

Nevada Educator Performance Framework

Workshop Series Guide for SCIENCE Educators

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

Indicator 1 - Tasks purposefully employ **all** students' cognitive abilities and skills

Indicator 2 - Tasks place appropriate demands on each student

Indicator 3 - Tasks progressively develop **all** students' cognitive abilities and skills

Indicator 4 - The teacher operates with a deep belief that **all** children can achieve regardless of race, perceived ability and socio-economic status.

Science Teacher Professional Development Sessions Sequence:

Session I (20 min.)

- Introduction
- Video

Session II (20 min.)

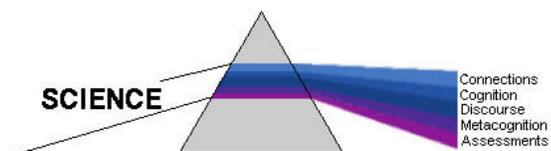
- Video
- Strategy Highlights

Session III (20 min.)

- Strategy Highlights
- Team Talk
- Applications

Session IV (20 min.)

- Applications
- Reflection



Key Ideas from Theory and Research:

- The success of students in developing high-level cognitive abilities and skills is dependent on their engagement in deep and rich tasks that afford such opportunities (Lin, 2005; Stein, Grover, & Henningsen, 1996; Stigler et al., 1999).
- The nature and level of a task will vary among students. This needs to be considered when planning activities that have high cognitive demand for diverse learners as a goal (Moll, 1990).
- Students attain deep knowledge when engaged in tasks that are authentically related to the everyday practices of professionals in a discipline, retaining fundamental, disciplinary practices and beliefs while also being age appropriate (Sawyer, 2006).
- Learning tasks that connect new learning to prior learning in networks structured around key ideas of the subject-matter can support the development of schema (Good & Brophy, 1994).
- Teachers engage students in learning that is within their ZPD, (Zone of Proximal Development, not too hard and not too easy) through tasks and interactions that involve a gradual release of assistance so that the learning ultimately becomes part of the student's independent achievement (Tharp & Gallimore, 1989; Vygotsky, 1986).

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Session I:

Introduction: 3 min.

This video shows a teacher, Mrs. Sjoberg, half way through a unit of instruction about the behavior of gases under pressure in an 11th grade Chemistry class. She is a 2nd year teacher. The student demographics are: 64% Free/Reduced Price Lunch, 8% English Language Learners, 5% Hispanic, 20% White, 75% Black, 13.6% Special Education Students.

Videos from: <http://ambitiousscienceteaching.org/video-series/high-school-gas-laws-legacy-series/>

Video: 17 min.

Video segments with independent, teacher focus questions.

1. Reviewing homework and connecting content:

Time: 0:00 - 10:57

https://www.dropbox.com/s/sb4vlx8vix8c9v2/Beth_Days_5%266_P1.mp4?dl=0

Do you think the classroom practice of asking students to either make or modify diagrams and/or models based upon science reading assignments is valuable?

Please explain your response.

2. Using models to connect science concepts:

Time: 0:00 - 6:00

https://www.dropbox.com/s/cl9vrdnopajtpic/Beth_Days_5%266_P2.mp4?dl=0

After watching the teacher discuss different student models, what would you like to see the teacher do next to engage all students in cognitively demanding tasks?

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Session II:

Video (continued): 11 min.

3. Students work in lab setting, guided to record observations, model their observations, and explain their thinking:

Time: 0:00 – 10:20

During the “mini-lab” the students investigate the concept of pressure using different systems and a guide. Notice how the teacher moves from group to group during the “mini-lab” and pushes the students to clarify and retest their understanding. On occasion, she replaces their incorrect science terms with scientifically appropriate terms.

Note* The “Can Crushing Activity” that the teacher refers to when discussing pressure with a student (Javier) is a lab that the students completed using hot and cold water to crush a can.

https://www.dropbox.com/s/5dm7nnl8gaeerg0/Beth_Days_5%266_P3.mp4?dl=0

When you think about student understanding, of concepts related to pressure, some teachers have different opinions about how best to provide students with content. Which teacher’s description below do you agree with and why?

Teacher A: Students must be provided with science terms and definitions so when they are completing a lab they can understand what they are doing.

Teacher B: Students must be provided with lab opportunities and experiences with science concepts so they have a reference to link science terms to a model.

Task Analysis: 10 min.

After watching the video and addressing each of the teacher focus questions in Sessions I and II, what do you believe constitutes “high cognitive demand” when referencing student tasks? Specifically, some teachers think that high cognitive demand tasks occur when student understanding is challenged. Others believe that high cognitive demand tasks occur when students are engaged. Describe the basic elements of a “high cognitive demand tasks” and give some examples and non-examples of tasks that you have seen in science classrooms. Use the indicators for Standard 2 as a guide for developing your working definition.

High cognitive demand tasks are:	
Examples of high cognitive demand tasks are:	Non-examples of high cognitive demand tasks are:

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Session III:

Team Talk: 10 min.

After watching the video and addressing each of the teacher focus questions in Sessions I and II, and describing what you believe constitutes “high cognitive demand” tasks, describe and compare your thoughts with the thoughts of your peers. When discussing, refer to the indicators for Standard 2 as a guide.

Discuss as a group the working definitions, examples, and non-examples of “high cognitive demand” tasks

Central Ideas from the Group Discussion:

Do all department members agree about what constitutes a “high cognitive demand” task? Explain.

Applications: 10 min.

Based on the group discussion with your peers, select two types of “high cognitive demand” tasks that you think connect well with your current or next unit of instruction. As you plan your current, or next, unit of instruction think about ways of strategically incorporating two types of “high cognitive demand” tasks that you believe are valuable into your instruction.

- What two tasks did you select?
- Describe the big science idea your tasks will target.
- Describe how your tasks connect to the big science idea.
 - Do they cover all or part of the big idea?
 - Do the tasks build upon each other, relate to each other, or are unconnected?
- **You must implement the tasks before moving to Session IV.**

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Session IV:

Applications (continued): 10 min.

Work in small, discipline specific teams. Describe the implementation of the tasks to your peers so they understand what you did, what the students did, and your big science goal for the two tasks.

Discuss your over all experience in implementing the two “high cognitive demand” tasks.

Describe how the tasks did or did not help your students develop a deeper understanding of the big science idea you were targeting. Use the indicators for Standard 2 to support your claim of effectiveness.

Describe how well your two tasks connected with each other to support student understanding of the big science idea. Specifically, how well did the first task build to the second task and how did each task connect to the content standards?

Reflection: 10 min.

After your small group discussion, think about your implementation and the results. Effectiveness should be measured based upon the indicators for Standard 2:

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After discussing the tasks with your peers, do you believe the tasks were **effective** in accomplishing the learning goals you set for your students?

What can you claim went well with regard to the implementation of your tasks? What evidence do you have to support your claim(s)?

What could you change about the tasks to make them more cognitively demanding? What evidence do you have to support your claims?