Science *K-6*

Overview

Are You New to K-6 Science?

Need to Teach It Next Week?

August 28, 2023

Alberta Regional Professional Development Consortia

Adult learning for students' sake

Facilitators: Chris Zarski (CARC) & Ted Zarowny (ERLC)

Land Acknowledgement

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

Stephen Paquette

Agenda

1. How did we get here?
2. Architecture of the New Curriculum?
3. Overview of Curricular - Broad ideas - what each of the OI's are
4. Numbered Outcomes
5. Language Conventions
6. Curriculum Comparison
7. Progressions (Competencies, Literacy, Numeracy)
8. Concepts
9. Concept Progression K-6
10. A Closer Look at the KUSPs
    a. Knowledge
    b. Understandings
    c. Skills and Procedures
11. Phases of Learning (Surface, Deep, Transfer)
12. Additional Informational/Instructional Videos you could watch before the next scheduled Session 4.

How Did We Get Here?

May-June 2022

Mid-August 2022
Indication several School Divisions/Teachers intent to *Pilot*

August 26, 2022
Overview sessions in Science began

K-6 Sessions offered unpacking one organizing Idea in each session. Total Pilot participants: 330

March 17 - Minister Announces K-3 Implementation for September 2023 Grades 4-6 Optional Implementation.

The March 17 announcement of Science Implementation also saw significant changes to the curriculum documents. Please note that *Pilot* Sessions and Resources will remain available to teachers, however, if using these materials, please reference your updated curriculum document for any potential changes or omissions. Implementation sessions will reflect the *New Revised Curriculum Outcomes*.

Chris Zarski
czarski@carcpd.ab.ca

Architecture of the Curriculum

Architecture and Design of Provincial K–12 Curriculum

Guiding Framework Document

"The organizing idea is a statement of the learning within a given section of a subject area or discipline."

"Guiding questions are informed by the organizing idea and frame the learning outcome."

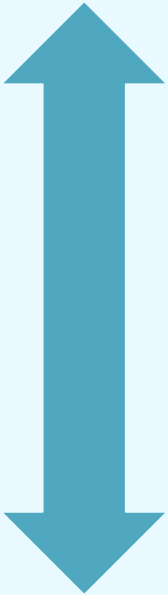
"The learning outcomes describe what students are required to know, understand, and be able to do by the end of a grade. Student achievement of the learning outcome must be assessed and reported."

New LearnAlberta

Alberta

Architecture of the Curriculum

Broad/General Idea or Understanding



More Specific Knowledge, Understandings, and Skills

Organizing Idea

Guiding Question
&
Learner Outcome

KUSPs
- Knowledge
- Understanding
- Skills & Processes

Organizing Idea

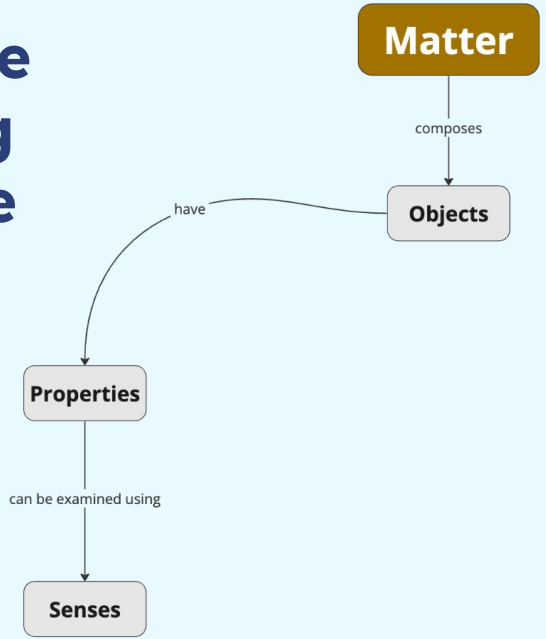
- statement of the learning
- spans all or most grades
- main concepts

Science Kindergarten to Grade 6 Curriculum

	Kindergarten			Grade 1			Grade 2		
Organizing Idea	Energy: Understandings of the physical world are deepened by investigating matter and energy.								
Guiding Question	How can objects, humans, and other animals move?			How can movement of objects and animals be understood?			Where do light and sound come from, and how do they move?		
Learning Outcome	Children explore movement of objects, humans, and other animals.			Students investigate direction, pathway, and speed of moving objects and animals.			Students investigate the behaviours of light and sound.		
	Knowledge	Understanding	Skills & Procedures	Knowledge	Understanding	Skills & Procedures	Knowledge	Understanding	Skills & Procedures
	Movement is a change in position or location that happens over time. Objects can be moved in various ways, including • straight lines • curves • circles • back and forth • zigzags • up and down • fast and slow Humans and other animals can move in a variety of ways, such as • flying	Objects, humans, and other animals can move or be moved in various ways.	Move objects in a variety of ways. Identify objects that move. Identify objects that do not move. Observe and imitate how animals can move. Identify various ways that humans and other animals can move.	Directions of movement can be described as • up • down • forward • backward • sideways • toward • away from A movement pathway is the path an object or animal follows when it moves. Movement pathways can be described as • straight • curved • spiral	Movement consists of direction, a pathway, and speed.	Observe and describe the direction, pathway, and speed of objects or animals. Conduct an investigation to determine how objects move. Describe and record ways objects or animals move along different pathways.	Sound behaves in various ways, including • travelling in a straight line from its source • transferring from one object to another • bouncing off a surface (reflection/diffusion) • stopping in an object (absorption) Sound is produced by vibrations of objects. Vibration is a rapid back-and-forth movement.	Behaviours of sound affect its characteristics.	Relate vibration to the production of sound. Identify sources of sound. Listen to sounds and describe their characteristics. Safely explore the production and behaviour of sound. Build a device to change the behaviour of sound.

Understandings of the physical world are deepened by investigating MATTER and ENERGY

Building the Organizing Idea Grade to Grade

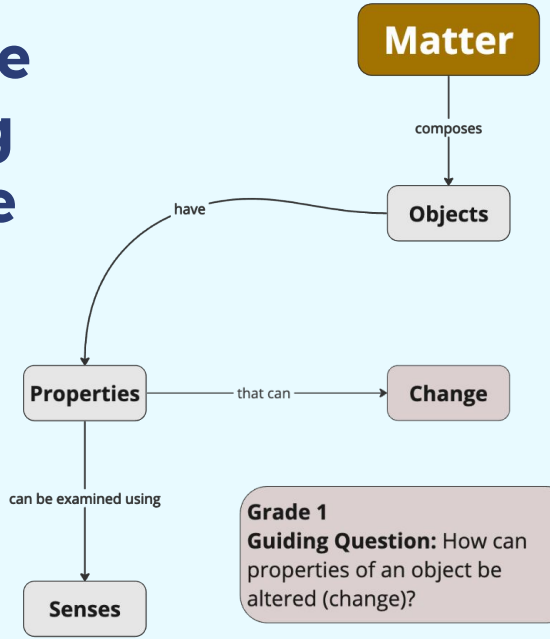


Kindergarten
Guiding Question: How can properties of an object be distinguished from one

Kindergarten
Learning Outcome:
Children examine properties of objects.

Understandings of the physical world are deepened by investigating MATTER and ENERGY

Building the Organizing Idea Grade to Grade



Kindergarten
Guiding Question: How can properties of an object be distinguished from one

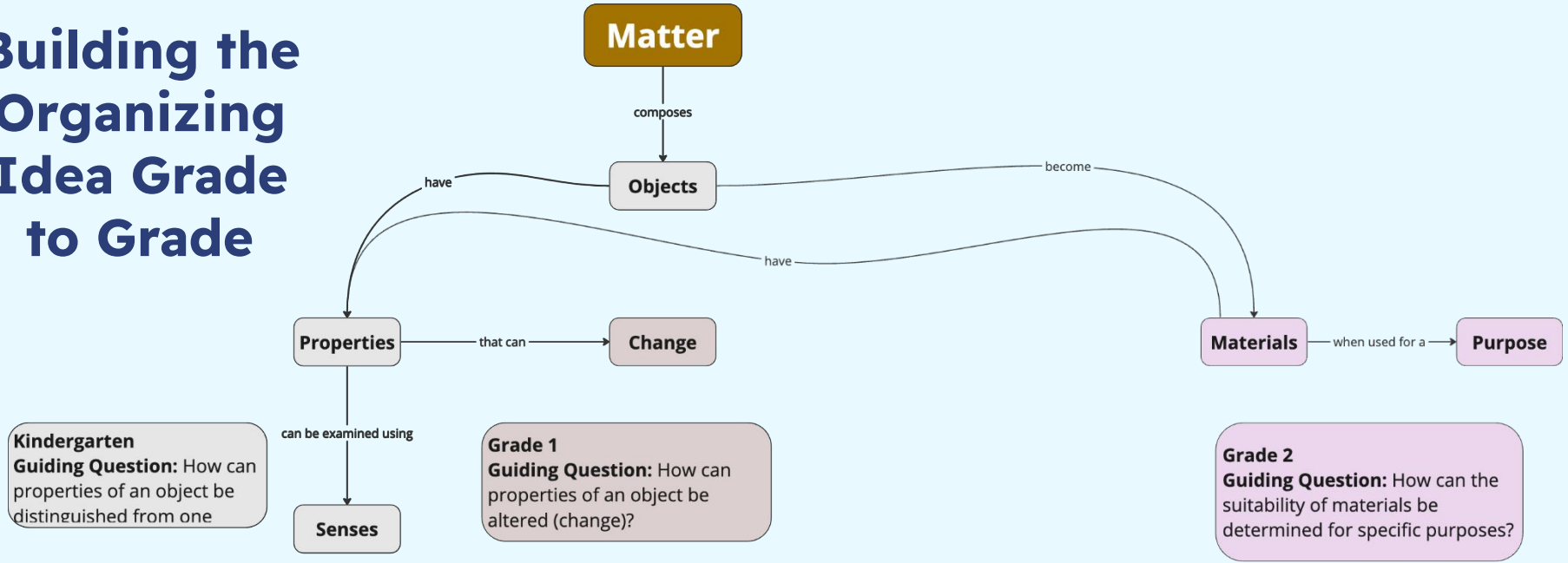
Grade 1
Guiding Question: How can properties of an object be altered (change)?

