Nevada Educator Performance Framework

Workshop Series 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 3: Students Engage in Meaning-Making through Discourse and Other Strategies

Indicator 1 - Teacher provides opportunities for extended, productive discourse between the teacher and student(s) and among students

Indicator 2 - Teacher provides opportunities for **all** students to create and interpret multiple representations

Indicator 3 - Teacher assists **all** students to use existing knowledge and prior experience to make connections and recognize relationships

Indicator 4 - Teacher structures the classroom environment to enable collaboration, participation, and a positive affective experience for **all** students

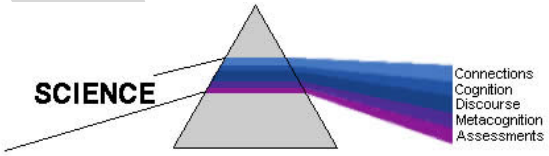
Science Teacher Professional Development Sessions Sequence:

Session I (20 min.)
- Introduction
- Video

Session II (20 min.)
- Video
- Strategy Highlights

Session III (20 min.)
- Strategy Highlights
- Team Talk
- Applications

Session IV (20 min.)
- Applications
- Reflection



Key Ideas from Theory and Research:

- To engage students in active meaning making, students need to participate in discourse patterns in all domains, both orally and in written format (e.g., Jewitt & Ogborn, 2001). These discourse patterns include developing arguments, explaining, critiquing, using logic, and giving evidence to support or refute a claim (e.g., Halliday & Martin, 1993).
- Students' use of meaningful academic language has been shown to be much more prevalent in classrooms when teachers establish clear learning structures aligned with clear learning expectations and provide appropriate scaffolding for students (Quinn, Lee, & Valdes, 2012).
- Being able to understand and create representations is related to and may affect complex problem solving, transfer of knowledge to novel situations, and understanding of higher-level concepts (e.g., Greeno & Hall, 1997; Skemp, 2012).
- When students are engaged in learning processes which are driven by discourse about objects and ideas, they more effectively progress through increasingly complex states of conceptual understanding (e.g., moving from observations to modeling observations to then explaining and defending models) (National Research Council, 2011; Quinn, Lee, & Valdes, 2012).
- In science, for example, when students can spontaneously generate analogies for the scientific phenomenon they are learning, particularly in the process of overcoming misconceptions, their understanding greatly improves (e.g., Clement, 1989; Wong, 2006).
- Collaboration with peers encourages motivation and cognitive engagement. Collaboration involves working with others to obtain information, to share and discuss ideas and interpretations, and to receive feedback (Blemenfeld, Kempler, & Krajcik, 2006; Wentzel, 1997).

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Standard 3: Students Engage in Meaning-Making through Discourse and Other Strategies

Session I:

Introduction: 2 min.

This video shows a teacher, Brian, having students work on a small group project to use evidence to construct scientific explanations of pitch & volume of sound, in a 9th grade Physical Science class. He incorporates the strategy of Evidence Buckets for students to draw evidence from to assist with constructing their explanations. This video represents Day 7 in the instructional sequence, and students have had multiple experiences upon which to draw their reasoning.

He is a 2nd year teacher. The student demographics are: 75% Free/Reduced Price Lunch, 15% English Language Learners, 78% Students of Color, 20% Special Education Students.

Videos from: http://ambitiousscienceteaching.org/video-series/high-school-physics-of-sound-legacy-series/

Video: 20 min.

https://www.dropbox.com/s/f46307ijxx8y9qd/Day%207%20compiled%20video.mp4?dl=0

Video segments with independent, teacher focus questions.

1. Introduction to small group project task:
   Time: 0:00 - 2:52
   What strategies is the teacher using to provide students with opportunities to engage in extended, productive discourse (orally and written) within their small groups?

2. Individual thought:
   Time: 2:52 - 19:55
   How is the teacher providing students with opportunities to create and interpret multiple representations of the concept of pitch & volume of sound?

