period of time, can slowly change the beach front. We call that **erosion.** Look at this picture of a big wave caused by an earthquake (Note: The word tsunami is probably too difficult for children at this age and they will learn more about them later).

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		 Retrieved from: https://www.youtube.com/watch?v=NH4zekbIU0w (12:20 mins) **Examples of Processes: Erosion** Students have you ever noticed that some stones in a stream bed are really smooth? (***show children an example of a smooth stone or take them to a small stream as a field trip to observe the effects of slow erosion***) The water runs over sharp stones for a very long time and wears them down to be smooth. Sometimes if you watch really closely in stream you can see other stones tumbling over each other. That also wears them down and makes them smooth. We call this **erosion** also and it usually takes a long time to get a smooth stone! When you look at this picture can you imagine how long it must take for the ocean to wear down that rock as the water goes in and out every day? It

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		takes a very long time to make these funny rocks by **erosion.**  Retrieved from: https://www.viator.com/en-CA/tours/Hopewell-Cape/Hopewell-Rocks-Admission/d51622-43008P1 **Review Materials and Extended Examples** As review of the ideas above the teacher may find it useful to access the following videos: (220) Slow and Rapid Changes on Earth- Science Grade 2 - YouTube (2.18 mins) (220) Our Ever-changing Earth: Quick or Slow Events | MightyOwl Science 2nd Grade - YouTube (6.48 mins)

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		(220) What are Weathering and Erosion? | Calming Science For Kids - YouTube (6.02 mins) **Extension Activity: Preparing for Fast Events** Invite guest speakers such as a meteorologist or someone from the disaster management agency to talk to students about fast events, how they can be monitored and how the public can be prepared for them. Discuss the effects that a fast earth event may have on life and what will be urgent needs of persons living in communities experiencing fast earth events. Food and water shortages need for medical supplies, damage to infrastructure e.g. roads, electricity damage to pets and plants.

Useful Content Knowledge for the Teacher about the Outcome*: (Links to professional sources that connect back to the Curriculum and Assessment Principles of Learning and Principles of Assessment)*

Important Note: This is the first exposure to these topics. The physical details of how these events happen is dealt with in higher grades

Fast Earth Events:

Earthquakes: earthquakes are fast events that can happen when the earth's crust suddenly moves or shifts, causing shaking and vibrations. Children can learn that earthquakes can cause damage to buildings and homes, and that people need to be prepared by having emergency kits and knowing what to do during an earthquake.

Volcanic eruptions: volcanic eruptions can happen quickly and dramatically, with lava, ash, and gas spewing out of a volcano. Children can learn about the different types of volcanoes and how they can be both dangerous and beautiful. It's also important to discuss how people can prepare for volcanic eruptions and stay safe.

Include a list of current volcanoes in Member States.

Slow Earth Events:

Erosion: erosion is a slow process that happens over time as wind, water, and other forces wear away the land. Children can learn that erosion can change the shape of the land and create new landscapes, like canyons and valleys.

Weathering: weathering is another slow process that happens over time as rocks and other materials are broken down by weather and other forces. Children can learn about the different types of weathering, like freezing and thawing, and how it can change the appearance of rocks and other materials.

It's also important to emphasize that while some events may be fast or slow, they can all have an impact on our planet and the people and animals that live here. Encourage children to think about how they can help protect the earth and its resources, and to be aware of the different events that can happen around them.

Inclusive Resources and Materials From Regional Specialists *Use of multisensory activities and materials to assist all learners. (texts, family &community knowledge and resources, contextually relevant professional web resources)*
items to create models - sand, fan or hair dryer, rocks, soil, leaves, baking soda, vinegar, food dye, baking tray, water, watering can, tables, pictures showing fast and slow earth events.

Additional Resources:

Educational Videos: Educational videos are a great way to introduce students to the concepts of fast and slow earth movements. Some excellent resources include BrainPOP Jr. and National Geographic Kids.

Interactive Websites: Interactive websites such as KidsGeo.com and Earthquake.usgs.gov have games and activities that teach children about different types of earth movements.

Books: Books can be a great way to help children understand complex concepts in a fun and engaging way. Some excellent options for grade two students include "Earthquakes" by Seymour Simon, "Volcanoes!" by Anne Schreiber, and "The Magic School Bus Inside the Earth" by Joanna Cole.

Hands-On Activities: Hands-on activities can help reinforce the concepts of fast and slow earth movements. Teachers can use activities such as building a volcano, making a seismometer, or creating a tsunami in a bottle.

Field Trips: Field trips to natural/virtual history museums or geological sites can help students see firsthand the effects of fast and slow earth movements.

Collaborative Learning: Collaborative learning activities can help students learn about fast and slow earth movements in a fun and engaging way. For example, group projects or class discussions can help students learn from one another and reinforce their understanding of the concepts.

Opportunities for Subject Integration: ***(How the inclusive learning strategies might be adapted and/or applied to include other subjects in the curriculum)***

- ***Mathematics: How often do volcanoes erupt, how often do we have earthquakes- a timeline for local events?***
- ***Social Studies:*** **How do people cope with the challenges of earth events (food, shelter, health?) Where in the world are the most volcanoes/earthquakes?**
- ***Language Arts:*** Reading materials EROSION read aloud for kids! https://youtu.be/0fQFevB2Iis (9:04 ins), Weathering and Erosion Read Aloudhttps://youtu.be/XZ31wSN0sC4 (10:04 mins)
- ***TVET:*** Discuss how houses are built to help withstand hurricanes for example use of hurricane straps.
- ***Agriculture:*** How does soil erosion or landslides affect crop production.
- ***Health:*** Items in a first aid kit and their uses.

Elements from Local Culture:

The submerged volcano "Kick em Jenny" in Grenada's waters can pose a fast earth event threat to Grenada and other neighbouring islands.

Pictures of hurricane destruction to Caribbean islands including Hurricane Ivan's impact on Grenada.

In Saint Lucia, the warm waters from the volcano are very therapeutic and create mineral baths which are a popular tourist destination. The Caldera is named as the only drive through volcano in the world.

Dominica has the most volcanoes in the Eastern Caribbean but not all are active.

La *Soufrière*, a stratovolcano on the Caribbean island of Saint Vincent in Saint Vincent and the Grenadines, began an effusive *eruption* on 27 December 2020.



Pictures retrieved from:
https://news.un.org/en/story/2021/04/1089722

https://eecentre.org/2022/03/24/saint-vincent-and-the-grenadines-rapid-environmental-assessments-after-la-soufriere-volcano-eruption/

https://sps.columbia.edu/news/building-awareness-st-vincent-families-displaced-la-soufriere-volcano

See: Ash dropping from sky here: https://news.sky.com/story/st-vincent-drone-video-shows-idyllic-island-blanketed-with-volcanic-ash-after-la-soufriere-eruption-12288605

- Increased number of earthquakes in the region.
- Landslides after periods of heavy rainfall.
- When the river "comes down" (i.e. flows rapidly after rainfall in mountains).
- On the windward side of St. Vincent evidence of wind erosion can be observed in the shapes of the rocks and treetops.
- Blown down trees (plantain/banana trees) after a tropical storm/water shortages/outages during or after the passing of the storm.

Resources for a learner who is struggling: ***(Links to earlier learning activities for similar knowledge, links to resources for special education needs)***

Playing games to determine fast and slow events.
Participating in hands-on activities creating models to show how fast and slow events occur.

Resources for a learner who needs challenge: ***(Links to learning activities and resources in later grades)***

Do research and identify and draw a world map showing location of volcanoes and earthquakes.
Search the internet for interviews of people living near the volcano Soufriere in Saint Vincent and the Grenadines and describe for your peers their experience.

Strategies that Support the OECS Curriculum and Assessment Framework
Elements of the Essential Education Competencies that are addressed:

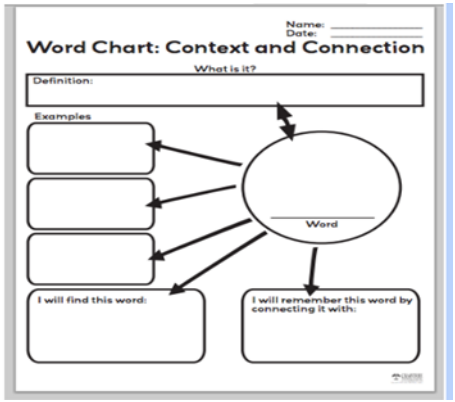
An educated person in the OECS will demonstrate they have:	**Where might this competency be promoted/developed in this learning outcome and associated lessons?**
Developed Citizenship Competencies	Care and compassion for those citizens affected by earth events.

Developed Critical Thinking and Ethical Communication Competencies	Distinguishing fast and slow events and their impact on our world in terms of the landforms .
Developed Well-being Competencies	Preparing for events and attending to precautions related to health.
Developed Knowledge and Entrepreneurial Competencies	Connections to hospitality industry. E.g., Saint Lucia- muds from mineral baths/Dominica- hiking trails & champagne beach/St. Vincent * Grenadines- Soufriere volcano viewing/Montserrat- volcanic aftermath.

Purpose of the Subject: The study of science encompasses knowledge, processes, and values. Scientifically literate persons will foster an attitude of caring not only for themselves but as responsible citizens, for the world around them. Their decision-making will be enhanced by a systematic study of the structure and behaviour of the physical and natural world through observation and experiment. In learning science, students benefit from leveraging and evaluating available technological tools to study and therefore understand the world and their relationship to it.
Topic or Strand: Earth Systems: Processes That Shape The Earth
Essential Learning Outcome (ELO-2): Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.* [Clarification Statement: Examples of solutions could include different designs of dikes and windbreaks to hold back wind and water, and different designs for using shrubs, grass, and trees to hold back the land.]
Grade Level Guidelines: Refer to grade level expectations at the beginning of this curriculum document

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies

Learners are expected to:
 	
<u>Knowledge</u>
 	
• Define the terms:
  ○ Weathering
  ○ Erosion
  ○ Livestock
  ○ Graze
  ○ Diverting
  ○ Retaining Wall
  ○ Roots
  ○ Crops
  ○ Windbreaks
 	
• Demonstrate they understand that water and wind can change the shape of the land.
	New Vocabulary (Comprehension)
	The teacher reads these sentences off the chalkboard and asks students to choose a word from the list that best fits the context of the sentence.
	eroded/crop/livestock/roots/weathered/windbreak/ retaining wall/grazing/diverted/solutions
	
	1) The farmer's _____included cows and pigs. (*livestock*)
	2) The stream slowly _____ away the large rock until you could see a vein that looked like gold! (*weathered*)
	3) Food grown in a field by a farmer is often called a _____. (*crop*)
	4) We can protect our fields from wind by putting up a _____ (*windbreak*)
	5) The mouth of the river had a lot of tiny pebbles that had been _____ from upstream. (*eroded*)
		What do we Observe in Nature?
		Students, what do you see in this picture from the White Desert in Egypt? (*a rock with the center worn out*)
		
		 
		
		Retrieved from: https://the-earth-story.com/post/185600839473/amazing-wind-these-wind-erosion-features-in
		
		What caused the rock to look like this? (*wind)*

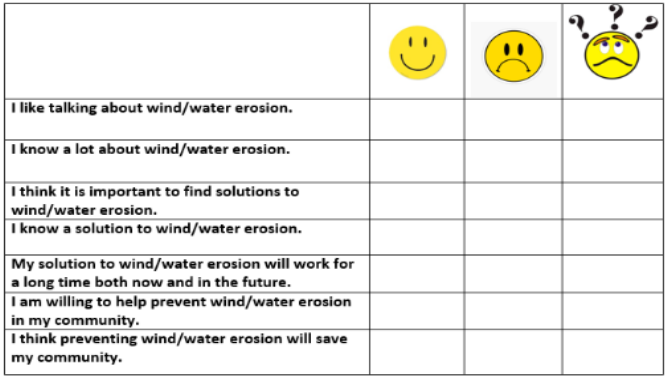
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
• Distinguish between weathering and erosion. • Compare ways to prevent wind/water from changing land shape. • Explain at least two given solutions to slow down or prevent wind or water from changing the shape of the land. • Distinguish between water and wind erosion. • Investigate the effects of wave action on the environment (ST-4-LS-ECS-10). • Plan and execute appropriate research using technological methodology to solve environmental challenges (ST-4-TE-TM-1). **Skills**	 Name: Date: **Word Chart: Context and Connection** What is it? Definition: Examples Word I will find this word: I will remember this word by connecting it with: 6) We call a pile of rocks assembled to hold back shifting soil a _____. (*retaining wall*) 7) When sheep wander a field eating grass we say they are_____. (*grazing*) 8) The traffic in the village was held up by a stalled truck. Everyone had to drive around on another street. We would say they were _____(*diverted*) 9) The _____ of plants are very helpful for binding the soil together so it isn't easy for water to wash it away. (*roots)* 10) When we seek out problems caused by water and wind in the community, we have to be clever to create _____ to those problems. (*solutions*) **Vocabulary word charts** to define terms: Retrieved from: https://www.pinterest.com/pin/340584790569110462/ **Can Students Identify Incidences if Weather/Erosion?**	Let us look at another picture. What caused these rocks to look similar? (*water washed in and wore down the rock*)  Retrieved from: https://www.bayoffundy.com/about/geology/ When continuous flow of wind and water break away pieces of rock, we call it **weathering**. When the pieces of rock are moved to another location we call it **erosion**. Do you think these two processes happen quickly or slowly? (*slowly)* Water from tides and rainwater run off can have dramatic affects on coastal regions and agricultural hillsides.

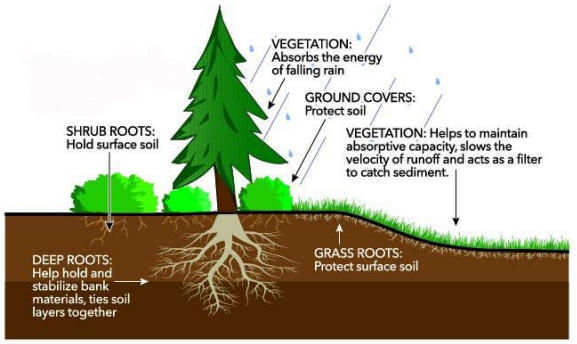
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
• Observe that the processes of weathering and erosion take a long time but we can readily see their long-term effects. • Classify a process as either weathering or erosion. • Devise a solution to a problem of weathering/erosion based on careful observation of historical pictures. • Hypothesize how diversion of water can be an effective erosion deterrent. • Hypothesize how retention walls can be an effective erosion deterrent. • Hypothesize how placing plants on hillsides can be an effective erosion deterrent. • Hypothesize how adding windbreaks to a field can protect crops.	Determine if students can identify whether pictures are showing wind or water erosion taking place. Let them justify their answer.  **Design Challenge**. The sand is shifting on the ocean shore because of higher tides than normal due to storms. Draw a picture in your journal of a solution you might propose to keep the sand from shifting further. Be prepared to defend your choice of design (i.e. how will it work?) **Creating models** If you feel that your students have sufficient manual dexterity, you might ask them to build a model of their	 Photograph by Desmond Brown Retrieved from: https://theanguillian.com/2022/06/coastal-erosion-an-urgent-call-for-action/ **More Examples of Wind and Water Impacts** https://www.youtube.com/watch?v=-43_HBy9huc (3:23 mins) **Establishing Community Problems** Students will be directed to interview teachers and people in the community to find out causes, effects and solutions to wind and water weathering and erosion. Suggested questions for the interview:

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
• Communicate to peers the rationale behind models that explain weathering/erosion problem solutions. • Construct a model to explain weathering/erosion control. • Analyse information (field trip, interviews, pictures) from the community in order to formulate problem solutions. • Interpret video to better understand the slow process of weathering/erosion. • Investigate the effects of wave action on the environment (ST-4-LS-ECS-10). • Plan and execute appropriate research using technological methodology, to solve environmental	solution using cardboard and simple materials such as paper, glue, straws, coffee sticks or wood. The teacher could use the following rubric to evaluate the model. **Discussion** What could this homeowner do or what should they have done to avoid the problem in this picture? 	• Have you ever noticed erosion taking place in your area, like in front of your yard, or on the dam, road or street? • What do you think caused it? • What was done about it? • What can be done about it? Learners will record responses on the interview sheet and bring them back to class to discuss with the entire group. Focus Question: Students, what have you learned about local problems with erosion and how the public has responded with a solution. **A Design Challenge: How to Prevent Erosion** A farmer has a hillside field that they use as pastureland for their sheep and goats. The rainy season has caused erosion such that the rainwater has begun to run in streams down the hillside and wash away the hill. The farmer is concerned that there will be dangerous holes and steep inclines as a result of rains. Then his **livestock** (sheep and goats) will not have land to **graze** on (eat grass). Let us make a **quick erosion model** of how water can erode a hillside. **Demo**: teacher access tray and place sand in it. Tilt the tray and pour water down the side. Demonstrate for children how quickly rainwater can wash away the soil on a slope.

Categories	10 Points	7 Points	4 Points	0 Points	Total
Preventative Measures Observed	Model shows four or more ways to prevent wind or water erosion.	Model shows three ways to prevent wind or water erosion.	Model shows two ways to prevent wind or water erosion.	Model shows no ways to prevent wind or water erosion.	
Feasibility of Preventative Methods	The ways to prevent wind or water erosion are very feasible.	The ways to prevent wind or water erosion are partially feasible.	The ways to prevent wind or water erosion show little feasibility.	The ways to prevent wind or water erosion are not feasible.	
Science Concepts Observed	The model shows four or more related science concepts.	The model shows three related science concepts.	The model shows two related concepts.	The model does not identify any related concepts.	
Use of Resources	The model shows maximum use of natural resources and reuse of wasted materials.	The model shows partial use of natural resources and reuse of wasted materials.	The model shows little use of natural resources and reuse of wasted materials.	The model shows no use of natural resources and reuse of wasted materials.	
Construction of Model	The construction of the model was excellent.	The construction of the model was very good.	The construction of the model was good.	The construction of the model was poor.	