Kindergarten
Learning Outcome:
Children examine properties of objects.

Grade 1
Learning Outcome: Students analyze properties of objects and investigate how they can be. changed.

Understandings of the physical world are deepened by investigating MATTER and ENERGY

Building the Organizing Idea Grade to Grade



Kindergarten
Guiding Question: How can properties of an object be distinguished from one

Grade 1
Guiding Question: How can properties of an object be altered (change)?

Grade 2
Guiding Question: How can the suitability of materials be determined for specific purposes?

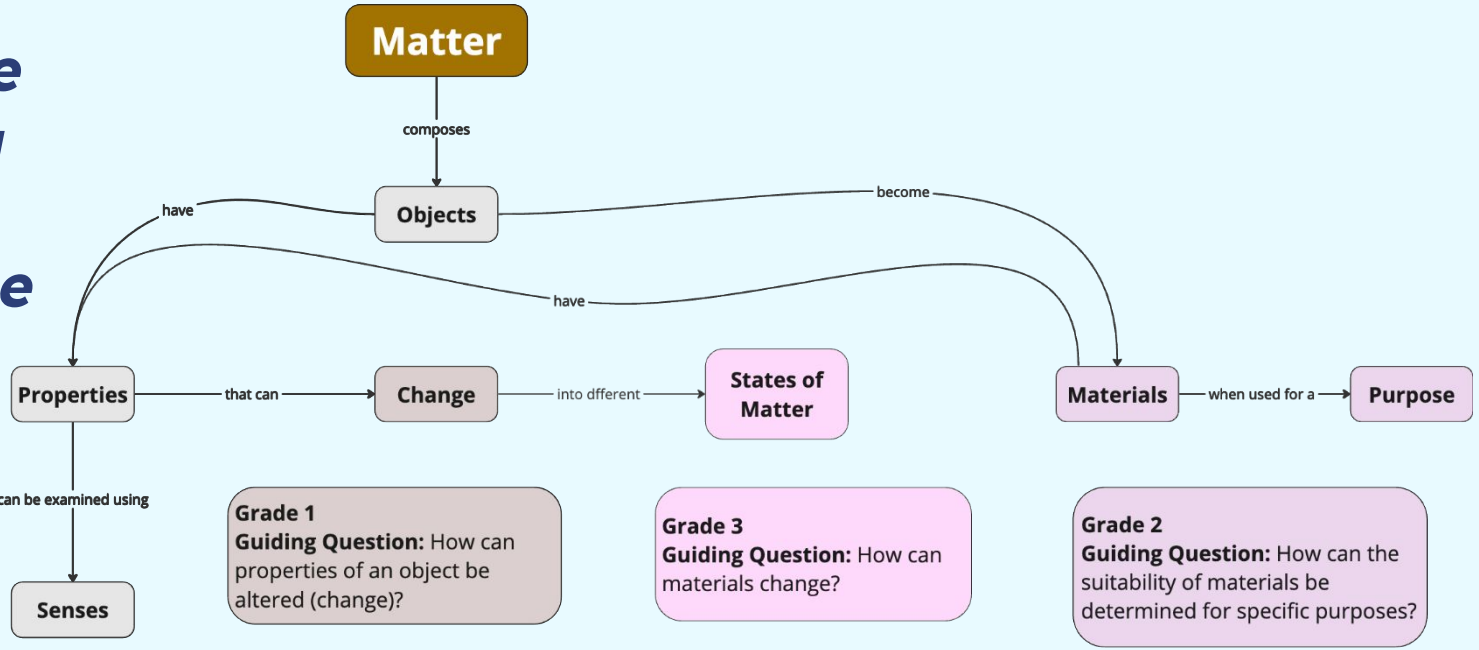
Kindergarten
Learning Outcome:
Children examine properties of objects.

Grade 1
Learning Outcome: Students analyze properties of objects and investigate how they can be. changed.

Grade 2
Learning Outcome: Students investigate properties of materials and relate them to a purpose.

Understandings of the physical world are deepened by investigating MATTER and ENERGY

Building the Organizing Idea Through the Grades



Kindergarten
Guiding Question: How can properties of an object be distinguished from one

Grade 1
Guiding Question: How can properties of an object be altered (change)?

Grade 3
Guiding Question: How can materials change?

Grade 2
Guiding Question: How can the suitability of materials be determined for specific purposes?

Kindergarten
Learning Outcome:
Children examine properties of objects.

Grade 1
Learning Outcome: Students analyze properties of objects and investigate how they can be. changed.

Grade 3
Learning Outcome: Students investigate and analyze how materials have the potential to be changed..

Grade 2
Learning Outcome: Students investigate properties of materials and relate them to a purpose.

Organizing Idea Progression

Organizing Idea	Kindergarten	Grade 1	Grade 2	Grade 3	K	1	2	3	4	5	6
Matter	Matter: Understandings of the physical world are deepened through investigating matter and energy.										
	• Explore properties using the five senses.	• Analyze measurable properties of objects and physical changes.	• Examine properties, types, and selection of materials based on suitability,availability, and sustainability.	• Investigate how substances can change, including water and the water cycle.							
Energy	Energy: Understandings of the physical world are deepened through investigating matter and energy.										
	• Examine movement of objects, humans, and other animals.	• Investigate characteristics of movement.	• Investigate the sources and behaviours of light and sound.	• Conduct investigations to determine the effects of contact forces on objects, including simple machines.							
Earth Systems	Earth Systems: Understandings of the living world, Earth and space are deepened through investigating natural systems and their interactions.										
	• Examine components of environments. • Protect the environment by reducing waste, recycling, and reusing.	• Analyze seasonal changes and their effects on plants and animals	• Examine Earth's landforms, bodies of water, and relationship to the Sun.	• Analyze changes to Earth's surface caused by natural events and the activities of plants, humans, and other animals, including growing crops and farming. • Examine how layers of Earth's surface, including the discovery and location of dinosaur fossils, hold information about the past. • Discuss First Nations, Métis, and Inuit relationships with and intergenerational knowledge of land and Earth's surface.							
Living Systems		Living Systems:Understandings of the living world, Earth and space are deepened through investigating natural systems and their interactions.									
		• Investigate plants and animals and the relationships among them.	• Investigate the growth and development of plants and animals and explore their relationship to humans.	• Analyze interactions between plants, humans, other animals, and the environment.							
Space											
Computer Science	• Order and follow instructions	• Order and follow instructions	• Apply creativity to design precise, reliable, and efficient instructions.	• Investigate creativity and its relationship to computational and divergent thinking.							
Scientific Method		• Describe the steps of an investigation and make predictions, observations, and conclusions.		• Relate sources, accuracy, and analysis of data to building scientific knowledge.							

Organizing Idea Progression: Kindergarten

Organizing Idea	Kindergarten	K	1	2	3	4	5	6
Matter	• Explore properties using the five senses.							
Energy	• Examine movement of objects, humans, and other animals.							
Earth Systems	• Examine components of environments. • Protect the environment by reducing waste, recycling, and reusing.							
Living Systems								
Space								
Computer Science	• Order and follow instructions							
Scientific Method								

Organizing Idea Progression: Grade 1

Organizing Idea	Grade 1	K	1	2	3	4	5	6
Matter	• Analyze measurable properties of objects and physical changes.							
Energy	• Investigate characteristics of movement.							
Earth Systems	• Analyze seasonal changes and their effects on plants and animals							
Living Systems	• Investigate plants and animals and the relationships among them.							
Space								
Computer Science	• Order and follow instructions							
Scientific Method	• Describe the steps of an investigation and make predictions, observations, and conclusions.							

Organizing Idea Progression: Grade 2

Organizing Idea	Grade 2	K	1	2	3	4	5	6
Matter	• Examine properties, types, and selection of materials based on suitability,availability, and sustainability.							
Energy	• Investigate the sources and behaviours of light and sound.							
Earth Systems	• Examine Earth's landforms, bodies of water, and relationship to the Sun.							
Living Systems	• Investigate the growth and development of plants and animals and explore their relationship to humans.							
Space	•							
Computer Science	• Apply creativity to design precise, reliable, and efficient instructions.							
Scientific Method	• Describe purposes and procedures of investigations in science.							

Organizing Idea Progression: Grade 3

Organizing Idea	Grade 3	K	1	2	3	4	5	6
Matter	• Investigate how substances can change, including water and the water cycle.							
Energy	• Conduct investigations to determine the effects of contact forces on objects, including simple machines.							
Earth Systems	• Analyze changes to Earth's surface caused by natural events and the activities of plants, humans, and other animals, including growing crops and farming. • Examine how layers of Earth's surface, including the discovery and location of dinosaur fossils, hold information about the past. • Discuss First Nations, Métis, and Inuit relationships with and intergenerational knowledge of land and Earth's surface.							
Living Systems	• Analyze interactions between plants, humans, other animals, and the environment.							
Space								
Computer Science	• Investigate creativity and its relationship to computational and divergent thinking.							
Scientific Method	• Relate sources, accuracy, and analysis of data to building scientific knowledge.							

