

# **Agenda**

- 1. The New BC Science Curriculum
  - > What's changed
- 2. Foundations of the New BC Science Curriculum
- 3. Unpacking Nelson Science K-3
- 4. Observing and Supporting Learning with Nelson Science K-3
- 5. The Complete Nelson BC Resource Suite
- 6. Questions

## The New BC Science Curriculum

What's changed?



## **KDU – Curriculum Model**



# "Know" - The New Content Learning Standards

80%

of curriculum topics from the 2005 curriculum have been moved, modified, or removed

84%

of curriculum topics in the 2016 curriculum are new to the grade or have been modified

# "Do" - Increase Emphasis

In 2005:

23%

of the learning standards were about skills and processes

In 2016:

71%

of the learning standards are about skills and processes

# Understanding

 Basic content knowledge is essential to support the 'doing of science'

 Deeper learning is achieved when students have a starting point for scientific inquiry and it's connected to the real world and supported by a foundation of content knowledge

# Foundations of the New BC Science Curriculum



### New elements of the curriculum:

- Big Ideas
- **Curricular Competencies**
- **Core Competencies**
- First Peoples Knowledge, Perspectives, and Ways of Knowing
- Placed-based Learning

## What is a Big Idea

- Represents what students will come to understand
- Reflects the 'Understand' of KDU framework
- Covers 4 big ideas at each grade one from biology, chemistry, physics, and earth/space
- Big Ideas are understood through Content Standards

# Big Idea – Navigating Curriculum Document

BRITISH COLUMBIA

**Area of Learning: SCIENCE** 

Big Ideas

Kindergarten

Ministry of Education

**BIG IDEAS** 

Plants and animals have observable features.

Humans interact with matter every day through familiar materials.

The motion of objects depends on their properties.

Daily and seasonal change affect all living things.

**Learning Standards** 

**Content Standards** 

### **Curricular Competencies**

Students are expected to be able to do the following:

#### Questioning and predicting

- · Demonstrate curiosity and a sense of wonder about the world
- Observe objects and events in familiar contexts
- Ask simple questions about familiar objects and events

#### Planning and conducting

- · Make exploratory observations using their senses
- Safely manipulate materials
- · Make simple measurements using non-standard units

#### Processing and analyzing data and information

- Experience and interpret the local environment
- Recognize First Peoples stories (including oral and written narratives), songs, and art, as ways to share knowledge

#### Content

Students are expected to know the following:

- basic needs of plants and animals
- adaptations of local plants and animals
- local First Peoples uses of plants and animals
- properties of familiar materials
- effects of pushes/pulls on movement
- effects of size, shape, and materials on movement
- weather changes
- seasonal changes
- living things make changes to accommodate daily and seasonal cycles
- First Peoples knowledge of seasonal changes

# Example of Big Ideas & Content Standards

### Big Idea for Grade 1 Biology is:

'Living things have features and behaviours that help them survive in their environment'

### There are four Content Standards for the biology unit:

- 1. classification of living and non-living things
- 2. names of local plants and animals
- 3. structural features of living things in the local environment
- 4. behaviour features of living things in the local environment

# Unifying Concepts – Why are they tied to the Big Ideas

 Larger ideas that span across all branches of science – biology, chemistry, physic, earth/space

### **10 Unifying Concepts:**

Patterns	Form and Function
Cycles	Cause and Effect
System	Change
Evolution	Energy and Matter
Sustainability	Interconnectedness

# **Curricular Competencies**

- The science skills, process, and attitudes
- Curricular competencies same from grade to grade but they evolve and deepen through the grades

### **Six Science Curricular Competencies K-9:**

- 1. Questioning Predicting
- 2. Planning and Conducting
- 3. Processing and Analyzing
- 4. Evaluating
- 5. Applying and Innovating
- 6. Communicating

# Curricular Competency Example

### **Questioning & Predicting**

K/1	Grade 6/7
Demonstrate curiosity & sense of wonder about the world	Demonstrate sustained curiosity about scientific topic/problem of personal interest
Observe objects and events in familiar contexts	Make observations in familiar or unfamiliar contexts
Ask questions about familiar objects and events	Identify questions to answer or problems to solve through scientific inquiry
Make simple predictions about familiar objects and events	Make predictions about the findings of their inquiry

