GRADE 1 BRINGING IT TOGETHER

motion

ENERGY & SCIENTIFIC METHODS

Example:

“Movement consists of direction, a pathway, and speed”

Nicole Lamoureux, M.Ed.
Designer of Professional Learning Consultant, ARPDC

Land Acknowledgement

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

AGENDA

1.Review Subject Introduction to Scientific Methods

2. Key verbs to look for as cues for integrating

3. Walk through “Planning Guide” Resource

4. Sample beginning of plan with “Movement consists of direction, a pathway, and speed.”

Session & Resources

School or division leaders can share slides and information from session sourcing as follows: ARPDC (2024)

TQS Alignment
Demonstrates a Body of Knowledge

A teacher applies a current and comprehensive repertoire of effective planning, instruction, and assessment practices to meet the learning needs of every student.

a) planning and designing learning activities that:
- address the learning outcomes outlined in programs of study (curriculum);

reflect short, **medium** and long range planning;

b) applying student assessment and evaluation practices that:
- accurately reflect the learner outcomes within the programs of study (curriculum);

Do the best you can
until you know better.
Then when you know better,

do better.

(Maya Angelou)

KEY IDEAS

Scientific Methods	Integrated in all other organizing ideas. Way students should build knowledge in each organizing ideas. “Explore before Explain”
Teacher Clarity of Curriculum	Taking time to unpack the curriculum empowers you to choose activities & resources that truly align with curriculum.
Learning Sequence	Logical flow and sequence of knowledge & skills to **intentionally plan** for including the scientific methods.
Planning Guide	Resource developed to assist with intentionally integrate scientific methods in other organizing ideas

Integrating The Scientific Methods

“The Science curriculum engages students in active investigation to build scientific knowledge and develop critical-thinking and problem-solving skills....Students will have opportunities to **integrate these skills into all other areas of the Science curriculum.”**

Science Curriculum Subject Introduction

Learning Outcomes in Every Organizing Idea Begin With

"Students investigate…."

Grade 1 Knowledge Statement

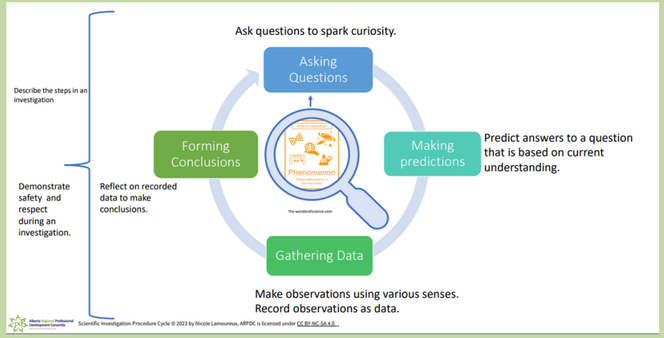
Steps followed during an investigation include

- asking questions
- making predictions
- gathering data
- forming conclusions

Glossary for Student Action Verbs
~ Alberta's K-6 Science Curriculum

This glossary was developed to help provide clarification, context and support for teaching of the student actions in Alberta's K-6 Science Curriculum (2023).

Grades found as LO	Grades found within Ss & Ps	Verb	Definition
1, 2, 3, 4, 5, 6	1, 2, 3, 4, 5, 6	investigate	To use a process of inquiry or exploration to gain deeper understanding.

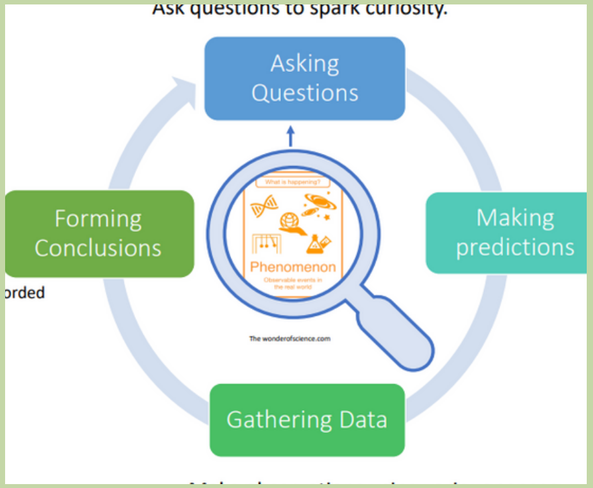


Students investigate (process to find answers or build knowledge)

Explore Before Explain

Explore First

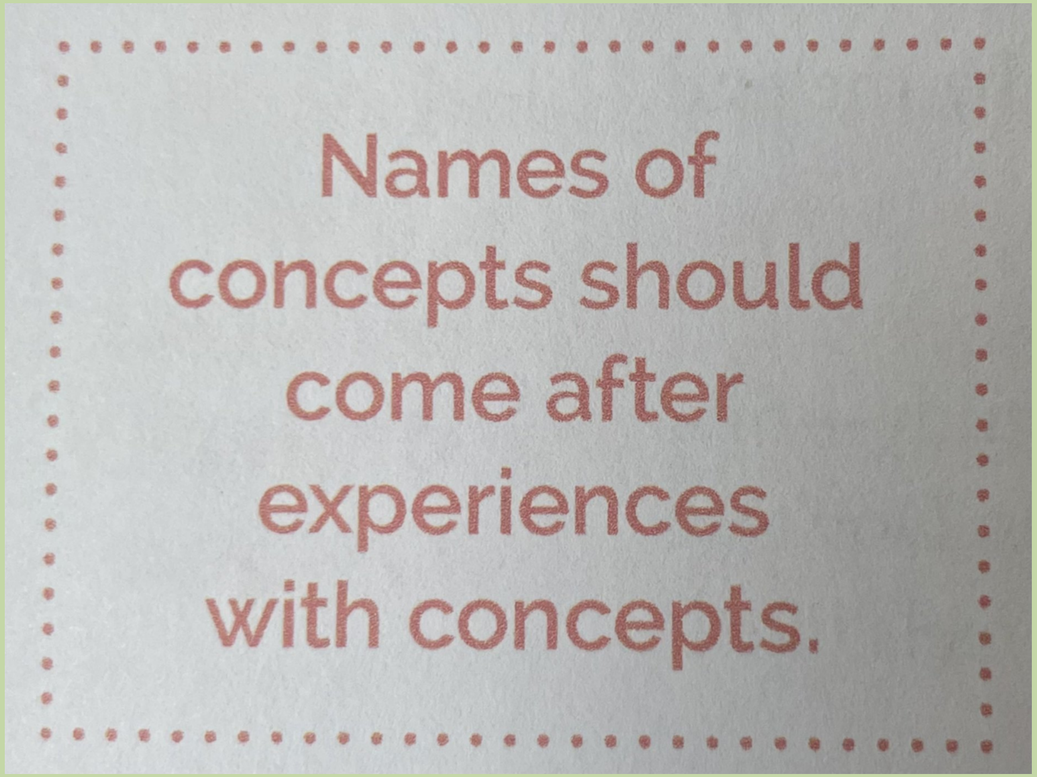
- Students go through process to reach conclusions and explain their thinking.



Explain:

- Students confirm conclusions and introduced to vocabulary to connect with videos, books, teacher explanations

Explore Before Explain



Learning truly sticks when students engage in hands-on math[science] investigations. “Names of concepts should come after experiences with concepts.” Otherwise they are simply memorizing.

Peter Liljedahl (Building Thinking Classrooms in Mathematics, 2020)

Integrating The Scientific Methods With Other Organizing Ideas

Key words in the skills and procedures in other organizing ideas. Indicates students need to integrate aspects of the scientific methods

Predict	Explore	Investigate
Determine	Observe	Examine

Integrating The Scientific Methods With Other Organizing Ideas

KNOWLEDGE	UNDERSTANDING	SKILLS & PROCEDURES
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 • side to side	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.
Objects or animals move along pathways in a variety of ways, such as • rolling • bouncing • sliding Speed can be described as • fast • slow • changing • not changing		

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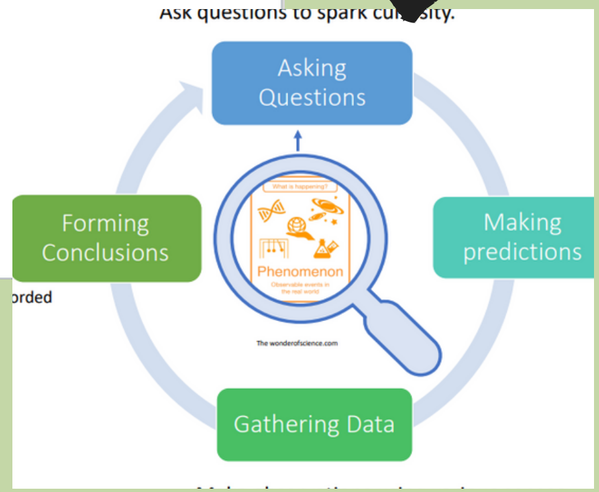
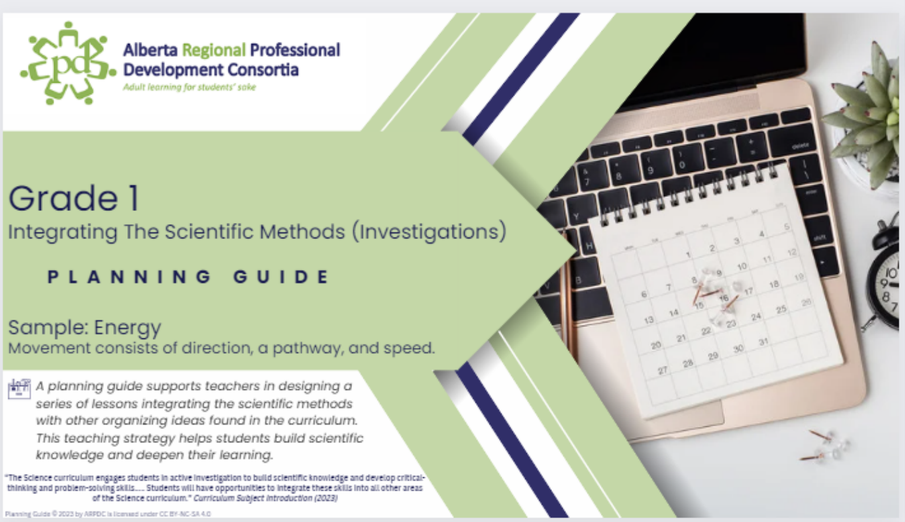
	1, 2, 3, 4, 5, 6	conduct	**To engage in the process of planning and carrying-out (such as for an investigation).**