Guiding Question

- informed by the organizing idea and frames the learning outcome
- intended to spark curiosity and wonder about the LO
- identifies more specific concepts

Science Kindergarten to Grade 6 Curriculum

	Kindergarten			Grade 1			Grade 2		
Organizing Idea	Energy: Understandings of the physical world are deepened by investigating matter and energy.								
Guiding Question	How can objects, humans, and other animals move?			How can movement of objects and animals be understood?			Where do light and sound come from, and how do they move?		
Learning Outcome	Children explore movement of objects, humans, and other animals.			Students investigate direction, pathway, and speed of moving objects and animals.			Students investigate the behaviours of light and sound.		
	Knowledge	Understanding	Skills & Procedures	Knowledge	Understanding	Skills & Procedures	Knowledge	Understanding	Skills & Procedures
	Movement is a change in position or location that happens over time. Objects can be moved in various ways, including • straight lines • curves • circles • back and forth • zigzags • up and down • fast and slow Humans and other animals can move in a variety of ways, such as • flying	Objects, humans, and other animals can move or be moved in various ways.	Move objects in a variety of ways. Identify objects that move. Identify objects that do not move. Observe and imitate how animals can move. Identify various ways that humans and other animals can move.	Directions of movement can be described as • up • down • forward • backward • sideways • toward • away from A movement pathway is the path an object or animal follows when it moves. Movement pathways can be described as • straight • curved • spiral	Movement consists of direction, a pathway, and speed.	Observe and describe the direction, pathway, and speed of objects or animals. Conduct an investigation to determine how objects move. Describe and record ways objects or animals move along different pathways.	Sound behaves in various ways, including • travelling in a straight line from its source • transferring from one object to another • bouncing off a surface (reflection/diffusion) • stopping in an object (absorption) Sound is produced by vibrations of objects. Vibration is a rapid back-and-forth movement.	Behaviours of sound affect its characteristics.	Relate vibration to the production of sound. Identify sources of sound. Listen to sounds and describe their characteristics. Safely explore the production and behaviour of sound. Build a device to change the behaviour of sound.

Learning Outcome

- describes what students are required to know, understand, and be able to do by the end of a grade.
- must be assessed and reported.
- discipline (subject) specific
- key concepts to be learned and assessed are identified.

Science Kindergarten to Grade 6 Curriculum

	Kindergarten			Grade 1			Grade 2		
Organizing Idea	**Matter and Energy**: Understandings of the physical world are deepened by investigating matter and energy.								
Guiding Question	How can objects, humans, and other animals move?			How can movement of objects and animals be understood?			Where do light and sound come from, and how do they move?		
Learning Outcome	Children explore movement of objects, humans, and other animals.			Students investigate direction, pathway, and speed of moving objects and animals.			Students investigate the behaviours of light and sound.		
	Knowledge	Understanding	Skills & Procedures	Knowledge	Understanding	Skills & Procedures	Knowledge	Understanding	Skills & Procedures
	Movement is a change in position or location that happens over time. Objects can be moved in various ways, including • straight lines • curves • circles • back and forth • zigzags • up and down • fast and slow Humans and other animals can move in a variety of ways, such as • flying	Objects, humans, and other animals can move or be moved in various ways.	Move objects in a variety of ways. Identify objects that move. Identify objects that do not move. Observe and imitate how animals can move. Identify various ways that humans and other animals can move.	Directions of movement can be described as • up • down • forward • backward • sideways • toward • away from A movement pathway is the path an object or animal follows when it moves. Movement pathways can be described as • straight • curved • spiral	Movement consists of direction, a pathway, and speed.	Observe and describe the direction, pathway, and speed of objects or animals. Conduct an investigation to determine how objects move. Describe and record ways objects or animals move along different pathways.	Sound behaves in various ways, including • travelling in a straight line from its source • transferring from one object to another • bouncing off a surface (reflection/diffusion) • stopping in an object (absorption) Sound is produced by vibrations of objects. Vibration is a rapid back-and-forth movement.	Behaviours of sound affect its characteristics.	Relate vibration to the production of sound. Identify sources of sound. Listen to sounds and describe their characteristics. Safely explore the production and behaviour of sound. Build a device to change the behaviour of sound.

KUSPs: Knowledge

- Knowledge includes the facts, symbols, rules, principles, and concepts.

Science Kindergarten to Grade 6 Curriculum

	Kindergarten			Grade 1			Grade 2		
Organizing Idea	Energy: Un[illegible]ndings of the physical world are deepened by investigating matter and energy.								
Guiding Question	How can o[illegible] humans, and other animals move?			How can movement of objects and animals be understood?			Where do light and sound come from, and how do they move?		
Learning Outcome	Children [illegible]ovement of objects, humans, and other animals.			Students investigate direction, pathway, and speed of moving objects and animals.			Students investigate the behaviours of light and sound.		
	Knowledge	Understanding	Skills & Procedures	Knowledge	Understanding	Skills & Procedures	Knowledge	Understanding	Skills & Procedures
	Movement is a change in position or location that happens over time. Objects can be moved in various ways, including • straight lines • curves • circles • back and forth • zigzags • up and down • fast and slow Humans and other animals can move in a variety of ways, such as • flying	Objects, humans, and other animals can move or be moved in various ways.	Move objects in a variety of ways. Identify objects that move. Identify objects that do not move. Observe and imitate how animals can move. Identify various ways that humans and other animals can move.	Directions of movement can be described as • up • down • forward • backward • sideways • toward • away from A movement pathway is the path an object or animal follows when it moves. Movement pathways can be described as • straight • curved • spiral	Movement consists of direction, a pathway, and speed.	Observe and describe the direction, pathway, and speed of objects or animals. Conduct an investigation to determine how objects move. Describe and record ways objects or animals move along different pathways.	Sound behaves in various ways, including • travelling in a straight line from its source • transferring from one object to another • bouncing off a surface (reflection/diffusion) • stopping in an object (absorption) Sound is produced by vibrations of objects. Vibration is a rapid back-and-forth movement.	Behaviours of sound affect its characteristics.	Relate vibration to the production of sound. Identify sources of sound. Listen to sounds and describe their characteristics. Safely explore the production and behaviour of sound. Build a device to change the behaviour of sound.

KUSPs: Understanding

- how facts and knowledge fit together in a logical and meaningful order
- organized knowledge to understand concepts, skills, and procedures which can be applied to new situations

Science Kindergarten to Grade 6 Curriculum

	Kinde n			Grade 1			Grade 2		
Organizing Idea	Energy: Understandings of the physi rld are deepened by investigating matter and energy.								
Guiding Question	How can objects, humans, and othe als move?			How can movement of objects and animals be understood?			Where do light and sound come from, and how do they move?		
Learning Outcome	Children explore movement of obje mans, and other animals.			Students investigate direction, pathway, and speed of moving objects and animals.			Students investigate the behaviours of light and sound.		
	Knowledge	Understanding	Skills & Procedures	Knowledge	Understanding	Skills & Procedures	Knowledge	Understanding	Skills & Procedures
	Movement is a change in position or location that happens over time. Objects can be moved in various ways, including • straight lines • curves • circles • back and forth • zigzags • up and down • fast and slow Humans and other animals can move in a variety of ways, such as • flying	Objects, humans, and other animals can move or be moved in various ways.	Move objects in a variety of ways. Identify objects that move. Identify objects that do not move. Observe and imitate how animals can move. Identify various ways that humans and other animals can move.	Directions of movement can be described as • up • down • forward • backward • sideways • toward • away from A movement pathway is the path an object or animal follows when it moves. Movement pathways can be described as • straight • curved • spiral	Movement consists of direction, a pathway, and speed.	Observe and describe the direction, pathway, and speed of objects or animals. Conduct an investigation to determine how objects move. Describe and record ways objects or animals move along different pathways.	Sound behaves in various ways, including • travelling in a straight line from its source • transferring from one object to another • bouncing off a surface (reflection/diffusion) • stopping in an object (absorption) Sound is produced by vibrations of objects. Vibration is a rapid back-and-forth movement.	Behaviours of sound affect its characteristics.	Relate vibration to the production of sound. Identify sources of sound. Listen to sounds and describe their characteristics. Safely explore the production and behaviour of sound. Build a device to change the behaviour of sound.

KUSPs: Skills & Procedures

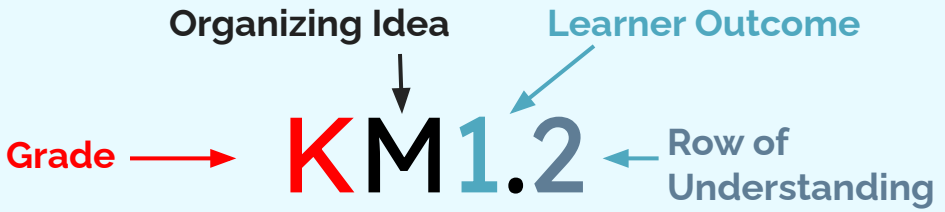
- what students do to demonstrate their knowledge and understanding

nce Kindergarten to Grade 6 Curriculum

	Kindergarten			Grade 1			Grade 2		
Organizing Idea	Energy: Understandings of the physical world are deepened by igating matter and energy.								
Guiding Question	How can objects, humans, and other animals move?			How can movement of objects and animals be understood?			Where do light and sound come from, and how do they move?		
Learning Outcome	Children explore movement of objects, humans, and other an			Students investigate direction, pathway, and speed of moving objects and animals.			Students investigate the behaviours of light and sound.		
	Knowledge	Understanding	Skills & Procedures	Knowledge	Understanding	Skills & Procedures	Knowledge	Understanding	Skills & Procedures
	Movement is a change in position or location that happens over time. Objects can be moved in various ways, including • straight lines • curves • circles • back and forth • zigzags • up and down • fast and slow Humans and other animals can move in a variety of ways, such as • flying	Objects, humans, and other animals can move or be moved in various ways.	Move objects in a variety of ways. Identify objects that move. Identify objects that do not move. Observe and imitate how animals can move. Identify various ways that humans and other animals can move.	Directions of movement can be described as • up • down • forward • backward • sideways • toward • away from A movement pathway is the path an object or animal follows when it moves. Movement pathways can be described as • straight • curved • spiral	Movement consists of direction, a pathway, and speed.	Observe and describe the direction, pathway, and speed of objects or animals. Conduct an investigation to determine how objects move. Describe and record ways objects or animals move along different pathways.	Sound behaves in various ways, including • travelling in a straight line from its source • transferring from one object to another • bouncing off a surface (reflection/diffusion) • stopping in an object (absorption) Sound is produced by vibrations of objects. Vibration is a rapid back-and-forth movement.	Behaviours of sound affect its characteristics.	Relate vibration to the production of sound. Identify sources of sound. Listen to sounds and describe their characteristics. Safely explore the production and behaviour of sound. Build a device to change the behaviour of sound.