# What are Core Competencies

- Overarching skills that apply to all subject areas
- Embedded into the curricular competencies

### **Core Competencies are:**

- Communication
- Creative Thinking
- Critical Thinking
- Positive Personal & Cultural Identity
- Personal Awareness & Responsibility
- Social Responsibility



First Peoples
Knowledge,
Perspectives, and
Ways of Knowing

Authentically woven into the narrative of applicable activities

Nelson Science 4 Physics and Earth/Space Student Resource, page 19





Nelson Science K Activity Card 8A Pushes and Pulls

- Is about students seeing themselves in the science – what's important to them, what's relevant in their community
- Place-based approach to science often experiential and involves teaching in the local natural environment
- Fosters personal connections, is student-centred and interdisciplinary

# Unpacking Nelson Science K-3



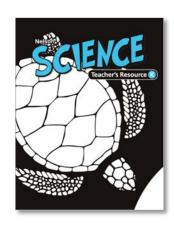
### K-3 Classroom Kit includes:

# Student Activity Cards





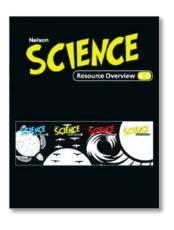
### **Teacher's Resource**



**Teacher Cards** 



### **Resource Overview**

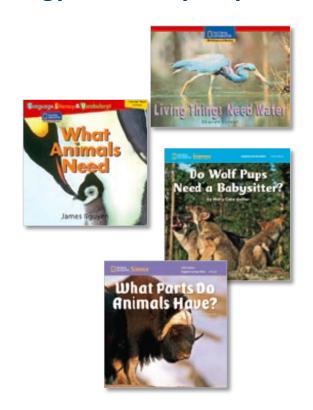


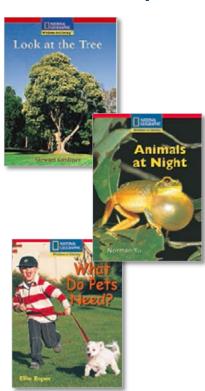
**Online Teaching Centre** 



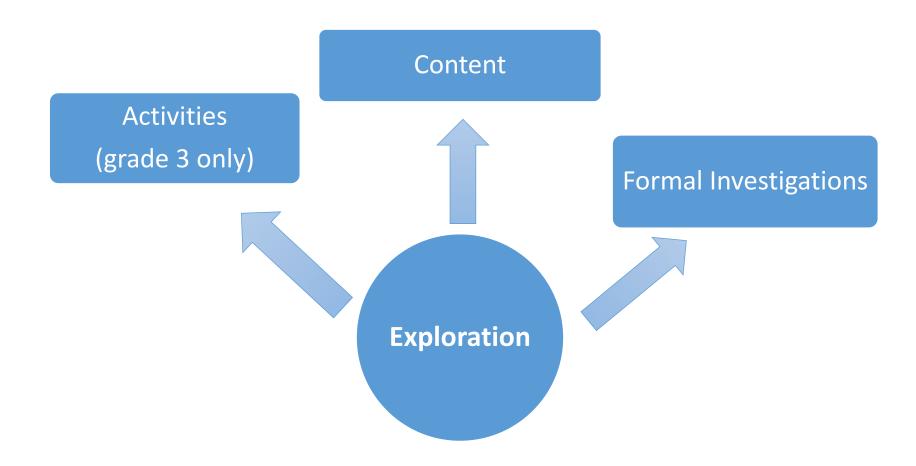
# **Additional Components:**

Levelled Little Book Libraries for Biology, Chemistry, Physics, and Earth and Space Sciences