https://curriculum.learnalberta.ca/curriculum/en/c/sci2?s=SCI

Resource Documents



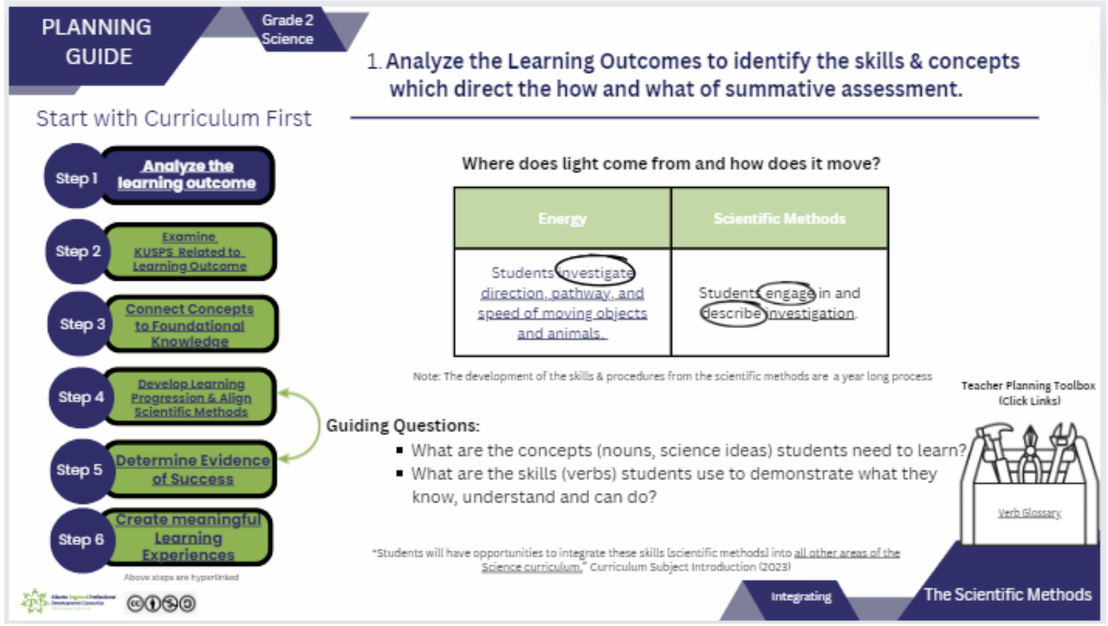
Planning Guide to assist when planning: Exemplar to refer to

Toolbox Contains:

Hyper linked resources to assist with each phase

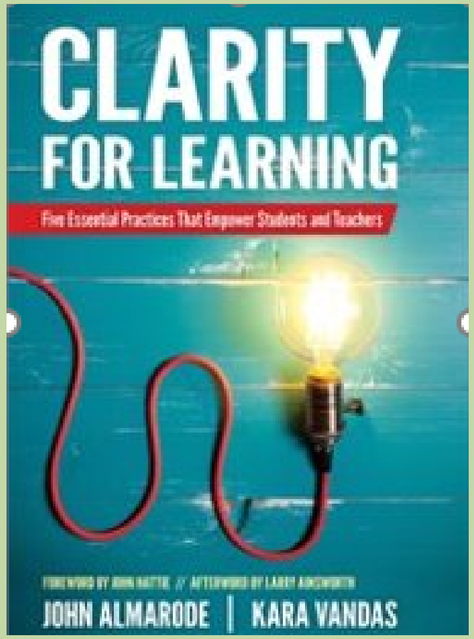
- Science Verb Glossary
- ARPDC Planning & Assessment Document
- CMASTE
- Blank Planner Template

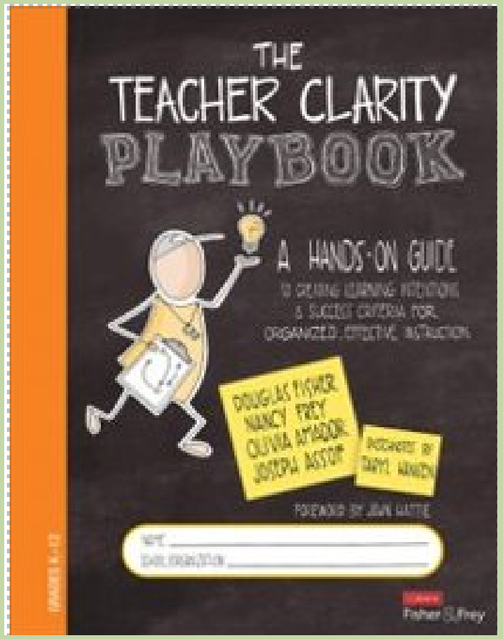
Linked Planning Steps

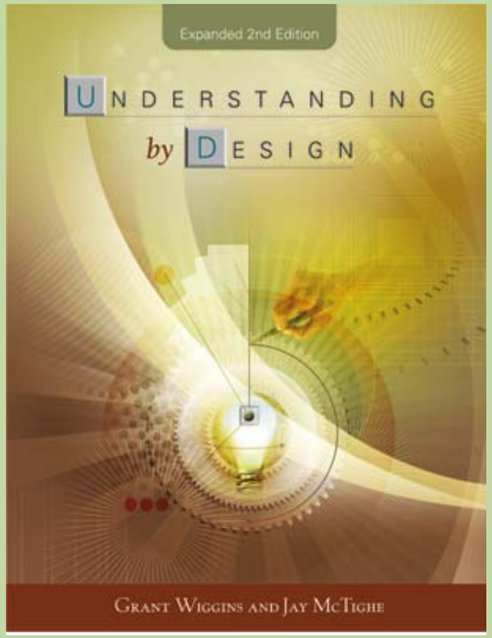


Guiding questions to consider at each phase of planning

Sources for Planning Guide

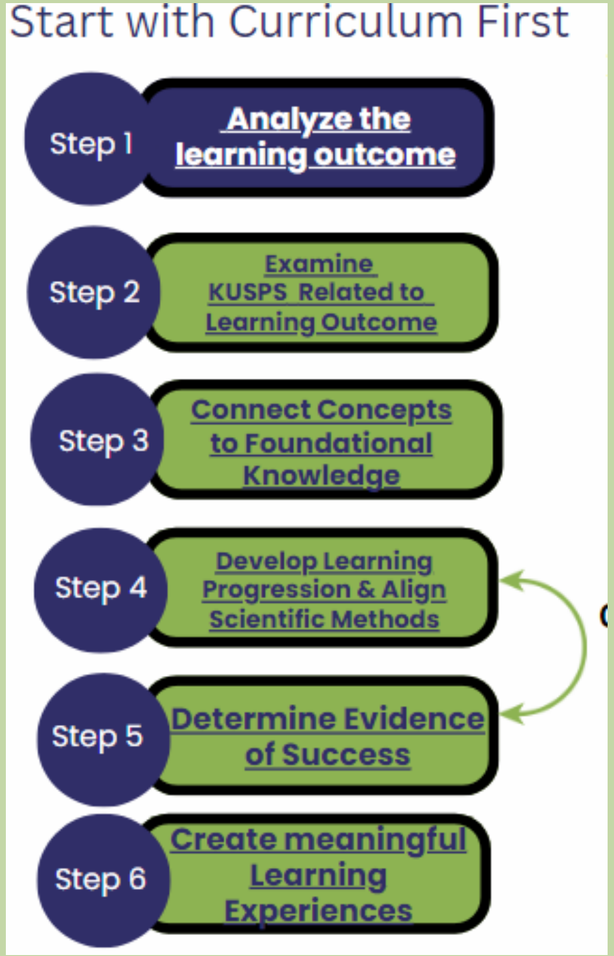






Planning Guide Begins to Focus On Clarity By Starting With

Unpacking The Curriculum:



1. Sequence Learning Progressions beginning, middle and end of learning journey

Alberta Regional Professional Development Consortia

Adult learning for students' sake

Grade 1

Integrating The Scientific Methods (Investigations)

P L A N N I N G G U I D E

Sample: Energy

Movement consists of direction, a pathway, and speed.

A planning guide supports teachers in designing a series of lessons integrating the scientific methods with other organizing ideas found in the curriculum. This teaching strategy helps students build scientific knowledge and deepen their learning.

"The Science curriculum engages students in active investigation to build scientific knowledge and develop critical-

PLANNING GUIDE

Grade 1 Science

Start with Curriculum First

- Step 1: Analyze the learning outcome
- Step 2: Examine KUSPS Related to Learning Outcome
- Step 3: Connect Concepts to Foundational Knowledge
- Step 4: Develop Learning Progression & Align Scientific Methods
- Step 5: Determine Evidence of Success
- Step 6: Create meaningful Learning Experiences

Above steps are hyperlinked

1. Analyze the Learning Outcomes to identify the skills & concepts which direct the how and what of summative assessment.

How can the movement of objects and animals be understood?

Energy	Scientific Methods
Students investigate direction, pathway, and speed of moving objects and animals.	Students engage in and describe investigation.

Note: The development of the skills & procedures from the scientific methods are a year long process

Guiding Questions:

- What are the concepts (nouns, science ideas) students need to learn?
- What are the skills (verbs) students use to demonstrate what they know, understand and can do?

"Students will have opportunities to integrate these skills [scientific methods] into all other areas of the Science curriculum." Curriculum Subject Introduction (2023)

Teacher Planning Toolbox (Click Links)

Integrating The Scientific Methods

Glossary for Student Action Verbs
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Grades found as LO	Grades found within Ss & Ps	Verb	Definition
1	K, 5	engage	To take part/be involved in.
K, 1, 3, 4, 6	K, 1, 2, 3, 4, 5, 6	describe	To communicate (orally or in writing) the qualities, attributes, features or properties of something.

Scientific Methods

Students **engage** in and **describe** investigation

PLANNING GUIDE

Grade 2 Science

Start with Curriculum First

- **Step 1** Analyze the outcomes
- **Step 2** Examine KUSPS Related To Learning Outcome.
- **Step 3** Connect Concepts to Foundational Knowledge
- **Step 4** Develop Learning Progression & Align Scientific Methods
- **Step 5** Determine Evidence of Success
- **Step 6** Create Meaningful Learning Experiences

2. Examine the KUSPS to identify important concepts (science ideas),and the skills students will use to demonstrate successful learning

Understanding: Movement consists of direction, a pathway, and speed.

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
- side to side

Objects or animals move along pathways in a variety of ways, such as
- rolling
- bouncing
- sliding

Speed can be described as
- fast
- slow
- changing
- not changing

skills

Conduct an investigation to determine how objects move.

Observe and describe the direction, pathway, and speed of objects or animals.

Describe and record ways objects or animals move along different pathways.

Guiding Questions:

*Note: parenthesis is for teacher, not the student
Include means must teach, such as is sampling but not all

- What concepts (nouns, science ideas) in the knowledge & Understanding statements are integral to student understanding?
- What skills (verbs, verb definitions) will students use to show what they know and can do?

Integrating

The Scientific Methods

PLANNING GUIDE

Grade 1 Science

Start with Curriculum First

- **Step 1** Analyze the outcomes
- **Step 2** Examine KUSPS Related To Learning Outcome.
- **Step 3** Connect Concepts to Foundational Knowledge
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Integrating The Scientific Methods

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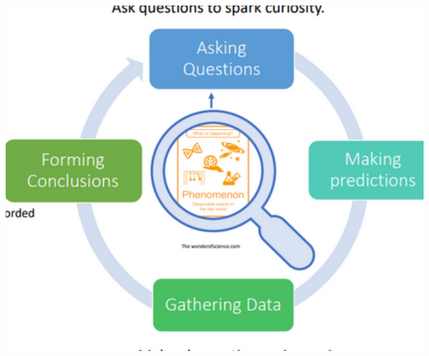
	1, 2, 6	determine	**To find a conclusion and/or solution using reasonable strategies, procedures, and/or calculations.**

Conduct an investigation to **determine** how objects move



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K, 1, 3, 4, 6	K, 1, 2, 3, 4, 5, 6	describe	To communicate (orally or in writing) the qualities, attributes, features or properties of something.
	K, 1, 5	observe	To use the senses to find attributes, properties and features of objects, places and events.
	K, 1, 4, 5	record	To put facts, information or observations on paper or in a digital format.