Numbered Outcomes

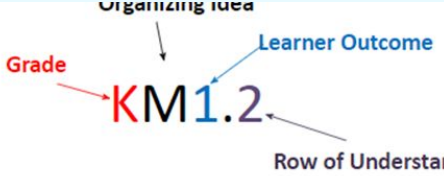
Science K-6
Numbered Outcomes



	Kindergarten			Grade 1		
Organizing Idea	Matter: Understandings of the physical world are deepened through investigating matter and energy.					
Guiding Question	How can properties of an object be distinguished from one another?			How can properties of an object be altered?		
Learning Outcome	KM1.2: Children examine properties of objects.			KM1.2: Students analyze properties of objects and investigate how they can be.		
	Knowledge	Understanding	Skills & Procedures	Knowledge	Understanding	Skills & Procedures
	Reasons for human and other animal movement include • seeking food and water • exercising and playing • escaping danger	Humans and other animals move for many reasons.	Examine the reasons why humans and other animals move.	The movement of objects can be influenced by • the shape of the object • the materials the object is made from • the surface texture of the object • interactions with other objects Wheels can make objects easier to move.	The movement of objects can be influenced in a variety of ways.	Identify measurable properties of objects. Directly compare the length, area, and weight of various objects.

Science K-6 Numbered Outcomes

Science K-6 Numbered Outcomes
2023-2024 Revised Version



	Kindergarten			Grade 1			Grade 2		
Organizing Idea	Matter: Understandings of the physical world are deepened through investigating matter and energy.								
Guiding Question	How can properties of an object be distinguished from one another?			How can properties of an object be altered?			How can the suitability of materials be determined for specific purposes?		
Learning Outcome	KM 1.1 Children examine properties of objects.			1M 1.1 Students analyze properties of objects and investigate how they can be changed.			2M 1.1 Students investigate the properties of materials and relate them to a purpose.		
	Knowledge	Understanding	Skills & Procedures	Knowledge	Understanding	Skills & Procedures	Knowledge	Understanding	Skills & Procedures
	An object is anything that can be perceived using one or more of the five senses. The five senses are • sight • touch • hearing • smell • taste Properties are distinctive characteristics. Properties of objects that can be perceived using one or more of the five senses include • colour; e.g., blue, ,yellow • size; e.g., long, short	Objects have identifiable properties Objects may be similar in one or more properties and different in another property	Explore properties of various objects using one or more of the five senses. Describe properties of various objects Sort various objects according to properties. Compare properties of various objects.	Measurable properties of objects include • length • how much flat space an object covers (area) • weight (mass) Weight is the heaviness of an object. Tools, such as balance scales and magnifying glasses, can be used to examine properties of objects and materials.	Objects have measurable properties.	Identify measurable properties of objects. Directly compare the length, area, and weight of various objects. Use various tools safely when examining the properties of objects.	Materials are used to make objects.	Materials can be combined in a variety of ways to make objects.	Identify the materials used to make various objects. Combine materials to create an object for a specific purpose.

[Link]

Language Conventions in the Curriculum

Language Conventions

Examples:

Interpretation

Objects in space **include**
- the Moon
- the Sun (a star)
- stars and their planets
- planets and their moons

A list following “including” or “include(s)” contains **required** knowledge. Students must know all elements on the list in order to achieve the learning outcome.

Light travels in various ways, including in a straight line from its source through *bouncing off* a surface **(reflection).**

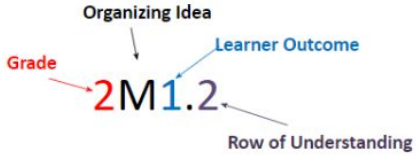
Words in parentheses are subject-specific terms for teachers and parents. These words follow the age-appropriate words for students.

Diverse plants and animals can be found in many environments in Alberta, **such as**
- forests
- prairies
- lakes and rivers mountains

A list following “such as” or “e.g.” provides a list of illustrative examples that supports the learning outcome. Teachers may use any of these examples, or they may choose others.

Curriculum Comparison Document

Looking at Changes – Curriculum Comparison Document



Grade 2 Curriculum Comparison to the New Alberta Science Curriculum

M = Matter E= Energy ES = Earth Systems S = Space LS = Living Systems CS = Computer Science SM = Scientific Method.

Outcomes from 1996 Curriculum	Learner Outcomes from New Curriculum	Understandings & Knowledge from New Curriculum	Skills and Procedures from New Curriculum
Possible Links to the 1996 Science Curriculum	**Matter(M) : Matter: Understandings of the physical world are deepened through investigating matter and energy.** **Guiding Question:** How can the suitability of materials be determined?		
Grade 1 **Topic C: Building Things** 1–7 Construct objects and models of objects, using a variety of different materials. 1–8 Identify the purpose of different components in a personally constructed object or model, and identify corresponding components in a related object or model. **Grade 2** **Topic B : Buoyancy and Boats** 2-7 Construct objects that will float on and move through water, and evaluate various designs for watercraft.	LEARNER OUTCOME 2M 1.1 Students investigate the properties of materials and relate them to a purpose..	UNDERSTANDING Materials can be combined in a variety of ways to make objects. KNOWLEDGE Materials are used to make objects.	SKILLS and PROCEDURES Identify the materials used to make various objects. Combine materials to create an object for a specific purpose.
	LEARNER OUTCOME 2M 1.2 Students investigate the properties of materials and relate them to a purpose..	UNDERSTANDING Materials have unique properties. KNOWLEDGE Properties of materials that can be tested include • if light passes through (transparency) • if water is absorbed • if the material can be shaped (malleability) • if light is reflected (reflection)	SKILLS and PROCEDURES Test properties of various natural and processed materials. Measure the length and mass of various objects using non-standard measurement

Looking at Changes – Curriculum Comparison Document

Curriculum Comparison Document Kindergarten:
https://arpdc.ab.ca/wp-content/uploads/2023/04/kindergarten-science-curriculum-comparison-to-new-alberta-curriculum-2023-2024.pdf

Curriculum Comparison Document Grade 1:
https://arpdc.ab.ca/wp-content/uploads/2023/04/grade-1-curriculum-comparision-document-to-new-alberta-curriculum-2023-2024-master.pdf

Curriculum Comparison Document Grade 2:
https://arpdc.ab.ca/wp-content/uploads/2023/04/grade-2-science-curriculum-comparison-2023-2024-master.pdf

Curriculum Comparison Document Grade 3:
https://arpdc.ab.ca/wp-content/uploads/2023/04/grade-3-science-curriculum-comparison-to-alberta-curriculum-2023-2024.pdf

Curriculum Comparison Document Grade 4:
https://arpdc.ab.ca/wp-content/uploads/2023/04/grade-4-science-curriculum-comparison-to-new-alberta-curriculum-2023-2024.pdf

Curriculum Comparison Document Grade 5:
https://arpdc.ab.ca/wp-content/uploads/2023/04/grade-5-science-curriculum-comparison-to-new-alberta-curriculum-2023.pdf

Curriculum Comparison Document Grade 6:
https://arpdc.ab.ca/wp-content/uploads/2023/04/grade-6-science-curriculum-comparison-to-new-alberta-curriculum.pdf

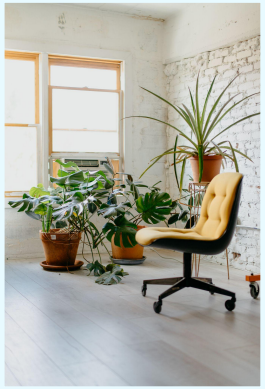
Concepts

What is a concept?

A concept is ...

- A organizing idea of 1 -2 words (noun)
- with distinct attributes
- that are shared across multiple examples





Chair is a Concept

A concept is ...

- an organizing idea of 1 -2 words
- with distinct attributes
- that are shared across multiple examples

Democracy
Planet
Addition
Dialogue
Landform
Discussion
Paragraph
Strategy

A Conceptual Lens

Concepts can be used provide a focus or help “zoom in.”

“I Spy …”

Science Concept Lenes

- ecosystem
- diversity
- interaction
- climate

Example: Grade 5
Living Systems

Concepts in the Curriculum

Guiding Question	How are organisms supported by vital biological processes and systems?	
Learning Outcome	**5LS1 Students investigate the internal systems of organisms and explain how they support vital biological processes.**	
Knowledge	Understanding	Skills & Procedures
Vital biological processes in complex organisms are carried out by biological systems that rely on each other. Vital biological processes of complex organisms include • movement • nutrition • respiration • growth • reproduction	Humans are complex organisms with biological systems that carry out vital biological processes.	Relate vital biological processes to a human or other animal's internal biological systems.

