Integrating Science And Language For All Students With A Focus On English Language Learners

Brief 6 of 7

SCIENCE AND LANGUAGE ASSESSMENT SHIFTS

Produced for the New York State Education Department by
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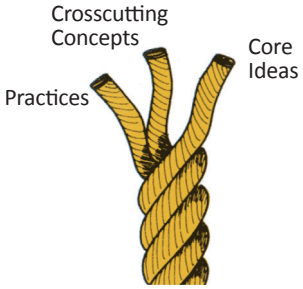
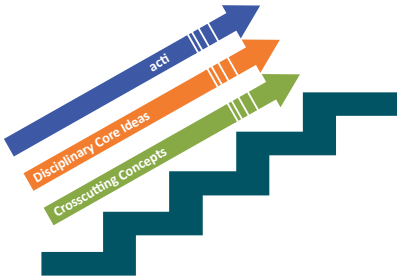
The New York State (NYS) P-12 Science Learning Standards call for changes in the way we teach, or instructional shifts. The goal is not just for students to learn science facts and information but rather to make sense of phenomena by engaging in three-dimensional learning and building their understanding over time, or learning progressions.

Phenomenon

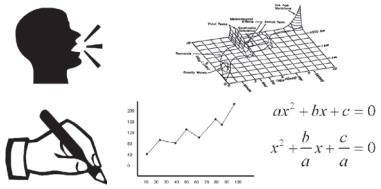


Three-dimensional Learning



Learning Progressions

To engage in this type of science learning, all students, and English language learners (ELLs) in particular, benefit from using multiple modalities, drawing from everyday and specialized registers, and engaging in different types of interactions in a community of practice.



Modalities

Registers

Interactions

The type of science learning promoted by the standards requires not only shifts in instruction but also assessment. We refer to these as the **science and language ASSESSMENT shifts**.

In this brief, we illustrate how the assessment shifts are reflected in classroom assessment tasks, both tasks used for summative purposes (e.g., an end-of-unit assessment) as well as tasks used for formative purposes as part of the teaching and learning process. We illustrate the assessment shifts in the context of a fifth-grade science unit aligned to the standards and designed with a specific focus on ELLs. In this unit, students explain the phenomenon of garbage in their home, school, and community while developing their understanding of key physical and life science ideas.

Science and Language Assessment Shifts

PHENOMENON

Design assessment tasks anchored in local phenomena that draw on students' everyday experiences and language.

MODALITIES

Design assessment tasks that provide opportunities for students to use multiple modalities, both as part of the assessment input (what students are given) and the expected response (how students respond).

3-D LEARNING

Design assessment tasks that engage students in three-dimensional learning that blends science and engineering practices, disciplinary core ideas, and crosscutting concepts.

REGISTERS

Design assessment tasks that provide opportunities for students to respond using everyday and specialized registers.

Prioritize science disciplinary meaning over linguistic accuracy.

LEARNING PROGRESSIONS

Design assessment tasks with scaffolds that can be gradually removed as students become more proficient with three-dimensional learning over time.

INTERACTIONS

Design assessment tasks that provide opportunities for students to engage in a range of interactions.

Recognize that students' language use will vary to meet the communicative demands of different types of interactions.

PHENOMENON

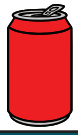
This task is anchored in the unit phenomenon of garbage. Tasks anchored in the unit phenomenon are particularly beneficial for ELLs, who have had multiple and sustained opportunities to develop proficiency with the language associated with the phenomenon during instruction.

3-D LEARNING

This task engages students in three-dimensional learning that blends a science and engineering practice, disciplinary core idea, and crosscutting concept. To respond to this task, students use the crosscutting concept "Patterns" to interpret the data in the tables in order to generate evidence for the argument. Students also engage in argument from evidence, one of the science and engineering practices. Finally, students use their understanding of the disciplinary core idea that materials are identified by their properties as the reasoning that links their evidence to their claim.