Second KUSP

Demonstrate how the movement of objects can be influenced

	K, 1, 3, 4, 5, 6	**demonstrate**	**To show or express understanding through one's actions.**

KNOWLEDGE	UNDERSTANDING	SKILLS & PROCEDURES
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.	Demonstrate how the movement of objects can be influenced.

The paper ball dropped faster than the sheet of paper

First KUSP provides foundational understanding of movement and vocabulary to describe movement

Skills: Students' Actions Used To Demonstrate Learning

Resources & Activities

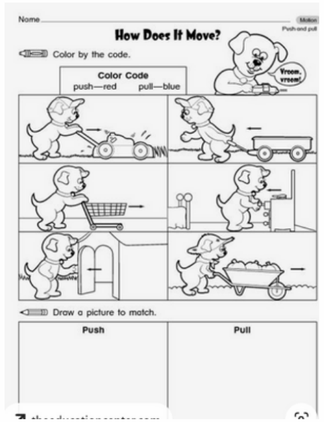
Which activity allows students to **best display** the combined knowledge & skills:

Second KUSP

<u>Demonstrate</u> how the **movement** of objects can be influenced by the interactions with other objects

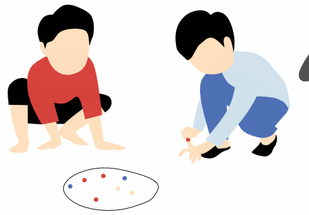
1)

Source:the educationcenter.com



2)

When my marble hit the other marble it bounced and rolled forward



Skills: Students' Actions Used To Demonstrate Learning Resources & Activities

<u>Demonstrate</u> how the **movement** of objects can be influenced by the interactions with other objects

1)

- Force is an interaction between 2 objects
- Push and pulls **describe** the interaction between 2 objects.
- Grade 3 knowledge statements explicitly states push and pull resulting in the interaction of 2 objects
- Grade 1 students not asked to demonstrate **<u>not</u>** describe interaction
- focus is on influence of movement not the interaction itself

Teaching Resources are tools in your toolbox

Understanding the curriculum enables you to pick the right tool

Clarify: Energy LO Grade I

Students **investigate** direction, pathway and speed of moving objects and animals

KNOWLEDGE

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- slow
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UNDERSTANDING

Movement consists of direction, a pathway, and speed.

SKILLS & PROCEDURES

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.

Conduct an investigation to determine **how objects move**.

Objects	**Animals**
Conduct an investigation to determine how objects move	Observe and describe the **direction pathway and speed** of objects or animals (both)
Observe and describe the **direction pathway and speed o**f objects or animals (both)	Describe and record ways objects or animals **move along different pathways**
Describe and record ways objects or animals **move along different pathway**s	

PLANNING GUIDE

Grade 1 Science

Start with Curriculum First

- Step 1: Analyze the outcomes
- Step 2: Examine KUSPS related to learning outcome
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- Step 6: Create Meaningful Learning Experiences

Understanding: Movement consists of direction, a pathway, and speed.

- **Determine essential science ideas for teacher clarity to enhance student learning**

Look for sources of information connected to:

- Position is the location of an object in relation to a nearby object or place. The second object or place is called a reference point.
- Movement an act of changing physical location or position or of having this changed.
- Movement implies qualities and deliberate
- Movement is always used with living things (living things move on their own)
- Motion implies movement without intention (used with objects)
- Motion describes physical properties of movement
- Something is in motion, it is moving Note: We do not say "in movement"

Teacher background only

- Change of motion or movement indicates a force has occured

- **Determine potential student misconceptions to consider when teaching and assessing**

- Meaning of direction is telling what to do or instructions. Science: path an object follows to reach a location (can be communicated so others understand)
- Distinction between object's movement and the movement path an object travels on

Teacher Background Builder (Click Links)

Guiding Questions:

- What terms and science ideas do I understand and what do I need to learn more about?
- What concepts in this learning outcome are connected to previous grade?
- What science vocabulary might be used in a non-science context that may potentially confuse students? (Ex: force, reflection, etc.)

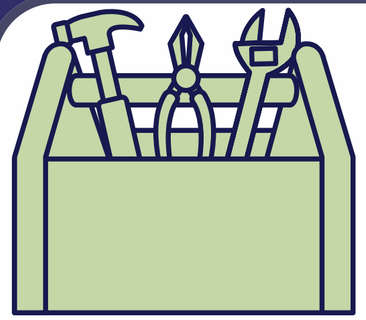
Integrating The Scientific Methods

CONNECTING CURRICULUM

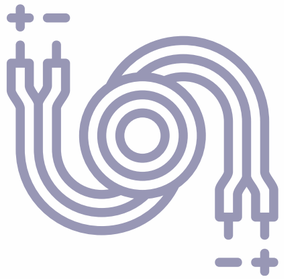
TO FOUNDATIONAL SCIENCE IDEAS
&
CONSIDER POTENTIAL MISCONCEPTIONS

"teachers who know their students' most common misconceptions are more likely to increase their students' science knowledge than teachers who do not. Having a teacher who knows only the scientific "truth" appears to be insufficient. It is better if a teacher also has a model of how students tend to learn a particular concept, especially if a common belief may make acceptance of the scientific view or model difficult." (Sadler & Sonnert 2016)

Source: CMASTE Site, 2023



LINKS TO FIND FOUNDATIONAL SCIENCE IDEAS & MISCONCEPTIONS



EXPLORIFY

Tackle the Tricky Bits
Uk site

CMASTE

Center For Mathematics Science, and Technology Education.
Misconceptions are being updated

NSTA.ORG

Can search without a membership
Paige Keeley's.
Formative Assessment Probes based on research

TEACHER BACKGROUND BUILDER

Movement & Motion in Physical and Biological Sciences

- Use Motion
- Need other object or people to move
- Observable and describable effect of force (grade)

When moving we say “in motion” not in movement or moving

- can move on own (locomotion
- Use movement

Source: Education Endowment Foundation

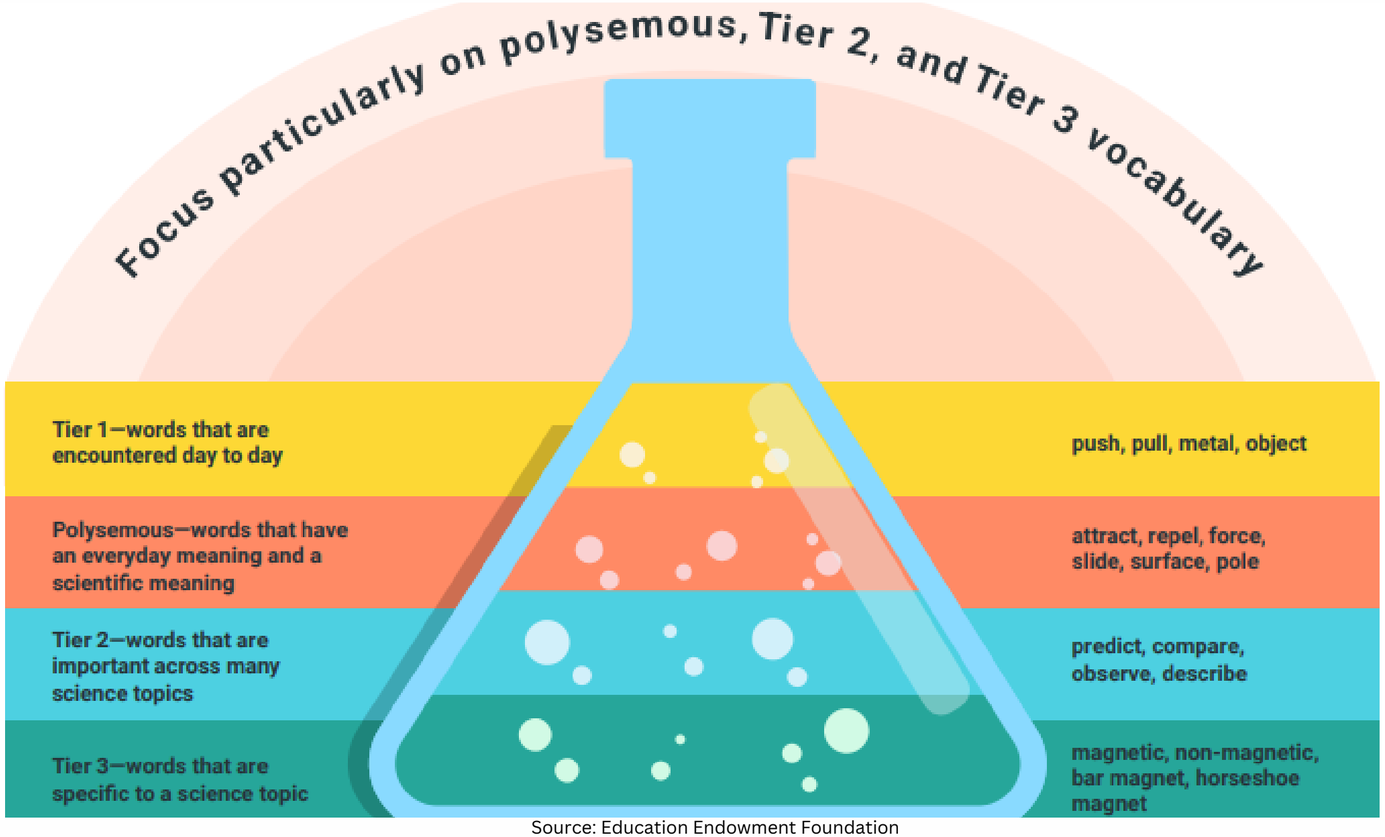
PREVIOUS LEARNING

Source: Education Endowment Foundation

SCIENCE VOCABULARY

Polysemous - Words that have everyday meaning but different Science meaning can cause confusion for students

Word	Common meaning	Science Meaning
Direction	Intstuction how to do something	line or course that an object takes in movement
Force	coercion, compulsion	push or pull
Slide	playground	describe motion of an object



Source: Education Endowment Foundation

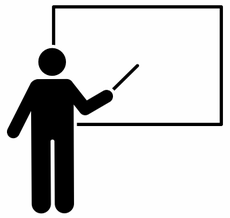
THE THIRD TEACHER

A WELL-DESIGNED LEARNING ENVIRONMENT

1 FIRST TEACHER
TEACHER or PARENT

2 SECOND TEACHER
PEERS

3 THIRD TEACHER
ENVIRONMENT



SCIENCE VOCABULARY

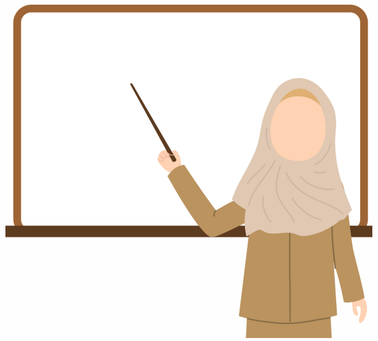
Strategies for Teaching Vocabulary

Explicitly make students aware of double meanings

Some words more than 1 meaning. Every day meaning and science meaning

Direction in every day meaning can be how to do something.