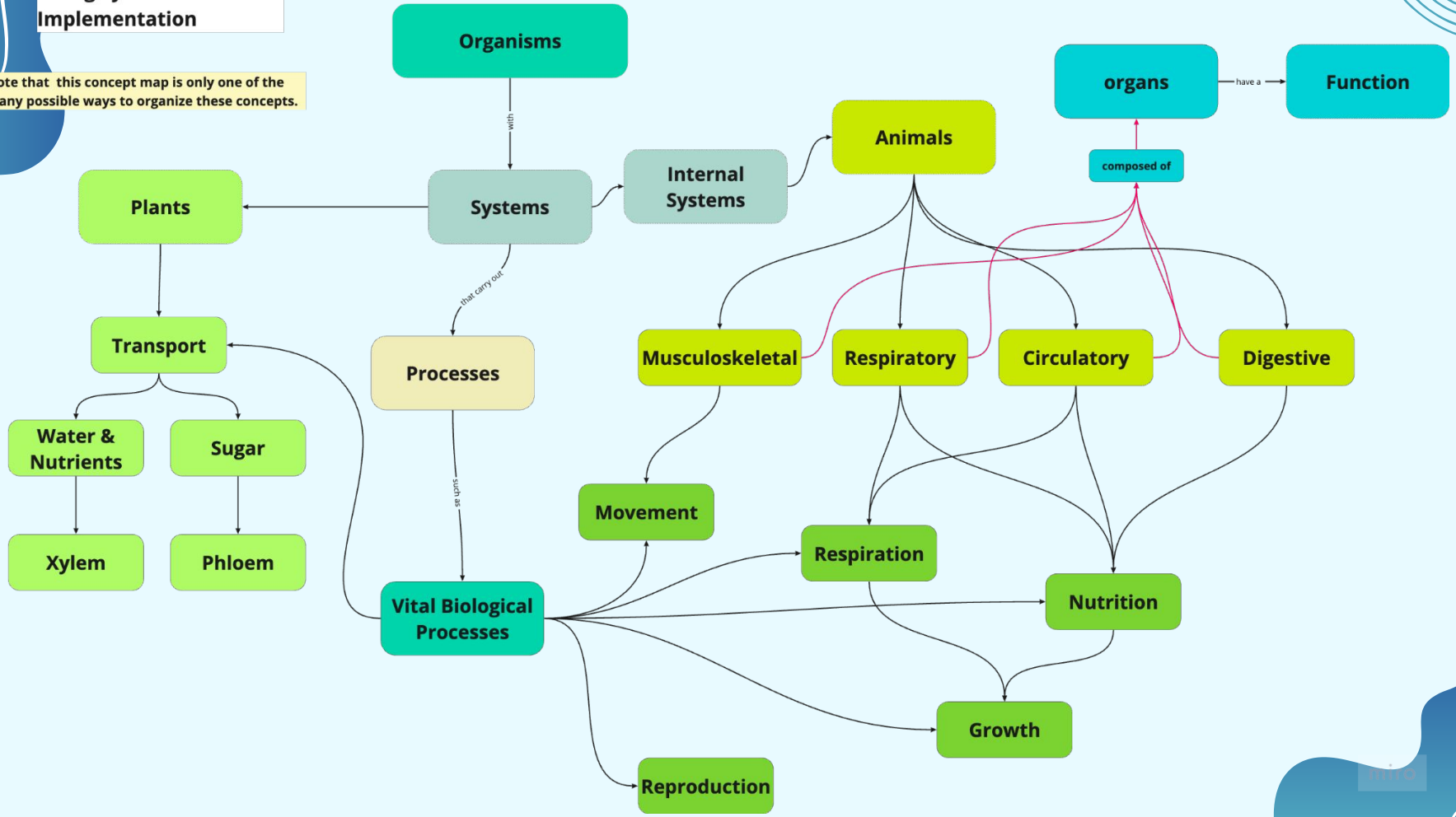
Example: Grade 5
Living Systems

Concepts in the Curriculum

Guiding Question	**How are organisms supported by vital biological processes and systems?**	
Learning Outcome	**5LS1 Students investigate the internal systems of organisms and explain how they support vital biological processes.**	
Knowledge	Understanding	Skills & Procedures
Vital biological processes in complex organisms are carried out by biological systems that rely on each other. Vital biological processes of complex organisms include • movement • nutrition • respiration • growth • reproduction	Humans are complex organisms with biological systems that carry out vital biological processes.	Relate vital biological processes to a human or other animal's internal biological systems.

Living Systems Grade 5 Implementation

Note that this concept map is only one of the many possible ways to organize these concepts.



Concept Progressions:
A Spiraling Curriculum

Concept Progressions:
https://drive.google.com/file/d/15m6G_OomaCEkTqSZ1IsPwUepLRgAZKaT/view

Concept Progressions

Science Curriculum (March 2023)

Kindergarten to Grade 6

Matter

Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6
Guiding Question: *How can properties of an object be distinguished from one another?*	**Guiding Question:** *How can properties of an object be altered?*	**Guiding Question:** *How can the suitability of materials be determined?*	**Guiding Question:** *How can materials change?*	**Guiding Question:** *How can materials be managed safely?*	**Guiding Question:** *How can states of matter and other physical properties be explained using the particle model of matter?*	**Guiding Question:** *How can the particles of matter be influenced by heating or cooling?*
Learning Outcome: *Children examine properties of objects.*	**Learning Outcome:** *Students analyze properties of natural and constructed objects and investigate how they can be changed.*	**Learning Outcome:** *Students investigate the properties of materials and relate them to a purpose.*	**Learning Outcome:** *Students investigate and analyze how materials have the potential to be changed.*	**Learning Outcome:** *Students investigate the management of waste and dangerous materials and describe environmental impacts.*	**Learning Outcome:** *Students investigate the particle model of matter in relation to the physical properties of solids, liquids, and gases.*	**Learning Outcome:** *Students investigate how particles of matter behave when heated or cooled and analyze effects on solids, liquids, and gases.*
KEY CONCEPTS				**KEY CONCEPTS**		
Object	Change: Physical (eg. bending, twisting)	Material: Combining	Change: melting, freezing, evaporation, condensation	Impact: Environmental	Attractive Force	Attractive Force
Properties: Observable	Weight	Measurement	Change: permanent, reversible	Production & Consumption	Behaviour of Particles: movement & arrangement	Behaviour of Particles: movement & arrangement
Senses	Object: Natural	Object	Cycle	Responsible Use & Disposal	Particle Model of Matter	Expansion & Contraction
Similarities	Object: Processed	Properties: Testable (eg. transparency, malleability)	Cycle: Water	Symbols: Hazard (explosive, flammable, corrosive, poisonous)	Properties: Physical (state mass, volume, density, compressibility	Heating & Cooling
Difference	Properties: Measurable (eg. area, length)	Material Purpose	Evaporation	Waste Material	State of Matter: solid, liquid, gas	Particle Model of Matter
	Properties: Changeable (eg. shape, texture, area)	Material Suitability	Interaction	Waste Management Methods (landfills & combusting & composting & recycling)	SI units	Temperature Tools: thermometer
	Senses	FNMI: Objects from Natural Material	Material: Natural & Processed			Phase Change
	Tools	FNMI: What informs use of materials	Matter			
		FNMI: What informs use of materials	Properties			
			State of Matter: solid, liquid, gas			
			FNMI: Relating to land, plants, and animals as equals			
			FNMI: Interaction with natural materials for a specific purpose.			

Link

A Closer Look at the KUSPS

Example: Grade 6 Space

Knowledge: Concept Definitions

Guiding Question		
Learning Outcome		
Knowledge	**Understanding**	**Skills and Procedures**
6S1.1 **Celestial bodies** are natural bodies located beyond Earth's atmosphere.		

The Knowledge section of the curriculum often defines key concepts.

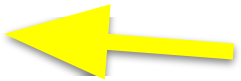
If there is no definition, search a .pdf of the K-6 Science curriculum. The definition may be in

- another organizing ideas
- different grade

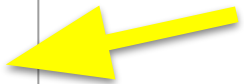
Example: Grade 6 Space

Knowledge: Concept Definitions

Guiding Question		
Learning Outcome		
Knowledge	**Understanding**	**Skills and Procedures**
6S1.1 Celestial bodies have **characteristics** that vary in many ways, including • surface conditions; e.g., temperature, gravity, and atmosphere • composition; e.g., gas, ice, or visible rings • size • shape; e.g., round or irregular **Some celestial bodies** emit light and others reflect light.		



The Knowledge section of the curriculum often provides examples of concepts.



If there are no examples, they will need to be generated.

Example: Grade 3 Living Systems

Understanding

The *Guiding Framework* defines "understanding" as "how facts and knowledge fit together in a logical and meaningful order."

Individual Concepts	Understanding
Human Activities Change Land on Earth	*Change **to** land on Earth **affects** human activities.* *Human activities **can cause** changes **to** Earth's surface.*

Example: Grade 3

Understanding

Guiding Question	What visible changes can be identified through examination of Earth's surface?	
Learning Outcome	**3ES1.5: Students analyze changes in Earth's surface and explain how layers of the landscape hold stories of the past.**	
Knowledge	Understanding	Skills & Procedures
Human activities that can **change Earth's surface** include ● living on the land ● building towns and cities getting and using resources growing crops and farming (agriculture) ● polluting ● stewardship	Plant, **human**, and other animal **activities can cause changes to Earth's surface.**	Relate **human activities** to **changes** in **Earth's surface.**

Understanding

Example: Grade 4 Earth Systems

Guiding Question	**What visible changes can be identified through examination of Earth's surface?**	
Learning Outcome	**3ES1.5: Students analyze changes in Earth's surface and explain how layers of the landscape hold stories of the past.**	
Knowledge	Understanding	Skills & Procedures
Conservation is the preservation and protection of Earth's systems from pollution, depletion, or extinction.	**Conservation** can impact l**and, natural resources**, and **organisms.**	Investigate **conservation** practices in natural and human-made areas.

Identifying Key Concepts

	What visible changes can be identified through examination of Earth's surface?
	3ES1.5: Students analyze changes in Earth's surface and explain how layers of the landscape hold stories of the past.

ACTIVITY

1. Choose a KUSP line from an Organizing Idea.
2. What are the concepts in the Understandings?
3. Do they appear in the Guiding Question or Learner Outcome?
4. Do they appear in the Knowledge column? Are they defined?
5. Do they appear in the Skills and Procedures column?

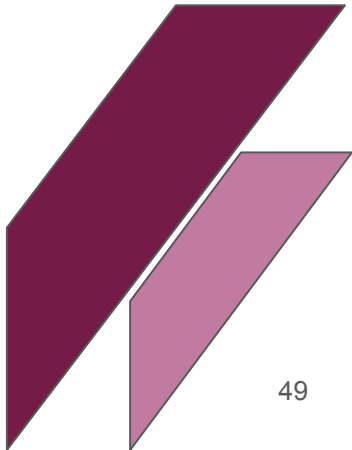
Skills & Procedures Progressions

Skills and procedures “are what students do to demonstrate knowledge and understanding” (*Guiding Framework*)

Skills and Procedures Progressions K-3 Link

Science

Kindergarten to Grade 3
Skills and Procedures
Progressions



Learner Outcome Verbs				
	Grade			
	K	1	2	3
Apply Creativity				
Analyze				
Describe				
Examine				
Explain				
Explore				
Follow Instructions				
Interpret Instructions				
Investigate				
Relate				

Learner Outcome Verbs

Verbs are the skills and procedures that students do or perform.

Learner outcome verbs are those verbs that are identified in the learner outcome

Skills & Procedures Verbs

Skills & Process Verbs	Grade			
	K	1	2	3
Ask Questions				
Classify (Sort)				
Compare & Contrast				
Conclude				
Create				
Demonstrate Safety				
Describe				
Design				
Discuss				
Examine				
Explain				
Explore				
Investigate				
Observe				
Predict				
Record Data				
Relate				
Represent				

Skills and procedures verbs are those identified in the Skills & Procedures column of the curriculum guide.