Assessment Task 1

Rafael is carrying out an investigation to find out what happens to his garbage over time. He puts a piece of a soda can and a piece of an orange into a bottle with water and soil and leaves the bottle open for 2 weeks. He records his observations at the beginning of the investigation and then again after 2 weeks:

Material: ***Soda can*** 

	Color	Texture	Smell	Reflectivity
Beginning	red	smooth	none	shiny
After 2 weeks	red	smooth	none	shiny

Material: ***Orange*** 

	Color	Texture	Smell	Reflectivity
Beginning	orange	smooth	fruity	shiny
After 2 weeks	brown	fuzzy	bad-smelling	dull

Based on these observations, **has the ORANGE changed after two weeks?** Write an argument based on evidence to answer this question. Your argument should include a claim, evidence, and reasoning. 

a. Claim (HINT: Answer the question)

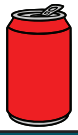
b. Evidence and Reasoning (HINT: Support your answer using evidence from the tables)

LEARNING PROGRESSIONS

This task, which is part of the first instructional unit of the school year, includes scaffolds related to the practice of engaging in argument from evidence. Students are reminded that an argument "should include a claim, evidence, and reasoning." They are also provided two boxes, one for the claim and one for the evidence and reasoning. Finally, students are provided "hints" as reminders of what counts as a claim, evidence, and reasoning in a science argument. Over the course of the year, as students become more proficient with the practice, these scaffolds are gradually removed from assessment tasks.

Assessment Task 1: Student Response

Rafael is carrying out an investigation to find out what happens to his garbage over time. He puts a piece of a soda can and a piece of an orange into a bottle with water and soil and leaves the bottle open for 2 weeks. He records his observations at the beginning of the investigation and then again after 2 weeks:

Material: ***Soda can*** 

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Material: ***Orange*** 

	Color	Texture	Smell	Reflectivity
Beginning	orange	smooth	fruity	shiny
After 2 weeks	brown	fuzzy	bad-smelling	dull

Based on these observations, **has the ORANGE changed after two weeks?** Write an argument based on evidence to answer this question. Your argument should include a claim, evidence, and reasoning. 

a. Claim (HINT: Answer the question)

Yes the orange did change after two weeks.

b. Evidence and Reasoning (HINT: Support your answer using evidence from the tables)

The orange properties change thats how I now that after 2 weeks it change some of the properties that change is the color before it was orange and now its brown and the texture before was smooth and now its fuzzy

MODALITIES

To respond to this task, students interpret a data table and then respond in the written modality.

REGISTERS

To respond to this task, students can draw from everyday and specialized registers, or ways of using language. In this response from an ELL, there are some grammatical issues, but the student makes a claim that answers the question and then supports their claim using evidence from the tables. The student uses the specialized term "properties," and they are precise in comparing the properties of the orange at the beginning of the investigation with the properties after 2 weeks. In the science classroom, assessment criteria should prioritize precision of disciplinary meaning over linguistic accuracy, as students can express accurate science ideas with less-than-perfect English and without always using specialized language.

INTERACTIONS

To respond to this task, students engage in a one-to-many interaction in the written modality. Students need to communicate with an audience not immediately present, and they cannot rely on a shared frame of reference as is common in one-to-one interaction in the oral modality.

In this response, the student communicates their ideas explicitly by writing, "Some of the properties that change is the color before it was orange and now it's brown." In a one-to-one interaction with a peer in the oral modality, the student might have just pointed to the data table and communicated the same idea by saying, "They changed."

Assessment Task 2

You are in the school cafeteria, and you smell food coming from the kitchen.

a. Develop a model of how the smell of food travels from the kitchen to your nose. Your model should include both *components* and their *interactions*.

b. Based on your model, explain in words (1) how the smell of food travels from the kitchen to your nose and (2) why you cannot see the smell.

3-D LEARNING

This task engages students in three-dimensional learning that blends science and engineering practices, a disciplinary core idea, and a crosscutting concept. Specifically, the task engages students in the practices of developing models and constructing explanations. To respond to the task, students need to understand a disciplinary core idea related to the particle nature of gas. Students also engage with the crosscutting concept of "Scale, Proportion, and Quantity," as they explain that the gas particles are too small to see.

