Nevada Educator Performance Framework

A Guide for SCIENCE Educators

STANDARD 1	STANDARD 2	STANDARD 3	STANDARD 4	STANDARD 5
New Learning is Connected to Prior Learning and Experience	Learning Tasks have High Cognitive Demand for Diverse Learners	Students Engage in Meaning-Making through Discourse and Other Strategies	Students Engage in Metacognitive Activity to Increase Understanding of and Responsibility for Their Own Learning	Assessment is Integrated into Instruction

Standard 4: Students Engage in Metacognitive Activity to Increase Understanding of and Responsibility for Their Own Learning

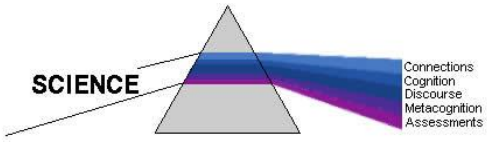
Indicator 1 - Teacher and **all** students understand what students are learning, why they are learning it, and how they will know if they have learned it

Indicator 2 - Teacher structures opportunities for self-monitored learning for **all** students

Indicator 3 - Teacher supports **all** students to take actions based on the students' own self-monitoring processes

General Examples of Science Classroom Strategies:

- Recursive Modeling
- Reflective Prompting
- Write Learning Goals and Action Steps



Key Ideas from Theory and Research:

- Metacognition is a foundational cognitive process for effective learning in all disciplines. At its most basic, it is "thinking about thinking" (Flavell, 1979).
- Students who monitor their own thinking and take action are more successful than their peers in academic activities (e.g., Bransford et al., 1982; Slife, Weiss, & Bell, 1985; Zimmerman & Martinez-Pons, 1992).
- The 21st Century skill of adaptability, including the ability to respond effectively to feedback, is what the learner does in the monitoring and reflection phase of self-regulated learning (e.g., National Research Council, 2012)
- Affective self-regulation (the ability to properly regulate one's emotions) is related to academic success through motivation, a state supported my metacognition (Bandura, 1986; Eisenberg, Valiente, & Eggum, 2010; Ray & Smith, 2010).
- A learning goal orientation supports adaptive motivational patterns that promote the establishment, maintenance, and attainment of personally challenging and valued learning goals (e.g., Dweck & Leggett, 1988; Elliott & Dweck, 1988).
- Instructional strategies for teaching metacognition and encouraging motivation to use metacognitive strategies need to occur at a meta-level instead of performance level (Kuhn, 2000).

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Key Practice Examples for a Science Classroom:

Indicator 1 Example:

Ask students to generate and modify models in their interactive science notebooks and describe how their models are *AND* are not accurate.

Students' representations, inscriptions, diagrams, statements, etc. provide opportunities for ownership of their learning. Ideally, after students write the unit learning goals and what makes the topic relevant to them into their interactive science notebook, students could be asked to represent major concepts, cycles, or objects with diagrams, written descriptions, and mathematical descriptions prior to the start of the lesson, lab, or unit. As the lesson, lab, or unit progresses, ask students to revisit their models (written, diagrams, 3-D models, mathematical, etc.) and recreate them taking into account what they learned from the investigation. It is important that students' original representations remain as a reference for comparison at the end of the lesson, lab, or unit. As students develop their understanding throughout the lesson, lab, or unit, they should be asked to compare their models to the major concept, cycle, or object. it is intended to model and modify them accordingly. Near the end of the lesson, lab, or unit, the teacher can share an expert model with students. The students should be asked to compare their work with the expert model and note the similarities and differences in a T-chart. Below the T-chart, students can create a final model and write about how their understanding has changed, specifically stating the changes from their original to current model.

Common Example Representations:

- Physical Science – Energy flow diagrams before, during and after activities.
- Life Science – Cycles of matter and energy transfer in an ecosystem.
- Earth and Space Science – Representations of density, using the same volume cubes.
- Engineering – Iterative model designs, before, during and after testing.

Indicators 2 & 3 Example:

Ask students, with scaffolding appropriate to grade level, to document and apply strategies for self-monitoring throughout units of instruction.

At the beginning of the lesson or unit students are directed to write learning goals (objectives, standards, personal goals, etc.) in their interactive science notebook and describe how they plan to reach each of them, including strategies for learning and time management. At the close of the lesson or unit, ask students to revisit their learning goals and describe current understanding and the degree to which they followed their time management strategies. Ask students to evaluate their learning strategy and how well or poorly their strategy worked. This metacognitive strategy can be simply done through a science notebook reflection or talking with their teacher.