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
challenges (ST-4-TE-TM-1). **Attitudes/Values** • Show concern for community problems related to weathering/erosion. • Appreciate the importance of windbreaks and long walls in preventing erosion. • Actively participate in class discussions. • Work diligently to interpret pictures and videos for the information they offer. • Contribute solutions to identified issues of water and wind erosion. • Respect for evidence as students explain their results and conclusions drawn from their investigations.	Retrieved from: https://www.nrdc.org/stories/soil-erosion-101 **Matching Solutions to Type of Erosion/Weathering** Match the following methods to reduce erosion with the type of erosion it helps prevent/reduce.  **Do Erosion Solutions Pose an Environmental Risk?**	 Retrieved from: https://teacher.scholastic.com/dirt/erosion/lab.htm Students let us talk about ways that might prevent the soil on a farmer's hillside from eroding. **Possible solutions**: What do you see in this picture? (*a line of rocks*) What will happen when water runs down and meets the rocks? (*the water will fall into the rock line and follow the rocks*) 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
• Inventiveness- Suggest new ways of preventing water and wind erosion. • Collaboration & Cooperation- Work together with others to investigate erosion in their surrounding. • Stewardship/Respect for Living Things- Show sensitivity to living things while conducting investigation and proposing solutions on erosion. • Safety- Observe safety instructions while carrying out investigations on wind and water erosion. • Display sensitivity and offer assistance to peers who may have physical or learning challenges when conducting practical and group work.	Ask students to consider the following erosion solutions from the farmer hillside scenario namely: a) Diversion of water b) Retaining walls c) Vegetation to create erosion-resistant soil Ask them to work in groups (think/pair/share) and then offer at least two possible environmental impacts (good or bad) of the solutions. (*divert waterways- wildlife dependence on water; rock wall- endangering mobility for animals; plants to bind soil - more vegetation added to ecosystem*). **Attitudinal test** to have students show their feelings toward the importance of preventing wind and/or water erosion. Suggested sample attitudinal test:  **Using Technology to Assess**	Retrieved from: Minnesota Stormwater Manual Students, this is an example of **diverting** the water. This means to make another path that is less harmful to the hillside. Can you think of another way to divert the flowing rainwater? You could purposely make a trench or dig a stream bed, so all the rain went in a special channel away from the soil. What solution do you see for the farmers problem here in this picture?  Retrieved from: https://www.ecolibriumvt.com/hardscapes The farmer can build a wall to keep the soil from moving down the hill. These piles of rocks are sometimes called **retaining walls** (or long walls) because they retain the shape of the land by maintaining the soil that has been eroded.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Teacher-made Kahoot game to assess students' knowledge on causes, effects and solutions of water and wind erosion. Sample question:  Sample question:  Have students **create a scrapbook** using pictures and reports from field trips to compile causes, effects and solutions of wind and/or water erosion.	**Another Solution to the Farmer's Problem- How Plants Can Help**  EFFECTS OF VEGETATION IN MINIMIZING EROSION Retrieved from: https://graniteseed.com/blog/how-do-plants-help-prevent-erosion/ Students, you will notice in this diagram that **the roots** of a range of plants help to hold the soil together and prevent erosion. **Closure:** Now that you see some possible solutions to the farmer's problem maybe this helps you think about solutions to the problems of erosion in your community? Based on these discussions, each student should report to the class a solution they would recommend

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies

Types of Erosion	Causes	Effects	Solutions
Wind	Wind is a major type of erosion, especially in dry areas. Wind can erode by picking up and carrying loose particles and dust away (called deflation). It can also erode when these flying particles strike the land and break off more particles (called abrasion).	-There is damage to farming communities. -Poor soil quality can cause small amounts of crops to grow. This means the farmer will need to use fertilizers and pesticides. -When soil is washed away from one place to another, it can carry harmful materials like chemical, fertilizers, or pesticides. These dangerous chemicals can pollute our water supply. -Sediment that gathers down the slope due to erosion can block the flow of water in rivers, streams, and drainage canals, leading to flooding.	Farmers use several methods to slow down erosion. They plant trees around farmland to block wind. They also cut terraces, or ledges, into sloping land. **Contour Plowing** This is done to slow down the flow of water and the soil that it carries. **Crop Rotation** This is used to maintain the good quality of the soil and prevent pests from destroying the plants. It means planting crops in a different spot each year.
Water	Water is the main cause of erosion on Earth. Some of the ways that water causes erosion are: *Rainfall* - Rainfall can cause erosion both when the rain hits the surface of the Earth, called splash erosion, and when raindrops accumulate and flow like small streams.		
	Rivers - Rivers can create a significant amount of erosion over time. They break up particles along the river bottom and carry them downstream. *Waves* - Ocean waves can cause the coastline to erode. The shear energy and force of the waves causes pieces of rock and coastline to break off changing the coastline over time. *Floods* - Large floods can cause erosion to happen very quickly acting like powerful rivers.		**Terrace cultivation** This is planting on terraces or steps built on the slope of the mountainsides. The wide flat rows are built to act as a ridge that helps slow down the water and the soil that it carries. **Mulch Cropping** Mulch is spread over the surface of the soil to lessen the effect of raindrops striking the soil and to cover it from the wind. **Natural Vegetation** This is done by allowing trees, shrubs, and other kinds of plants to grow naturally. The roots of these plants and trees hold the soil together and make it more stable.

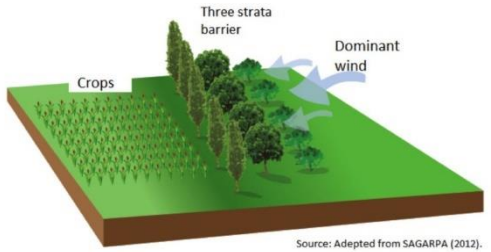
Suggested causes, effects and solutions to wind and water erosion:

- Links to websites with content on causes, effects and solutions to erosion
- https://www.ducksters.com/science/earth_science/erosion.php#:~:text=Wind%20can%20erode%20by%20picking,more%20particles%20(called%20abrasion).

for a community problem they observed in their earlier interviews.

How to Protect Against Wind That May Cause Erosion

The farmer to avoid erosion of their fields containing **crops** (fruits & vegetables) will sometimes plant a row of trees to stop the wind.



Retrieved from:
https://www.thegreendirectory.net/blog/windbreak-planning-design

Windbreaks are rows of trees or shrubs that reduce the force of the wind. They can reduce soil erosion, increase crop yields and protect livestock from heat and cold. Windbreaks can shield buildings and roads from drifting snow. They beautify the landscape and provide travel routes and habitat for wildlife.
Retrieved verbatim from:
https://www.nvca.on.ca/Shared%20Documents/Th

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	• https://kidskonnect.com/science/erosion/ **Extended Assessment Items** • Community-based projects to have students participate in community services to help in the clean-up of areas affected by wind/water erosion. • Interview recording with experts who will describe causes and solutions to water and wind erosions. • Journal entries to assess students' ability to state what they can do in situations of wind and/or water erosions.	e%20Benefits%20of%20Windbreaks%20Extension%20Notes.pdf As a **review of weathering and erosion** the teacher may refer to this video: https://www.generationgenius.com/videolessons/weathering-and-erosion-video-for-kids/ (12:25 mins) Teacher Note: Particulars of weathering are addressed later in the science curriculum.

Useful Content Knowledge for the Teacher about the Outcome*: (Links to professional sources that connect back to the Curriculum and Assessment Principles of Learning and Principles of Assessment)*

Link to Sample Lesson on Introduction to Erosion:

https://www.generationgenius.com/wp-content/uploads/2019/06/Intro-to-Erosion-Lesson-Plan-GG.pdf

Wind & Water Changes - Weathering & Erosion Activities 2nd Grade Science Centers

https://www.teacherspayteachers.com/Product/Wind-Water-Changes-Weathering-Erosion-Activities-2nd-Grade-Science-Centers-3417904?st=d6f3f25f075f0ec098222292c622ceee

Inclusive Resources and Materials From Regional Specialists *Use of multisensory activities and materials to assist all learners. (texts, family & community knowledge and resources, contextually relevant professional web resources)*

Extended Approaches to Discuss Impacts of Wind and Water

- Jigsaw to have students research causes, effects and solutions to wind and water erosion then have these students act as experts to discuss with peers.
- Inviting a human resource personnel/professional to discuss causes, effects and solutions to wind and water erosion.
- Think-pair-share to have students discuss the importance of preventing wind and/or water erosions.
- 'Fishbowl' cooperative learning strategy to have students separate into an inner and outer circle. In the inner circle or fishbowl, students have a discussion on causes, effects and solutions to wind and/or water erosion while students in the outer circle listen to the discussion and take notes.
- KWL chart to discuss what students "Know", "Want to Know" and "Learnt" about wind and/or water erosion.
- Having students write a letter to the local Minister for Infrastructure and Physical Development, Public Utilities, Civil Aviation and Transportation on the importance of constructing a long wall to prevent water erosion in an identified local area.
- Roleplaying the causes, effects and solutions to wind and/or water erosion through a real-life scenario.
- Creating a class video with students as a mini documentary to report causes, effects and solutions to wind and/or water erosion in a local area then publishing this video on Flip, Grid or through a class YouTube channel.
- Roleplaying television/radio news on the causes, effects and solutions to wind and/or water erosion in a local area.
- Think-pair-share to have students think about solutions to wind and/or water erosion, then discuss with their peers then share with the whole class.
- QAR strategy to answer questions based on passages read about wind and/or water erosions.
- Writing thank you cards to show appreciation to important people in their community who offer services to prevent water/wind erosion.

Additional Resources:

Interactive Websites: Interactive websites such as KidsGeo.com

Books: Weathering and Erosion (2014) by Torrey Maloof . Published by Teacher Created Materials

Field Trips: Field trips to natural/virtual history museums or geological sites can help students see firsthand the effects of fast and slow earth movements.

Collaborative Learning: Collaborative learning activities can help students learn about fast and slow earth movements in a fun and engaging way. For example, group projects or class discussions can help students learn from one another and reinforce their understanding of the concepts.

PowerPoints, worksheets, hands-on experiments, scientific investigation activities, assessments, and homework projects that help teach children to compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.

Opportunities for Subject Integration: ***(How the inclusive learning strategies might be adapted and/or applied to include other subjects in the curriculum)***

Mathematics*:*

- Accessing data on annual rainfall.
- *Reading and interpreting graphs and charts on the communities affected by water erosion for given years.*
- *Using a grid to determine the area in square units of a plot of land affected by wind/water erosion.*

Social Studies*:*

- Create audio recordings of the oral history stories to recount the experiences of villagers about wind and water erosion in their villages.
- Interviewing/ inviting important people in the community who offer their services to prevent water/wind erosion. This in turn, will showcase careers related to these fields.
- Discussing the conservation of resources in the environment by preventing wind/water erosion.
- Looking at maps with areas affected by wind/water erosion.
- Discussing the effects on families who are affected by wind/water erosion.
- Having students vote for/against the erection of a long wall in their community to prevent erosion.
- Having students sign a petition for the erection of a long wall in their community to prevent erosion.

Language Arts:

- Practicing new vocabulary.
- communication skills through interview experience.
- Journaling of problem solutions (drawing and adding key words).

- Using oral and written language to communicate thoughts and feelings on issues regarding the causes, effects and solutions to wind/water erosion.

TVET:

- Develop a model to represent an erosion problem solution.
- Building a rock wall.
- Redirecting a stream or constructing a rock channel.
- Sketching/Creating a design for a long wall to prevent erosion.

Agriculture:

- Understanding the importance of windbreaks in the survival of farmlands.
- Identifying the effects on crop yield and livestock in situations of water/wind erosion.
- Discussing economic challenges of farmers who are affected by wind/water erosion.

Health:

- Discussing safety measures in situations of wind/water erosion.
- Discussing ways of caring for the environment.
- Discussing the effects of wind/water erosion on the physical health of individuals.

Elements from Local Culture:

- The break water project at Sauteurs; See: https://caribbean.loopnews.com/content/protest-grenada-over-sauteurs-breakwater-project
- Use of Vetiver grass for soil stabilization in Saint Lucia. See: https://vimeo.com/540412046
- Erosion of Telescope beach. See: https://www.ctvnews.ca/sci-tech/encroaching-sea-already-a-threat-in-caribbean-1.1272251
- Use of "back walls" (highly reinforced stonewalls) to prevent landslides, use of gutters and pavements to channel water.

- Vermont River (e.g. Xmas Eve floods) and Georgetown flood which occurred due to the rivers overflowing their banks and changing their course after heavy rains.

- Sea defense in Georgetown and Owia Fishery has triangle artificial stones.
- Use of local plants as windbreaks.
- Use of local plants to reduce landslides,

Resources for a learner who is struggling: ***(Links to earlier learning activities for similar knowledge, links to resources for special education needs)***

- Use of text-to-speech for students who have challenges with reading.
- Picture cards with wind/water erosion.
- Sample models depicting the causes, effects and solutions to wind/water erosion to promote hands-on learning.
- Visual charts and graphic organizers with pictures depicting causes, effects and solutions to wind/water erosion.

Resources for a learner who needs challenge: ***(Links to learning activities and resources in later grades)***

- Use of classroom desktop/laptop for advanced students to research causes, effects and solutions to wind/water erosions
- Reading passages on wind and/or water erosions: https://www.teacherspayteachers.com/Product/Erosion-Reading-Passages-Differentiated-2nd-Grade-Science-7921317
- Educational games on wind and/or water erosion: https://games.legendsoflearning.com/game/memoria-weathering-and-erosion/1201?partner=legends-public&media=video
- https://games.legendsoflearning.com/game/walters-travels-weathering-and-erosion/1193?partner=legends-public&media=video
- Worksheets on wind and/or water erosion: https://www.kidsacademy.mobi/printables/erosion/

Strategies that Support the OECS Curriculum and Assessment Framework

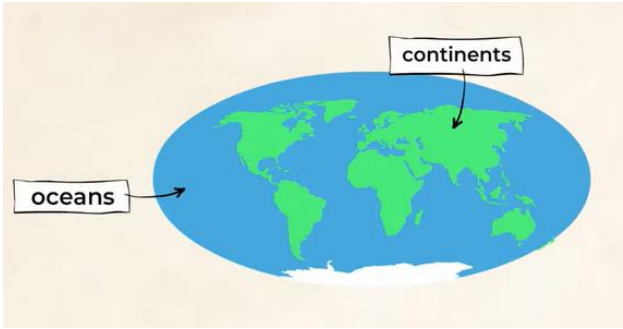
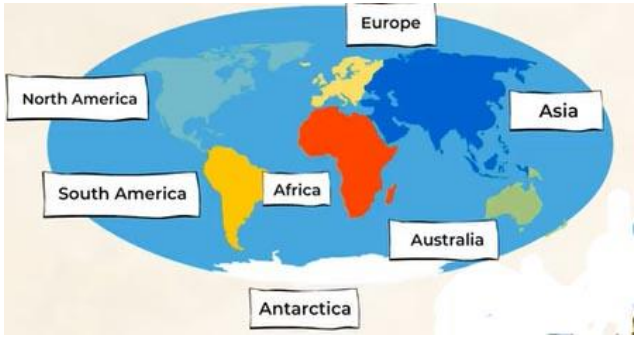
Elements of the Essential Education Competencies that are addressed:

An educated person in the OECS will demonstrate they have:	**Where might this competency be promoted/developed in this learning outcome and associated lessons?**
Developed Citizenship Competencies	Students participating in community services to assist in the cleaning up of areas affected by wind/water erosion. Students writing a letter to the local Minister for Infrastructure and Physical Development, Public Utilities, Civil Aviation and Transportation on the importance of constructing a long wall to prevent water erosion in an identified local area. Students participating in pageant shows with 'Mr. and Mrs. Erosion Prevention' to address the effects and solutions of wind and/or water erosion in their communities. Students signing petitions for the erection of a long wall in their community to prevent erosion. Students voting for or against the erection of a long wall in their community to prevent erosion.
Developed Critical Thinking and Ethical Communication Competencies	Demonstrate a knowledge of different careers related to this field of science e.g. geologists, environmental conservationists etc. Students conducting projects to derive solutions to wind/water erosions. Students answering questions about wind and water erosions. Students role playing television/radio news on the causes, effects and solutions to wind and/or water erosion in a local area. Students creating posters and brochures on the causes, effects and solutions to wind and/or water erosion.

Developed Well-being Competencies	Students developing communication and collaboration skills in group work. Students building their competency in oral and written language. Students developing their technological skills in using various technological tools and devices. Students developing a positive attitude in caring for their environment.
Developed Knowledge and Entrepreneurial Competencies	Students discussing ways to conserve the resources in their community by applying measures to prevent wind/water erosion. Students discussing economic challenges as a result of wind/water erosion. Students discussing the finances needed to erect a long wall to prevent erosion.

Purpose of the Subject: The study of science encompasses knowledge, processes, and values. Scientifically literate persons will foster an attitude of caring not only for themselves, but as responsible citizens, for the world around them. Their decision making will be enhanced by a systematic study of the structure and behavior of the physical and natural world through observation and experiment. In learning science, students benefit from leveraging and evaluating available technological tools to study and therefore understand the world and their relationship to it.
Topic or Strand: Earth Systems: Processes That Shape The Earth
Essential Learning Outcome (ELO-3): Develop a model to represent the shapes and kinds of land and bodies of water in an area. *[Assessment Boundary: Assessment does not include quantitative scaling in models.]*
Grade Level Guidelines: Refer to grade level expectations at the beginning of this curriculum document.

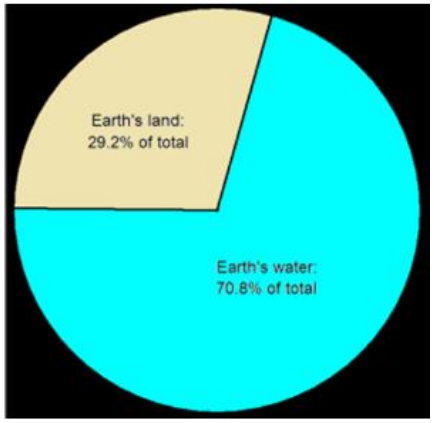
Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
Learners are expected to: **<u>Knowledge</u>** • Define the following terms: ➢ Landform ➢ Continents ➢ Oceans ➢ Pie Chart ➢ Fresh or still water ➢ Soft water ➢ Hard water ➢ Salt water (saline) ➢ Water Pollution ➢ Technology ➢ Oil Tankers ➢ Fertilizer ➢ Effluents ➢ Reduce ➢ Reuse ➢ Recycle	**Developing Students Descriptive Language- a guessing game** The teacher will collect pictures of landforms. They will distribute these between pairs of students so they each have several pictures within the pair. They are not allowed to show their partner the pictures they have. One person in a pair of students will have to describe the landform they see on their picture They can't use the actual name to describe the picture, just words about it. They alternate between pictures to see how well the pair can describe landforms and guess the correct answer! Teacher notes: • Use pictures or photographs of specific landforms such as mountains, hills, valleys, and beaches. • Use diagrams or illustrations showing different bodies of water like oceans, seas, rivers, and lakes in the Caribbean.	Students have you ever heard the word landform? A **landform** is any natural feature of the earth's surface. I want you to look at the following picture and tell me the landforms that you see (*hills, rivers*, *mountain, canyons, oceans, islands, volcano, desert, waterfall).*  Retrieved from: https://www.youtube.com/watch?v=07nrh786eP o

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
➢ Organic materials • Define and identify locations of different landforms and bodies of water in the Caribbean region, such as hills, rivers, mountains, canyons, oceans, islands, volcanoes, deserts, waterfalls, and estuaries. • Identify the two major landforms on the earth. • Identify the 7 continents that make up the earth's land masses. • Describe at least three means of traveling over landforms. • Compare and define different forms of water (fresh, hard, soft and salt). • Provide examples of water pollution. • Give three examples of how technology has resulted in water pollution (oil spill, fertilizer, industrial effluent). • List 5 examples of land pollution.	**Student Story Telling** Ask children to go home and talk to their families about the most interesting landforms or bodies of water they have seen in the country or in other countries they may have visited. Children should come to class prepared to tell their peers in a presentation about the landform and answer any questions. **Drawing Maps of Local Landforms** Have students create a map of their local area, identify different landforms and bodies of water in their surroundings, and explain how these geographical features impact their daily lives. *Rubric* Accuracy of Map 3 marks Explanation of landforms 5 marks Neatness of Map 2 marks **Local Area Art Project** Students can create an art project depicting one of the landforms or bodies of water studied using different interesting materials such as paper, pasta, vegetables, fruits, recyclable materials etc. They can include a label and short description of their features for display. *Rubric* • Accurately depicts landform or water body. 5 marks	(5:48 mins) The largest landforms on earth are the oceans and continents. **Continents** are the land parts (green) of our earth and **Oceans** are the water parts (blue) of the earth.  There are seven continents on the earth.  **Landforms in my Country**

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
• Explain how the three R's mitigate the effects of pollution. • Explain the dangers of litter in the school and organize a clean-up project (ST-2-ESS-ER-4). • Describe how pollutants affect people's activities and their health (ST-2-ESS-ER-8). • Distinguish between activities that harm and those that preserve habitat/the environment (ST-2-LS-ECS-6). • Define the term environmental destruction and investigate the factors that cause and prevent tis destruction (ST-2-LS-ECS-24). • Identify and discuss some of the unintended consequences of using fuels for transport and production of materials for commerce (e.g., pollution) (ST-3-PS-EN-5). • Define the term solid waste, identifying methods of managing this waste in home/school/community-	• Shows creativity and thoughtfulness. 3 marks • Is well constructed using very interesting materials. 2 marks • Description is accurate and contains at least two facts about the chosen landform or water body. 3 marks • Description is written using complete sentences 2 marks **Student Self Assessment** Students can complete a self assessment checklist concerning their knowledge of landforms or water bodies. <u>Sample checklist</u> • I can name at least four landforms • I can name at least four water bodies • I know which water bodies have fresh or saltwater • I know which water bodies have running or still water • I can describe the features of at least three landforms • I can describe the features of at least three water bodies **As a school project**, our class is going to set up three bins outside our classroom. One for paper products, one for recyclable plastic products and one for **organic materials** (e.g., *left over food, fruit peels, vegetable skins etc.)*	The teacher should align several activities to build up a list of landforms that is common to the students' country. Students would be expected to keep a journal with drawn and labelled pictures of the landforms they have come to know about in their country. This includes but is not limited to: • A field trip in the community to see very local landforms. (collecting pictures with cellphones to make a PowerPoint® collage) • Inviting experts and elders from the community to speak about the range of landforms in the country. • Pictures collected of exceptional landforms unique to the country. • Regular and topographical maps that the teacher can use in a demonstration lesson. • Google Earth® perspectives of landforms (if the technology is available) see: <u>https://earth.google.com/web/</u> After the teacher and students agree to a comprehensive list, the teacher supplies materials and guidance in the group building of a classroom model of their country's landforms (or even more local their community landforms). **Suggested materials**: 1) Plasticine or modeling clay and a flat cardboard or wooden surface.