# What will you find in a Unit?

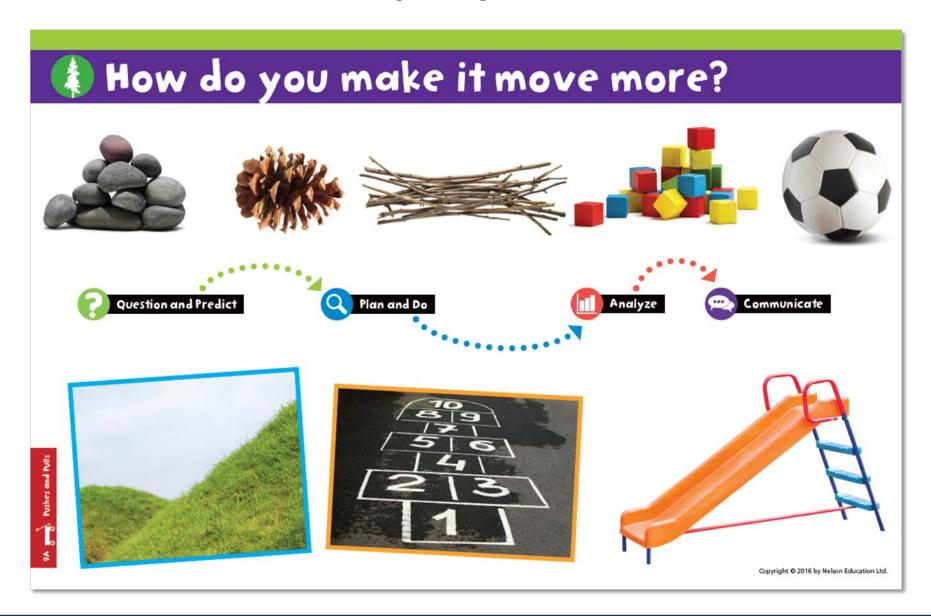


# **Exploration Activity Cards**

Place-based activities



# Conduct an Inquiry!



# Design and Make!



# **Teacher Support Cards**







#### Inquiry: questioning and predicting; planning and conducting

- · Students go on a scavenger hunt, looking for materials that have each type of property shown on the activity card (smooth, rough, dull, shiny, green, red, brown, blue).
- · Students can take photos of materials they are not able to move (such as rough bark on a tree or
- · Focus on how the senses help us gather observations. Encourage students to concentrate on what they can see and feel while looking for materials.
- · Connect to First Peoples knowledge, practices. What are some ways you can be careful not to waste materials?

#### Formative Assessment

#### Collecting and Using Information

- While students look for materials, observe to what extent they use their senses to Identify properties.
- Check for understanding: "I can tell all the properties of a material just by looking at it." Ask students who disagreed why they did so. Descriptive feedback: "You used your sense of touch to observe whether the rock was smooth."
- If students use only their eyes, have them compare two very different materials side by side, such as a smooth rock and rough bark, to feel the difference between properties.
- Observe how students experience and Interpret their environment. Descriptive feedback: "You noticed our school yard has lots of rough rock, but not many smooth ones."
- While students sort materials, observe whether they share their observations about properties.

Descriptive feedback: "You shared your observation that the bark feels rough."

Contain summaries of the placebased portion of the activity, including prompting questions and the related formative assessment strategies



#### Learning from the land

Invite the students to list some ways they can care for the land while they are outdoors collecting materials.

Encourage students to respect nature. They should not harm living things deliberately, and they should avoid doing so while walking.

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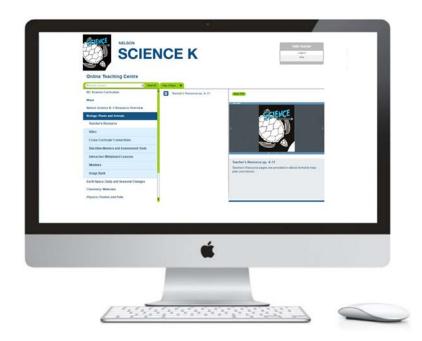
## **Teacher's Resource**



# **Online Teaching Centre**

### **Includes:**

- Teacher's Resource eBook
- Modifiable Blackline Masters and Assessment Tools
- Videos
- Weblinks
- RSS Feeds
- Image Bank
- Literature Connections
- Cross-curricular Connections
- Interactive Whiteboard Lessons
- Science Skills Toolkit





# Inquiring into...

### **General Unit Overview**



### **Inquiring into Pushes and Pulls**

In this unit, students are introduced to forces using the simple language of pushes and pulls. Children entering Kindergarten will likely have already experimented with pushing and pulling while playing with toys, and this prior knowledge will be extended as students investigate the effects of pushes and pulls, and the effects of the properties of objects, for example, the size, shape, and materials, on movement. Through hands-on activities, students will construct their own knowledge about the properties that affect the movement of objects.

