



Grade 1

Integrating The Scientific Methods (Investigations)

PLANNING GUIDE

Sample: Energy

Movement consists of direction, a pathway, and speed.

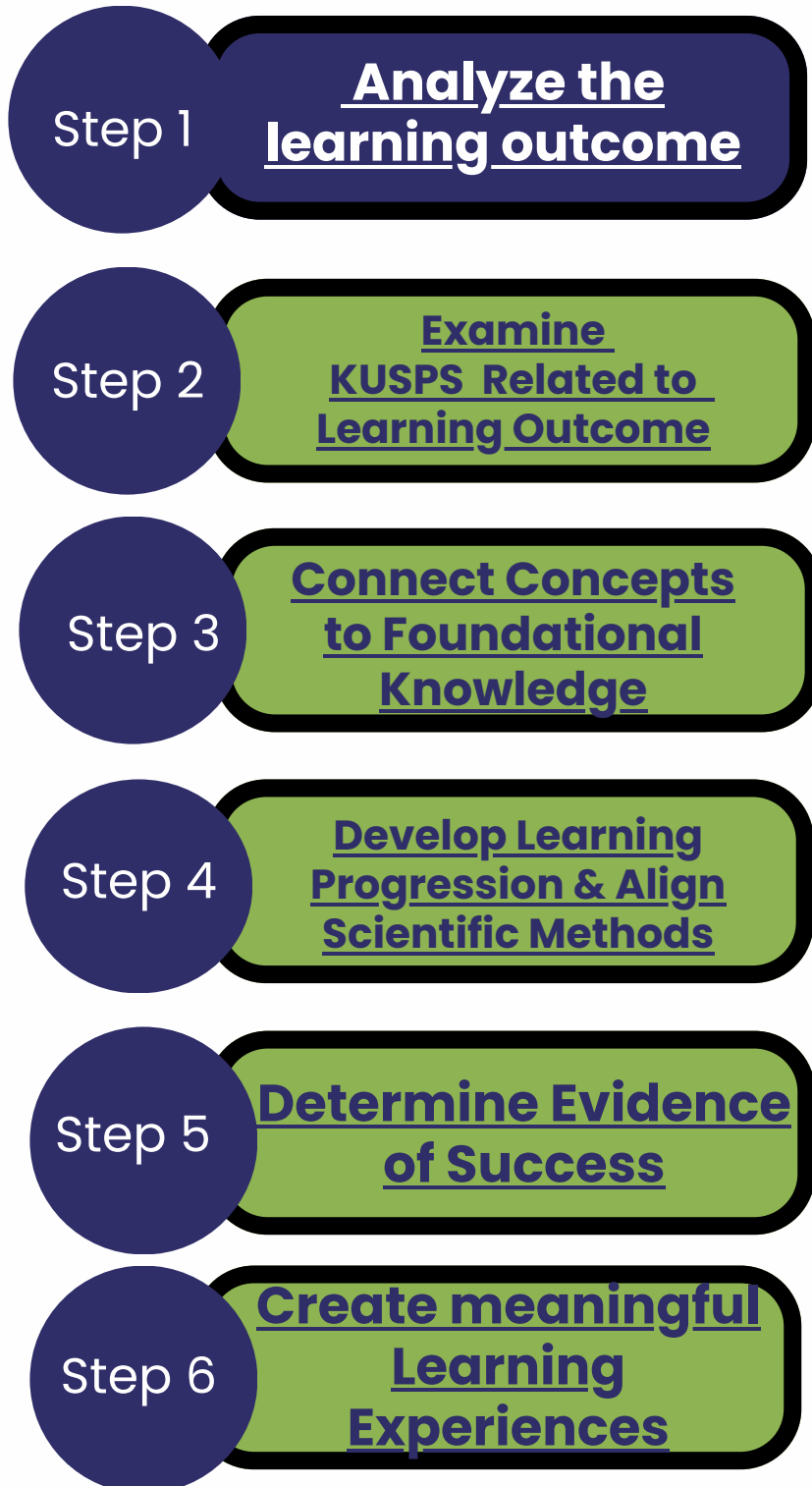


A planning guide supports teachers in designing a series of lessons integrating the scientific methods with other organizing ideas found in the curriculum. This teaching strategy helps students build scientific knowledge and deepen their learning.