In Science when talking about movement direction is used to describe the movement of objects and animals for example: up, and down,



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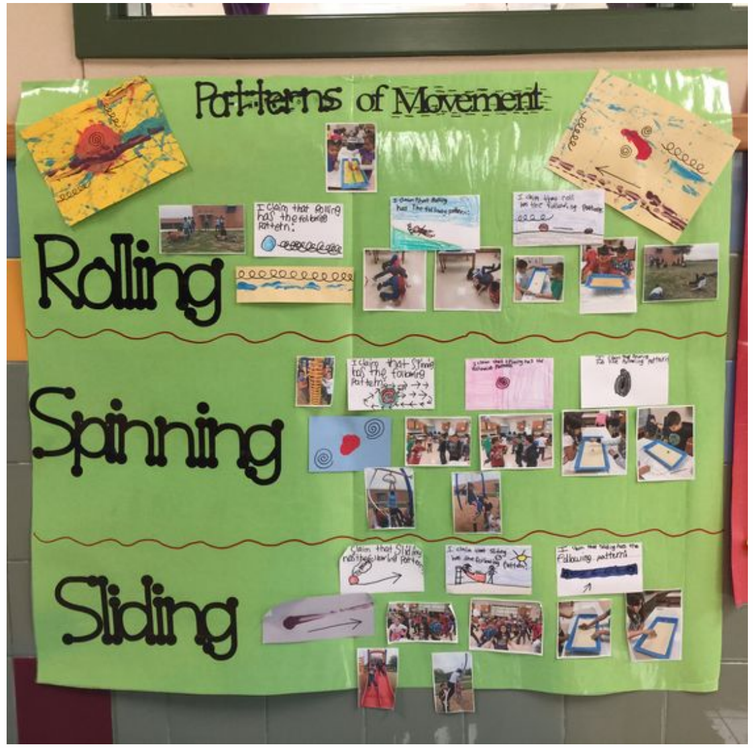
STRATEGIES FOR TEACHING VOCABULARY

Science vocabulary word wall - Add visuals

Environment as Third Teacher



Source: http://www.thesciencetoolkit.com/

Co-construct Anchor Charts with students

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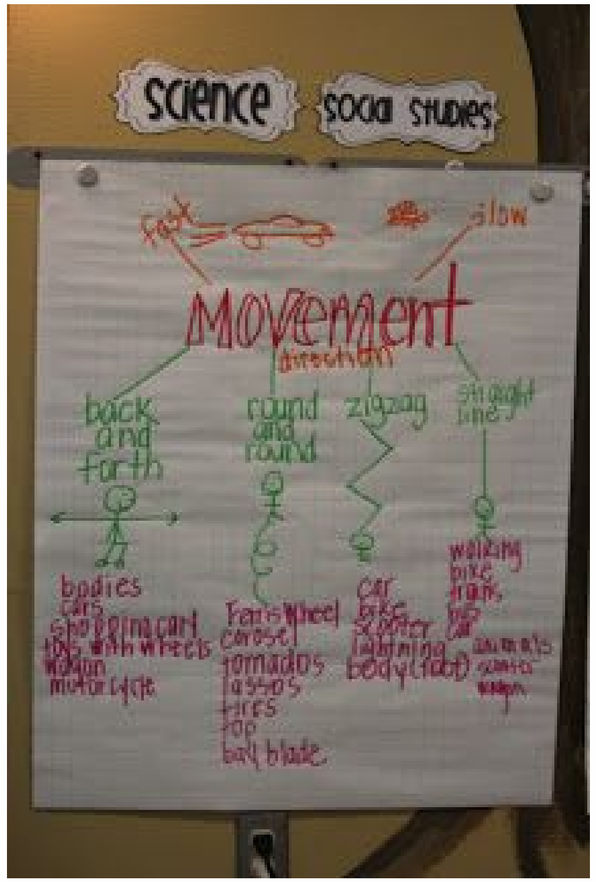
STRATEGIES FOR TEACHING SCIENCE VOCABULARY

Concept Building - Concept Map- Co Construct with Students



hSource: ttps://thegototeacher.blogspot.com/2012/11/nonfiction-and-common-core.html

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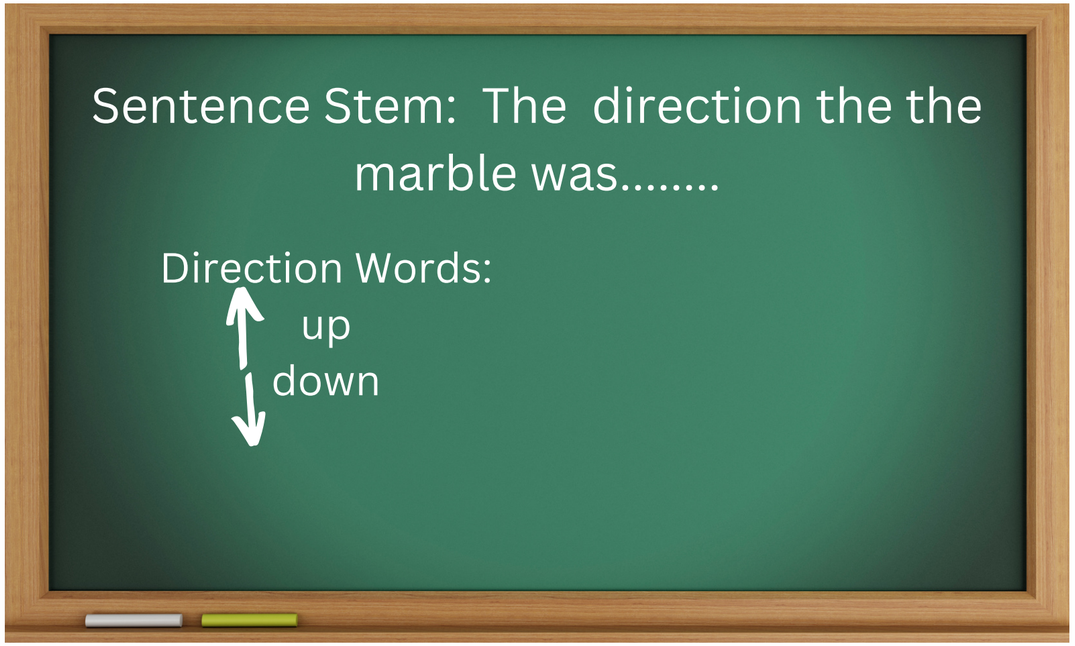
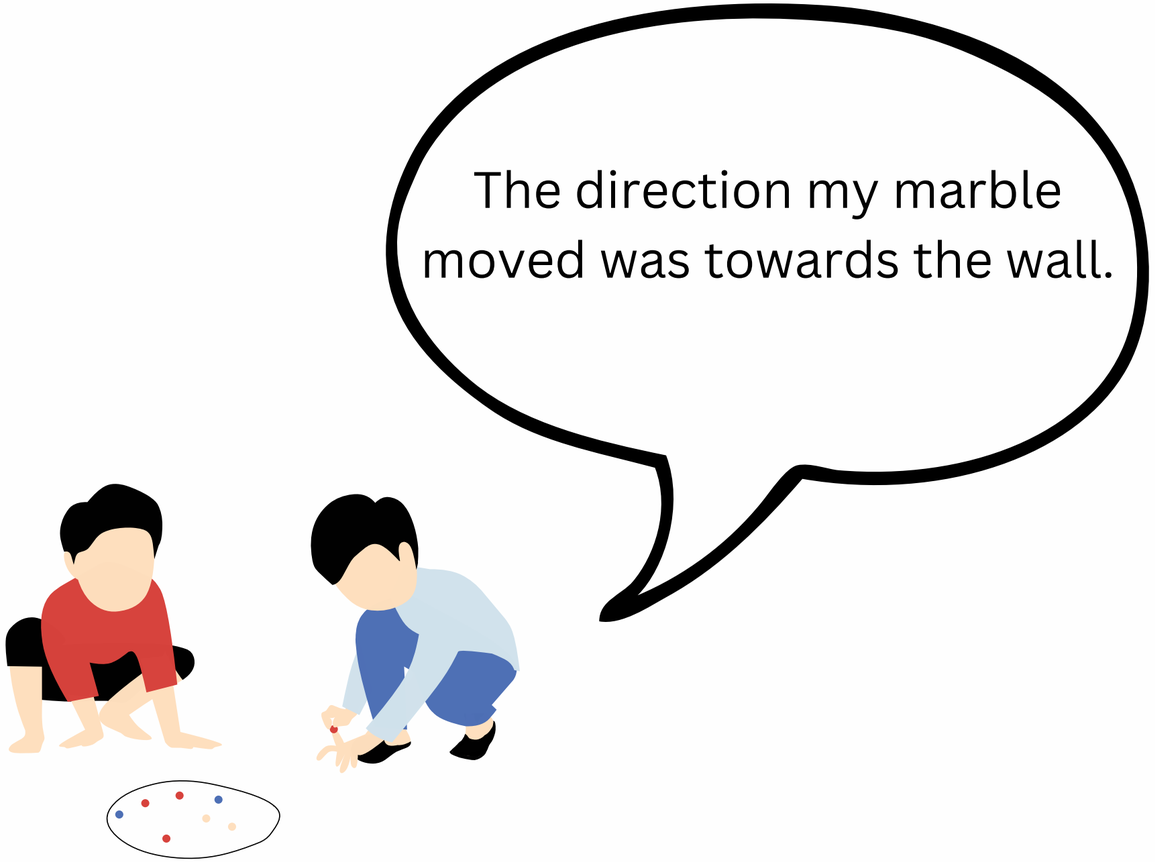
SCIENCE VOCABULARY

Strategies for Teaching Vocabulary

Reinforce use of proper vocabulary when talking





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SCIENCE VOCABULARY

Strategies for Teaching Vocabulary

Reinforce use of proper vocabulary when students are talking

Sentence Stem: The direction the the marble was.....

Direction Words:
up
down

You mention that the ball moved up. So the **direction** of the ball moved was up.

Sou

PLANNING GUIDE

Grade 1 Science

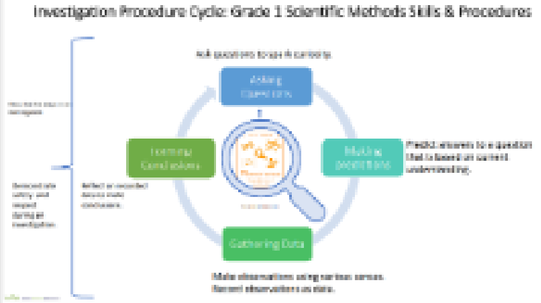
1. **Develop learning progressions that have a logical sequence from the perspective of the student. Combine the skills with knowledge statements.**
2. **Consider how the scientific methods will be integrated in the progression**

Start with Curriculum First

- **Step 1** — Analyze the outcomes
- **Step 2** — Examine the KUSPS Related to the Learning Outcome
- **Step 3** — Connect Concepts to Foundational Knowledge
- **Step 4** — Develop learning progression & align Scientific Methods
- **Step 5** — Determine Evidence of Success
- **Step 6** — Create Meaningful Learning Experiences

Understanding: Movement consists of direction, a pathway, and speed.