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
recycling, composting. (ST-2-LS-ECS-23) **Skills** • Interpret a pie chart. • Classify the Caribbean region's common landforms (e.g., mountains, hills, valleys, plains). • Compile information on regional landforms from several sources. • Use technology (Google Earth®) to investigate landforms in the region. • Interpret pictures by careful observation. • Gather information from video resources. • Create posters to communicate the need for responsible recycling. • Construct a model or representation (e.g., using clay, or paper) that accurately depicts the	Each student group of three is going to make a poster that advertises the protection of our landforms by directing school students to the recycling program outside our classroom. Rubric Statement of the problem. 2 marks Explanation of three Rs. 5 marks Creativity in design. 3 marks	2) Papier- mâché (flour & water), newsprint and a flat wooden surface. See: https://www.instructables.com/Tools-and-Materials-for-Paper-Mache/ From their journal entries students should make landform labels of the correct words to place on their model (e.g. *river, mountain etc.)* Sample of model captured from: https://www.youtube.com/watch?v=GnpxyqxYbEA 

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
shapes and kinds of land and bodies of water in their area. • Group litter in their school according to size, colour, what it is made of, recyclable and non-recyclable (ST-2-ESS-ER-3). • Classify samples of water as hard or soft by their ability to form lather with soap, explain the advantages and disadvantages of both types of water (ST-3-ESS-ER-11). **Attitudes/Values** • Appreciate that water and land are important resources that must be protected. • To be curious about the shapes and kinds of land and bodies of water in their environment. • Collaborate with peers to discuss and compare different landforms and bodies of water found in the Caribbean, fostering an appreciation for the diversity and uniqueness of the region's geography.		**How do we Navigate Landforms?** Students. Look at these three pictures and tell me how humans travel over landforms.  Retrieved from: https://i0.wp.com/www.skabash.com/wp-content/uploads/2022/05/ship-2500x1597.jpg?fit=940%2C600&ssl=1  Retrieved from: https://www.intrepidtravel.com/adventures/wp-content/uploads/2017/05/FU8A0260-88x450.jpg 

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
• Demonstrate respect for the environment by discussing ways to protect and preserve landforms and bodies of water. • Demonstrate Stewardship/Respect for living things that may be affected by lack of clean water. • Demonstrate Stewardship/Respect for living things that are impacted adversely by pollution. • Display sensitivity and offer assistance to peers who may have physical or learning challenges when conducting practical and group work. • Participate actively in classroom discussions. • Unplanned and excessive science and technological activities may destroy the earth as we know it, resulting in untold disasters (Oil exploration, global warming) (ST-2-STSE-2). • Acknowledge that human-made things hold the potential to pollute the atmosphere and disrupt the environment (ST-2-TE-UT-2).		Retrieved from: https://static.toiimg.com/thumb/msid-79681152,width-748,height-499,resizemode=4,imgsize-228264/.jpg **Protecting the Landforms** Water makes up more than half of the landform space on earth (71%) Let us look at this **pie chart** as a way of understanding how much water we have compared to land.  We have different types of water on earth. **Fresh water or Still water** is the purest form of water (we

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
		sometimes call **soft water**) and it comes from mountain runoffs and rivers. It has very little dissolved in it, just pure water! Water can mix with minerals easily like rocks (limestone) and we call that **hard water**. The water in the ocean has mixed with salt (like our table salt for cooking). We call that **salt water or saline**. As part of a balanced diet, we need to drink lots of clean water. Our rivers and oceans support plants and animals too. This tells us that water is important and we must take care of it in all forms. Sometimes we are careless, and we don't think about hurting the water. When we add unnatural things to water, we call it **water pollution.** Students tell me some ways that you have seen water polluted in your community (*garbage in the water, spills of liquids near water supply).* **Technology** is referred to as a "way of adapting". Because humans naturally want to improve their lifestyle, they adapt with technologies. But sometimes technology causes problems for water. **Oil tankers** are used to transport our fuel across the world's oceans but, if they sink or develop a leak it causes problems for wildlife. This bird got covered in oil from a ship that sunk in Spain. 

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
		Retrieved from: https://safety4sea.com/cm-learn-from-the-past-prestige-sinking-one-of-the-worst-oil-spills-in-europe/  Retrieved from: https://www.theguardian.com/pictures/image/0,8543,-10304549059,00.htmlm Many farmers will add **fertilizer** (a technology to adapt farming) to their fields in order to make crops grow faster and bigger. But sometimes the rain will wash the fertilizer from the ground into the local rivers. This can kill fish and plants that grow there and we can't use the water for drinking. Sometimes processing plants that make new products for us like carpets and clothing, food or

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
		plastics will put their building beside a river. This allows them to dump chemicals and waste (**effluents**) into the river through pipes. The water is then polluted by effluents. We have to be careful because even though we want to live better lives, our new technologies can cause us problems if don't manage them. **Air Pollution** When we burn fuels to heat homes, power cars/trucks or operate factories, what do we notice is produced children? (smoke). The smoke rises into the atmosphere and affects the air we breath so it can be a health problem. We call that smoke **air pollution**. **Land Pollution is a Problem**. Land pollution affects our landforms too! Students, list at least five examples of pollution on land that you have seen in your community? When we add garbage to our landforms we sometimes call it **solid waste**. The plant and food materials we can actually collect and use for fertilizer. This is called **composting.** In order to protect our land, we need to think about the three R's **Reduce**: means to stop using so many manmade products (like plastic) because it is convenient to throw away.

Specific Curriculum Outcomes	Inclusive Assessment Strategies:	Inclusive Learning Strategies
		Reuse: means using items in our lifestyle over and over e.g., instead of a Styrofoam® cup and throwing it away, we reuse a glass cup. **Recycle:** some products we use everyday can be donated to a processing plant that can break them down and then make new products from them (e.g., you may have seen recycled paper that can be used again; you may have seen recycled plastics that can be used to make new products. **Review of Landforms** As student watch the following videos, they should make their own list of the 20 landforms that are mentioned. https://youtu.be/6vrIg8P9ERg (4:46 mins) https://www.youtube.com/watch?v=b-IBCpenyKg (7:59 mins) **Landform Song:** To the tune of Frere Jacques (listen to melody here: https://www.youtube.com/watch?v=QI0abuwq31g) Hills and mountains Hills and mountains Rivers and streams Rivers and streams Waterfalls and oceans These are all landforms Sing with me, sing with me!

Useful Content Knowledge for the Teacher about the Outcome*: (Links to professional sources that connect back to the Curriculum and Assessment Principles of Learning and Principles of Assessment)*

Glossary of terms

Landform is a natural feature on the surface of the Earth, such as mountains, hills, valleys, fields, plateaus, or islands.
A mountain is a big piece of land that rises high above the rest of the land around it. It usually has steep sides and a pointed or rounded top.
A hill is a rounded, raised piece of land higher than the surrounding land but not as steep as a mountain.
A valley is a low area of land between hills or mountains where a river or stream usually flows.
Plain: An area of land that is either flat or slightly rolling, with few or no hills or mountains.
Plateau: A big, flat, elevated area of land that is higher than the land around it. Its edges are usually steep cliffs.
An island is a piece of land surrounded by water on all sides.
Peninsula: A piece of land surrounded on three sides by water but is only linked to the mainland on one side.
Coastline: The coast is where land meets the sea or ocean.
A beach is an area of sand, dirt, or small rocks near the water.
A river is a big stream of water flowing across land and usually empties into another body of water, like a lake, sea, or ocean.
A lake is a big body of freshwater water that is usually surrounded by land and is in the middle of the land.
A pond is a small body of shallow water that is usually filled with fresh water. It is smaller than a lake.
A gulf is a large part of a sea or ocean partly surrounded by land and has a small opening to the open water.
A bay is an area of water partly surrounded by land but has a wider entrance than a gulf.
An estuary (local name: bushiree) is a body of water on the coast partly surrounded by land and where freshwater from a river or stream mixes with saltwater from the ocean or sea.
Coral reefs are ridges or mounds of coral polyps that grow and stick together in warm, shallow water.
Mangroves are a type of tree or shrub that grows in tropical coastal places and has special adaptations to live in saltwater environments.
A wetland is an area of wet or underwater land, like a marsh, swamp, or bog.
A cave is a natural underground room or group of rooms. They are usually made by the erosion of soft rocks like limestone.

Mountains:

The Caribbean region has several mountain ranges, including the Blue Mountains in Jamaica.
Teach students about the characteristics of mountains, such as their height and steep slopes.

Rivers:

The Caribbean region has several rivers, including the Orinoco River in Venezuela and the Paradise River in Grenada.
Introduce students to rivers as flowing bodies of water that start from a source (such as a mountain) and empty into another body of water (such as a lake or an ocean).

Lakes:

Explain to students that lakes are bodies of water surrounded by land and can be freshwater or saltwater. Emphasize their importance as habitats for plants and animals.
Example: Grand Etang Lake in Grenada

Oceans:

The Caribbean Sea is a large body of water in the Caribbean region and is part of the Atlantic Ocean.
Teach students that the Caribbean Sea connects to the Gulf of Mexico and is home to many islands and coral reefs. Help them understand the concept of an ocean as a vast expanse of saltwater covering most of the Earth's surface.
Other notable landforms in the Caribbean include beaches, coral reefs, and cays (small, low-lying islands).
Familiarise students with these landforms by explaining that beaches are sandy areas along the coast, coral reefs are underwater structures supporting diverse marine life, and cays are small islands often found in clusters.
Encourage hands-on activities, visual aids (maps, pictures), and discussions to engage students and reinforce their understanding of landforms and bodies of water in the Caribbean region.

Landforms:

Mountains: Tall, rugged landforms with steep slopes and often pointed peaks.
Hills: Smaller landforms with rounded or sloping tops and gentler slopes than mountains.
Valleys: Low-lying areas between mountains or hills, often with rivers running through them.
Deserts: Dry, barren areas with little vegetation and very little rainfall.

Bodies of Water:

Oceans: Large bodies of saltwater covering most of the Earth's surface.
Seas: Smaller bodies of saltwater partially enclosed by land.
Lakes: Bodies of freshwater surrounded by land.
Rivers: Flowing bodies of water that usually start in mountains or hills and flow into lakes, seas, or oceans.
Streams: Smaller flowing bodies of water that may flow into rivers.
Ponds: Small bodies of freshwater, usually shallower than lakes.
Waterfalls: Places where rivers or streams flow over a steep drop in elevation.

Characteristics and Features:

Landforms:

Elevation: Landforms can be high or low in relation to sea level.
Shape: Landforms have distinct shapes such as pointed (mountains), rounded (hills), or flat (plains).
Soil and Vegetation: Different landforms support different types of soil and vegetation.
Formation: Landforms are shaped by various forces like erosion, tectonic activity, or volcanic activity.

Bodies of Water:

Size: Bodies of water can vary in size from small ponds to vast oceans.
Salinity: Oceans and seas are saltwater bodies, while lakes and rivers are typically freshwater.

Currents: Water bodies can have currents that affect the movement of water and influence their ecosystems.
Depth: Bodies of water can be shallow or deep, with varying depths across different areas.
Aquatic Life: Different bodies of water support diverse ecosystems and aquatic life.
By comparing and contrasting these landforms and bodies of water, teachers can help students develop an understanding of the natural features and characteristics of the Earth's surface.

Inclusive Resources and Materials From Regional Specialists *Use of multisensory activities and materials to assist all learners. (texts, family &community knowledge and resources, contextually relevant professional web resources)*

Primary Science for the Caribbean Mission: Science Book
https://kids.nationalgeographic.com/
https://www.education.com/resources/?q=landforms
https://www.teacherspayteachers.com/Browse/Search:grade%202%20landforms
Sand and Water Play: Students can make islands, mountains, hills out of the sand, and seas, rivers, and lakes out of the water.
Playdough Creations: They can use their hands to shape rocks, hills, volcanoes and islands.
Map making: Give things like rough papers, cardboard, and fabric representing different types of land and water. Students can cut and paste these pieces onto a base map and add names and symbols to show where certain things are.
Virtual Field Trip: Use technology to take your kids on virtual field trips to different places in the Caribbean. Get students to talk about what they see and explain what they see.
Sensory Bin Exploration: Create a sensory bin by filling a container with rice, sand, or beans. Add small plastic toys or models of Caribbean landforms and bodies of water to the bin. Students can explore the bin using their hands, scoop and pour the materials, and identify and discuss the features they encounter.
Nature Walk and Collecting: Take students on a nature walk around the school or community to look at and collect natural items that reflect different types of land and bodies of water. Students can collect rocks, seashells, leaves, and other things that can be used to sort, organise, and make visual displays or collages.

Additional Resources:
Some recommended books include:
"Me on the Map" by Joan Sweeney
"Geography from A to Z: A Picture Glossary" by Jack Knowlton
"Geography: Know Your World" by Richard Bowood
YouTube Channels: National Geographic Kids, SciShow Kids, and Crash Course Kids
https://kids.nationalgeographic.com.

Opportunities for Subject Integration: ***(How the inclusive learning strategies might be adapted and/or applied to include other subjects in the curriculum)***

Mathematics:

- Reading charts and graphs.
- Classify different geometric shapes in the landforms and bodies of water. They can learn about shapes such as circles (e.g., lakes), squares (e.g., fields), and triangles (e.g., mountains).
- Measure the length, width, and height of mountains, the circumference of lakes, or the area of fields using non-standard units (e.g., hand spans, paper clips) or standard units (e.g., centimetres, meters).
- Use mapping skills to draw and interpret simple maps, including symbols to represent various features like mountains, rivers, lakes and islands.

Social Studies:

- How water is used as a resource.
- Demonstrating map reading skills.
- Cultural and historical significance of landforms and bodies of water in a region.
- The impact of human activities on the environment and the importance of conservation.

Language Arts:

- Using new words and expressions in conversations and presentations.
- Demonstrating adequate oral presentation skills.
- Reading nonfiction texts to get information about landforms and bodies of water.
- Songs and books about landforms.

TVET:

- 3D modelling
- Using materials like playdough to construct models that mimic real geographical features.

Agriculture:

- The impact of landforms on agriculture, such as how the slope of the land affects water drainage and crop cultivation.
- Water bodies and their importance to agriculture; basic soil types.

Health:

- Why all water is not safe to drink; Making water safe to drink.
- Landforms and bodies of water can provide opportunities for outdoor activities and exercise, such as hiking and swimming.

Elements from Local Culture:

Each country will have landforms that have cultural, spiritual or heritage significance.
These landforms may be part of regular celebrations that the teacher should recognize and expose their students to.

Depictions of early Carib & Arawak boats for travel between islands and fishing

Pictures retrieved from:
https://www.britannica.com/topic/Carib
https://members.tripod.com/livi_d/history/history.htm

- Make connections to history, travel and spread of the Tinos and Kalinagos.
- Mountains, limestone, cays, rivers, beaches, waterfalls, salt ponds, mangroves, ocean, waterfalls (e.g., Falls of Baleine and Darkview Falls).
- Fresh water springs and mineral springs (e.g. Belair Mineral Spa).
- Sulphur springs, valleys

Resources for a learner who is struggling: ***(Links to earlier learning activities for similar knowledge, links to resources for special education needs)***

- Websites like Khan Academy, National Geographic Kids, and BBC Bitesize offer interactive lessons, videos, and games that can help children understand geography concepts, including landforms and bodies of water.
- Field trips or nature walks to observe and explore real-life examples of landforms and bodies of water in your local area.
- Provide learners with physical materials such as clay, playdough, or building blocks to create different landforms and bodies of water.
- Utilize visual aids like posters, charts, or flashcards displaying different landforms and bodies of water.
- Age-appropriate picture books that illustrate different landforms and bodies of water.

- Make some simple and easily understandable social stories or visual narratives about the many types of land and water features.
- Memory match game with peers.
- Interactive notebooks using picture cut outs and printed words.

Resources for a learner who needs challenge: ***(Links to learning activities and resources in later grades)***
(https://kids.nationalgeographic.com/) and BBC Bitesize (https://www.bbc.co.uk/bitesize/levels/z3g4d2p) provide interactive activities and quizzes on landforms that are appropriate for students in the second grade. These activities can provide a stimulating, and challenging learning environment.