### Developing the Big Idea and Unifying Concepts

### Developing the Big Idea and Unifying Concepts

The Big Idea for the unit is "The motion of objects depends on their properties." The unifying concept for the unit is cause and effect. Studying pushes and pulls gives students a clear sense of the relationship between cause and effect. They will be able to see that a force (a push or a pull) is required to make objects move, and that they can vary these forces to make objects move differently. Students will further explore cause-and-effect relationships as they consider how the size, shape, and materials of objects affect their movement.

Learning from First Peoples: First Peoples understand that learning is experiential and place a high value on connectedness to place. By learning about pushes and pulls through hands-one divities with natural materials from their local environment, students can learn through experience and develop a sense of place. They will pay attention to what kinds of objects are in their environment, and how they can move.

As students take care not to disturb the natural environment when they are working outdoors, they will come to appreciate that learning involves recognizing the consequences of one's actions.

### Multi-Year Classrooms

#### **Multi-Year Classrooms**

 In Kindergarten, students will learn about the motion of objects. In Grade 1, students will learn about light and sound. Students won't revisit the topic of forces until Grade 2.

#### **Using an Opening Provocation**

Students will race toy cars on various race courses and surfaces. This
activity will help students access their natural prior knowledge about
pushing and pulling and will get them to start thinking about how
different forces affect movement in different ways.

#### **Observing and Supporting Learning**

- Set up two or more straight race courses for the toy cars. Set up another couple of race courses that have at least one curve. Consider setting up courses outside on different surfaces, such as dirt, grass, or pavement.
- Have students push or pull their cars through the courses. Students may
  notice that they can push their cars on the straight courses, but they may
  need to pull their cars along the curved courses to make sure they stay
  on the track. They may also notice that their cars move differently on
  different surfaces.
- Listen for and record students' naturalistic questions, or statements that could be turned into questions, so students can investigate them in inquiries throughout the unit.

Using an Opening Provocation

Observing and Supporting Learning

### **Learning from First Peoples**

Science K. Teacher's Resource MEL NO. Pubes and Pulls 5

# **Activity Card Support**



### **Types of movement**



### **Core and Curricular Competencies**

Scientific Inquiry Scale Kr-3 Documenting Official Thinking: Profiles Documenting Official Thinking: Faces Documenting Communication: Profiles Documenting Communication: Faces Scientific Inquiry Toolet (observe, question, use materials and tools safely, observe, sort and desking, communication.

### Focus Question

### Science Background

8A F C Pushes and

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#### **Using This Activity**

Curricular and Core Competencies: As students select natural objects in their local outdoor environment, they have an opportunity to demonstrate curiosity and a sense of wonder about the world, observe objects and events in familiar contexts, and ask simple questions. As they conduct an initial investigation into some of the ways objects can move (e.g., bounce, roll, slide, and glide), they will practise safely manipulating materials, making exploratory observations using their senses, representing their observations and ideas by sorting and classifying them on the activity card or making a hula hoop Venn diagram, discussing their observations, and sharing their observations and ideas orally.

In this activity, students will develop the core competency of Critical Thinking (facet: question and investigate) as they explore how the natural objects they collected can move. They will also develop the core competency of Communication (facet: explain/recount and reflect) as they share their observations and ideas orally.

Focus Question: How do pushes and pulls affect movement?

Big Idea and Unifying Concepts: The Big Idea is "The motion of objects depends on their properties." As students investigate how objects move, they will also begin to understand that a force (push or pull) is required to make things move. This begins to develop the unifying concept of cause and effect.

Learning from First Peoples: As keen observers of the natural world, First Peoples learned how objects in nature move, for example, that feathers glide, and used that knowledge to develop technologies. Some First Peoples groups used feathers at the ends of arrows to help the arrows glide through the air (providing balance and trajectory).

#### Science Background

A force is a push or a pull that affects the motion of an object. This activity will build on students' prior experience with pushing and pulling objects to make them move. Students will be investigating four different types of movement: bouncing, rolling, sliding, and gliding.

Bouncing means that an object regains some of its initial height after hitting a surface. Rolling means that an object is turning over and over again as it moves along a surface. Sliding means that an object moves across a surface without leaving it (it does not bounce), or rotates on the surface (it does not roll). Gliding means that the object slows or moves sideways (horizontally) through the air as it gradually descends (e.g., a paper airplane in flight, a parachutist coming down to the ground, and a falling leaf or balloon).