Movement consists of a direction, a pathway and speed Combine the knowledge statement and skills together	Scientific Method Steps Skills
1. Conduct an investigation to describe the direction of an objects (see sample lesson plan below) **Explore:** Offline Coding, Directing our marbles, playground observation **Explain:** Co- construct concept map anchor chart	**Step:** Asking Questions, Making Predictions, Gathering Data, Forming Conclusions **Skills:** Predict the answer to a question, Make observations using various senses., Record observations as data (words,drawings),Reflect on recorded data to make conclusions
2. Conduct an investigation to describe the movement pathway of an object • Observe and describe pathway (straight, curved, spiral, side to side) of objects **Explore:** Concept attainment, Hands on investigation **Explain:** Co-construct concept map anchor chart with students	**Step:** Asking Questions, Making Predictions, Gathering Data, Forming Conclusions **Skills:** Predict the answer to a question, Make observations using various senses., Record observations as data (words,drawings),Reflect on recorded data to make conclusions, Describe steps in an investigation
3. Conduct an investigation to describe the movement of an object • Observe and describe the speed of objects using fast, slow, changing , not changing **Explore:** Marble observation **Explain:** Movement Speed (video), Add to concept map (Co-construct)	**Step:** Asking Questions, Making Predictions, Gathering Data, Forming Conclusions **Skills:** Predict the answer to a question, Make observations using various senses., Record observations as data (words,drawings),Reflect on recorded data to make conclusions, Describe steps in an investigation
Explain Synthesize Learning Lesson: Describing Movement (video) While watching video do (Connect/ Extend/Challenge thinking routine pausing strategically for students to discuss if it is something they already know (connection) or new information (extend) after they can ask questions.	



Linked Resource

Note: Progressions are sequencing of combined skills and concepts, not lesson plans

Guiding Questions:

- How will the concepts & skills be combined and sequenced in a way that is cohesive from the students' perspective to build on each idea (flow)?
- How will students use "explore before explain" to integrate the scientific methods to build knowledge?
- What resources would support student learning engagement with both the "explore and explain" phase of concept development?

Forced Copy

Energy Sample Planner

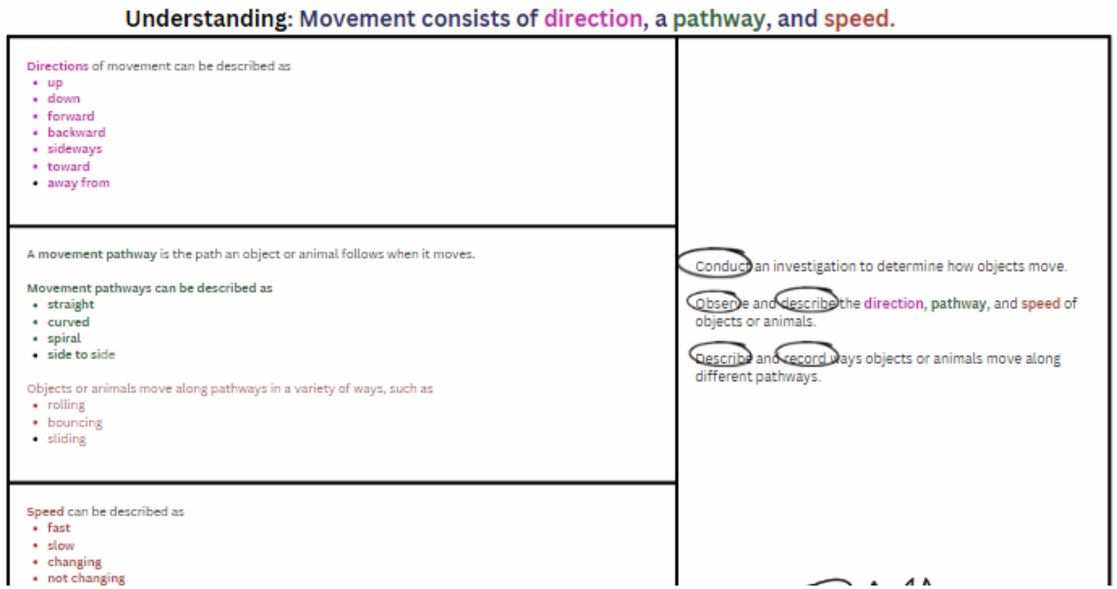
Blank Planner Template

The Scientific Methods

4a) Learning Sequence:

Combine skills with knowledge

Note: these are NOT lesson plans and each step may take several lessons for students to work through. Sequencing provides the order or flow to develop lessons from



Conduct an investigation to determine the direction of an objects (up,down, forward, backward,sideways, towards, away from)

- Observe and describe (up, down, forward, backward, sideways, towards, away from) the direction of objects

Conduct an investigation to determine the movement pathway of an object

- describe (straight, curved, spiral, side to side) and record pathway of objects

Conduct an investigation to determine the speed of an object

- Observe and describe the speed (fast, slow, changing, not changing) of objects (fast, slow, changing, not changing

4b) Align the Scientific Methods Steps & Skills/Procedures

Movement consists of a direction, a pathway and speed **Combine the knowledge statement and skills together**	**Scientific Method** **Steps** **Skills**
1. **Conduct an investigation to describe the direction of an objects (see sample lesson plan below)** **Explore:** Offline Coding, Directing our marbles, playground observation **Explain**:Co- construct concept map anchor chart	**Step:** Asking Questions, Making Predictions, Gathering Data, Forming Conclusions **Skills:** Predict the answer to a question, Make observations using various senses., Record observations as data (words,drawings),Reflect on recorded data to make conclusions
2. Conduct an investigation to describe the movement pathway of an object • **describe and record the pathway (straight, curved, spiral, side to side) of objects** **Explore:** Concept attainment, Hands on Investigation **Explain:** Co-construct concept map anchor chart with students	**Step:** Asking Questions, Making Predictions, Gathering Data, Forming Conclusions **Skills:** Predict the answer to a question, Make observations using various senses., Record observations as data (words,drawings),Reflect on recorded data to make conclusions, Describe steps in an investigation
3. Conduct an investigation to describe the movement of an object • **Observe and describe the speed of objects using fast, slow, changing , not changing** **Explore:** Marble observation **Explain**: Movement Speed (video), Add to concept map (Co-construct)	**Step:** Asking Questions, Making Predictions, Gathering Data, Forming Conclusions **Skills:** Predict the answer to a question, Make observations using various senses., Record observations as data (words,drawings),Reflect on recorded data to make conclusions, Describe steps in an investigation

Explain Synthesize Learning Lesson: Describing Movement (video)

- **Bring together describing movement of objects by describing the direction, speed and pathway of an object**

While watching video do Connect/ Extend/Challenge thinking routine pausing strategically for students to discuss if it is something they already know (connection) or new information (extend) after they can ask questions.

PLANNING GUIDE

Grade 2 Science

Start with Curriculum First

- Step 1: Analyze the outcomes
- Step 2: Examine the KUSPS in the Organizing idea
- Step 3: Connect Concepts to Foundational Knowledge
- Step 4: Develop Learning Progressions & Align Scientific Methods
- Step 5: **Determine Evidence of Success**
- Step 6: Create Meaningful Learning Experiences

SourceShallcross (2017):

5. Determine evidence of what students know, understand, and are able put in action in an unfamiliar or real life context as a result of learning in this unit.

Science Methods **Learning Outcome:** Students engage in and describe investigation **Computer Science:** **Learning Outcome:** Students follow instructions and relate them to outcomes	**Organizing Idea:** Energy **Learning Outcome:** Students investigate direction, pathway, and speed of moving objects and animals **Understanding:** Movement consists of direction, a pathway and speed (objects only)
Student Name:	Date:

Grow	Met Criteria	Glow
	Skill: Observe and describe the direction of an object ☐ Correctly uses either up, down, forward, backward, toward or away from to describe the direction their marble took in the game	
	Skill: Observe and describe the pathway of an object ☐ Correctly uses either, curved, straight, spiral or side to side when describing the pathway the marble took in the game	
	Skill: Observe and describe the speed of an object ☐ Correctly uses fast, slow, changed or not changed to describe the speed of the marble as it traveled on its path	
	SM Skill: Reflect on recorded data to draw conclusions ☐ Uses drawings, words and/or video to record observations ☐ Uses recorded data to reflect and draw conclusions to make descriptions of : ☐ Direction ☐ Pathway ☐ Speed	
	CM Skill: Sequence two or three instruction steps to achieve a desired outcome. ☐ Given 3 steps on how to play marbles, correctly sequences the steps to clearly provide instructions on how to play the game marbles.	

Guiding Questions:

- How will students (insert verb from LO) their understanding of (insert understanding statement from KUSPs? (Ex: How will students students investigate direction, pathway and speed of objects?)

Scientific Methods

- How can I use the Understanding statements to develop summative assessment that assess what students know, understand? (EX: How will students record observations to be referenced in the future?)

Integrating

The Scientific Methods

Sample Summative: Performance Task

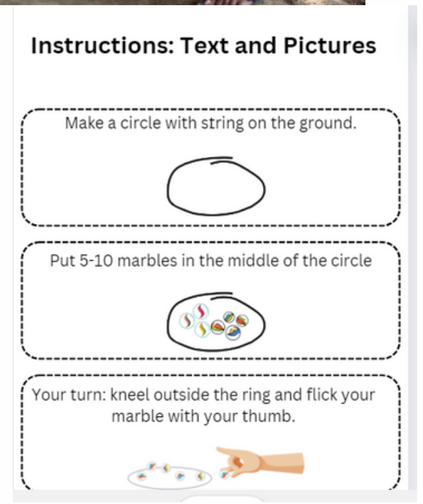
Using what students have learned through investigating how movement consists of speed, direction and a pathway, students will teach others (buddy class, parents, siblings) how to play marbles

Criteria:

1. Provided with 3 steps of directions students place steps in proper order

2. They demonstrate how to play and describe the speed, direction and pathway of one of the marbles using proper words

Flip or ipad



SourceShallcross (2017):

Co-construct Criteria
with students

Grade 1 Marble Mania Single Point Rubric

Science Methods **Learning Outcome:** Students engage in and describe investigation **Computer Science:** **Learning Outcome:** Students follow instructions and relate them to outcomes	**Organizing Idea:** Energy **Learning Outcome:** Students investigate direction, pathway, and speed of moving objects and animals **Understanding:** Movement consists of direction, a pathway and speed (objects only)
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	SM Skill: Reflect on recorded data to draw conclusions ☐ Uses drawings, words and/or video to record observations ☐ Uses recorded data to reflect and draw conclusions to make descriptions of : ☐ Direction ☐ Pathway ☐ Speed	
	CM Skill: Sequence two or three instruction steps to achieve a desired outcome. ☐ Given 3 steps on how to play marbles, correctly sequences the steps to clearly provide instructions on how to play the game marbles.	