Strategies that Support the OECS Curriculum and Assessment Framework
Elements of the Essential Education Competencies that are addressed:

An educated person in the OECS will demonstrate they have:	**Where might this competency be promoted/developed in this learning outcome and associated lessons?**
Developed Citizenship Competencies	Discuss the importance of preserving and protecting the land and bodies of water in the local area. Engage students in discussions about environmental issues and brainstorm ways to take action as responsible citizens. Encourage students to share their models and findings with the local community through presentations or exhibitions. Explore opportunities for community service related to environmental conservation.
Developed Critical Thinking and Ethical Communication Competencies	Engage students in activities that require critical thinking, such as identifying similarities and differences between various landforms and bodies of water or categorizing them based on their characteristics.
Developed Well-being Competencies	Promote group discussions where students can share their observations, findings, and thoughts. Encourage active listening, respectful communication, and the consideration of different viewpoints.
Developed Knowledge and Entrepreneurial Competencies	Recognizing local features of the landforms may prepare students well to be tourism advocates.

Purpose of the Subject: The study of science encompasses knowledge, processes and values. Scientifically literate persons will foster an attitude of caring not only for themselves, but as responsible citizens, for the world around them. Their decision making will be enhanced by a systematic study of the structure and behavior of the physical and natural world through observation and experiment. In learning science, students benefit from leveraging and evaluating available technological tools to study and therefore understand the world and their relationship to it.
Topic or Strand: **Earth Systems: Processes That Shape The Earth**
Essential Learning Outcome (ELO-4): Obtain information to identify where water is found on Earth and that it can be solid or liquid
Grade Level Guidelines:. Refer to grade level expectations at the beginning of this curriculum document

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **<u>Knowledge</u>** • Define the terms: ○ conserve ○ sphere ○ ocean ○ sea ○ north pole ○ south pole ○ solid water ○ glacier ○ liquid water ○ ground water ○ hail ○ sleet ○ snow ○ fresh water ○ salt water ○ precipitation ○ solids ○ liquids ○ gas	**Using a Map or Globe to Identify Water** • Have students look at a globe and colour the land masses in brown and bodies of water in blue.  • Students draw pictures of the different places where water sources can be found. • On a blank map of your country/ island colour the places where water can be found in blue. • Pupils visit different areas in their island where different sources of water can be found and add labelled drawings to their journal.	**Situating the Importance of Water** Students have you have ever thought about all the water we use every day? Let's write down some examples you might think of (*wash my face, bathing, drinking, washing dishes, toilets, washing our fruits and vegetables).* We sometimes think that water is always going to be available for us to use but some places in the world people have to be very careful to **conserve** water. **Conserve** means to save it and use it only when we need to. We should never waste water because we never know when it will run it. Students, can you tell the class when have you heard of someone running out of water at their home, on a farm, at their business? **Where water can be found on Earth?** Today we are going to talk about where all of water comes from. If we know this, maybe we can be more careful to **conserve** our water so we have it for all of those things you told me about.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
○ water vapor ○ condensation ○ collection ○ evaporation ○ water cycle ○ freezing ○ melting ○ temperature ○ thermometer ○ water pollution ○ reuse ○ recycle ○ reduce • Identify where water can be found on Earth. • Show where water can be found in its different forms (solid, liquid) on Earth. • Compare and describe different bodies of water. • Use a globe or map to show that planet Earth is made up of more water than land. • What is a water cycle? • How do the particles in a solid compare to a liquid and a gas? • Observe different types of weather -rainy, sunny, cloudy windy (ST-2-ESS-EW-1).	• Pupils are to make their own model of the Earth to show where sources of water can be found. The teacher assists students in this activity. Create Your Own Earth Model | Education.com **Recalling the Sources of Water** Teacher can read these to students have a show of hands for the answer. Where is most of Earth's water? A. rivers B. lakes C. oceans Water can be found in oceans, lakes and ponds. True False The earth has more water than land. True False *Other Quiz Tools here:* Teacher may decide to use an electronic recall quiz here: Bodies Of Water Free Activities online for kids in 2nd grade by Kathy Gordon (tinytap.com) Pupils complete a quiz, identifying where water is found on earth. Free 2nd Grade Science Flashcards - Identify where water is on Earth (varsitytutors.com) Pupils complete a worksheet identifying water sources. Sources of water worksheet (liveworksheets.com)	Have you ever wondered where water is found on earth? Give me some examples that you know of (*river, rain, lakes, ocean, sea*). Have you ever seen a globe? It is a model of the earth. You can see that it looks like a round ball, we call it a **sphere**. **Note:** If the teacher has access to a globe they can bring it into class, otherwise a picture of a globe as below should suffice. Take a look at this picture of a globe. I have some questions for you!  Retrieved from: https://s3-ap-southeast-2.amazonaws.com/wc-prodpim/JPEG_1000x1000/SMGL1_studymate_globe.jpg Questions: **Which part do you think is the water?** (*blue area*) It is really large. The biggest blue areas are called **oceans** and **seas**. Examples would be the Atlantic ocean here

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies

- Design, draw and label a simple diagram to indicate the water cycle (ST-2-ESS-EW-5).
- State at least 3 properties of water. (ST-2-ESS-ER-11).
- Identify and list at least 3 uses of water (ST-ESS-ER-12).
- State that water can change from solid to liquid and from liquid to solid (St-2-PS-MM-7).
- Describe the conditions that cause the changes (ST-2-PS-MM-8).
- Identify and name the elements of weather (water vapor, precipitation) (ST-3-ESS-EW-2).
- Describe and demonstrate how clouds are formed (ST-3-ESS-EW-3).
- Identify the heat source that powers nature's water cycle, and explain the process (ST-3-ESS-EW-7).
- Describe how temperature affects weather (ST-3-ESS-EW-8).

Skills

- Identify bodies of water and land on a map or globe.

Pupils match the source of water to its definition in the table.

glaciers	Water as a gas, cools and converts to liquid and is stored here.
lake	a continuous body of salt water on the earth surface
river	land consisting of swamps
ocean	a large area of water surrounded by land
ground water	water that occurs below the surface of the Earth
clouds	a large natural stream of water flowing in the sea.

Forms of Water

Draw a picture that shows that you know three different forms that water might take.

Which picture shows water in liquid form?

(*show students*) and the Caribbean sea here. (*show students*). In other parts of the world we have the Mediterranean Sea (*show students*) and the Black Sea(*show students*). You can tell by the blue area that seas are smaller than oceans. Look here, this the Pacific Ocean (*show students*), it is much larger than the Caribbean sea (*show students*).

Which part do you think is the land? (*colored areas)*
Let us see if we can find our country on the globe. Here it is!

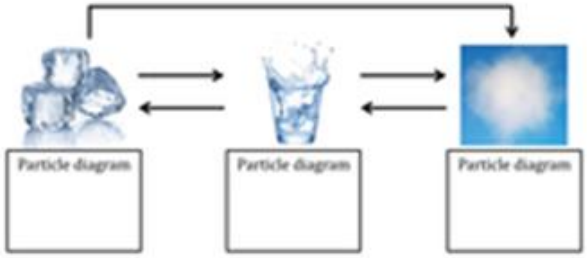
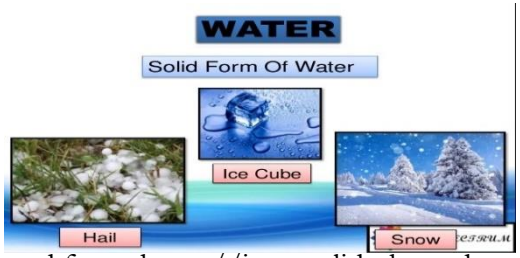
Different Forms of Water

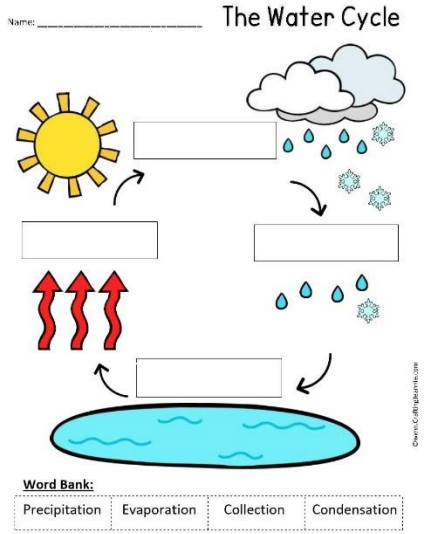
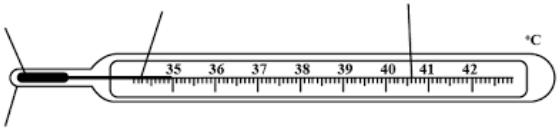
Look at this picture. Do you know what it is?

Retrieved from:
https://www.worldwildlife.org/pages/six-ways-loss-of-arctic-ice-impacts-everyone

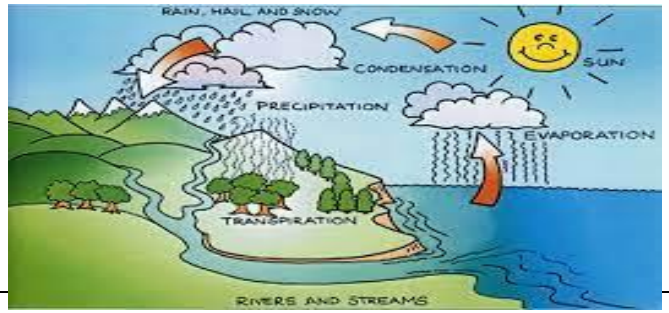
Let me give you a hint.

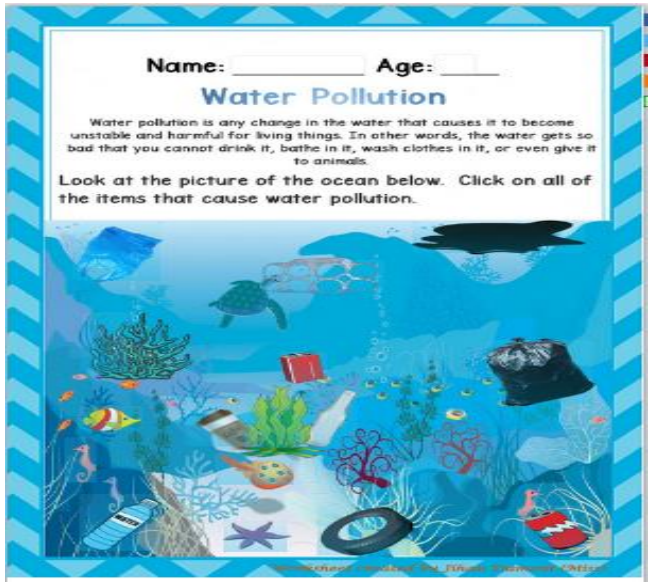
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
• Distinguish salt water and fresh water. • Observe and describe the physical changes that occur when water freezes, melts, and evaporates. • Observe and interpret a condensation experiment. • Classify the various sources of water on earth as solid, liquid or gas. • Show how a thermometer can measure the temperature. • Measure the temperature of frozen water, water and boiling water. • Label a diagram of the water cycle. • Use fists to demonstrate particle distance in solids, liquids and gas. • Use fist model to explain the processes in the water cycle	Retrieved from: https://cdn.pixabay.com/photo/2017/12/14/17/33/matterhorn-3019429__340.jpg  Retrieved from: https://cdn.pixabay.com/photo/2014/09/21/14/39/rain-455124__340.jpg  Retrieved from: https://cdn.pixabay.com/photo/2019/02/04/13/12/icicle-3974617__340.jpg Flashcard Games for Identifying states of water Free 2nd Grade Science Flashcards - Explain how water on Earth can be solid or liquid (varsitytutors.com) **Physical Change in state in matter.** Using the words below, label the diagram showing the physical states of matter.	In other parts of the world (especially at the top and bottom – show globe) the sun's rays only indirectly reach them so it gets very cold there. What is this picture?  Retrieved from: https://cdn.pixabay.com/photo/2018/06/29/23/01/ice-cubes-3506782__340.jpg You are right- these are ice cubes-How do we make them? (*we freeze water in the refrigerator*) In those parts of the globe where it gets really cold, some of the water is actually frozen, just like an ice cube! We call those places on the globe, the **North Pole** and the **South Pole** (*show students on the globe).* We know from scientific studies that those poles have a lot of water frozen! We call frozen water **solid water** because it takes up space just like a rock. The frozen water you saw in the picture above is called a **glacier**. When the sun shines on a glacier, it melts and that water trickles into the sea water. **Liquid water** is what we see coming out of our tap. It can be pumped from a rain water tank but also from a well underground. The water

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
(evaporation, condensation, precipitation). • Debate the importance of water conservation. • Apply the reuse, recycle and reduce model to community improvement. • Observe the evaporation and condensation of water (ST-3-ESS-EW-6). • Collect and compare measurements of rainfall, temperature, wind direction and windspeed during a specific period (ST-2-ESS-EW-7). • Use a thermometer to measure temperature and, explain how the device works (ST-3-ESS-EW-9). **Attitudes/Values** • Appreciation: Students will develop an appreciation for the importance of water as a	Solid Liquid Gas Evaporation Melting Freezing  Retrieved from: https://d1uvxqwmcz8fl1.cloudfront.net/tes/resources/11585539/4844b66a-d096-49bc-a7bf-b4c2316ba771/image?width=1000&height=190&version=1493059500289 **Web-Based Resources** Pupils play a game identifying the different forms of water Forms Of Water Free Games | Activities | Puzzles | Online for kids | Preschool | Kindergarten | by apart from sKOOL (tinytap.com) **Labelling The Water Cycle**	down in the earth is called **groundwater**. It can be poured into many different containers, so it doesn't have the same shape all the time. Liquid water also falls from the sky as rain. In some parts of the world where it gets very cold the rain falling from the sky freezes and fall as ice pellets called **hail or sleet** or fluffy flakes we call **snow**. As a review the teacher can show this graphic organizer.  Retrieved from: https://image.slidesharecdn.com/water-160513085810/95/water-survival-of-living-being-9-638.jpg?cb=1463130220 **Other sources of Water** Students do you know of other places we find water besides the ocean, seas and solid water at the poles? Where can we catch fish? (*rivers, streams, lakes etc*) I have two glasses of water here. One is from a nearby river (or lake) and one is from the ocean. When I taste them, they are very different (NOTE: you can also supply individual samples to students*)*. The ocean water tastes like salt, like the salt we put on our food. The river water doesn't have a salty taste. We sometimes call the river water **fresh water.** The **glaciers**

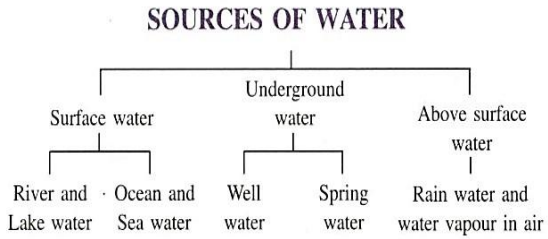
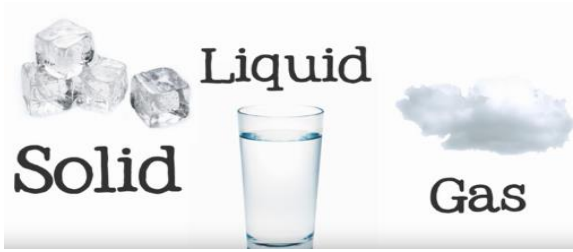
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
precious natural resource and recognize the need for conservation efforts. • Interest/Curiosity: Students will develop a deep interest and curiosity in the topic of water by exploring and investigating its properties, distribution, and importance to living things. • Inventiveness: Students will use their creativity and inventiveness to develop and implement solutions to real-world water-related problems, such as water pollution, scarcity, and distribution. • Active Participation: Students will participate actively in classroom discussions related to water, developing critical thinking and communication skills through classroom debates, discussions and presentations about water. • When conducting practical and group work, display	 Retrieved from: https://www.craftingjeannie.com/water-cycle-worksheets/ **Temperature of water in various conditions.** Look at this picture students. What is this instrument called? (thermometer) What does it measure? (temperature) 	at the poles are frozen fresh water. Oceans and seas are **salt water**. Nearly all of earth's available water is in the oceans. Most freshwater is in **glaciers** or underground. Only a tiny fraction is in streams, lakes and rivers**.** In some countries fresh water runs underground and flows into wells that can be pumped for drinking. **Properties and Uses of Water** Students, we know that water is a liquid. As a liquid, what are its properties? ➢ *Takes the shape of a container* ➢ *Has a definite volume* ➢ *Can be poured* Water is all around us. Can you name at least three uses of water? ➢ *Drinking* ➢ *Washing ourselves* ➢ *Washing clothes & dishes* ➢ *Watering plants* **Water from The Sky: The Water Cycle** We also know that water falls from the sky in the form of rain. We call rain a form of **precipitation.** Why does that happen? Foundational Ideas

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
sensitivity and offer assistance to peers who may have physical or learning challenges.	Complete the following fun facts on boiling and freezing. 1. Pure water boils at _____. (*100 degrees Celsius).* 2. Pure water freezes at _____. (*0 degrees Celsius)* 3. Where on the earth would you expect there to be cooler temperatures and therefore glaciers. _____ (*North or south pole*) 4. Name three types of precipitation. (*rain, sleet, snow)* 5. The Caribbean region doesn't often get sleet and snow because _____. (*it isn't cold enough for the rain to freeze)* **Physical Activity** Everyone stand up. A. Use your fists to show me what happens when water **evaporates** from a lake (*fists coming apart and moving*). B. Use your fists to show me liquid water as it cools in the clouds and **condenses** to make rain (*fists coming closer together and slowing down).* **True or False** Write T if the statement is true or F if it is false. • We don't need water. (F) • People should use water wisely. (T) • Keeping the tap opened while brushing our teeth is good. (F)	Begin with a discussion about the particles that make up solids, liquids and gases. Get children to stand up and mimic the teachers' fist actions as you explain. Use your fists to show children that particles that make up **solids** are close together. (keep fists close). Tell them that with heat the particles begin to move and get farther apart (move fists apart) These are called **liquids.** Lastly explain that with even more heat the particles will get enough energy to move far apart and form what we call a **gas.** Next you will perform a demonstration experiment (or show pictures- see below) and use discussion to help students understand what is happening. **<u>Teacher Demonstration</u>** Retrieve two plastic two liter bottles. Cut them in half and throw away the tops. Place ice in one half bottle (bottle #1) . Place boiling water in the other half bottle (bottle #2). Now place bottle #1 (ice) on top of bottle #2 (hot water) and you will see condensation forming at the bottom of bottle #1.  