This list represents the ***more frequently used verbs.***

- A darker shade signifies a verb used directly in a Skills and Procedures statement.
- A lighter shade indicates that verb is not stated as a separate skill, but is included in a procedure (eg. “Ask Questions” is a step in the “Investigation” procedure at every grade).

Instruction and Assessment

These skills and procedures can be taught, practiced, and assessed.

Doing so will help students become more proficient in their use and better able to demonstrate their knowledge and understanding when using these skills.

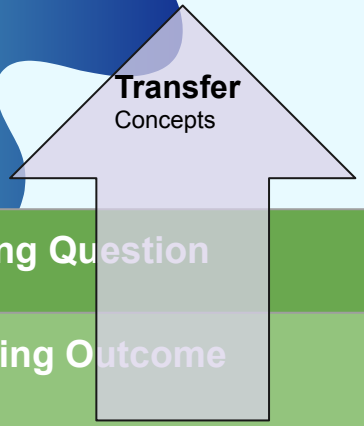
Computer Science

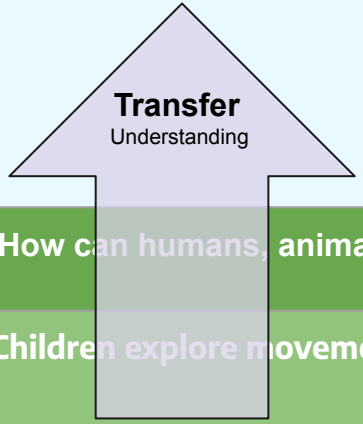
Kindergarten	Grade 1	Grade 2	Grade 3
Recognize when actions do not correspond to instructions.	Determine if instructions with two or three steps given in different orders still produce the desired outcome.	Predict the outcome of instructions that have three to four steps.	
		Debug any errors in a set of instructions to achieve a desired outcome.	
		Refine instructions to more efficiently achieve a desired outcome.	
		Test instructions with three to four steps to verify that a desired outcome is achieved.	
Match an action to the corresponding instruction.			
Engage in activities that involve following instructions in various contexts.			Identify computational thinking used to solve problems or achieve desired outcomes.
Engage in activities that involve following instructions presented in various ways.	Follow instructions during investigations.		
Follow a sequence of two steps related to a learning experience.	Follow instructions with two or three steps given in different forms.		
Communicate a sequence of two steps for a given purpose.	Sequence two or three instruction steps to achieve a desired outcome.	Create three-step to four-step instructions that achieve a desired outcome.	Create a set of instructions.
	Exchange ideas for creating three-step instructions that achieve a desired outcome.	Exchange ideas to design clear three- to four-step instructions, including repetition, to achieve a desired outcome.	Collaborate to write two different sets of instructions that achieve the same outcome.
		Work individually or in groups to create instructions using precise words, pictures, or diagrams.	
			Create something new by combining, changing, or reapplying existing ideas.

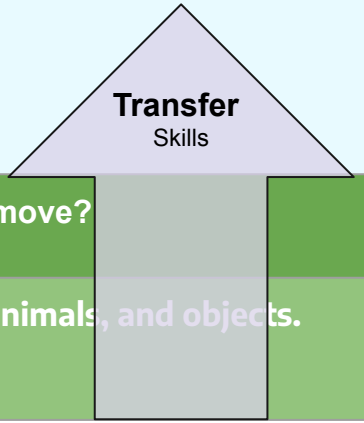
NOTE: The statements are colour-coded to reflect similar types of skills or thinking involved.

Scientific Methods				
Investigation Process Grade 1	**Grade 1**	**Investigation Process Grade 2 & UP**	**Grade 2**	**Grade 3**
Steps followed during an investigation include • *asking questions* • *making predictions* • *gathering data* • *forming conclusions*	Ask a question sparked by curiosity.	*Procedures scientists use to guide investigations include* • *asking questions* • *making predictions* • *planning the investigation* • *observing and recording data* • *analyzing data reaching conclusions* • *discussing observations and conclusions*	Explore various purposes for conducting an investigation.	Develop new questions for further investigations.
			Develop questions for the purpose of an investigation.	
	Predict the answer to a question.			
	Make observations using various senses.		Determine if observations relate to the purpose of the investigation.	Collect data using techniques to improve the accuracy of data.
	Record observations as data.		Collaborate to combine recorded data into a single list or chart.	Compare the trustworthiness of sources of data
	Reflect on recorded data (analyze) to make conclusions.			Analyze data collected during investigations.
			Compare observations and data with others.	Reflect on how conducting an investigation contributes to building knowledge.
				Compare the trustworthiness of sources of data
	Demonstrate safety and respect during investigations.			

NOTE: The statements are colour-coded to reflect matches to steps in the investigation process.







Guiding Question	KE1: How can humans, animals, and objects move?
Learning Outcome	KE1: Children explore movement of humans, animals, and objects.

Knowledge	Understanding	Skills & Procedures

In the new science curriculum, what students know, what they understand, and the skills they learn resurface in the grades that follow.

When students take what the learn and apply it to a new context (eg. new grade), students are building and transferring what the learn.

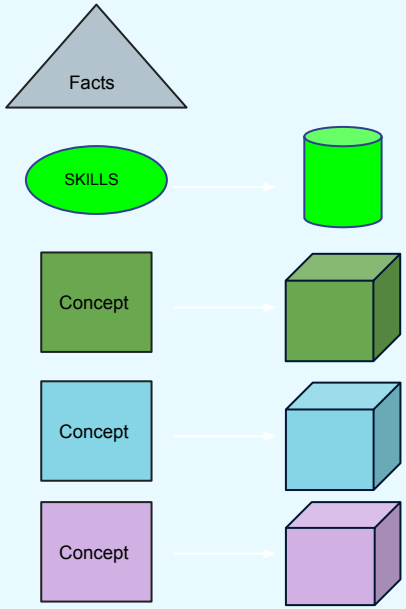
Helping students transfer what they learn contributes to their ongoing success.

Hattie, Fisher & Frey: *Visible Learning for Literacy* (2016)

Phases of Learning

Surface

Students are first exposed to individual skills, concepts and their related knowledge.

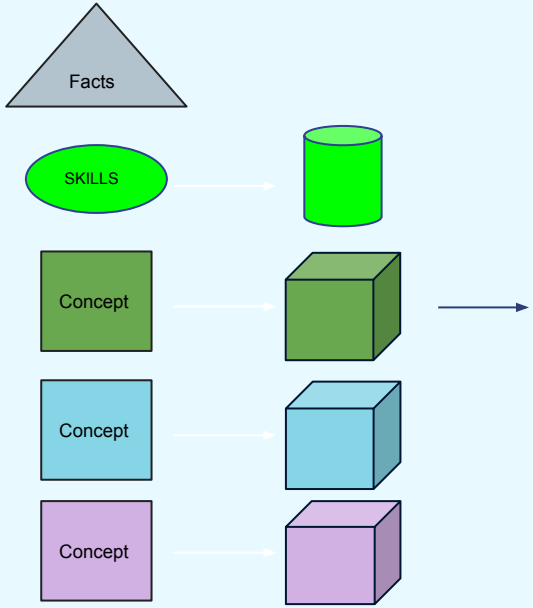


Hattie, Fisher & Frey: *Visible Learning for Literacy* (2016)

Phases of Learning

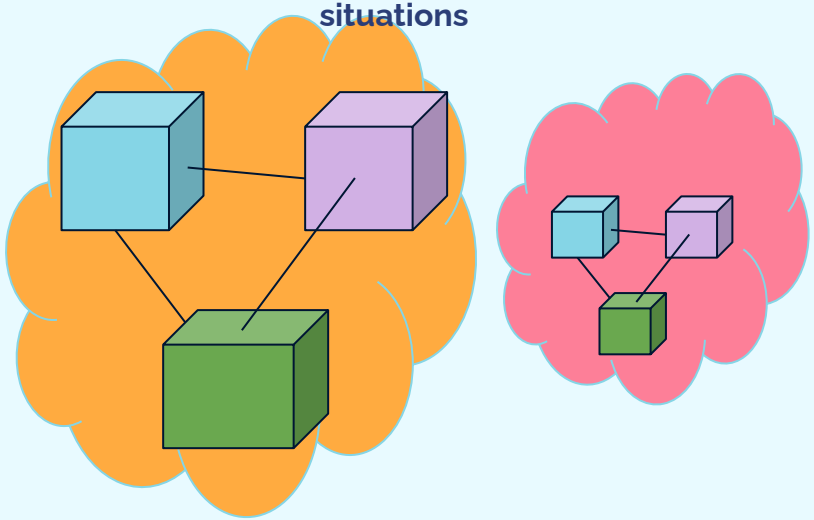
Surface

Students are first exposed to individual skills, concepts and their related knowledge.