   What types of prompting does the teacher use to encourage student discourse both with him and within the small groups? (List several examples)

3. Initial group work:

   Why do you think the teacher does not just tell the students to use specific pieces of evidence, from the four Evidence Buckets, in order to help them complete their small group task?

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Session II:

Video (continued): 20 min.

4. Students engage in extended, productive discourse with the teacher and within groups to develop scientific explanations based upon evidence. The teacher scaffolds student experiences, explanations, and models to elicit richer explanations supported with evidence:
   Time: 0:00 - 9:52
   https://www.dropbox.com/s/9p2oosy87uklm09/Day%208%20Video%201%20Compiled.mp4?dl=0
   Notice how the teacher moves from group to group and negotiates the discussions. He is asking clarification questions about the strength of the scientific explanations based upon evidence, and uses scaffolded questions to guide, not tell, student thinking. He is letting the students struggle with using their experiences to explain the phenomena.

   Why do you think he asks the students to explain their models and evidence pieces, and what is he doing when they are explaining?

   Why do you think the teacher asks the students to modify their models based upon the group discussion and his guiding questions?

5. Teacher intentionally uses student's language and partial understandings as building blocks to shape the direction of classroom conversations. He promotes productive conversation and investigates students' lines of thinking by merging their explanations with scientifically acceptable ideas.
   Time: 0:00 - 10:58
   https://www.dropbox.com/s/h0u120k5ir6iifc/Day%208%20Video%202.mp4?dl=0

   What strategies does the teacher use to challenge the students' explanations? Are they effective?

   What evidence can you cite from the video to support the claim, "the teacher is supporting students as they use evidence to explain the varying pitch or volume phenomena within the drum problem"?

Strategy Highlights: 10 min. (in conjunction with the video)

After watching the video and addressing each of the teacher focus questions in Sessions I and II, what general science classroom strategies did you see the teacher use that you believe were or were not effective at achieving the indicators of Standard 3? Use examples to support your claims.

Strategies that were effective:	Strategies that were ineffective:

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Session III:

Strategy Highlights (continued): 3 min.

After watching the videos, addressing each of the teacher focus questions in Sessions I and II, and identifying general science classroom strategies, identify what challenges and successes you would expect if you were to implement one of the strategies that you thought was effective in your classroom. Remember, your focus is just on strategies that you believe will help you achieve the indicators of Standard 3.

I would like to think about implementing…

I think a challenge to this strategy would be…

I think a success to this strategy would be…

Team Talk: 10 min.

Using your colleagues as professional resources, share your thoughts about a strategy represented in the video that you would like to try in your classroom to target achievement of the indicators of Standard 3.

Discuss as a group the perceived benefits and challenges to the strategy.

Central Ideas for the Group Discussion:

Applications: 7 min.

Using the feedback from your peers, determine if you still value the strategy enough to try it out, or if you would like to choose another based upon the group discussion.

- **Create a list of the materials, student steps/directions, and resources that you will need to implement the strategy in your classroom.**
- **Describe the big science idea you will target with your strategy.**
- **Describe when you will implement the strategy (tomorrow, start of next lesson, etc.).**
- **You must implement the strategy before moving to Session IV.**

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Session IV:

Applications (continued): 10 min.

Work in small, non-discipline specific teams. Describe the application of your strategy to your peers so they understand what you did, what the students did, and your goal for the strategy implementation.

Discuss the list of the materials, student steps/directions, resources that you created, and the overall experience of implementing your strategy.

Describe how the strategy did or did not help you target the indicators for Standard 3.

Describe the aspects of your strategy implementation that you believe were **effective** at achieving the indicators of Standard 3.

Describe the aspects of your strategy implementation that you believe were **ineffective** at achieving the indicators of Standard 3.

Reflection: 10 min.

After your small group discussion, think about your implementation, the results, and you peer's feedback. Effectiveness should be measured based upon the indicators for Standard 3:

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What would you change to make your implementation more effective? What evidence do you have to support your claims?

What went well in the implementation of your strategy? What evidence do you have to support your claims?

Is this a long-term strategy that you can implement at the start of every thematic unit? Why or why not?