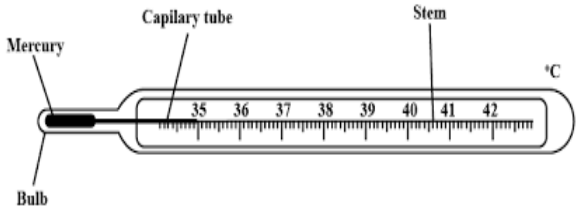
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	• Reusing and recycling things can reduce water pollution. (T) • Life would not be possible without water. (T) **Water conservation** Look at the pictures. What message are they trying to explain? (*Water is important, don't waste it, we should save water*)   retrieved from: https://www.pinterest.ca/pin/620863498642885957/ https://www.pinterest.ca/pin/201958364525040837/ **Differentiated Activities** Provide students with materials to paint, draw or color their own posters depicting water conservation. Children must demonstrate at least 3 practices in their community that would reduce the wasting of water. Organize a class exhibition to showcase their work and have others appreciate the importance of water.	Students, why did this happen? Let us see if we can explain this using our fists? The particles that make up liquid water get heated up to boiling. This makes them move apart and become a gas (show me with your fists what liquids look like- that is right, not as tightly packed as the solid) Now when we heat the liquid our fists come further apart- that is the liquid getting energy and becoming a gas and moving in many directions. Let us look at our bottles again… as the gas moves up to the cold bottle (#2) it starts to slow down and the particles get closer together again (show me with your fists) and becomes a liquid. That is why we see drops of water, the water as a **gas** (called **water vapor)** gets cold and forms a liquid again. We call that **condensation.** So let us take our experiment with the bottles and apply it to the water in the world. This diagram can help us. It is called the water cycle. Maybe we can guess why they call it a cycle! 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Rubric: 3 strategies to reduce consumption 5 marks Neat and demonstrative artwork 5 marks Clear explanation of poster 5 marks Water Pollution worksheet: Identify the different items that add to water pollution in the worksheet.  Retrieved from: https://www.liveworksheets.com/bz553023pd Teacher may work with the children to write a poem or song entitled "Water, Water Everywhere" that emphasizes the new vocabulary.	Adopted from: *The State of Water in the Water Cycle*. (2016). Whale Coast Conservation. https://whalecoastconservation.org.za/the-state-of-water-in-the-water-cycle/ Let us use our fists to pretend we are liquid water in the ocean, lake or stream. These places are where water is part of **collection**. The sun warms us up and our particles (fists) get farther apart and become water as a gas (**water vapor**). We call this **evaporation.** The water as a gas rises into the sky where it gets cold. Because it is cold, the particles get closer together again (fists get closer) and becomes liquid water again. We call that condensation (just like our bottle experiment) It collects up in clouds and when it gets really heavy, it falls as liquid water. If it is warm it falls as rain. If it is cold outside, it falls as sleet or snow. We call all of those forms (rain, sleet, snow) **precipitation.** **So why do we call it a water cycle students?** (*the water goes up from the lakes into the clouds and then falls back down again- over and over-that is a cycle*) As review of the water cycle, the teacher may find it useful for students to watch the following video and think about water as a liquid and water as a gas. Afterwards have them use their fists to explain that water cycle. See Water cycle video here https://www.youtube.com/watch?v=s0bS-SBAgJI (2.43 mins)

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Teacher can assist students to dramatize a short skit on the conservation and proper use of water. Teacher may set up a "pro" and "con" debate on the use of water in the community.	As a review the teacher can show this graphic organizer.  Retrieved from: https://image.slidesharecdn.com/unit8wateronearth-150221201505-conversion-gate01/95/unit-8-water-on-earth-6-638.jpg?cb=1488739492 **Review of Water Sources** Watch the video below and list or draw a picture of 4 places water can be found. https://youtu.be/zn9sdF4fysg (2:14 mins)

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Graphic Organizer to Summarise  **Useful book to support the curriculum outcome**: Olien, Rebecca (2005) Sources of Water. Capstone Press. Electronic version here: https://books.google.dm/books?id=GPouAlZWuxoC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false Physical changes of water in the solid, liquid and gaseous states in more detail. We know that water is around us in different forms. Students, let us review with these pictures. 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Retrieved from: https://www.youtube.com/watch?v=wclY8F-UoTE (4:34 mins)  Adopted from: Admin. (2022). Changing States Of Matter - Solid, Liquid And Gas | Phase Change. *BYJUS*. https://byjus.com/physics/changing-states-of-matter/ ***Students are brought to the Science laboratory/kitchen where the teacher will demonstrate to students as they observe the physical changes in water.*** • Teacher brings students to the drinking water trough and students are asked to open the tap and talk about the water's physical state (*Students will describe the water flows and it is a liquid*). • Now students, if you want the water from the tap to become hard (solid), what can be done to it?

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		(*We can put it in a container and place it in the freezer. We can freeze it.*) The physical change in state of water from a **liquid** to a **solid** is called **freezing**. ● Now students look at the ice in this glass. If we decide to leave it in the sun for 10 minutes what do you think will happen to the ice? (*It will melt. It will become water.*) The physical change in state of water from a **solid** to a **liquid** is called **melting**. **Measuring when the change happens** Who has heard of the word temperature? What does it mean? (*how hot it is outside*) **Temperature** is how hot or cold something is. *Temperature - 2nd Grade Math - Class Ace.* (n.d.). Class Ace. https://www.classace.io/learn/math/2ndgrade/temperature The temperature of an object is measured in "Degree Celsius (ºC)or Degree Fahrenheit" (ºF). A **thermometer** is an instrument used to measure temperature. The liquid inside the thermometer expands (gets larger) when it is heated because the molecules get energy to move further apart. 

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		The teacher should take a glass of ice cubes filled water and show children that we can measure the temperature that freezing and melting is happening (establish as zero degrees Celsius). ***The teacher will put a pot to heat then pour water in the heated pot***. ● Now students, can you describe what you observed when the water is poured into the hot pot. What happened to the water in the pot? (*It disappeared, it* ***evaporated****, it turned into steam* "gas") ● Have students use their fists to show/explain why the liquid turned to gas. The physical change in state of water from a **liquid** to a **gas** is called **evaporation.** The teacher should show children that we can measure the temperature of the water in the boiling pot when liquid water turns to water gas (establish as 100 degrees Celsius). The teacher may use the following video to show how temperature is measured. https://www.youtube.com/watch?v=J157oziu3zQ (9:00 mins) **Water is important to us!**

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Water is a very precious **resource**. A resource is something that is useful to us. Plants and animals need water to live. Students, what do you use water for? (Bathing, washing, drinking, cooking, cleaning etc.) Let's listen to a story about how water is important to us. Listen for some other ways water is important to us. (Fishing, playing, working, planting etc.) https://www.youtube.com/watch?v=jS1xbmvcb00 (0:00 – 2:42 mins) What would it be like without water at home? (It would not be good at all; we wouldn't be able to wash, cook, drink, clean etc.) **Water Conservation- We should save water!** Water is very important for our daily lives and for us to survive but did you know that there is a limited amount of water on our planet? This means that we need to be careful with how much water we use and make sure that we don't waste it. Students, what are some ways that people waste water? (Leaving the tap open when not in use especially when brushing your teeth, taking long baths, using too much water when doing certain chores like washing etc.) What do you think would happen if we continued to waste water? (It will soon run out. We won't be able to get enough to use in our homes and gardens, it will affect

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		the water pressure especially for people living in high areas). Let's see how we can save water by watching this video. https://www.youtube.com/watch?v=nEJSFSKwEtQ (4:2 5 mins) So how can we save water? •Turn off the tap when you are brushing your teeth or washing your hands. •Take shorter showers instead of long baths. •Fix any leaks in your house, such as dripping taps or running toilets. •Use a watering can instead of a hosepipe to water your plants. •Only use the washing machine and dishwasher when they are full. **Water Pollution** Take students to a nearby river. Students, look at the water and around it. Is there an abundance of plant and animal life that depends on the water? Do you also see that there is trash/garbage **polluting** (dirtying) the river? This is called **water pollution**. Water pollution happens when harmful things like trash/garbage, chemicals, or dirty things get into our water. This can make the water unsafe for animals and

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		plants that live in the water, and also for people who drink it or use it for other things like swimming or fishing. Make a list of the things that you observe polluting the water. (bottles, snack wrappers, plastic bags etc.) How do you think they got there? (people littering, dumping trash/rubbish in the rivers) What can we do to prevent water pollution? (Reuse, Recycle and Reduce) ● **Reuse** means finding ways to use something again instead of throwing it away. ● **Recycle** means turning something old into something new. ● **Reduce** means using less of something. By practicing these three things, we can all help take care of our planet and make it a better place to live!

Useful Content Knowledge for the Teacher about the Outcome*: (Links to professional sources that connect back to the Curriculum and Assessment Principles of Learning and Principles of As*
charts with sources of water
Worksheets

https://i.ytimg.com/vi/--t1cRc8fe0/maxresdefault.jpg

https://5.imimg.com/data5/ECOM/Default/2022/7/MK/YD/IN /2074628/10x14-92-500x500.png

https://www.diduknowonline.com/wp-content/uploads/2021/06/Water-Pollution.jpg

*https://miro.medium.com/v2/resize:fit:1400/0*bj7Qs35H2Wo_awSo.jpg*

https://www.liveworksheets.com/ko2797394cu

https://www.liveworksheets.com/sf1308667gz

https://www.liveworksheets.com/xu708319cl

Inclusive Resources and Materials From Regional Specialists *Use of multisensory activities and materials to assist all learners. (texts, family & community knowledge and resources, contextually relevant professional web resources)*

Sources of water | Uses of water | Source of water for kids | source of water for class 1| *(3 :09)*
Uses of water | Importance of water | Water and it's uses | Uses of water for kids | Use of water*(2:28)*
https://youtube.com/watch?v=DHlFxMq9VYo&feature=share (0:50)

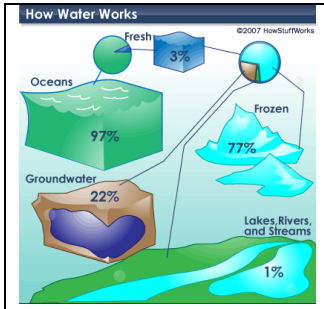
https://youtube.com/watch?v=nEJSFSKwEtQ&feature=share (4:25)

WonderGrove Kids | Water Conservation: Why We Need to Conserve Water (3:05)

Additional Resources:

container with water
two -2L soda bottles
Knife to cut bottles
Hot water kettle
Pot
ice
globe
thermometer

https://www.timvandevall.com/wp-content/uploads/2014/06/blank-world-map.jpg



https://images.nagwa.com/782168987127.jpg

Opportunities for Subject Integration: *(How the inclusive learning strategies might be adapted and/or applied to include other subjects in the curriculum)*

Mathematics: The Earth is a sphere/Study simple bar-graphs on average rainfall for a week./Measurement of temperature
Social Studies: How can we conserve water- where is it wasted? How do we protect water sources from pollution? How do we recycle so we don't create more garbage?

Language Arts: Building word bank/reading poems/oral language-(reading, speaking, listening)/Story comprehension related to water./communication through projects.

TVET: Water filtration models for purification/Water collection systems/Making a 'Fountain' model/ models of waterfalls. lakes, ponds, pools, aquariums/ making ice pops.

Agriculture: Why is water so important to farmers? Water is vital for life. Water is important for our crops, animals and manufacturing goods. Make a school garden and use watering cans.

Health: Why are liquids and solids important to our health? Clean freshwater is necessary for drinking, cleaning and bathing.
Create a chart with pictures showing how water is polluted and discuss ways we can make the water safe.

Elements from Local Culture:

- Create a song about water, short play on the Uses of Water/Dramatization of a story on how we obtained water in times past/water wheels/use of wells.
- Colonaire/Yambou Rivers, Villa Beach/Indian Bay, etc.
- River heads at Grand Bonhomme and Petite Bonhomme.

- Local songs:
  - "Coconut water, $1, it good for your daughter, $1"
  - "Oh there's a lovely island in the Caribbean Sea"
- The Old Well in Sandy Bay.

Resources for a learner who is struggling: (Links to earlier learning activities for similar knowledge, links to resources for special education needs)

Live Worksheet- Uses of Water
https://www.liveworksheets.com/lb902017ol
Questions: What are some of the uses of water? Which ones do you use? Is there anyone that you don't use water for? Why not? Do you think there is any use of water that is more important than the other? Why? Why not?

Video-
Water on Earth (Solid or Liquid?)
https://youtu.be/XSyWBNqvTrU

Resources for a learner who needs challenge: (Links to learning activities and resources in later grades)

Videos-
The Water Bodies
https://youtu.be/bNWuQD7QHBc

Questions?
Which source of water has freshwater? (rivers)
What is a lake? (large area of water surrounded by land)
Are there any lakes in your country?
How does water get into the lakes? (rain or underground water) So what happens to the lake when there is no rainfall? (it can dry up)

States of Water
https://youtu.be/Cgr9hzB66vA

Questions
- What is freezing? (When water becomes ice) have you seen freezing taking place anywhere? in your kitchen? anywhere else?

- What is melting? (When ice turns into liquid?) Have you witnessed melting happening anywhere? What things have you seen melting at home/school? (icepops.
-

Strategies that Support the OECS Curriculum and Assessment Framework
Elements of the Essential Education Competencies that are addressed:

An educated person in the OECS will demonstrate they have::	**Where might this competency be promoted/developed in this learning outcome and associated lessons?**
Developed Citizenship Competencies	Protecting our water source and conserving water.
Developed Critical Thinking and Ethical Communication Competencies	Identifying the importance of water. Debating water usage practices.
Developed Well-being Competencies	Working with fellow students in their community to conserve. water
Developed Knowledge and Entrepreneurial Competencies	Understanding the health issues related to polluted water.

Engineering Design

Purpose of the Subject: The study of science encompasses knowledge, processes and values. Scientifically literate persons will foster an attitude of caring not only for themselves, but as responsible citizens, for the world around them. Their decision making will be enhanced by a systematic study of the structure and behavior of the physical and natural world through observation and experiment. In learning science, students benefit from leveraging and evaluating available technological tools to study and therefore understand the world and their relationship to it.
Topic or Strand: Engineering Design
Essential Learning Outcome (ELO-1): Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool
Grade Level Guidelines: Grade Level Guidelines: Refer to grade level expectations at the beginning of this curriculum document

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **<u>Knowledge</u>** • Define the terms: o Technology o Engineering o Problem o Solution o Engineer o Inventions o Mechanical Engineer o Electrical Engineer o Industrial Engineer o Civil Engineer o Design Loop	**Identifying Technology Impacts** In a question answer session with students, the teacher should ask students to explain how each of the following technologies has improved life as humans**:** • Chalk board (*allows a better way to write*) • Flush toilet (*more sanitary than outdoor*) • Bicycle (*accessible transportation*) • Wheelbarrow (*effective tool for moving large objects)* • Pulley clothesline (*effective for drying many clothes at once*) • Wheelchair (*assists movement of the mobility challenged)* **What do all engineers have in common?**	**Technology and Engineering** Students we sometimes think of technology as only computers but actually technology is much broader. **Technology has been described as the way humans adapt or change their surroundings to improve their lives.** It is a type of problem solving that often requires **engineering** to produce a working product. Can we think of technology around us that fits that definition? Here are some examples: soap, a toaster, a car, a telephone, a microwave, hearing aid. These are examples of how humans solved a problem; tell me how these technologies improved life by solving a problem. Soap: *better for washing than just water* Toaster: *toasting bread without a fire* Car: *traveling quickly without a horse or walking* Telephone: *communicating over a distance*

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
○ Diagonal side ○ Ramp ○ Recycling ○ Biomedical Engineers • Distinguish technology as a problem-solving human adaptation and engineering as the tangible products (solutions) to that process. • Demonstrate an understanding that engineers plan and design objects and tools that are designed to solve problems faced by people. • Show how people are affected by natural and human-made problems or situations which	**Answer: (***They invent things and build things to solve problems for people***).** **Identifying Engineering in a Story: Galimoto** Pupils watch the video and list the materials Kondi used to build his galimoto. https://www.youtube.com/watch?v=tbchXWw-W68 (7:50 mins) Students, what materials could you have used to build a galimoto? (*scraps of wires, knife, a dancing man*) **Engineering in the Community** Take students out to a place of interest to observe how an engineering problem is solved. Prepare a few guided questions for the students. **Example of places:** • a bridge • a plumbing problem (house under construction) • a manufacturing facility Put these engineering steps in the correct order. • Identify the problem • Was the problem solved? • How do you solve the problem? • What would you use to solve the problem? **Match the problem to the solution**	Microwave: *cooking food quickly rather than stove* Hearing aid: *improving ability to hear* Let us read these books: (**Note**: *teacher can read one or both and it is recommended they purchase one for the classroom. "Galimoto" is suitable for earlier primary and "The Real McCoy" can be used again for higher grades as an introduction to inventors and problem solving/ engineering of more complex solutions*) Books: "Galimoto" by Karen Williams See online read aloud book https://www.youtube.com/watch?v=tbchXWw-W68 (7.50 mins**)** and The Real McCoy" by Wendy Towle See online read aloud book https://www.youtube.com/watch?v=ZaqimNQPSuQ (15:43 mins) Let us see if we can discover how they relate to technology and engineering. As I read, think about these questions: Guiding Questions • What is this story about? • Name some problems solved. • How did the main character solve a problem. Students, we are going to watch a video with a **problem** and a **solution.**

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies

they want to be changed or solved.

- Identify natural or human-made problems or situations to be changed or solved, in the home, school and community.
- Identify possible solutions to the problems based on observation and research (what others have done to solve similar problems).
- Describe the features of the tool or object that would solve a problem based on scientific information, materials used, and how it would be of benefit to

Problems	Solutions

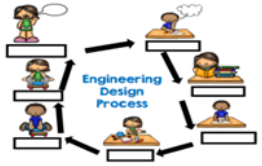
Ask students to think about how the design loop was applied to the engineering they saw in the community.

Reviewing the Steps

Engineering Design Process

Use the words in bold below to complete the diagram showing an engineer's design process

Test	Create	Design	Imagine
Plan	improve	Ask	



Retrieved from:
https://www.liveworksheets.com/tg3433356uk
(3.00mins)

Design Challenge

A **problem** is something that is not going right or causing difficulty. It can be a situation or challenge that needs to be fixed or solved.