“The Science curriculum engages students in active investigation to build scientific knowledge and develop critical-thinking and problem-solving skills..... Students will have opportunities to integrate these skills into all other areas of the Science curriculum.” *Curriculum Subject Introduction (2023)*

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

Start with Curriculum First



Above steps are hyperlinked

How can the movement of objects and animals be understood?

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

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?

Teacher Planning Toolbox (Click Links)



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

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

Start with Curriculum First

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

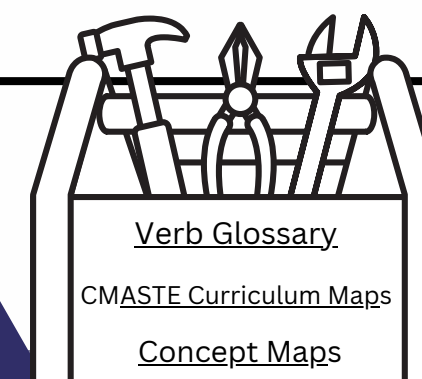
- Step 1** Analyze the outcomes
- Step 2** Examine KUSPS Related To Learning Outcome.
- Step 3** Connect Concepts to Foundational Knowledge
- Step 4** Develop Learning Progression & Align Scientific Methods
- Step 5** Determine Evidence of Success
- Step 6** Create Meaningful Learning Experiences

<p>Directions of movement can be described as</p> <ul style="list-style-type: none"> • up • down • forward • backward • sideways • toward • away from 	<p>Conduct an investigation to determine how objects move.</p> <p>Observe and describe the direction, pathway, and speed of objects or animals.</p> <p>Describe and record ways objects or animals move along different pathways.</p>
<p>A movement pathway is the path an object or animal follows when it moves.</p> <p>Movement pathways can be described as</p> <ul style="list-style-type: none"> • straight • curved • spiral • side to side <p>Objects or animals move along pathways in a variety of ways, such as</p> <ul style="list-style-type: none"> • rolling • bouncing • sliding 	
<p>Speed can be described as</p> <ul style="list-style-type: none"> • fast • slow • changing • not changing 	

Guiding Questions:

- 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?

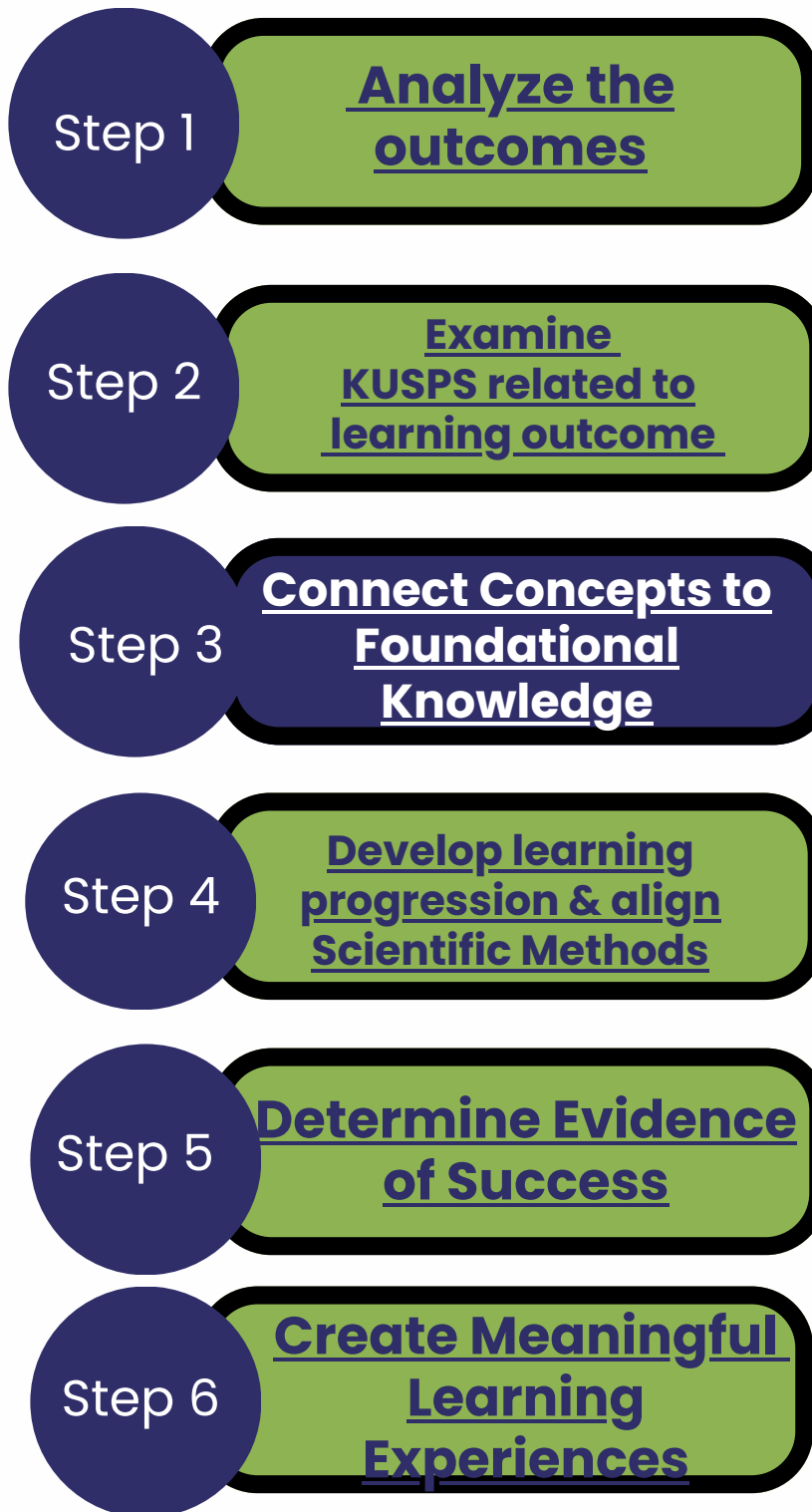
*Note: parenthesis is for teacher, not the student
Include means must teach, such as is sampling but not all