Alberta Regional Professional Development Consortia

PLANNING GUIDE

Grade 1 Science

1. **Plan for instruction that is cohesive from the students' perspective.**
2. **Be strategic in sequencing lessons that builds on prior knowledge and learning, as well as having the potential to extend student thinking.**

Start with Curriculum First

- Step 1: Analyze the outcomes
- Step 2: Examine the KUSPS in the Organizing idea
- Step 3: Connect Curriculum to Important Science ideas
- Step 4: Examine the KUSPS in the Scientific Methods
- Step 5: Determine Evidence of Success
- Step 6: Create Meaningful Learning Experiences

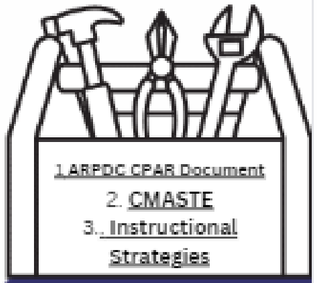
Clarity: Teacher & Learner can answer

	Where the learner is going	Where the learner is	How to get there
Teacher	Clarifying, sharing and understanding learning intentions	Engineering effective discussions, tasks, and activities that elicit evidence of learning	Providing feedback that moves learners forward
Peer		Activating students as learning resources for one another	
Learner		Activating students as owners of their own learning	

Dylan, W. (2011). *Embedded formative assessment*. Bloomington, IN: Solution Tree Press

Guiding Questions:

- What underlying prior knowledge do the students need to have from previous grades?
- How can I access what ideas students' already have (pre-assessment)?
- How can I minimize potential misconceptions with the science ideas?
- What vocabulary in science (scientific methods, every day meaning and science meaning) do students need to use and know?
- Where can I integrate cross curricular connections for students? For example KUSPs from ELAL (Ex: Oral Language, vocabulary development, text) and/or math (Ex: measuring, statistics)?
- What do I want to hear and see from students during lessons that demonstrate their progress in the Skills and Procedures? (Formative Assessment)



Integrating The Scientific Methods

“It really isn’t about you explaining to your students what the science idea is. It’s about you creating a learning environment in which they can construct the explanation.

—Carla Zembal-Saul, professor of science education, Penn State University[13]

PLANNING GUIDE

Grade 2 Science

1. **Plan for instruction that is cohesive from the students' perspective.**
2. **Be strategic in sequencing lessons that builds on prior knowledge and learning, as well as having the potential to extend student thinking.**

Start with Curriculum First

- Step 1: Analyze the outcomes
- Step 2: Examine the KUSPS in the Organizing idea
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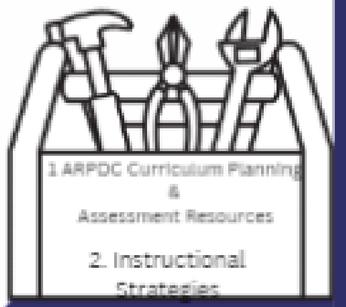
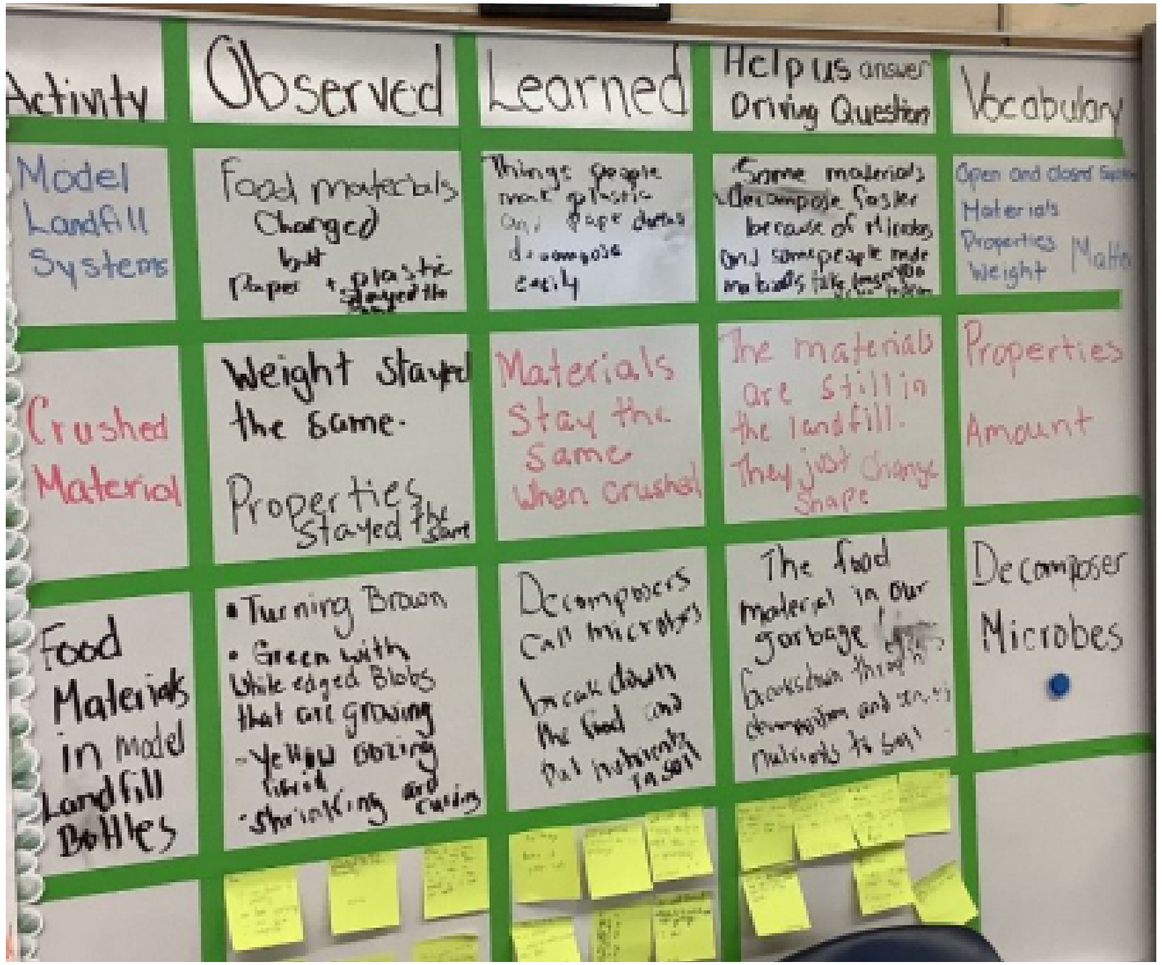
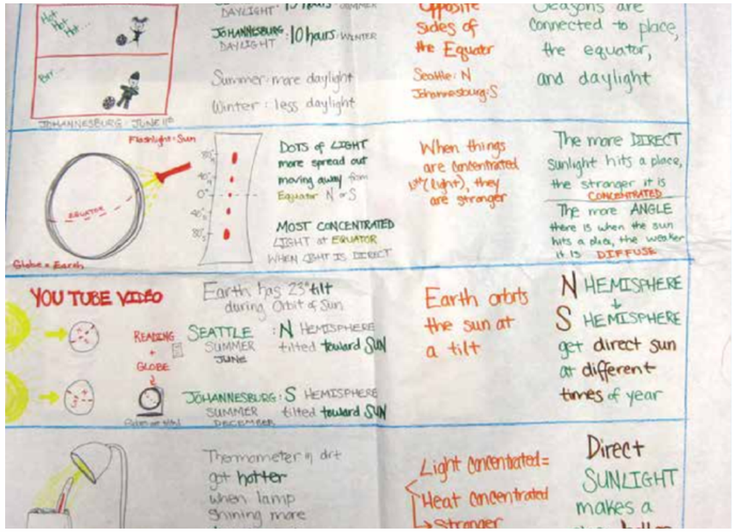


Integrating The Scientific Methods

Learning Summary Tables
Consolidate Learning (reaching conclusions)



Nicole Lamoureux, Grade 4 Classroom (2021)



Learning Summary Tables

How do our marbles move? How can we use movement to play the game of marbles?

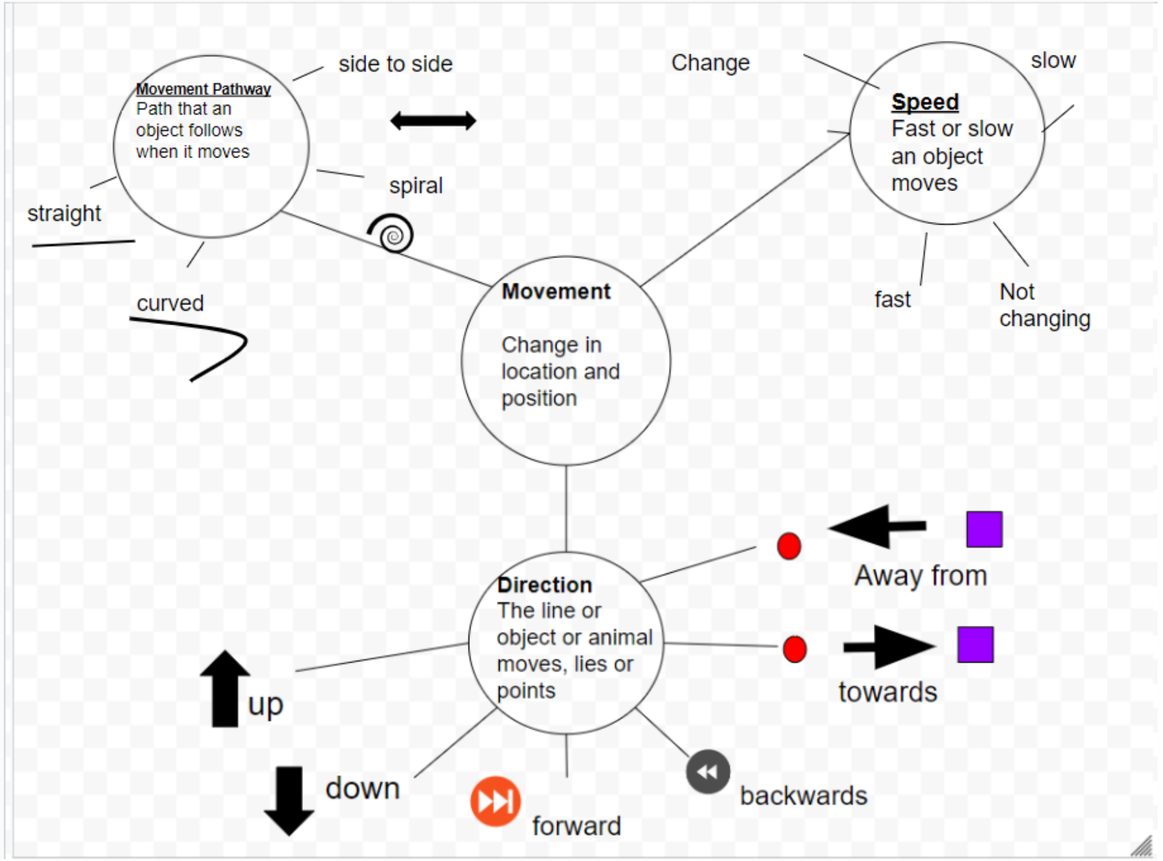
Driving Question: How can we use what we know about movement to play marbles?				
Our initial ideas				
Question Activity (Small investigation)	Observation What did we observe?	Conclusion What did we learn from our data? reading	How does this help us understand how marbles move during a game and to play the game of marbles?	Questions I wonder.. Record as students ask or can be put on a sticky