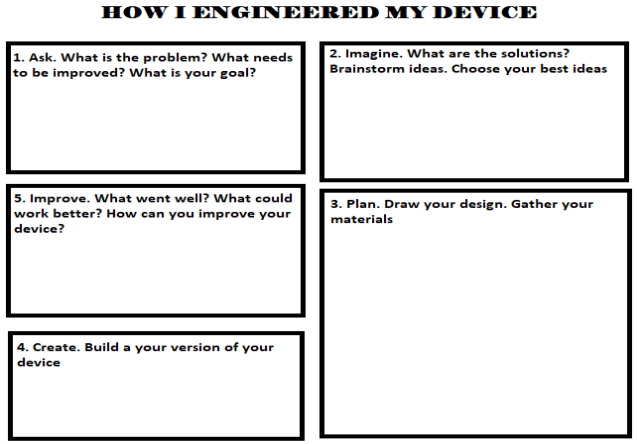
A **solution** is a way to make the problem better or fix it. It is like finding an answer or a way to make things right again.
As we watch, try to identify the problem and the solution.

https://www.youtube.com/watch?v=Sd9MZdB1ItU
(3.09 mins
)
Play video up to highpoint (0:55mins) where characters are faced with a problem.
Ask the following questions:

Note: ***For teachers without access to technology, it is recommended to access a book that highlights the importance of a bridge. Some examples include those in this table below.***

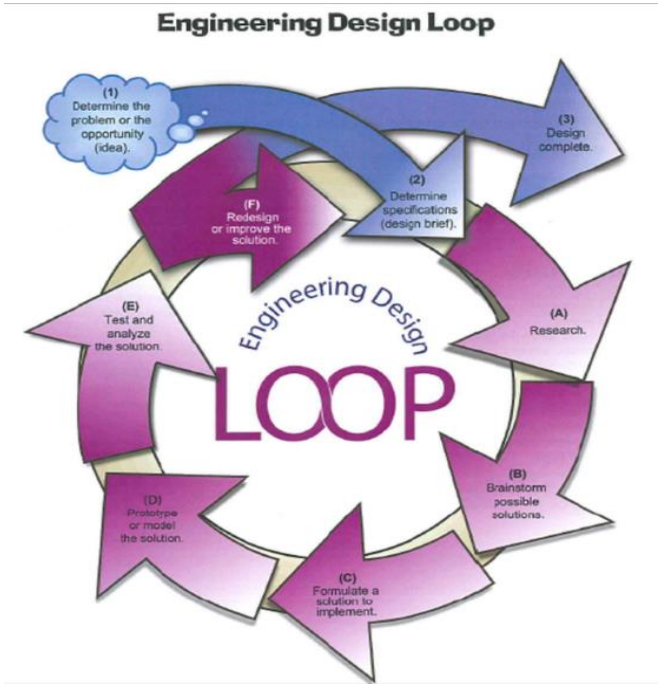
Title	Author
Pop's Bridge	Eve Bunting
Building Bridges	Tammy Enz
Cross a Bridge	Ryan Ann Hunter
Golden Gate Bridge	Jeffrey Zuehlke
Rosie Revere Engineer	Andrea Beaty
Bridges	Katie Marsico
Twenty- one Elephants & Still Standing	April Jones Prince

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
people and the environment. • Explain in their own words, the interrelationship between Science and Technology (ST-2-TE-TM-3). • Realise that some things are natural and some are human-made (ST-2-TE-NT-1). • Match simple gadgets to the use to which they were put (ST-2-TE-TM-2). • Identify and appreciate that the gadgets, tools and structures used in their homes and community are made by humans (ST-3-TE-UT-1).	We see towers all around us. They are used for monitoring fires and crops, sending cell phone messages and watching for ships. Some examples:  Retrieved from: https://www.planetware.com/paris/eiffel-tower-f-p-et.htm Student groups will be given the following materials and asked to build the tallest free-standing structure. • Give each group five sheets of newspaper, tape, and pieces of string., clay, push pins, thumb tacks. .. • Afterwards the teacher can help the pupils analyze which tower worked the best and summarize why. **Questions for Discussion** • Was your tower able to stand? (Yes/No) • Was your tower able to stand? (Yes/No)	**Alternately the teacher can make up their own story about a local river that required crossing.** **Referring to the Video**: Students, let's first understand the problem. What was the problem that the character faced? (*He couldn't cross the river because of the rain)* What do you think he will do to solve the problem? (*use a boat, build a raft, build a bridge, put a piece of wood over the creek etc.*) Teacher records responses on the board and continues playing the video. What were the solutions they suggested? (*Flying, building a raft, using a log*) Were his solutions the same as yours? (Yes, No) What was the **solution** to the **problem**? (*Building a bridge)* What is the name of a person who builds bridges? (*an engineer in the story)* **What is an engineer?** An **engineer** is someone who uses their creativity and knowledge of math and science to create real solutions to problems. Engineers solve problems with their **inventions**. What are some great inventions that people use? (*airplanes, electricity, cellphones, computers, etc.*) **Types of engineers**

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Skills • Demonstrate an understanding of a design approach by using the design loop or design steps in a real design challenge. • Make predictions about how to solve a real design challenge. • Make drawings of proposed solutions to real design challenges. • Hypothesize why problem solutions worked or didn't satisfy the design challenge. • Develop manual dexterity in building a solution to a real design challenge.	• If your answer is No! Why wasn't your tower able to stand straight? • If your answer is yes! Why was it able to stand? • What would you do differently next time in rebuilding the tower? The following rubric can be used to assess students' work.  Each group should be given an area to display their design model and talk about it and answer any questions that people may have. **Engineer Visits the Classroom** The students should have an opportunity to cycle through these questions with a visiting engineer. • What is your name? • What is your job? • What problems do you solve?	Students, engineers can create solutions to many different problems and therefore there are many different types of engineers! Let's watch this video and see if we can draw some pictures that represent at least 4 types of engineer. https://youtu.be/D9I35Rqo04E (4:06 mins) **Mechanical engineering**: invent and make parts for machines **Electrical engineering:** invent and make electrical devices **Industrial engineering:** invent and make equipment for factories, offices and business places. **Civil engineering:** design and create roads, bridges, Use the Following Video as a Review **https://www.generationgenius.com/videolessons/what-is-engineering-video-for-kids/** Play video sections: Introduction 1:20-3:00 mins. Discussion 4:00-10:00 mins. How to Apply the Engineering Process

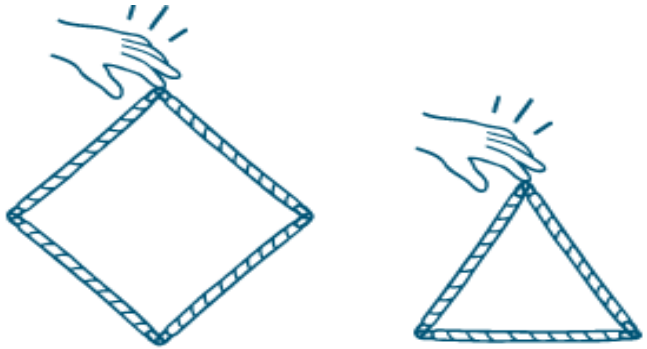
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
• Making measurements and preparing a scaled drawing. • Predicting a materials list for a project. • Observe and record natural or human made problems or situations that are affecting people, in the home, school and community. • Construct a device or tool, based on the plan, to solve the problem. • Predict the possible outcomes/results or benefits of the designed tool.	• How do you solve the problems? • If your idea/ solution doesn't work, what do you do? • Why do you like your job? **Match pictures on the left to an engineering solution on the right.** **Awareness of the need for Recycling**	(Engineering is using science and mathematics to solve our problems.) Scenario: A stream is created each year when the excessive rains cause water to run down from the hillside. Unfortunately, the water runs across an important road so no one can pass to get to the village to work or go to school. What is the problem that has to be solved? (To pass over the river.) How could you solve the problem? (I could build a bridge.) Students we are going to pretend we are trying to cross over a stream; we are going to build a bridge. These are the materials you have to try to build a bridge that passes over a gap 30 cm wide. Your bridge needs to be at least 6 cm wide. 6 cm  30 cm Box contents may include: • 10 pieces of spaghetti pasta (each 25 cm long) • 3 sheets of standard paper • White glue • 5 lengths of 5 cm Tape

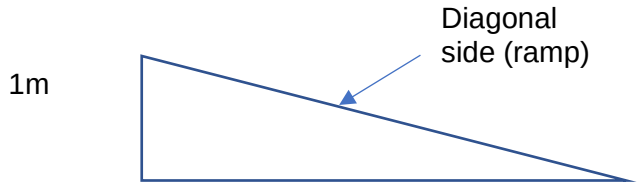
Problem	Solution
	
	
	 **hearing aid**

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
• Demonstrate the ability to explain to people the why/how and benefit of their model design. • Given problems, be able to design and construct simple gadgets (ST-2-TE-TM-1). • Evaluate two different gadgets using named criteria (ST-2-TE-TM-4). • Share information with peers on the nature of technology (St-2-TE-NT-2). • Formulate problems and do research in development of technological devices (construct models and	Complete the cloze passage below using these words: protect, collect, recycling, clean, paper, plastic, bottles, reduce, new, bins, waste, environment, old Caring for our _____ is important. We can do so by_____. Recycling is turning _____ things into something _____. We can _____ things like ____, _____, _____ and cans. We must place them in the right _____. We can make new things out of them. This will help to _____ our Earth and keep it _____. When we recycle, we are helping to _____ the amount of _____ around us. Appreciating the importance of Recycling as an engineering solution for reducing pollution. **Read the poem as a whole group on recycling and view a video.**  	In order to design a bridge, we need to take a careful approach called the design loop.  Retrieved from: https://delaware-valley.biz/wp-content/uploads/2017/06/design-loop.png 1) You can see from this design loop we start with a problem to solve. 2) We can do some research to see if someone elsewhere has solved a similar problem. 3) We can think and share our ideas about solving the problem. It is important to draw a picture of how we think we might solve the problem.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
gadgets) (ST-3-TE-TM-1) **Attitudes/Values** • Appreciate the importance of finding solutions to everyday problems and of objects and tools created/ used to solve problems. • Understanding the importance of problem-solving as a life skill. • Becoming aware of the viability and importance of careers in engineering and technology. • Participate actively in classroom discussions, contributing design ideas.	**Retrieved from:** https://images.app.goo.gl/X9j5YLdUNP1KNMfg9 https://youtu.be/mv9-FovyamY **(10:02 mins)** After reading the poem and viewing the video, ask the students what recycling happens in their community and what types of engineering solutions have been created to help with recycling.	4) After we build our solution, we should test it and see if it solves the problem. 5) After we try our bridge, we may think about improvements to design new bridges. Let us use our journal notebooks to follow and record this engineering loop as we build our bridges. When you are finished making your bridges, we are going to place them across a 30 cm span between our desks and test them. Teacher Note: You can use small stones of uniform size or wooden blocks placed on the bridge to see how much they will hold before they break. You can make it a competition to see which bridge will hold the most. The closure to the lesson: 1) Which bridge held the most weight? 2) What was special about the design of that bridge that you think made it hold more? 3) What would you do to your own bridge to improve its strength? 4) Let us look at these pictures of bridges and consider what they have in common.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
• Collaborating productively in team preparation of design planning and construction of solutions. • Express the desire to find solutions to the problem identified by asking many questions during the survey to understand the problems faced by people. • Demonstrate an awareness of the need to care for the environment by recycling materials to construct a tool or object to solve the problem identified. • Show sensitivity and assist their		 Retrieved from: https://trianglesinbridges.weebly.com/why-triangles.html  Retrieved from: https://usbridge.com/truss-bridge-designs-history/ Do you see the triangles all through the bridge, they must be very strong.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
peers who may have learning and physical challenges as they are engaged in the engineering design process. • Appreciate the advantages and disadvantages of using devices, tools and structures made by humans (ST-2-TE-UT-1). • Scientific and technological activities are usually influenced by the values and beliefs of humans and their societies.		The teacher can use a straw with the ends placed inside each other to make a triangle or a square. If they then place an object on top  of straw figure, the students will see the triangle is much stronger. Retrieved from: https://www.pbs.org/wgbh/buildingbig/educator/act_straw_ho.html Students, please draw a picture in your notebook of how you would change your design if you were going to design another bridge (look for triangles in the design). Practice With the Engineering Process Students, we have a set of steps into the school at the top of which is 1 metre high. These steps would not allow a student in a wheelchair to pass into the school. Can you draw a picture in your notebook of how you might design a ramp so that the person in a wheelchair could be rolled up to the school entrance?

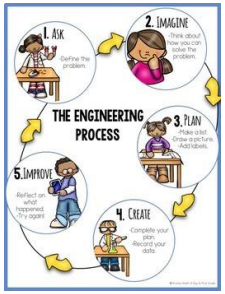
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		We don't want the ramp to be too steep. In your picture of the ramp, show how long the diagonal side is. Can you draw the picture to scale so you know how long the other side will be?  Teacher Note: Use a ruler to show children how to draw to scale. Example let 1 metre be equivalent to 10 cm on their page. They can draw any ramp with a gradual slope but get them to use the ruler to estimate the length of the diagonal. Students should make a list of materials they feel they will need in order to build their ramp. Creative Design & Recycling In the following design activity, have students use their notebooks to record their designs and how they are trying to solve a problem. **Recycle Activity** Students drink a lot of sodas or soft drinks during your break. These plastic bottles are difficult to dispose of and, many times pollute the environment. Can you think of a way these bottles can be reused creatively around the school? (Miss/Sir, we can make bird feeders from these bottles and hang them in the trees. We can also use the bottles to create a mini garden.) Some ideas for students here: https://www.nae-erboristeria.com/magazine/sostenabilita/article/5-ways-to-use-old-plastic-bottles-creatively.html

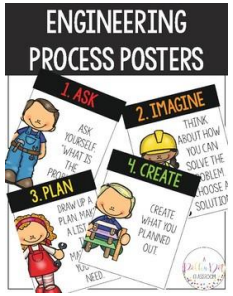
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		More Recycling Ideas That Involve Problem Solutions Let pupils view a video on reuse and recycling of materials as a means of solving the problem of pollution. https://youtu.be/idEmx40ZtX8 (1:49 mins) 1. What was the problem in the video? (plastic bottles were thrown on the road/ground.) 2. What can we do with plastic instead of throwing them away? (We can reuse them.) 3. How does nature feel when we throw things in the environment? (It makes nature sad.) 4. Name a few things that we can create with plastic instead of throwing them away? (make flower pots, shower baskets, glasses etc.) **Engineering Solutions to Physical Challenges** Helping others is very important, especially those with physical challenges. When we help someone, we show kindness and make them feel happy. It's like being a superhero! Helping others can solve their problems or make their day better. It also makes our classroom and school a friendly place where everyone feels cared for and included. What are some physical challenges that people face? (Seeing, hearing and movement impaired) How do you think it feels to face these challenges? (Helpless, uncomfortable, bad, low self-esteem)

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		Biomedical Engineers also help to invent solutions to help with these physical challenges. Can you name some inventions that have been developed to assist with these challenges? (walking canes, glasses, hearing aids, wheelchairs, artificial limbs)

Useful Content Knowledge for the Teacher about the Outcome*: (Links to professional sources that connect back to the Curriculum and Assessment Principles of Learning and Principles of Assessment)*

Charts to be used by teachers/students





Charts Websites

https://ecdn.teacherspayteachers.com/thumbitem/STEM-throughout-the-year-The-Bundle-preschool-kindergarten-and-first-grade--2591407-1541346608/original-2591407-3.jpg

https://ecdn.teacherspayteachers.com/thumbitem/STEM-Engineer-Poster-for-Elementary-1166805-1536205820/original-1166805-4.jpg

https://ecdn.teacherspayteachers.com/thumbitem/Engineering-Process-Posters-3004105-1486485467/original-3004105-1.jpg

Reading resource

Kids book read aloud: Girls Can Be Engineers By Jamila H Lindo - YouTube (5:25)

Inclusive Resources and Materials From Regional Specialists *Use of multisensory activities and materials to assist all learners. (texts, family & community knowledge and resources, contextually relevant professional web resources)*

- videos
- pictures
- story books
- charts

Additional Resources:
Types of engineers:
https:/ /youtu.be/HVPegJuasZk (4:41 mins)
https://youtu.be/mv9-FovyamY (2:29 mins)
https://www.youtube.com/watch?v=XiuU1mlFeEc (11:30 mins)

Engineering Song:
https://www.youtube.com/watch?v=R3a8oD6_YlU (1:06 mins)

What is engineering?
https://youtu.be/R3a8oD6_YlU (1:07 mins)

How to make a car from recycle bottles
How to make Propeller cars from plastic bottles | Recycle Toys - YouTube(2:35 mins)

Being an Engineer
10 lines on The Engineer / I want to be an engineer / when I grow up / essay /speech / for kids - YouTube (1:07 mins)

Opportunities for Subject Integration: ***(How the inclusive learning strategies might be adapted and/or applied to include other subjects in the curriculum)***

Mathematics:

- Pupils can test the strength of different shapes. How the shape affects the strength of a building.
  Shapes of Strength - YouTube (1:35 mins)
- Measuring triangles.
- Scaled drawings
- Estimating materials list.

Social Studies:

- Pupils identify some problems in their community and state ways these problems can be solved.
- Environmental concerns and recycling.

Language Arts:

- Use new words to construct sentences.
- Comprehension based on read aloud stories.
- Listen to stories and place events (sentences) in the correct order.
- Write poems on engineers, being an engineer.

TVET:

- Build models of towers.
- Drawings of ramp solutions.
- Design challenges for biomedical engineers.

Agriculture:

- Impacts of pollution on crops.
- Agricultural problems for engineers to solve.

Health:

- Biomedical engineers pose solutions for physical challenges like prosthetic limbs, mechanical hearts and valves, specialized wheelchairs.

Elements from Local Culture:

- Pupils construct flutes using bamboo/ pawpaw stalks.
- Use bamboo to make vases.
- Use calabash to make musical instruments (shack-shacks, bowls).
- Use of plant fibres to make ropes, furniture.
- Artefacts of stone tools and clay pots, etc.
- Cast iron tools and objects, e.g., coal pots, "copper", etc.
- Examine tools used in local activities such as in the picking of fruits and in the making of musical instruments, furniture, etc.'
- The metal stake that can be placed into the ground and used to dehusk dry coconuts.

- Building carts to move goods from place to place in tight spots (e.g. carts used by the cart men in Kingstown).
- Fruit pickers have been locally designed.
- Fishing rods from sticks and reels with plastic bottles.

Resources for a learner who is struggling: ***(Links to earlier learning activities for similar knowledge, links to resources for special education needs)***

Worksheets

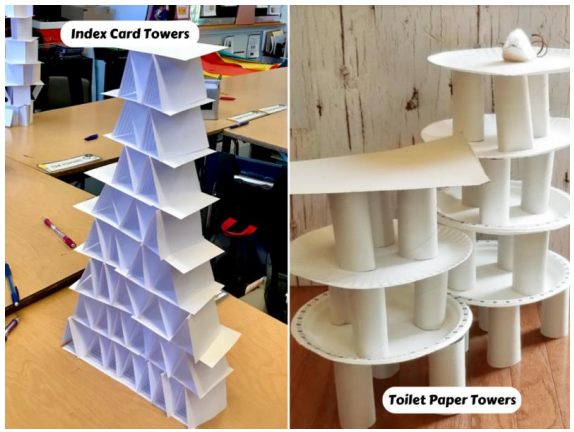
Types of engineers worksheet (liveworksheets.com)
Engineers worksheet (liveworksheets.com)
Design Challenge: Creating a Cup Tower | Education.com
What is Engineering? | Worksheet for Grades K-2 [PDF] (generationgenius.com)

Videos

I'm Going to be an Engineer (Big Dreams For Little People) | A Career Book for Kids - YouTube (3:57 mins)
I Want To Be An Engineer | Books Read Aloud | We ❤️ STEM!! Career Day Books for Kids - YouTube (4:41 mins)
How to make a flute- https://youtu.be/BaymX3qJRbQ (1:07 mins)

Resources for a learner who needs challenge: ***(Links to learning activities and resources in later grades)***

Make the biggest structure using index cards, paper plates, and toilet paper rolls.