Integrating

The Scientific Methods

Start with Curriculum First



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 occurred

Determine potential student misconceptions to consider when teaching and assessing

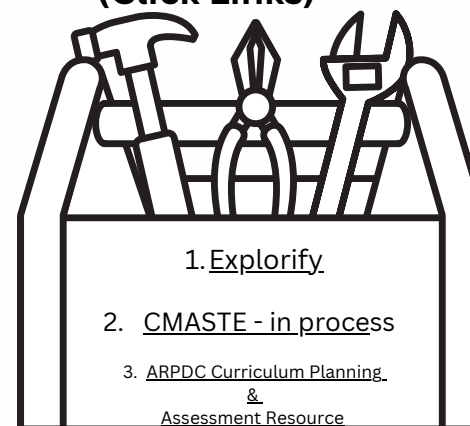
- Meaning of direction is telling what to do or instructions. Science: path an object follows to reach a location (can be communicated so others understand)
- Distinction between object’s movement and the movement path an object travels on

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.)

Teacher Background Builder

(Click Links)



The Scientific Methods

Integrating

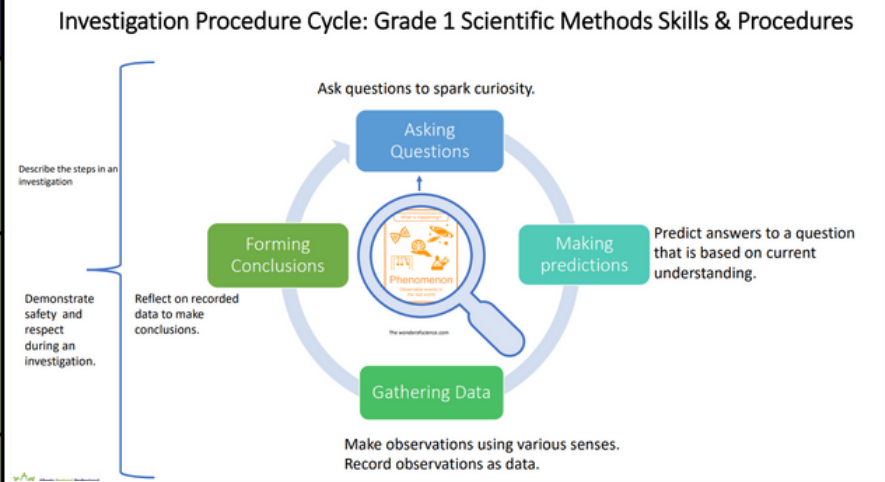
1. Develop learning progressions that have a logical sequence from the perspective of the student. Combine the skills with knowledge statements.
2. Consider how the scientific methods will be integrated in the progression

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 <u>direction</u> 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 <u>movement pathway</u> 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 <u>movement</u> of an object • Observe and describe the <u>speed</u> 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: <u>Describing Movement</u> (video) While watching video do <u>Connect/ Extend/Challenge thinking routine</u> pausing strategically for students to discuss if it is something they already know (connection) or new information (extend) after they can ask questions.	