Deep

Making connections between concepts to create deeper understanding and applying skills/ procedures to new situations

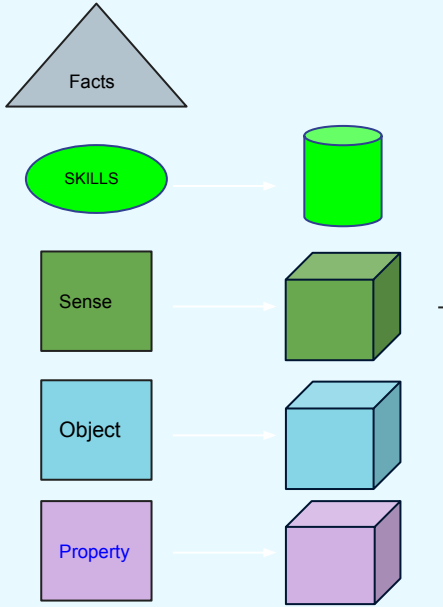


Hattie, Fisher & Frey: *Visible Learning for Literacy* (2016)

Phases of Learning

Surface

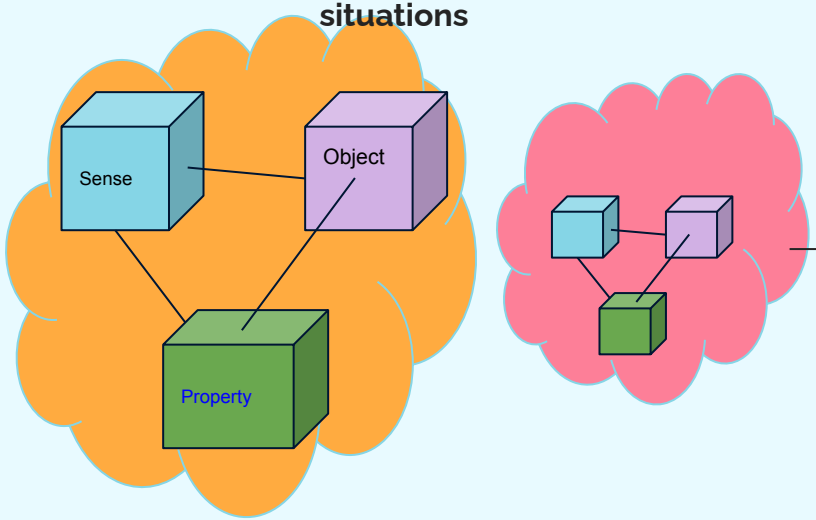
Students are first exposed to individual skills, concepts and their related knowledge.



E.e.: A"property" is what objects have (characteristics) that we can describe.

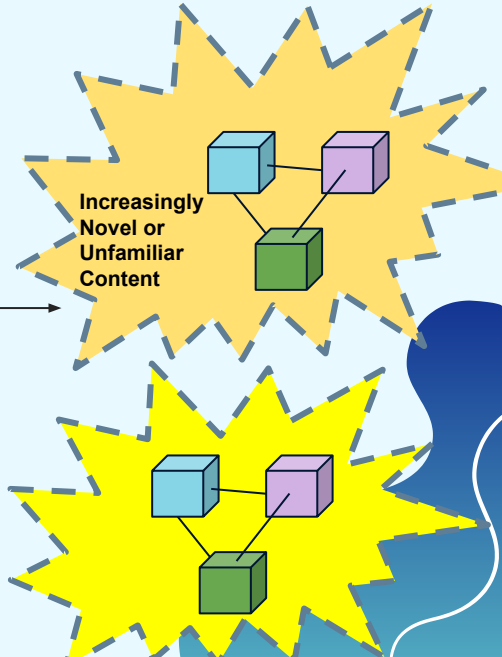
Deep

Making connections between concepts to create deeper understanding and applying skills/ procedures to new situations



Transfer

Applying understandings and skills to a variety of novel and unrelated contexts.



Hattie, Fisher & Frey: *Visible Learning for Literacy* (2016)

Phases of Learning

Surface

- What is a bump, set & serve?
- How do I bump set and serve?
- Ready Position

Practice

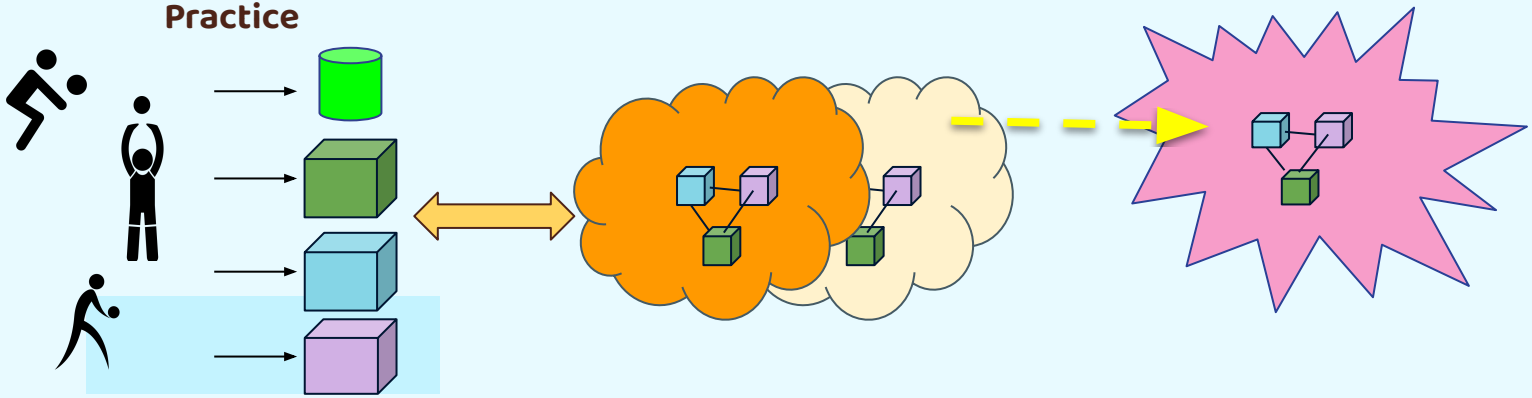
Deep

Put bump, set and serve together in a game.

- **Guided Scrimmages**
- **Practice Games**

Transfer

- **Playing New Teams**
- **Leagues**
- **Tournaments**



Concepts: Transfer

Guiding Question: What visible changes can be identified through examination of Earth's surface?

Learning Outcome: 3ES1.5: Students analyze changes in Earth's surface and explain how layers of the landscape hold stories of the past.

Knowledge

Human activities that can **change Earth's surface** include

- living on the land
- building towns and cities getting and using resources growing crops and farming (agriculture)
- polluting
- stewardship

Photo by Micah McKerlich on Unsplash

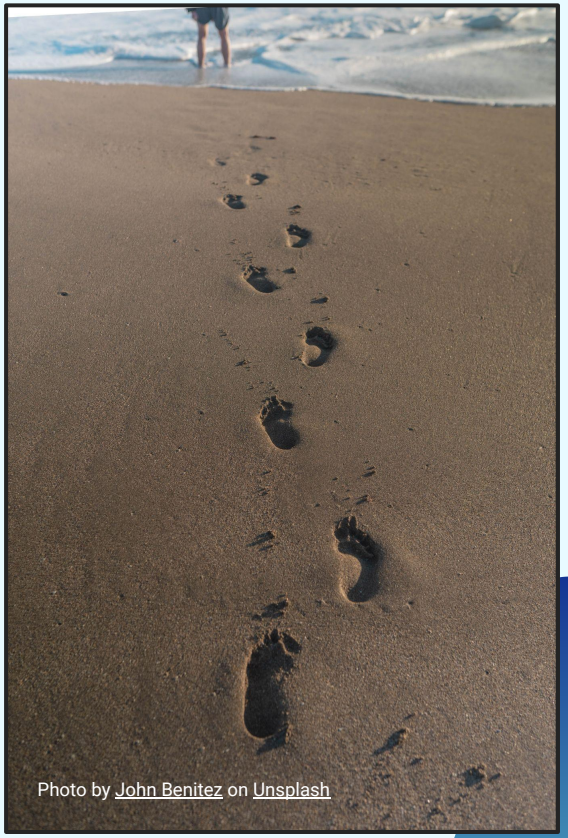


Photo by John Benitez on Unsplash

Understanding: Transfer

Guiding Question: What visible changes can be identified through examination of Earth's surface?
Learning Outcome: 3ES1.5: Students analyze changes in Earth's surface and explain how layers of the landscape hold stories of the past.
Understanding
Plant, **human**, and other animal **activities can cause changes to Earth's surface.**

Photo by Rohit Tandon on Unsplash

Guiding Question: What visible changes can be identified through examination of Earth’s surface?
Learning Outcome: 3ES1.5: Students analyze changes in Earth’s surface and explain how layers of the landscape hold stories of the past.
Skills and Procedures
Relate **human activities** to **changes** in **Earth’s surface.**

Skills & Procedures: Transfer and Can Demonstrate Understanding

Photo by Neil Mewes on Unsplash

Skills & Procedures
3ES1.5: Relate **human activities** to **changes** in **Earth's surface.**

Photo by Henning Witzel on Unsplash

Photo by Lode Lagrainge on Unsplash

Skills & Procedures 3ES1.5: Relate **human activities** to **changes** in **Earth's surface.**

Terrace

Earth Surface

City

Hill

Human Activity

River Valley

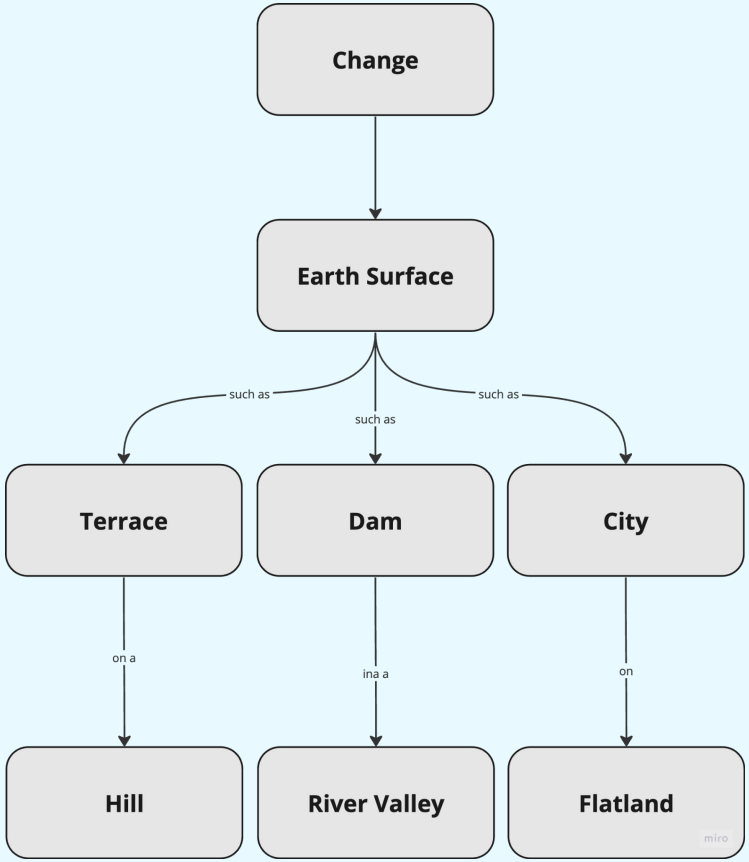
Dam

Flatland

Change

Skills & Procedures 3ES1.5: Relate human activities to changes in Earth's surface.