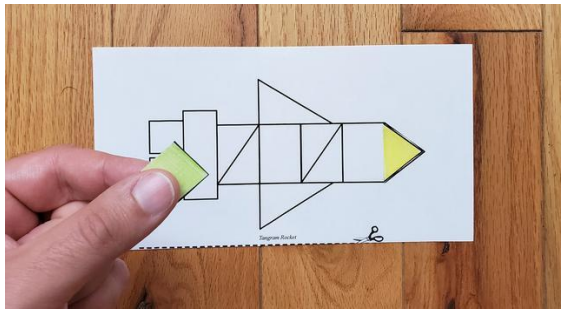
Websites

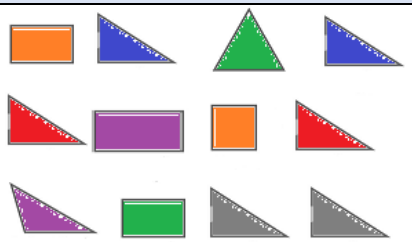
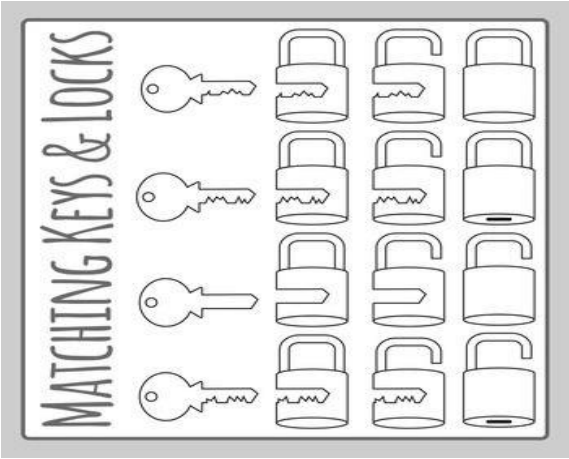
https://educationtothecore.com/2020/10/20-stem-challenges-for-kids/

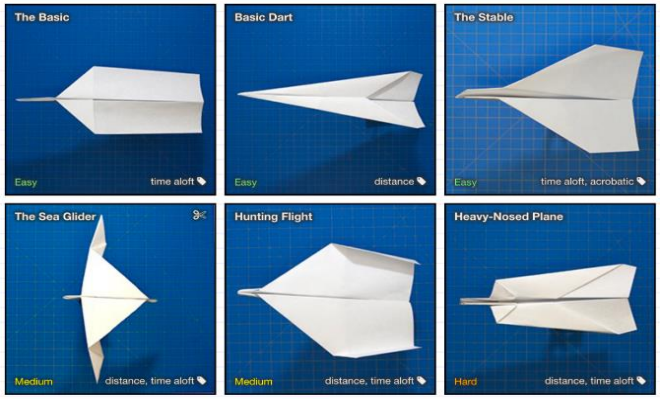
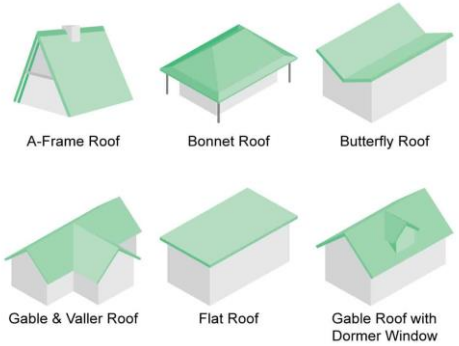
https://www.teachingexpertise.com/classroom-ideas/2nd-grade-engineering-projects/ https://www.sciencebuddies.org/stem-activities/subjects/second-grade
Strategies that Support the OECS Curriculum and Assessment Framework **Elements of the Essential Education Competencies that are addressed:**

An educated person in the OECS will demonstrate they have:	**Where might this competency be promoted/developed in this learning outcome and associated lessons?**
Developed Citizenship Competencies	Help in preserving, protecting and to appreciate the works of engineers. Working together to solve real problems in communities.
Developed Critical Thinking and Ethical Communication Competencies	Critically analyzing problems.
Developed Well-being Competencies	Working with and assisting other people in the community to solve problems. Solutions to building access for the less abled. New developments in assistive technologies for the impaired.
Developed Knowledge and Entrepreneurial Competencies	Understanding the process engineers use to solve problems. Developing materials lists for planning and potentially costing.

Purpose of the Subject: The study of science encompasses knowledge, processes and values. Scientifically literate persons will foster an attitude of caring not only for themselves, but as responsible citizens, for the world around them. Their decision making will be enhanced by a systematic study of the structure and behavior of the physical and natural world through observation and experiment. In learning science, students benefit from leveraging and evaluating available technological tools to study and therefore understand the world and their relationship to it.
Topic or Strand: Engineering Design
Essential Learning Outcome (ELO-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.
Grade Level Guidelines: Refer to grade level expectations at the beginning of this curriculum document.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
Learners are expected to: **<u>Knowledge</u>** ● Define the terms: ○ Shape ○ Technology ○ Engineering ○ Problems ○ Solutions ○ Design Brief ○ Prototype ○ Disability ○ Biomedical engineers ○ Blunt/sharp nose ○ Lock/Key	**Shapes and Design** To show how different shapes make up an object which helps it to function. Use the shapes to build your rocket design! Start by filling in the rocket that has interior lines. All the shapes must fit entirely inside the rocket's outline.  Use these shapes to complete the design of the rocket.	**Introduction** Where can we find objects with different shapes? (*At home, school and community*) Draw me a picture of at least three different shapes we see in our community. Did you ever put your left shoe on your right foot? It really does not work well because it doesn't fit the **shape**- our feet are different! **When we solve problems (technology) and design solutions (engineering) we have to pay careful attention to shapes.** Look at the model of the house, try to identify the problem and the possible solution.

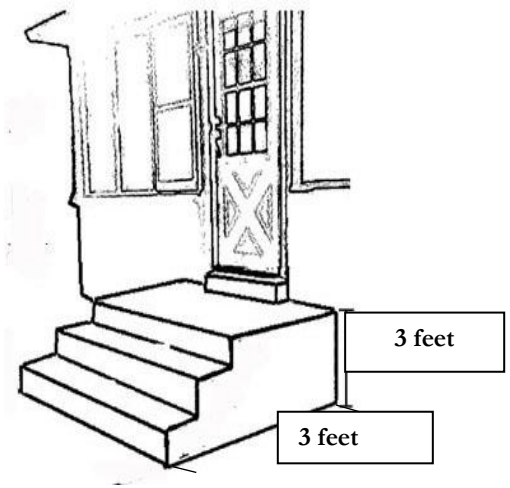
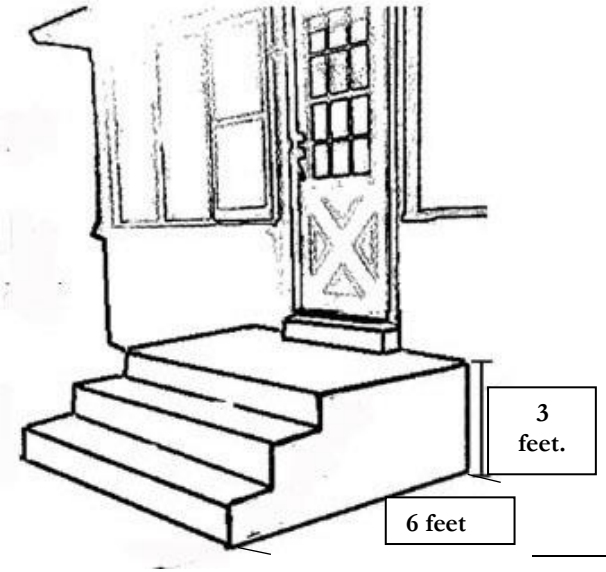
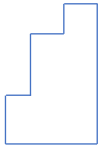
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
○ Controlled Experiment ● Demonstrate an understanding that the shape of an object depends on its function to solve a given problem. ● Recognize that there are different designs for a roof and that some designs are better for resisting the effects of wind and rain. ● Identify objects in the school, house and community that have specific shapes based on their functions. ● Recognize that certain shapes are required in order for a designed object to solve the problem. ● Recognize that keys are very carefully prepared to exactly fit a lock and	 **Shapes of Keys and Locks** Print out worksheets and cut out keys and locks. Students will match the key to the lock. Compare and contrast keys to discuss that keys open locks, but each lock is opened with a specific key even though they seem exactly the same and in other cases different.  Retrieved from: https://www.pinterest.com/pin/463448617896803837/	   Ask the following questions: ● Students, what problem do you see the builder having in putting up these windows? (The shape /design of the windows are different from the space to put them.) ● What shape are the windows of the house? (*square*) ● What shape are the windows they want to put in? (*Part of a circle and square.*) ● What do you think the builder will do in order to solve the problem? (*He needs to change the design of the windows to fit into the space.*) or (*Make the space the same as the windows.*) Students we can see that shapes have to be designed to fit the need. The windows here are not useful if they don't fit the hole in the building wall.

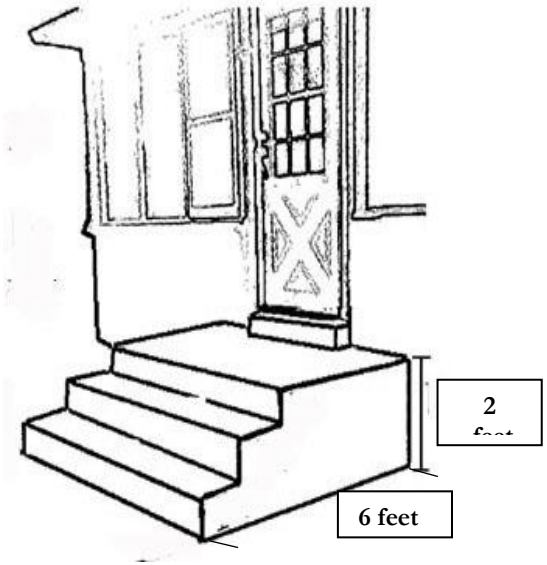
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
that this allows us to have secure homes and storage facilities. • Give examples of how poor design can lead to unsafe use and danger. • Be aware that there are engineers that assist humans with physical challenges and that this is an exciting and rewarding career. • Match simple gadgets to the use to which they are put (ST-2-TE-TM-2). • Identify and appreciate that the gadgets, tools and structures used in their homes and community are made by humans(ST-3-TE-UT-1). **Skills** • Understand and practice the engineering loop of stating the problem,	Ask learners the following questions: ➢ Why were door/car keys developed? What problem did it solve? (*keys/locks prevent the wrong person getting access*) ➢ What are the advantages of a key?(*security and a variety of keys to open pad locks/ doors*) ➢ What are the disadvantages? (*loss of keys, they get broken, can be copied*) We can see students that keys must exactly fit locks in order for them to accomplish the task of securing a room or a car or bicycle. **A Design Activity: Paper Airplanes** i. Background Knowledge Students, in your journal draw a picture of a paper airplane you think will fly the furthest.  	**The Best Roof Design for Storms** Let's take a look at these houses with different roofs. Which of these houses do you think will be able to withstand hurricane winds? (*A discussion will follow about exposed edges and surface area exposed to winds.*)  Retrieved from: https://www.homestratosphere.com/wp-content/uploads/2016/06/39_roof-styles-featured-image-hs.jpg 1. What are the different shapes you can see in the roofs? (*Triangular, rectangular*) 2. Which roof do you think will drain off water easily? (*A- Frame Roof, Gable and Valler Roof, Gable Roof with Dormer Windows.)* 3. Which roofs do you think is the Strongest to resist wind damage? (*Gable Roof)* Explain your answer?

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
creating a solution drawing and testing the prototype design. • Investigate how the shape of an object depends on its function to solve a given problem. • Sketch or draw to simply illustrate how the shape of an object depends on its function to solve a given problem. • Communicate effectively to explain their sketches or drawings as to how the shape of an object helps to solve a given problem. • Compare and contrast the shapes of objects with the same/ similar function. • Predicting the shape of an object to solve a given problem.	ii. Group Building of Airplanes Teacher has discussion with pupils. a) What do you see in the picture? (*Different shapes of paper airplanes*) b) What shapes do you see in the airplanes? (*Triangles, rectangles*) **Task**: Students, I will divide you into groups and assign each group a certain design of airplane to construct. Here are the four designs that the class will create, one per group: The teacher will distribute sheets of paper for the groups and assist them with construction of airplanes with the particular characteristics below. ***Note***: The teacher may want to review construction approaches using the following video: https://youtu.be/pHRLpUys5v4 (7:03 mins) 1. Airplane with blunt nose & big wings 2. Airplane with sharp nose & small wings 3. Airplane with a blunt nose & small wings 4. Airplane with sharp nose & big wings Using a standard departure point in the classroom, have the same student throw each of the group airplanes towards the other end of the classroom. Emphasize '**controlled experiment**" (i.e. all variables the same except one, in this case the airplane itself). Which plane do you think will fly the furthest? (*should be #4*)	You can see students that it is important to match the design of the roof to the climate the house is in. Think about the measurements and drawings the engineer would have to make in order to construct the best roof. What would they be? Measurements: (*house length, width, height, size of roof, angles of the roof*) Drawings (*front view, side view top view of the house, roof angles*) ***An excellent free technology tool for creating paper models of structures is FabLab Model Maker. See download here: https://fablab-modelmaker.software.informer.com/ **Importance of designing things appropriately** Students, did you know that it is important for engineers to design things the right way so that they work well and keep us safe? When people create or make things like toys, tools, or even playgrounds, it's important to think about how we will use them. Designing them the right way is very important. When things are made the right way, they work better and are safer to use. Look at the pictures below. Are they designed properly? What parts of the design do you think were not done well, in your opinion?

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
• Observe and recognize different shapes such as circles, squares, rectangles, triangles and more to help solve a problem. • Propose a design for a practical device (window stick) • Construct working models of paper airplanes. • Test models of paper airplanes using a controlled experiment. • Compare and contrast intuitive designs of airplanes with research-informed design. • Infer the suitability of design solutions from drawings. • Use a systematic approach to problem solving.	Have the students measure the distances for each airplane for comparison. What features seem to affect the distance? (*nose shape & wing size*) *Closure* We can see that the design of the shape makes a big difference in these paper airplanes' ability to fly a longer distance. Students, in your journal, draw a picture of the paper airplane that flew the furthest and make a note of why it flew further than others. Is it different than your initial design? What did you learn?	 Retrieved from: https://www.reddit.com/r/CrappyDesign/comments/ukuq0y/splitting_slide_because_why_not/
	Individual Activity Think of an idea to fix the problems with the slides. Sketch or draw a design of a slide that is safe and fun to use.' **Rubric for scoring** Presentation - 5 marks, Creativity -10 marks, Safety - 5 marks)  	 Retrieved from: https://www.reddit.com/r/CrappyDesign/comments/ktl9hs/curves_on_this_slide/

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
• Given problems, be able to design and construct simple gadgets (ST-2-TE-TM-1). • Evaluate two different gadgets using named criteria (St-2-TE-TM-4). • Formulate problems and do research in development of technological devices (construct models and gadgets) (ST-3-TE-TM-1). **Attitudes/Values** • Recognize that engineering makes a very important contribution to human's daily life. • Creation of assistive devices by engineers is a rewarding career. • Engineering is a creative job that involves much problem solving.	Retrieved from: https://ir.4sqi.net/img/general/original/2669323_FaMFPc55dsfxzBuRxBeExNuLf2U7BFGecTu_PAUCsSk.jpg https://i.redd.it/a1mf9iqe5ef71.jpg **Which Drawing Better Matches a Problem Solution?**  Retrieved from: https://hikingthegta.com/2020/02/29/claireville-ghost-towns-of-the-gta/ ***Read this introduction to students*:** The bottom of the front door of a house is 3 feet above the ground. Ishmael, Sandra and Gordon each created a design brief to build a step that would go from the ground to the bottom of the front door. The design brief included a statement of the problem, a drawing of the possible solution and a list of materials. Students, I want you to consider the three drawings from the design briefs. Which do you think is the best design. Explain why.	(*The shapes of the slides will prevent children from sliding properly, they can hurt themselves on the slides.*) **Design Briefs and the Importance of a Drawing** When an engineer designs a new product to solve a real problem, they often create a **design brief**. A design brief is a plan that a) states the problem, b) draws a picture of the possible solution c) lists materials and processes that will be necessary to build the engineered product and d) an explanation of how their design will work. This happens before the working model is made and tested as a **prototype.** A working model that helps us see advantages and disadvantages of our design is called a **prototype.** Students, I have a problem I want you to write a design brief for. Some summer days are hot and humid. On those days, we sometimes want the window up in our homes to let a gentle breeze cool the rooms. As the day progresses, maybe it cools down somewhat, so we might still want the window open but, not as high. I want you write a design brief for a single window stick that you could make that would allow the window to be held open at two different heights.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
• Show sensitivity in assisting those peers who may have learning and physical challenges as they are engaged in practical activities. • Appreciate the importance of having an object shaped for its function to avoid confusion and ensure safety. • Show concern for their safety and that of others when manipulating objects during investigation. • Work with others willingly to share ideas and materials to complete tasks. • Express the desire to find and share solutions to given problems. • Participate actively in classroom discussions.	**Ishmael's Drawing**  **Sandra's Drawing**  	 Retrieved from: https://www.windowscanada.com/media/CACHE/images/fbimages/Double-or-single-hung-windows-time-for-big-decision/9f4d8ac48103bb8517b342cc8682d4d1.jpeg Teacher Note: Popular design:  Wooden Block ***Scoring Rubric for this activity*** Description of Problem 2 marks Drawing of solution 5 marks Materials list 2 marks Explanation of the operation 3 marks **Appreciating and assisting peers**

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
• Appreciate advantages and disadvantages of using devices, tools and structures made by humans (ST-2-TE-UT-1).	**Gordon's Drawing**  **Teacher notes:** Ishmael's steps will reach the door bottom, but you can show students using two rulers that these steps will be much too steep to be useful. Gordon's steps are not high enough. They are only 2 feet high and the door is 3 feet above the ground. Sandra's design should work. The steps reach the 3 foot mark and they are much more gradual than Ishmael's design (the teacher can again show the difference using 2 rulers).	Today, we're going to talk about using engineering to help someone with a **disability**. A **disability** is when someone has a condition or a difference that makes some things a little harder for them to do. Having a disability doesn't mean that someone can't do anything! They just might do things a little differently or need some extra help or support. They use special objects or tools to help them. **Biomedical engineers** have to spend time with humans and animals in order to understand how their possible design best fits the lifestyle of the user (*wheelchairs, ramps, artificial limbs, assistive technologies for reading, hearing, seeing*). The boy in this film (An Animated Story of a boy who hates his disabled dog - YouTube (4.18 mins) is missing a limb. As you watch can you spot the engineered product that has helped him? (*a crutch*). What other engineered product might help the boy? (*wheelchair, artificial limb)* When engineers design products they have to make careful measurements and drawings so the product will work for a specific size and shape of a person or animal. A very famous scientist, Dr. Stephen Hawking required very specialized assistive tools so he could communicate.