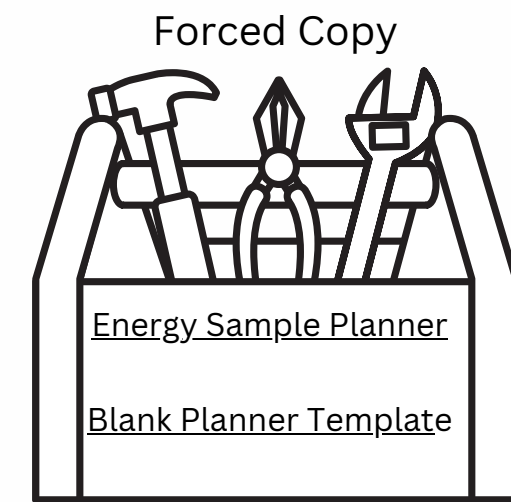


Linked Resource

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

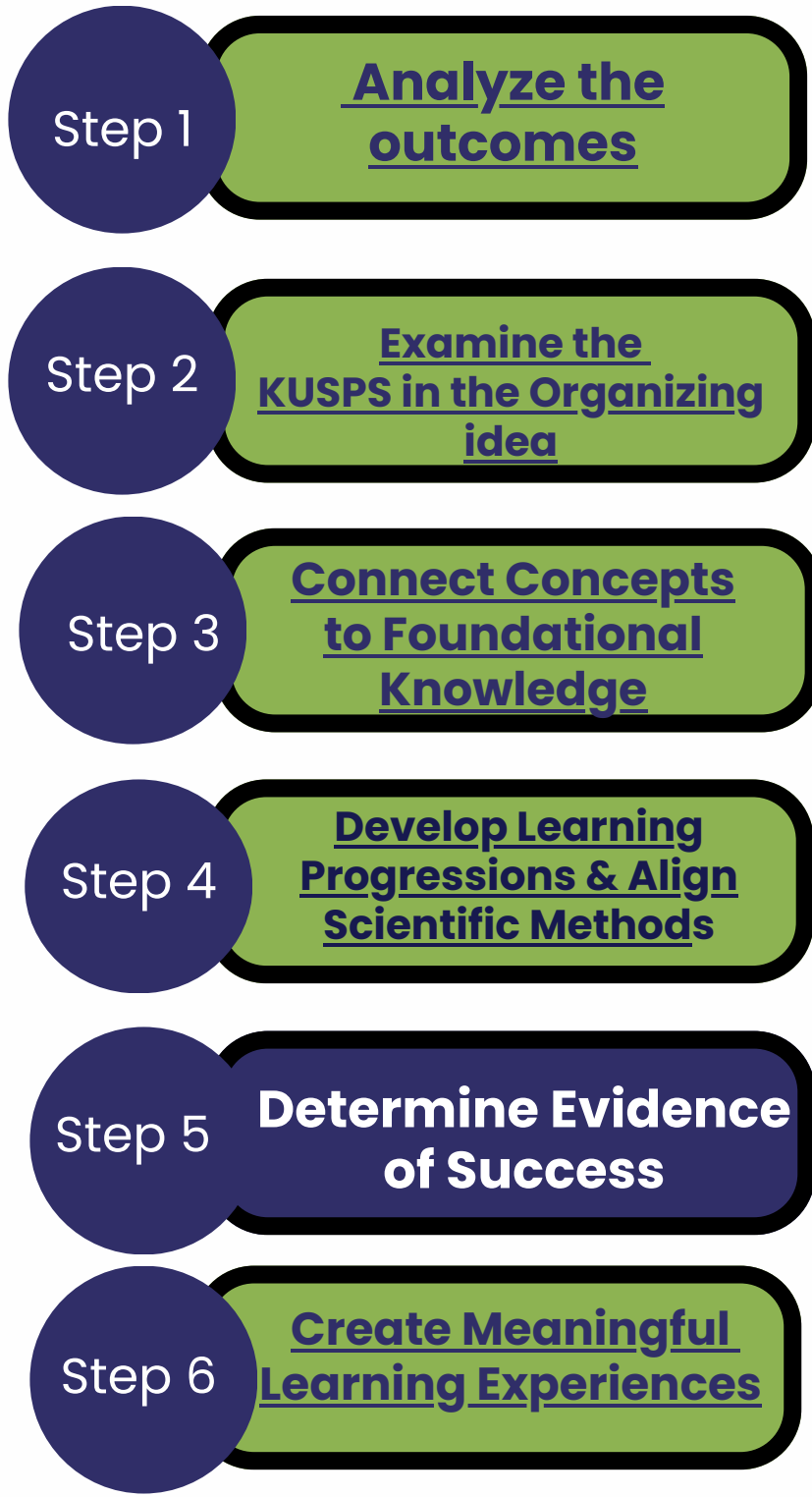
Guiding Questions:

- 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?



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.

Start with Curriculum First



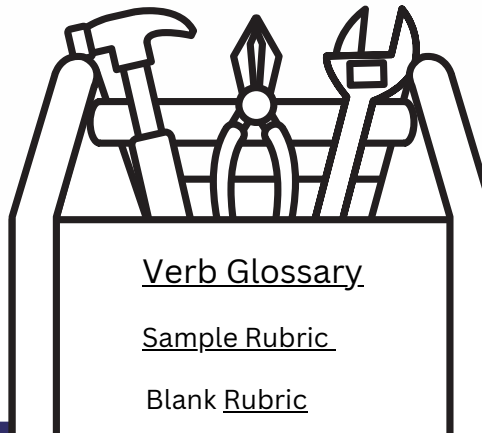
Science Methods Learning Outcome: Students engage in and describe investigation		Organizing Idea: Energy Learning Outcome: Students investigate direction, pathway, and speed of moving objects and animals Understanding: Movement consists of direction, a pathway and speed (objects only)	
Computer Science: Learning Outcome: Students follow instructions and relate them to outcomes			
Student Name:		Date:	
Grow	Met Criteria	Glow	
	Skill: Observe and describe the direction of an object <input type="checkbox"/> 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 <input type="checkbox"/> 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 <input type="checkbox"/> 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 <input type="checkbox"/> Uses drawings, words and/or video to record observations <input type="checkbox"/> Uses recorded data to reflect and draw conclusions to make descriptions of : <input type="checkbox"/> Direction <input type="checkbox"/> Pathway <input type="checkbox"/> Speed		
	CM Skill: Sequence two or three instruction steps to achieve a desired outcome. <input type="checkbox"/> 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?)