Find three more examples and at them onto the concept map.



Phases of Learning
and
Skills & Procedures Statements

When you examine your curriculum, try to identify

- a **Skills and Procedure** statement linked to a **Knowledge** statement which is a **Surface Level** activity.
- a **Skills and Procedure** statement linked to an **Understanding** statement is at the **Deep Level or Transfer level,** ***depending on the novelty of the context and the degree of independence expected.***
    - The same skills and procedures statement can be used to **"deepen"** understanding by **changing the context.**

Organizing Idea: Matter	Matter: Understandings of the physical world are deepened by investigating matter and energy.			
Guiding Question	**How can properties of an object be distinguished from one another?**			
Learning Outcome	**Children examine properties of objects.**			
Knowledge	**Understanding**	**Skills & Procedures Living Systems**	**High Frequency Verbs**	**Computer Science & Scientific Methods Integration**
An object is anything that can be perceived using one or more of the five senses. **The five senses are** • **sight** • **touch** • **hearing** • **smell** • **taste** **Properties are distinctive characteristics.** Properties of objects that can be perceived using one or more of the five senses include • colour; e.g., blue, yellow • size; e.g., long, short • shape; e.g., round, square • texture; e.g., rough, smooth • temperature; e.g., hot, cold • sound; e.g., loud, quiet • scent; e.g., fresh, rotten • taste; e.g., sweet, sour.	Objects have identifiable properties. Objects may be similar in one or more properties and different in another property.	Explore properties of various objects using one or more of the five senses. Compare properties of various objects. Sort various objects according to properties. Describe properties of various objects.	**Kindergarten** • Ask Questions • Compare & Contrast (Find Similarities and DIfferences) • Describe • Discuss • Explore • Observe • Record Observations • Relate (Connect) • Represent • Sort (Classify & Categorize)	• Recognize when actions do not correspond to instructions. • Match an action to the corresponding instruction. • Engage in activities that involve following instructions in various contexts. • Engage in activities that involve following instructions presented in various ways. • Follow a sequence of two steps related to a learning experience. • Communicate a sequence of two steps for a given purpose

Take a Peek

Curriculum Support Documents

Math and Science starting to posted on August 30 to ARPDC site

Upcoming Sessions

ECS
Grade 1
Grade 2
Many are embedded directly in our instructional videos

Angela Dearing
Computer Science

What exactly IS Computer Science?
What does successful integration of Computational Thinking across the grades look like?
How can we teach it and support each other integrating computational thinking into instructional practices effectively when we've never taken a computer science course ourselves?

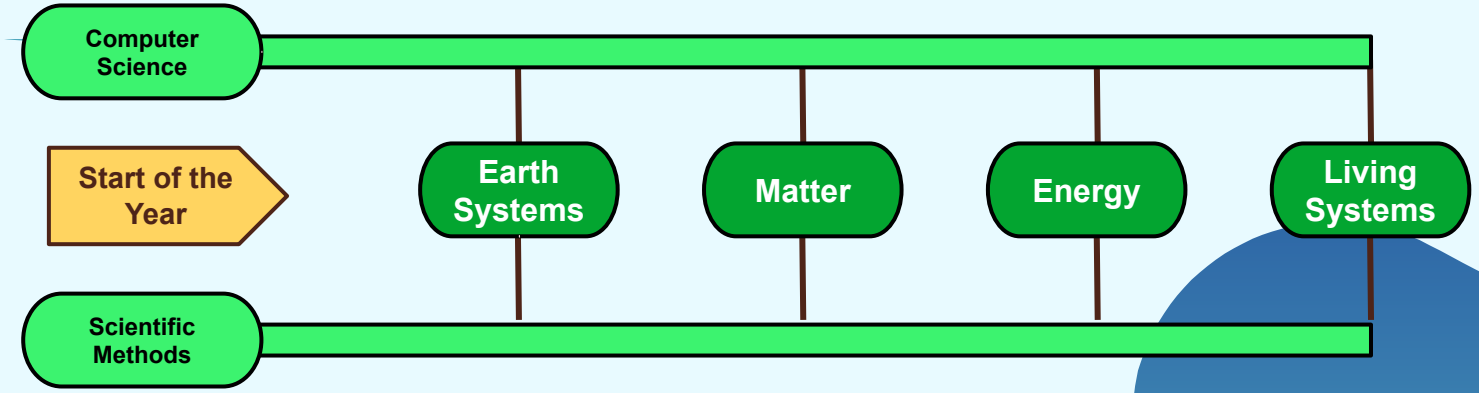
Nicole Lamoureux
Scientific Methods

This session provides an overview of the science methods for Grades 1-6 and examines the Scientific Methods organizing idea. The science methods are used to help students use investigations to build an understanding of the science ideas they are learning. Participants will examine how the skills are built from year to year to deepen students' understanding of the methods. Note: Kindergarten does not have learning outcomes for scientific methods.

Link

Where Do I Begin?
Scope & Sequence

Edmonton Catholic Pacing Guides

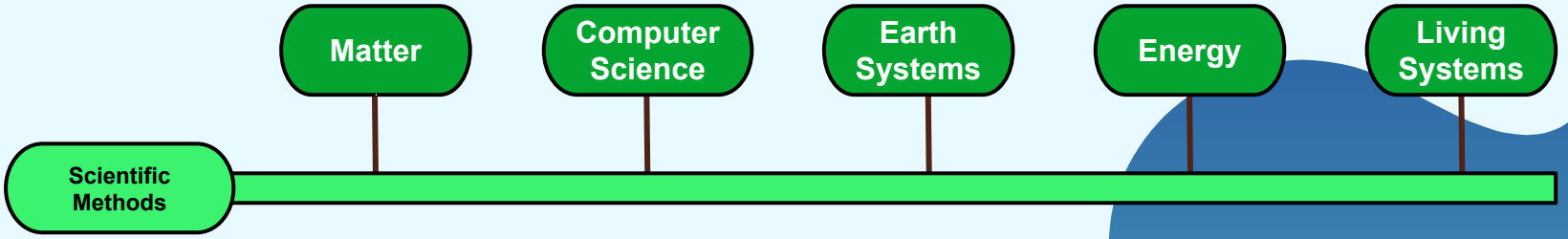


[Link: Edmonton Catholic Pacing Guides]

Note: Download the .pdf to be able to read it.

Where Do I Begin?
Scope & Sequence

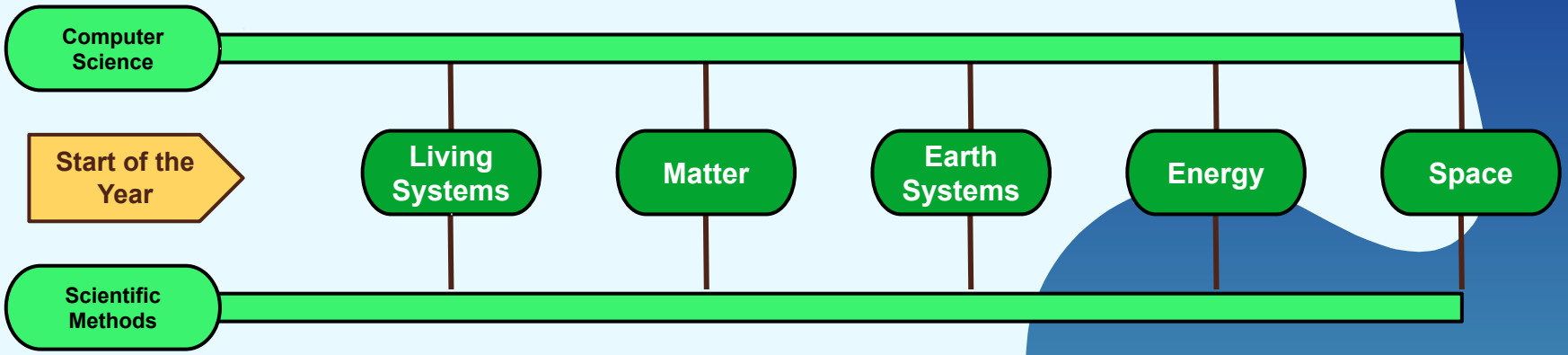
Edmonton Public Scope and Sequence



- Link: Edmonton Public Scope and Sequence

Where Do I Begin?
Scope & Sequence

ARPDC Scope & Sequence



Important Information

Posted and Upcoming Sessions

Have been Completed Before the End of June

- Introductory Videos
- Living Systems - May 1 (Grade 1) +
- Matter - June 8 (Kindergarten) +

Coming in the Next School Year

Fall (6-8 weeks apart)

- Earth Systems (Oct 10 - 19)
- Energy (November 20 - 29)
- Space (Feb 5, 6, 12)

Check the CARC or ERLC website for registrations

What happens at our Upcoming Sessions?

- Overview of the Organizing Idea : Concept Map
- Numbered Outcomes document available
- Concepts/skills & procedures/understanding will be unpacked for you to consider for assessment/planning.
- Sample Instructional approaches
- Assessment samples
- Integration of Computer Science and Scientific Methods into the organizing idea where possible.
- Sample Unit and Resources

New Learn Alberta
Where do I find the Science?

New Learn Alberta

www.Arpdc.ab.ca

Resources to Consider

- Sparkle Box
- Mystery Science
- Let's Talk Science
- Edmonton Catholic Schools Curriculum Crates
- Sample "concept introduction" activities (ARPDC)
- Concept Maps (ARPDC)
- ARPDC Site
- Common Sense Education
- Edmonton Public Scope and Sequence

Question Page

Is there something you needed to know and it wasn't talked about?

Not sure where to find something?

Questions?

Stock Photo by depoistphotos.com

THANKS!

Presentation Slide Deck

Chris Zarski
chris.zarski@arpdc.ab.ca

Ted Zarowny
ted.zarowny@erlc.ca