#### **Possible Misconceptions**

A common misconception is that there are no forces acting on stationary objects. There is a widespread belief that an object would frontfauer.

not be stationary if a force were actually acting on it. In fact, the gravitational force (or gravity) is acting on all objects, including stationary objects, at all times on the surface of Earth.

### **Observing and Supporting Learning**

#### Whole Class or Circle Time

- Show students the activity card and have them look at the pictures. Ask if
  they can name the objects shown. Ask, Have you ever seen these objects,
  or played with them? If so, how did they move?
- Have an initial discussion about each type of movement on the activity card. Demonstrate, or have a student demonstrate, how an object can bounce [roll, slide, or glide]. Use objects easily found in the classroom. Ask, Can someone describe bouncing [rolling, sliding, or gliding]? (e.g., bouncing means an object comes back up after hitting a surface; rolling means an object spins around [turns] as it moves across a surface; sliding means an object moves smoothly across a surface; gliding means an object moves through the air without falling straight down)
- Consider using Documenting Learning: Types of movement to document student learning in the curricular competencies as you observe students working.

#### Place-Based Experience

- Tell students they will be going outside to find some natural objects from the land that bounce, slide, roll, and glide.
- Invite students to list some ways they should care for the land while they are outdoors collecting materials. Ask students for examples of objects they should not collect (living things), and objects that would be fine to collect (fallen twigs, pine cones, rocks).
- Take the class ourside. Have students take a quiet moment to observe and connect with nature in their environment. Prompt students to quietly think about what they hear, see, and smell.
- Have students look for natural objects that they think will bounce, roll, slide, or glide. Encourage students to gather objects of various shapes, sizes, and materials. If students do not find natural objects that bounce, they will still learn more about that form of movement by trying.

Collecting Information	Using Information
As students search for natural	Provide descriptive feedback for students, such as, "
objects, observe for evidence of	can see you are really curious about how this object
curfosity and a sense of wonder.	can move."
Observe for students'	Provide descriptive feedback for students, such as,
observation skills.	"You found something I hadn't noticed."



#### Literature Connections

The Runaway Pumpkin by Kevin Lewis

### Observing and Supporting Learning

✓ Assessment Tool

Teacher Card: Types of movement

Place-based outdoor learning

Prubes and Pails 77

# **Activity Card Support**

Critical Thinking A

- Have students work in small groups to investigate how each of the objects they collected can move.
- Allow students to explore ways to test how their objects can move. For
  example, they can drop them to see if they bounce, drop them on an
  inclined surface to see if they roll, push them on a flat or inclined surface to
  see if they slide, or drop or throw them to see if they glide. Remind students
  to work safely.
- Students may observe some objects move in more than one way; for example, a rock can roll and slide.
- As students work, ask them if they're pushing or pulling the object to make it move.

Formative Assessment		
Collecting Information	Using Information	
Observe for safety issues.	If a student is working unsafely or in a way that interferes with the investigations of other students, sak the student to demonstrate a safe way of investigating how their object moves. If they cannot, demonstrate a safe method, then have the student demonstrate it for you.	
Observe whether students are coming up with appropriate ways to investigate whether their objects will bounce, roll, skide, or glide.	If students are having difficulty finding a way to test for one type of movement, provide additional instruction by asking questions about familiar objects, such as, What would you have to do to show that a skate sides befor than a sneake? What would you have to do to show that a rubber ball bounces before than a rock?	
Observe whether students are considering that they need to act on the object to make it move.	If students are not providing a force (push or pull) to make their object move, provide additional instruction by demonstrating what happens when you just place their object on the floor. Then ask them how they could make it move.	
Observe whether students are testing each object only for one way of movement or for multiple ways.	If students are testing for one way, choose one of their objects and ask them if they could test it another way, if students have difficulty understanding that objects can move in more than one way because of the objects they have selected, have objects on hand that easily move in two or more ways, such as a round rock.	
Observe the extent to which students think critically as they question and investigate the movement of their objects.	Provide descriptive feedback using the language of the Critical Thinking Competency Profiles, such as, "You can explore materials and actions, You can ask questions and use your senses to gather information. You can tell of show something about your thinking."	