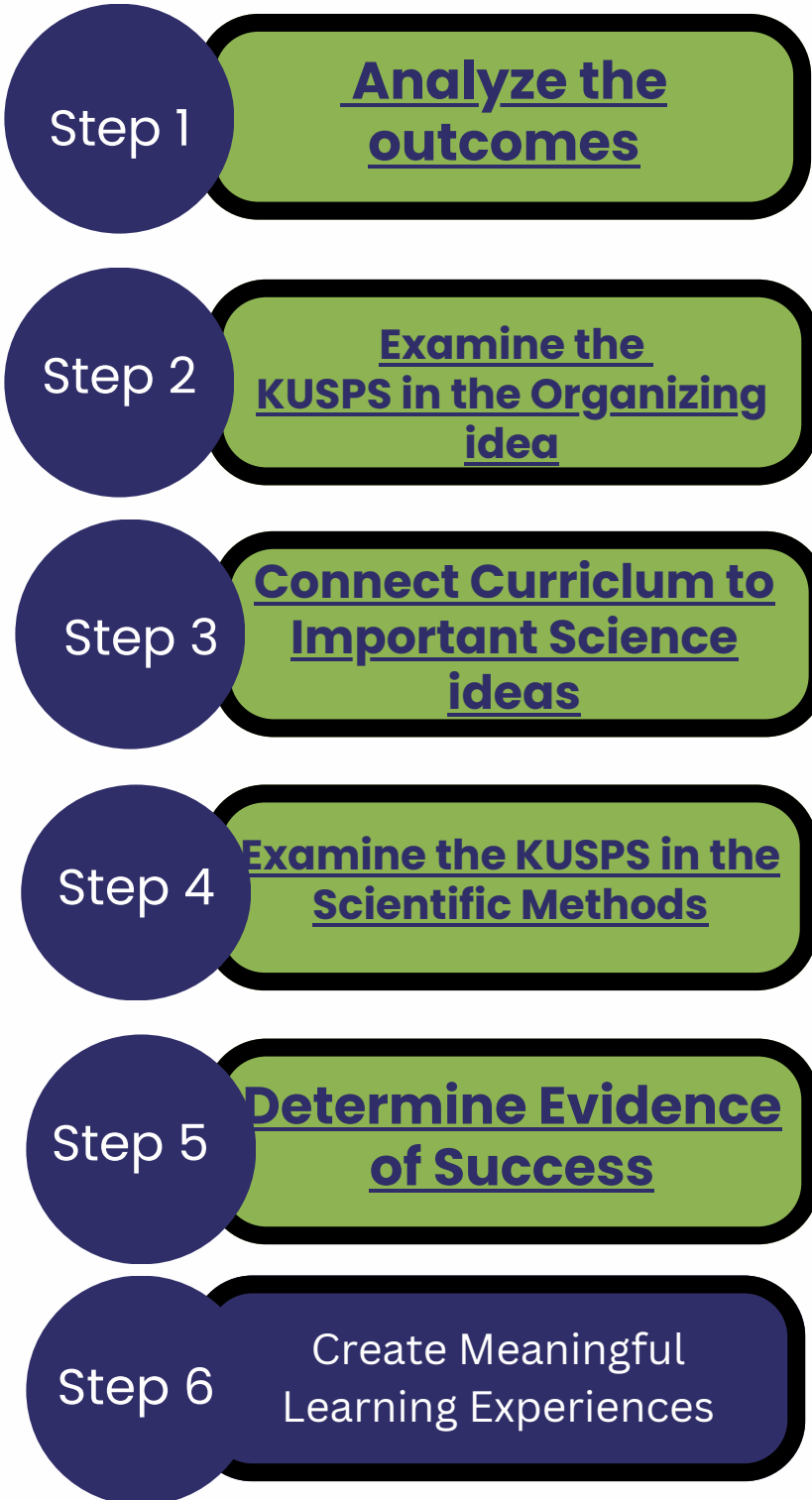
Scientific Methods

- 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?)



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



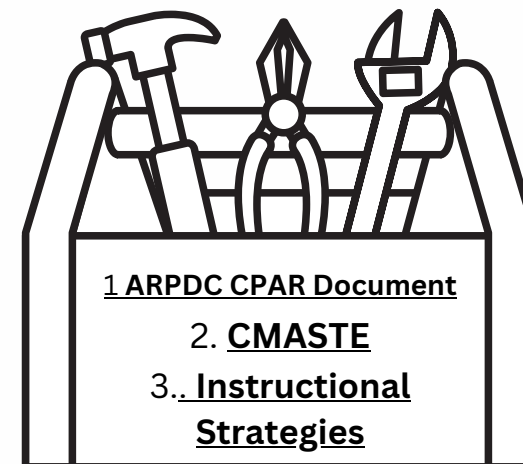
Clarity: Teacher & Learner can answer

	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)



The Scientific Methods

Integrating

Sources

Almarode J. & Vandas K. L. (2018). *Clarity for learning : five essential practices that empower students and teachers*. Sage/Corwin.

Brown P. (2020). *Instructional sequence matters grades 3-5 : explore before explain*. National Science Teaching Association.

Brown P. (2021) *Shining light on explore before explain for early childhood learners*. Science and Children: National Science Teaching Association.

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

Education Endowment Fund (December, 2023) Improving Primary Science Report Retrieved from <https://educationendowmentfoundation.org.uk/education-evidence/guidance-reports/primary-science-ks1-ks2>

Fisher D. Frey N. Amador O. & Assof J. (2019). *The teacher clarity playbook : a hands-on guide to creating learning intentions and success criteria for organized effective instruction ; grades k-12 (First)*. Corwin a SAGE Company

Kaiser, N (November 16, 2020) New Resources for Tackling Scientific Misconceptions. Retrieved from <https://educationendowmentfoundation.org.uk/news/eef-blog-introducing-new-resources-for-sorting-out-scientific-misconceptions>

Wiggins G. P. & McTighe J. (2011). *The understanding by design guide to creating high-quality units*. ASCD.

*Unless specified all images are licensed under Canva.com premium licensing