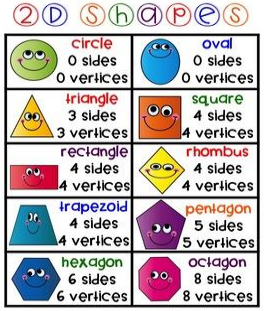
Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		 Retrieved from: https://www.wired.com/2015/08/stephen-hawking-software-open-source/ As you look at this picture, tell me what type of measurements would the engineer have to make and what would their drawing include? Measurements (*height of Dr. Hawking, placement of headrest, distance of headrest from the computer screen, height of computer above the chair, height of the chair, placement of hand controls etc.)* Drawing *(wheelchair, headrest, computer arm &screen, hand controls)*

Useful Content Knowledge for the Teacher about the Outcome*: (Links to professional sources that connect back to the Curriculum and Assessment Principles of Learning and Principles of Assessment)*

Read Aloud online books

https://www.youtube.com/watch?v=SnPdXiOm6JM (6:30 mins. Teachers can begin the read aloud from 1:27 mins)
https://www.youtube.com/watch?v=QB-wqD7gg-k (5:39 mins)
https://www.youtube.com/watch?v=5ctPwDr_e50 (7:42 mins)
https://www.youtube.com/watch?v=9Xm3McQ6upw (10:14 mins)

Anchor Chart



Inclusive Resources and Materials from Regional Specialists *Use of multisensory activities and materials to assist all learners. (texts, family &community knowledge and resources, contextually relevant professional web resources)*

Multisensory activities:
Students can construct buildings as part of STEAM projects using magna tiles, or Magnetic Balls and Sticks

Magna Tiles

Magnetic Balls and Sticks (These can be purchased at Amazon.com)

8.5 x 11 inch paper
Journals

Additional Resources:
Digital projection for analysis of pictures
Laptops
Tablets
Overhead Projector
Speakers
Modeling clay

Tooth picks/ Skewers
Gumdrops or marshmallows
Spaghetti
Paper take

Online Resources
ttps://www.amazon.in/Creative-Educational-Aids-Puzzle-Piece/dp/B009310P6G

https://letstalkscience.ca/educational-resources/lessons/its-all-in-shape

https://www.youcubed.org/wim/building-shapes-9-12/

Charts

Shape	Meaning	Color	Examples
Circle with diagonal bar	Prohibition	RED (contrast: white)	No smoking
Circle	Mandatory Action	BLUE (contrast: white)	Wear Eye protection
Equilateral Triangle	Warning	YELLOW (contrast: black)	Danger Flammable material
Square / Rectangle	Information about safe condition	GREEN (contrast: white)	Escape Route – Left
Square / Rectangle	Fire Safety	RED (contrast: white)	Fire Extinguisher

Worksheets
https://www.liveworksheets.com/py2376826vb
https://www.k5learning.com/worksheets/math/grade-2-geometry-identify-2d-shapes-a.pdf

Opportunities for Subject Integration: ***(How the inclusive learning strategies might be adapted and/or applied to include other subjects in the curriculum)***
Mathematics:

- New terminology for shapes

- Students will learn the different structure of shapes (their properties/characteristics) 2D shapes. https://www.youtube.com/watch?v=VAWaV1upv6E (14:44 mins)
- Measurement
- Interpreting Drawings

Social Studies:

- How engineering can help humans adapt.
- How engineering can help those with physical challenges.

Language Arts:

- Journaling of the experiments.
- Students will write expository pieces on how they constructed an object using different shapes.
- Use words to improve vocabulary and construct sentences.
- Write short poems on objects with different shapes.
- Create a word wall in the classroom.

TVET:

- Design briefs.
- Constructing paper airplanes.
- Designing solutions for real problems.
- Create a ramp with cardboard and different shapes to move objects. https://www.youtube.com/watch?v=B9pKkJSaR-w (10:06 mins)

Agriculture:

- The importance of planning a garden plot/field using the design loop approach. (problem/design/picture/materials/prototype/testing etc.)
- Students can use different materials or shaped objects for the growing of agricultural produce. Hydroponic farming using large PVC pipes to construct a small school garden.

Health:

- Availability of engineered assistive devices for physically challenged (see: https://www.youtube.com/watch?v=NBVCU1hGcmg (11:26 mins)
- Teach students the different safety symbols and their meanings. **https://youtu.be/CqH2QYt6oOc (4:45 mins)**

Elements from Local Culture:

- How are shapes of devices used to communicate in communities.
- Use local wood to create a small boat shaped like a triangle.

- What types of resources use lock and key for security in a community?
- The cone-like shape of the handmade toy tops.
- Investigate the shapes in some of the many arches in Kingstown (Local name of Kingstown: City of Arches).
- Cobblestone roads in Kingstown (investigate the shapes of the stones).
- The bamboo used for blowing.
- The copper used to make farine.
- Shape of local steel pans in producing different pitch sounds.
- Shape of different blocks produced locally for different purposes.
- Shape of drums, drumming connects us to our ancestors.
- Shape of canoes/driftwood boats.
- Shape of farming/construction tools: hoe, cutlass, pick, axe, spade.

Resources for a learner who is struggling: ***(Links to earlier learning activities for similar knowledge, links to resources for special education needs)***

Games: Teachers can clink on the links below and sign-up to these online educational sites to engage their students in some interactive games.
https://www.twinkl.com/resource/tg-ga-66-soup-sorter-2d-shapes-game
https://www.splashlearn.com/s/math-games/sort-shapes

Teachers can play "Shape Scavenger Hunt" with the class to assist weaker students in identifying shapes and their properties.
Create different 2D shapes using toothpicks or skewers, gum drops or marshmallows.

Worksheet links
https://www.liveworksheets.com/lr2285469rc

Resources for a learner who needs challenge: ***(Links to learning activities and resources in later grades)***

An excellent free technology tool for creating paper models of structures is FabLab Model Maker. See download here: https://fablab-modelmaker.software.informer.com/

Videos
https://www.youtube.com/watch?v=CvWrkxzCiaY (3:52 mins)
https://www.youtube.com/watch?v=gk_u1xr7jQg (8:13 mins)

Other Resources
https://drive.google.com/file/d/1Q7bgX09fuHIHY1aySnaB70iy-JKYBDGn/view (Click on this link to view the PowerPoint presentation, then click on the link below to access the worksheet)

https://drive.google.com/file/d/1xSY9fw3hdwsKw0b3qTc8baeNS7lxg97v/view

In class construction activities:
Students can build different structures using modelling clay and toothpicks. See video for clarification.
https://www.youtube.com/watch?v=TZDXz6V7VFA (18:36 mins)
Students can also create design of buildings, Pyramids or the Eiffel Tower using these materials) https://www.youtube.com/watch?v=zrnR2y2Bzl4 (2:15 mins)

Worksheets
https://www.liveworksheets.com/sd2566593mc

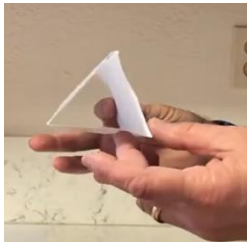
Strategies that Support the OECS Curriculum and Assessment Framework
Elements of the Essential Education Competencies that are addressed:

An educated person in the OECS will demonstrate they have:	**Where might this competency be promoted/developed in this learning outcome and associated lessons?**
Developed Citizenship Competencies	Show appreciation and assist their peers who may have learning and physical challenges as they are engaged in practical activities.
Developed Critical Thinking and Ethical Communication Competencies	How to analyze a problem and pose a solution that is well-documented and tested. Express the desire to find and share solutions to given problems.
Developed Well-being Competencies	Show concern for their safety and that of others when manipulating objects during investigation. Awareness of engineered assistive devices for those with physical and learning challenges.
Developed Knowledge and Entrepreneurial Competencies	Describe the shape and function of objects to solve given problems. How can problem solving, design and prototyping lead to a commercially available (useful) product.

Purpose of the Subject: The study of science encompasses knowledge, processes and values. Scientifically literate persons will foster an attitude of caring not only for themselves, but as responsible citizens, for the world around them. Their decision making will be enhanced by a systematic study of the structure and behavior of the physical and natural world through observation and experiment. In learning science, students benefit from leveraging and evaluating available technological tools to study and therefore understand the world and their relationship to it.
Topic or Strand: Engineering
Essential Learning Outcome (ELO-3): Analyze data from tests of at least two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.
Grade Level Guidelines: Refer to grade level expectations at the beginning of this curriculum document

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies

Learners are expected to:
 	
<u>Knowledge</u>
• Define the terms:
  ○ Adhesives
  ○ Cardboard
  ○ Corrugated
  ○ Collapse
  ○ Columns
  ○ Cylinder
  ○ Rebar
 	
• Demonstrate they understand that we can make comparisons and determinations by collecting data in experiments.
 	
• Compare the strengths of different folds of paper.
	Practicing the Testing Component of Engineering: A Summative Assessment
	
	Students, I want you to look at the following picture of a bridge. What do you notice about the **columns** (explain supports) under the bridge; what is their shape? Are they square or rectangular columns? No, they are round on the ends aren't they? We call this shape a **cylinder.**
	
	There must be a reason why these are shaped this way. I want you to conduct an experiment like before to test the strength of different shapes of columns.
	
	 
		Adhesives, An Important Invention
		Students, I am sure you are familiar with sticky notes. Did you know that invention was discovered by accident?
		
		"Post-It notes came about as a by-product of another invention. Dr Spencer Silver, a 3M scientist, invented a repositionable adhesive but didn't know what to do with it. A colleague of his, Art Fry, had the idea of a bookmark that would stay put in his church hymnal, and the rest as they say is history!"
		Quoted from:
		https://www.officesupplies.org.uk/Blog/Ten-things-you-probably-didn-t-know-about-the-Post-It-note!!!/
		
		Well, we are all constantly trying to stick things together, repair items and fasten things on walls. We call these sticky inventions **adhesives** and they are very useful as humans solve real problems with them.
		Teacher Note: You can read a funny story about a lazy squirrel who wanted to keep the seasons from changing (to avoid collecting nuts) by sticking the leaves back on trees.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
• Show that there are inventions all around us. • Distinguish different shapes of columns. • Match simple gadgets to the use to which they are put (ST-2-TE-TM-2). • Explain in their own words, the interrelationships between Science and Technology (ST-2-TE-TM-3). • Identify and appreciate that the gadgets, tools, and structures used in their homes and community are made by humans (ST-3-TE-UT-1). • Formulate problems and do research in development of technological devices (ST-3-TE-TM-1). **Skills**	Retrieved from: https://www.freepik.com/premium-photo/bridge-river-with-fortifications-form-gabions_22206959.htm **Materials**: • 3 sheets of paper • Small books or suitable masses • Tape or glue (Retrieved from: https://www.youtube.com/watch?v=Zd2SZE2sXIs (6:30 mins)) Students need to make three columns with the paper *(sides can be glued or taped)*. Teacher can assist them to make columns (see pictures below):    	Have students watch for what adhesives Sidney used? Reference: Silly Sidney by Morgan Matthews (1986) Troll Associates Press. Online here: https://openlibrary.org/books/OL2533357M/Silly_Sidney Read aloud here: https://youtu.be/YdEe79v0OVw (9:35 mins) **Which Tape is the Strongest?** We are going to do an experiment that compares the adhesive properties of different types of tape. Which adhesive holds the most weight? Materials • 1 sticky note • 20 or more large paperclips (uniform size) • Transparent cellophane tape • Masking tape • Painters Tape • Electrical tape The teacher should place a small piece of transparent tape on the centre of the bottom edge of a sticky note and then punch a hole through it. This will hold our paper clips. The teacher can then place the sticky note high on a door or wall so there is room to hang paperclips from the bottom.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies

- Observe the results of experiments and make a hypothesis.
- Infer that the number of folds has an impact on paper strength.
- Measure number of folds and numbers of paper clips.
- Communicate community inventions.
- Construct columns with paper.
- Investigate information about inventors.
- Analyse experimental data.
- Given problems, be able to design and construct simple gadgets (ST-2-TE-TM-1).
- Evaluate two different gadgets using named criteria (ST-2-TE-TM-4).

Attitudes/Values

The students then stack similar books carefully on top of columns and record which column is the strongest using the table below for their data.

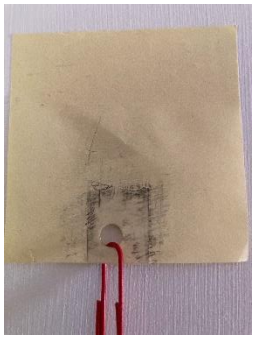
Column Type	Number of Books Before Collapse
Square	
Triangle	
Cylinder	

Students should report that the cylinder column held the most books before collapsing.

Extended Learning – Concrete and Rebar

While concrete looks strong, depending on the components, their relative quantities and the mixing process, concrete can develop cracks and become a hazard in construction.

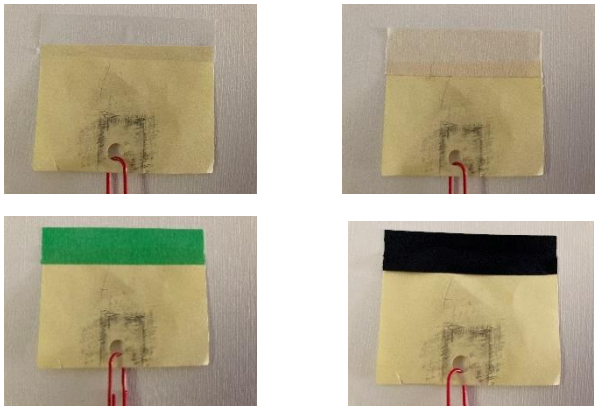
In concrete columns, it is not uncommon for builders to add steel bars called **rebar.** This metal

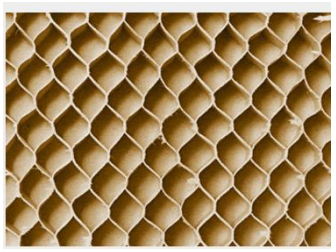
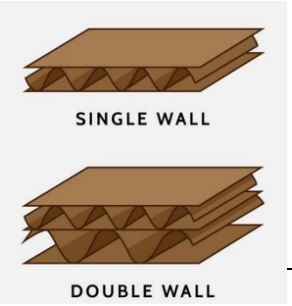


The teacher can add paperclips and children count how many paper clips can be added before the note falls. The number of clips can then be entered in this table.

Tape Type	# of paper clips
Sticky note	
Cellophane tape	
Masking tape	
Painters tape	
Electrical tape	

Note: The teacher may choose to add other uniform weights to the paperclips as well (e.g., washers or beads) For the second trial, the teacher will cut the top sticky strip from the sticky note and again fasten the note to the wall with uniform lengths of different types of available tape (as per the table and other examples of adhesives).

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
• Appreciate that humans adapt through problem solving (technology) and engineer new inventions to make life easier. • Demonstrate respect for evidence as they make conclusions based on collected data. • Collaborate & cooperate as they conduct experiments. • Display sensitivity and offer assistance to peers who may have physical or learning challenges especially when conducting practical and group work. • Participate actively in classroom discussions.	reinforces or strengthens the overall concrete product.  Retrieved from: https://www.quora.com/Why-do-we-provide-reinforcement-in-columns-although-concrete-works-good-in-compression  Retrieved from: https://structurepoint.org/publication/html/Interaction-Diagram-Tied-Reinforced-Concrete-Column-with-High-Strength-Reinforcing-Bars-ACI-318-19/index.html#t=Tied_Column_HSRB%2F0._Problem_Statement%2F0._Problem_Statement.htm **Inventions in the Home** Students should be asked to look around their home and community and identify at least 4 useful inventions that engineers have designed and built. They can report back to the class these inventions and asked to speculate how these inventions might have been tested before being put into production/use. **Integration With Mathematics**	 So, students, which adhesive was the strongest? Let us look at our numbers to see which one held the most clips before falling? **Researching A Common Practice** Students, we often pack things in boxes to transport them. Can you tell me some things we can do to make sure the items in the box are protected from breakage? (*strong box, spaces between items, soft packing material between items*) I want you to look at the following pictures of these packing boxes made from **cardboard.** What do you notice about the cardboard they are using in the box?  Retrieved from: https://www.ranpak.com/uk/solutions/

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
	Have a class discussion about how the numbers we collected in class helped us decide the strength of our products? (*clips and adhesives, marbles and paper bridge, books and columns*) **Integration with Social Studies** Have students research information on a local inventor. In a presentation they can display a picture of the invention and explain how it was important in their community.	 Retrieved from: https://www.shrisaiprinters.com/corrugated-boxes  Retrieved from: https://emballageslm.ca/en/cardboard-packaging/honeycomb/ What you see is something they call **corrugated** cardboard. It is made up of outer layers of paper that have a wavy layer of paper in between.  Retrieved from: https://www.webstaurantstore.com/blog/1138/types-and-sizes-of-corrugated-boxes.html

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		We see this in many different boxes for groceries and pizza and drinks. Let us do some testing to see why this is a preferred way of packing. **Teacher Note**: This is described below as an interactive demonstration, but children can also do this independently in groups depending on resources available. **Materials:** • 2 large or 4 small books • Sheets of plain paper (8.5 x 11 inch • Small dish • Small uniform coins or marbles or counters Set up the following apparatus for testing the strength of 1 flat sheet of paper (Retrieved from: https://www.youtube.com/watch?v=Zd2SZE2sXIs (6:30 mins))  Add your counters to the dish until the paper **collapses**. Have students fill in the following table as you increase the number of folds of the paper from 1 to 6 to 12.

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies

Number folds	Number of Counters to Collapse
0	
1	
6	
12	

1 fold of the paper in

6 folds of the

Specific Curriculum Outcomes	Inclusive Assessment Strategies	Inclusive Learning Strategies
		When the testing is complete, ask students to tell you which form of the paper was the strongest (held the most counters without collapsing). So, students, it seems that folding the paper makes it much stronger. That is why we see our boxes made from corrugated cardboard, it makes them stronger.

Useful Content Knowledge for the Teacher about the Outcome*: (Links to professional sources that connect back to the Curriculum and Assessment Principles of Learning and Principles of Assessment)*
How to Cast a Concrete Column -video https://www.quora.com/Why-do-we-provide-reinforcement-in-columns-although-concrete-works-good-in-compression(8:20 mins)
Engineering Design Process: https://www.teachengineering.org/populartopics/designprocess

Inclusive Resources and Materials From Regional Specialists *Use of multisensory activities and materials to assist all learners. (texts, family &community knowledge and resources, contextually relevant professional web resources)*
Paper, paper clips, sticky notes, marble or coins or counters, books for weights, different types of tape

Additional Resources: Silly Sidney book: Morgan Matthews (1986) Troll Associates Press.

Opportunities for Subject Integration: ***(How the inclusive learning strategies might be adapted and/or applied to include other subjects in the curriculum)***

Mathematics: counting, measurement and shapes.
Social Studies: How do humans adapt by making inventions? Local inventors and local problems to solve.
Language Arts: new vocabulary, researching inventions, books about engineering (Rosie Revere Engineer (by Andrea Beaty) Read aloud here: https://www.youtube.com/watch?v=31eBdgnPsCo (6:49 mins)
TVET: building structures and measuring strength.
Agriculture: Building retaining walls for eroding fields using concrete and rebar.

Elements from Local Culture:

Local inventors

Resources for a learner who is struggling: ***(Links to earlier learning activities for similar knowledge, links to resources for special education needs)***

- Counters and hands-on materials.
- Teacher to manage construction if student manual dexterity is weak.

Resources for a learner who needs challenge: ***(Links to learning activities and resources in later grades)***

- TVET construction of a column or support.
- Opportunities to develop ideas around simple inventions (problem solutions) the students could undertake given a local community problem to solve.

Strategies that Support the OECS Curriculum and Assessment Framework
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Developed Citizenship Competencies	Working together in groups collecting data.
Developed Critical Thinking and Ethical Communication Competencies	Interpreting results of experiments and drawing conclusions.
Developed Well-being Competencies	NA
Developed Knowledge and Entrepreneurial Competencies	Understanding strengths and properties of materials and the need/process to test are all fundamental to the construction industry- careers.