Formative Assessment

Have each small group discuss their observations and sort and classify
their objects by how they move, using the activity card as a chart.
Alternatively, four hula hoops can be laid out and labelled with each type
of movement. Students can place objects in the appropriate hula hoop
after they find out how it moves. This also allows for the possibility of a
Venn diagram with overlapping hula hoops.

#### Whole Class

Communication A

Have the class do a gallery walk to look at how the objects were sorted.
 Have students share their observations and ideas with classmates.

 Consider taking photos or recording students' classifications and oral explanations so students can add these to their portfolios.

Collecting Information	Using Information	
As students discuss their observations, observe and listen for evidence that students understand that pushes and pulls can cause objects to move in different ways.	If students have difficulty understanding that dropping something is a pull, provide additional instruction by giving a very simple explanation of gravity.	
Listen for evidence that students understand cause (push or pull) and effect (movement).	If you are not sure that students can identify cause and effect, provide additional instruction by having the class join you lin a call and response as they demonstrate each movement, for example, The cause is I pushed it, the effect is it rolled.	
Observe how effectively students represent their observations and ideas as they sort the objects on the chart or in the hula hoops.	Provide descriptive feedback for students, such as, "You can show your thinking on the chart."	
Observe for development as students communicate how they sorted and classified their objects by the way(s) they could move.	Provide descriptive feedback using the language of the Communication Competency Profiles, such as "You can answer questions about how your objects moved. You can tell something you learned."	

Unifying Concepts

- Consider highlighting relevant "I can" statements on the Scientific Inquiry Scale K-3 based on what you observed students were able to do during this activity.
- Consider using Documenting Critical Thinking/Communication: Profiles or Documenting Critical Thinking/Communication: Facets as you observe students working.
- Have students develop their habits of mind for science by making generalizations about the properties of objects that moved in each way to get them thinking about the effects of size, shape, and materials on movement. Ask questions such as, Did you observe anything similar about your objects that moved the same way? Was there anything similar about all the objects that rolled? Did you find objects that moved in more than one way? Were you surprised about any of your objects? Do not be concerned if students have some difficulty doing this. "How does it move?" will help them further develop their understanding of the effects of these properties on movement.

☑ Assessment Tool

Assessment Tool

Goals

#### **Identifying Inquiry Opportunities**

• Provide opportunities for students to investigate one or more of the questions you heard them ask as they conducted this inquiry. It may be necessary for you to provide students with a procedure for the inquiry. For example, students may wonder if there are any objects that move well in many different ways. Challenge students to find an object that moves well in at least three different ways and then demonstrate the movement of the object for the class.

Identifying Inquiry Opportunities

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# Let's Do a Conduct an Inquiry Activity



# Managing Open Ended Inquiry

### How can we make and change sounds?



# Assessment Observing and Supporting Learning



### **Overview**



Research-based approach to assessment



Supports both formative and summative assessment



Emphasis on day-to-day formative assessment

# Formative Assessment at Point-of-Use

Formative Assessment		
Collecting Information	Using Information	
Observe the extent to which students can evaluate whether their investigations were fair tests.	If students have difficulty getting started, adjust instruction by having them discuss the questions in the Evaluating Procedures section of the Scientific Inquiry Toolkit.	
Observe the extent to which students can identify possible sources of error.	Provide descriptive feedback. For example, You noticed that a possible source of error is your own reaction time when using the stopwatch.	
Observe the extent to which students can suggest improvements to their investigation methods.	Provide descriptive feedback. For example, I noticed that you have suggested videotaping the experiments so that you can time the reaction more accurately.	
As students determine whether they were able to collect evidence to answer their question, observe the extent to which they demonstrate an understanding and appreciation of evidence.	Provide descriptive feedback. For example, You can identify the evidence you collected that allowed you to answer your question. You realize that you did not collect enough evidence, or the kind of evidence that you needed to answer your question.	