SAMPLE LESSON PLANS INCLUDED

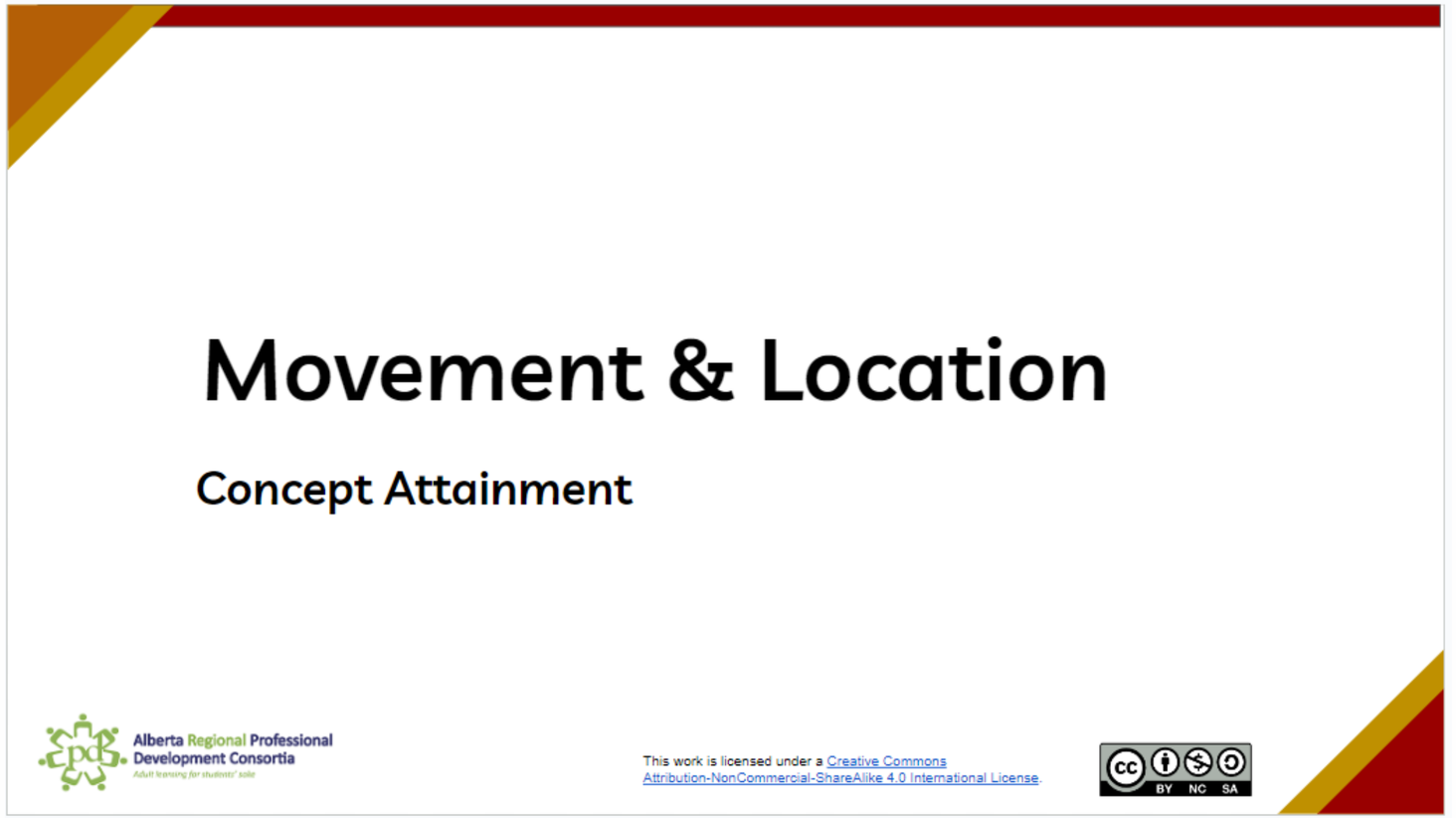
1. Bridge/Review Lesson Movement
2. Conduct an investigation to determine the direction an object is moving

Co-construct Anchor Chart For Whole Class Explain Phase

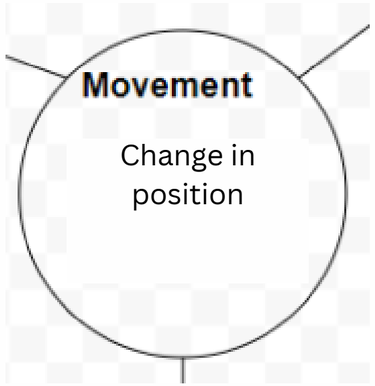
At the end of the unit



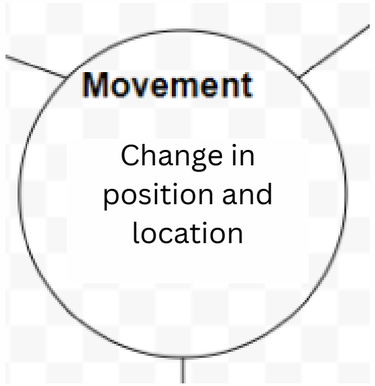
Sample Bridge/Review Lesson



Co-construct Anchor Chart
Bridge/Review Lesson



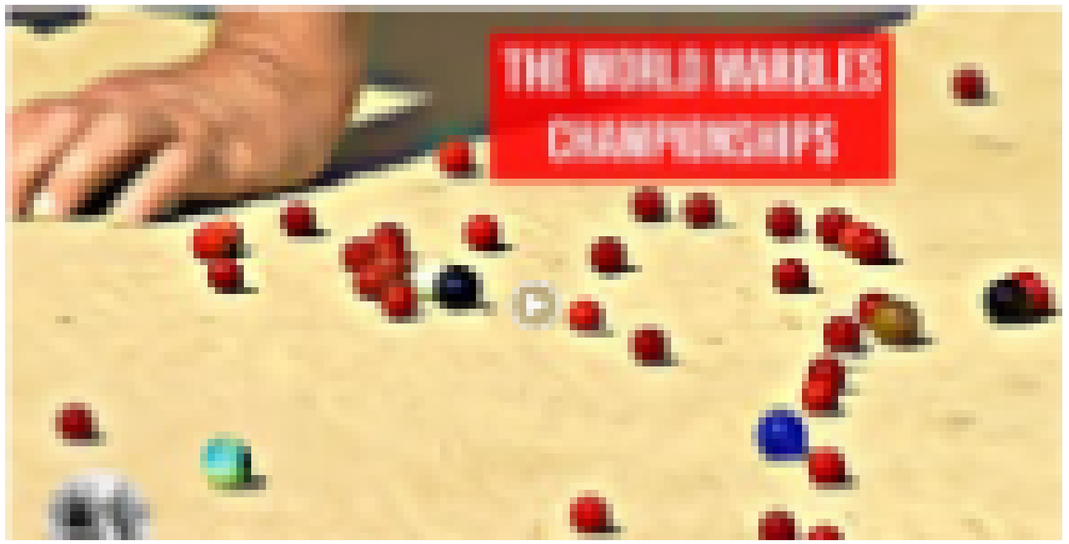
Co-construct Anchor Chart
Bridge/Review Lesson



Launch Unit: Present Phenomenon to Investigate

Think/pair/share

Present marble tournament to observe



Launch Unit: Present Phenomenon to Investigate

Driving Question: How can we use what we know about movement to play marbles?				
Our initial ideas	Record student thoughts here from the Launch Ex: The marble moved round and round The marble went straight			
Question Activity (Small investigation)	Observation What did we observe?	Conclusion What did we learn from our data? reading	How does this help us understand how marbles move during a game and to play the game of marbles?	Questions I wonder.. Record as students ask or can be put on a sticky

Launch Unit: Present Phenomenon to Investigate

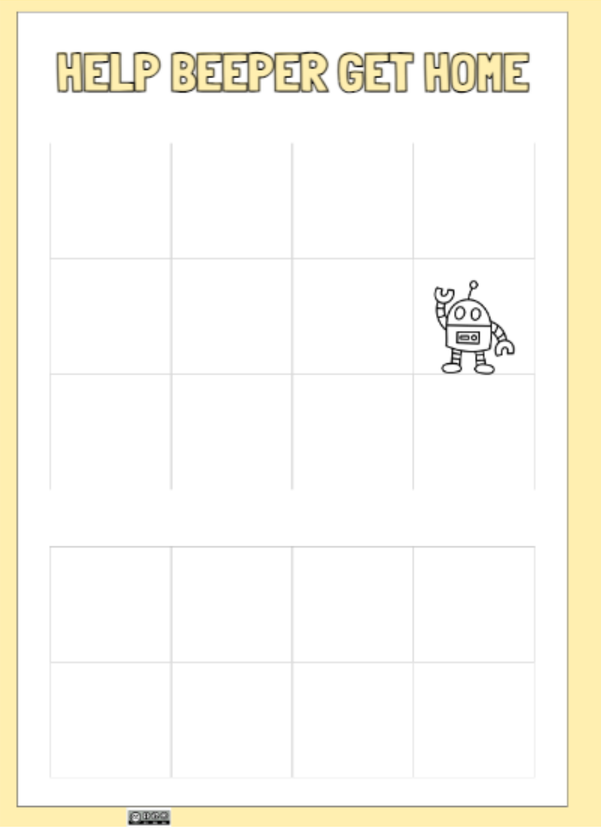
Describe the marble movement using pictures and words

Lesson 1 Day 1

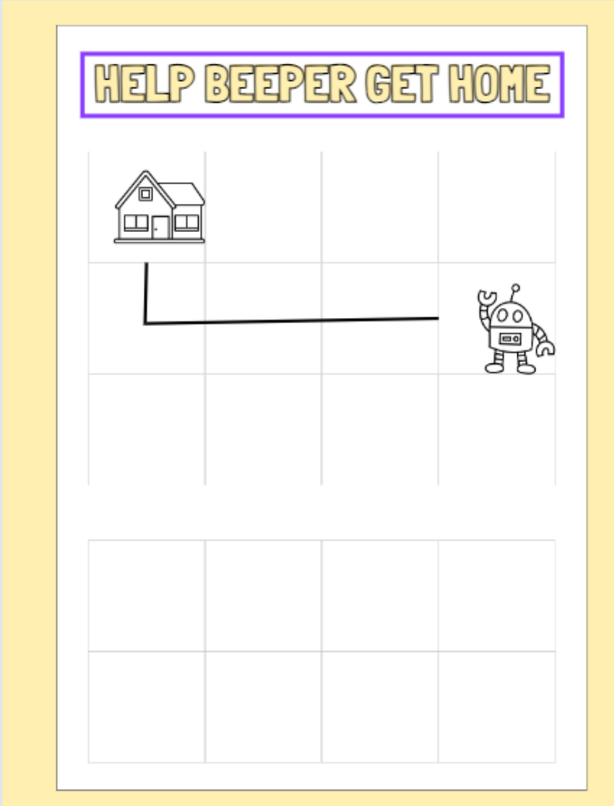
How can we help get Beeper home?

Anticipatory Set

Student copy

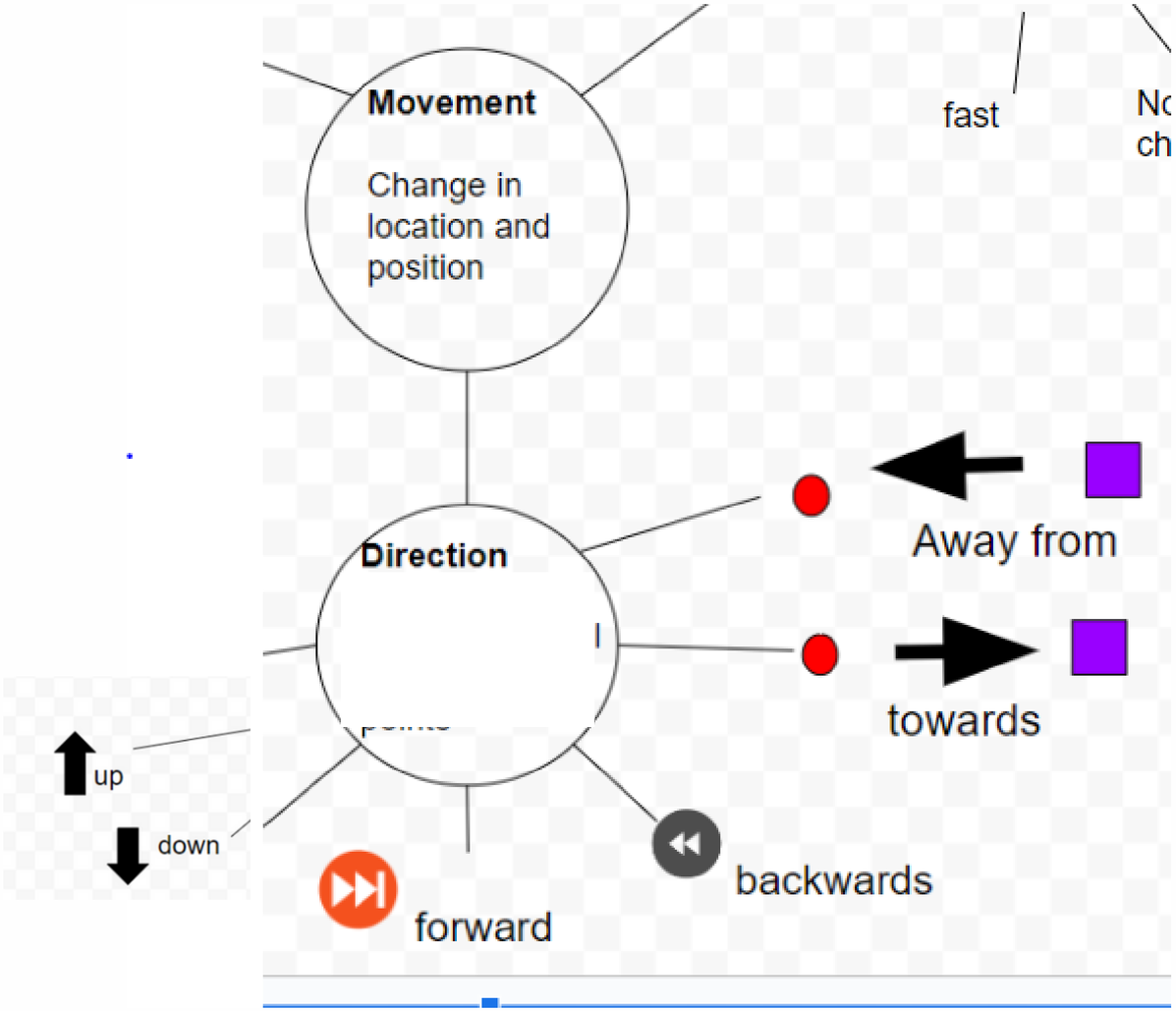


Teacher secret Copy



Lesson 1 Day 1

Just In Time Teaching Vocabulary



Lesson 1 Day 1
Practice & Reinforcement

Practice direction words

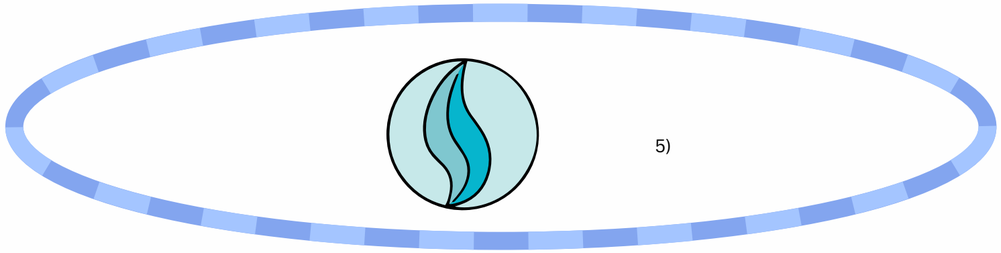
- Simon says
- Youtube videos
- Use Beeper and practice with offline coding
- May need more practice use transitions between subjects or movement breaks to practice directions

Lesson 1 Day 2

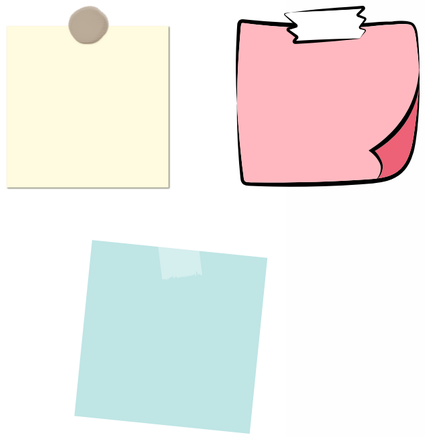
Make observations and use vocabulary to describe the <u>direction</u> of moving objects

4)

2)



5)

Driving Question: How do objects move?				
Our initial ideas	**Record student thoughts here from the Launch** **Ex:** **The marble moved round and round** **The marble went straight**			
Activity (Small investigation)	**Observation** **What did we observe?** **Describe direction**	**Conclusion** **What did we learn from our data?** Think/pair/share - students reflect on recorded data to share.	**How does this help us understand how marbles move during a game and to how play the game of marbles?**	**Questions** **I wonder..** **Record as students ask or can be put on a sticky**
1) Observe direction of marbles 2) Direction of playground and recess equipment	• Marbles bounced up and down • Marbles rolled forward and backwards • Marbles moved towards partner a and away from partner a	• Objects move in **different directions in different ways**. Some objects move in only 1 direction or not at all and others can move in all directions.	Marbles can move in all directions. We need to think about the direction we want our marble to go when we shoot the marble Note: This may need some prompting from you: 1) When shooting the marble what do we need to think about? Or provide sentence stems for students to complete	

need to continue develop plans for:

Conducting investigation to determine an objects pathway
Conduct an investigation to determine the speed of an objects movment
Describe how the object moves

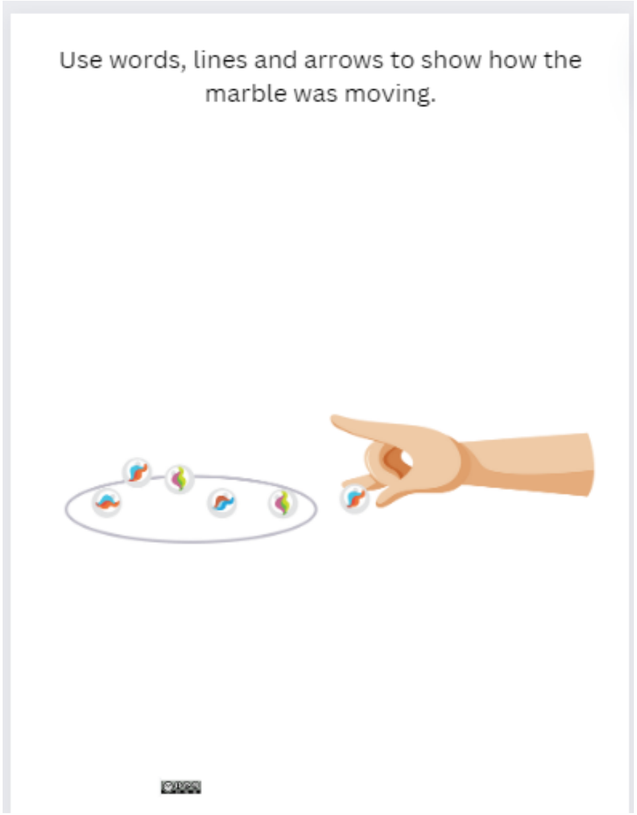
4)

2)

5)

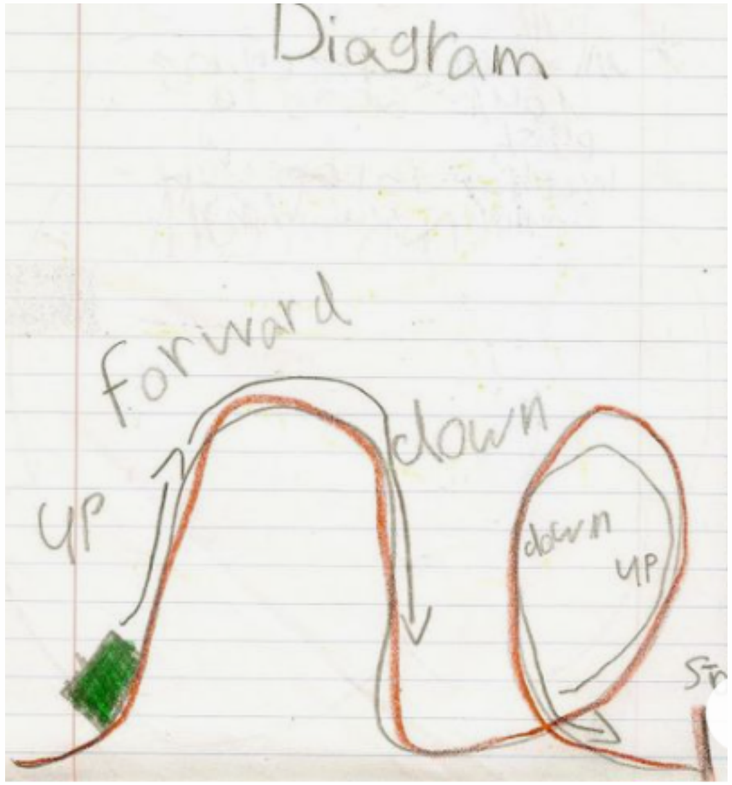
Give students first pictures after

Describe the marble movement using pictures and words



STRATEGIES FOR TEACHING SCIENCE VOCABULARY

Concept Building - Concept Map- Co Construct with Students



https://thegototeacher.blogspot.com/2012/11/nonfiction-and-common-core.html

Sou

KEY IDEAS

Scientific Methods	Integrated in all other organizing ideas. Way students should build knowledge in each organizing ideas. “Explore before Explain”
Teacher Clarity of Curriculum	Taking time to unpack the curriculum empowers you to choose activities & resources that truly align with curriculum.
Learning Sequence	Logical flow and sequence of knowledge & skills to **intentionally plan** for including the scientific methods.
Planning Guide	Resource developed to assist with intentionally integrate scientific methods in other organizing ideas

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