### Scientific Inquiry Scale K-3

	Meets expectations for Kindergarten	Meets expectations for Grades 1–2	Meets expectations for Grades 3-4
Questioning and predicting  observe question predict	<ul> <li>I demonstrate curiosity and a sense of wonder about the world.</li> <li>I can observe objects and events in familiar contexts.</li> <li>I can ask simple questions about familiar objects and events.</li> </ul>	<ul> <li>I demonstrate curiosity and a sense of wonder about the world.</li> <li>I can observe objects and events in familiar contexts.</li> <li>I can ask questions about familiar objects and events.</li> <li>I can make simple predictions about familiar objects and events.</li> </ul>	<ul> <li>I demonstrate curiosity and a sense of wonder about the world.</li> <li>I can observe objects and events in familiar contexts.</li> <li>I can identify questions about familiar objects and events that can be investigated scientifically.</li> <li>I can make predictions based on prior knowledge.</li> </ul>
Planning and conducting  • suggest procedures  • use materials and tools safely  • observe  • measure  • record	<ul> <li>I can make exploratory observations using my senses.</li> <li>I can safely manipulate materials.</li> <li>I can make simple measurements using non-standard units.</li> </ul>	<ul> <li>I can make and record observations.</li> <li>I can safely manipulate materials to test ideas and predictions.</li> <li>I can make and record simple measurements using informal or non-standard methods.</li> </ul>	<ul> <li>I can suggest ways to plan and conduct an inquiry to find answers to my questions.</li> <li>I consider ethical responsibilities when deciding how to conduct an experiment.</li> <li>I can safely use appropriate tools to make observations and measurements, using formal measurements and digital technology as appropriate.</li> <li>I can make observations about living and non-living things in the local environment.</li> <li>I can collect simple data.</li> </ul>

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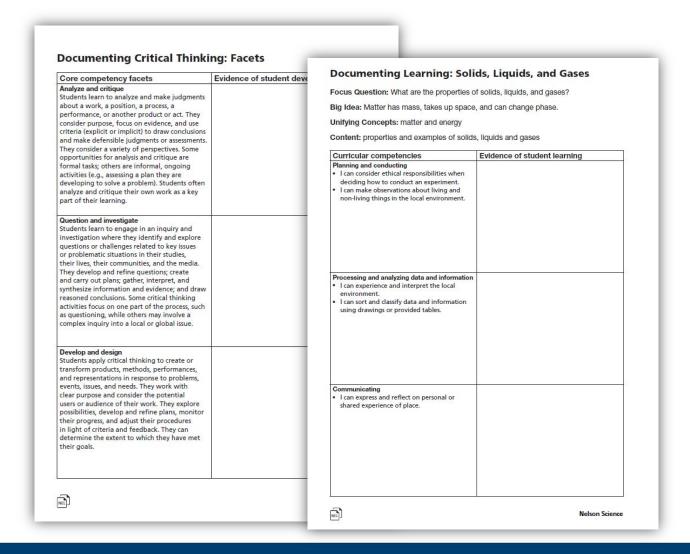
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### **Tools for Documenting Student Learning**

BLMs, templates and tools to support documenting student learning

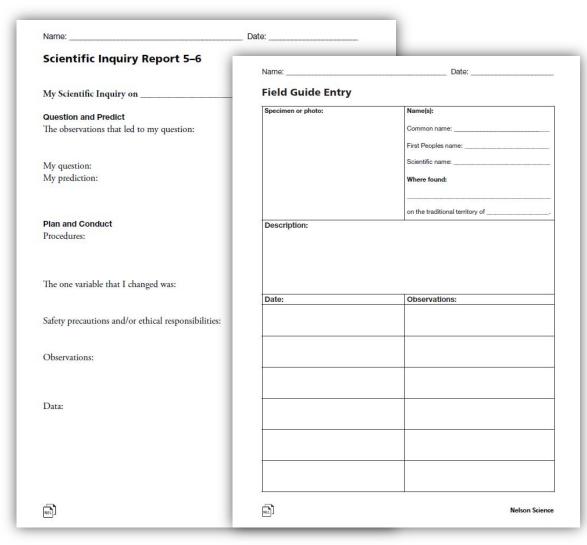


### By teachers

- Documenting Student Learning templates
- Templates of observational notes for core competencies, by facet, and by profile

### **Tools for Documenting Student Learning**

BLMs, templates and tools to support documenting student learning



### By students

- Graphic organizers
- Self assessment tools
- Templates for entries in science logs, design logs, science portfolios, and/or field guides