LEARNING PROGRESSIONS

This task, which is part of the first instructional unit of the school year, includes a scaffold related to the practice of developing models. Students are reminded that a model of a system "should include both components and their interactions." This scaffold is removed over the course of the year as students become more proficient with the practice of developing models.

PHENOMENON

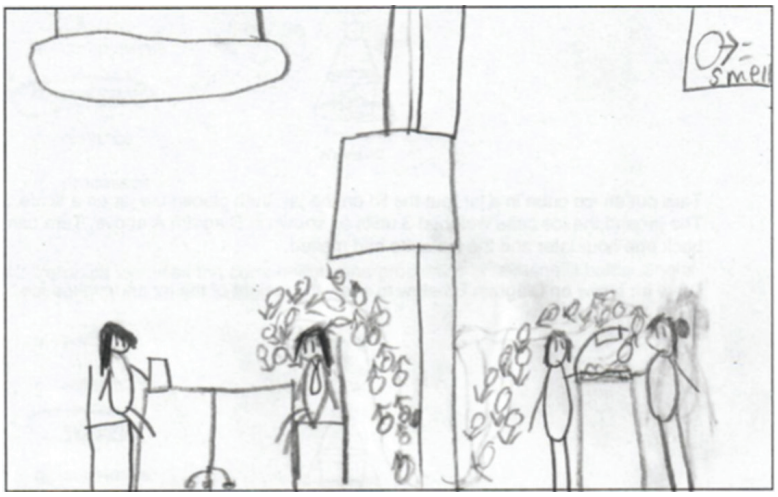
This task is anchored in the phenomenon of smell traveling from the kitchen to the nose, which is not explicitly addressed in the unit. In the unit, students develop models of smell produced by decomposing food materials. This "extension task" assesses the same science and engineering practice of modeling, crosscutting concept of scale, proportion, and quantity, and disciplinary core idea related to the particle nature of gas covered in the unit but in the context of a different phenomenon.

It is important to assess students using tasks anchored in phenomena different from the unit phenomenon to assess the extent to which students can apply what they learned to a less familiar context. Ideally, extension tasks should be anchored in other local phenomena that students are likely to be familiar with. Extension tasks may introduce new language demands for ELLs.

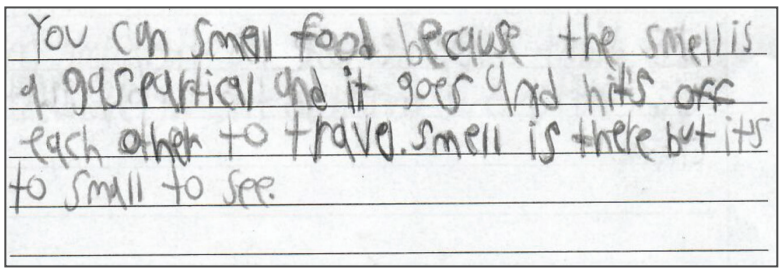
Assessment Task 2: Student Response

You are in the school cafeteria, and you smell food coming from the kitchen.

a. Develop a model of how the smell of food travels from the kitchen to your nose. Your model should include both *components* and their *interactions*.



b. Based on your model, explain in words (1) how the smell of food travels from the kitchen to your nose and (2) why you cannot see the smell.



MODALITIES

In this task, the student responds using both visual and linguistic modalities. First, the student uses dots and arrows to show how gas particles travel from the kitchen to the nose. Then, they explain in words, based on their model, how the smell of food travels and why they cannot see the smell.

While important for all students, using multiple modalities is especially beneficial to ELLs, who have sophisticated science ideas but are still developing the language to communicate those ideas in English.

REGISTERS

To respond to this task, students can draw from everyday and specialized registers. In this response from an ELL, the student uses the everyday expression "hits off each other" to describe how gas particles move freely. The student also refers to a singular gas particle ("a gas partical"), although the visual model shows multiple gas particles traveling across the room.

What's important is that assessment criteria keep the focus on *what* students are attempting to communicate (in other words, their meaning), not only *how* they are communicating.

INTERACTIONS

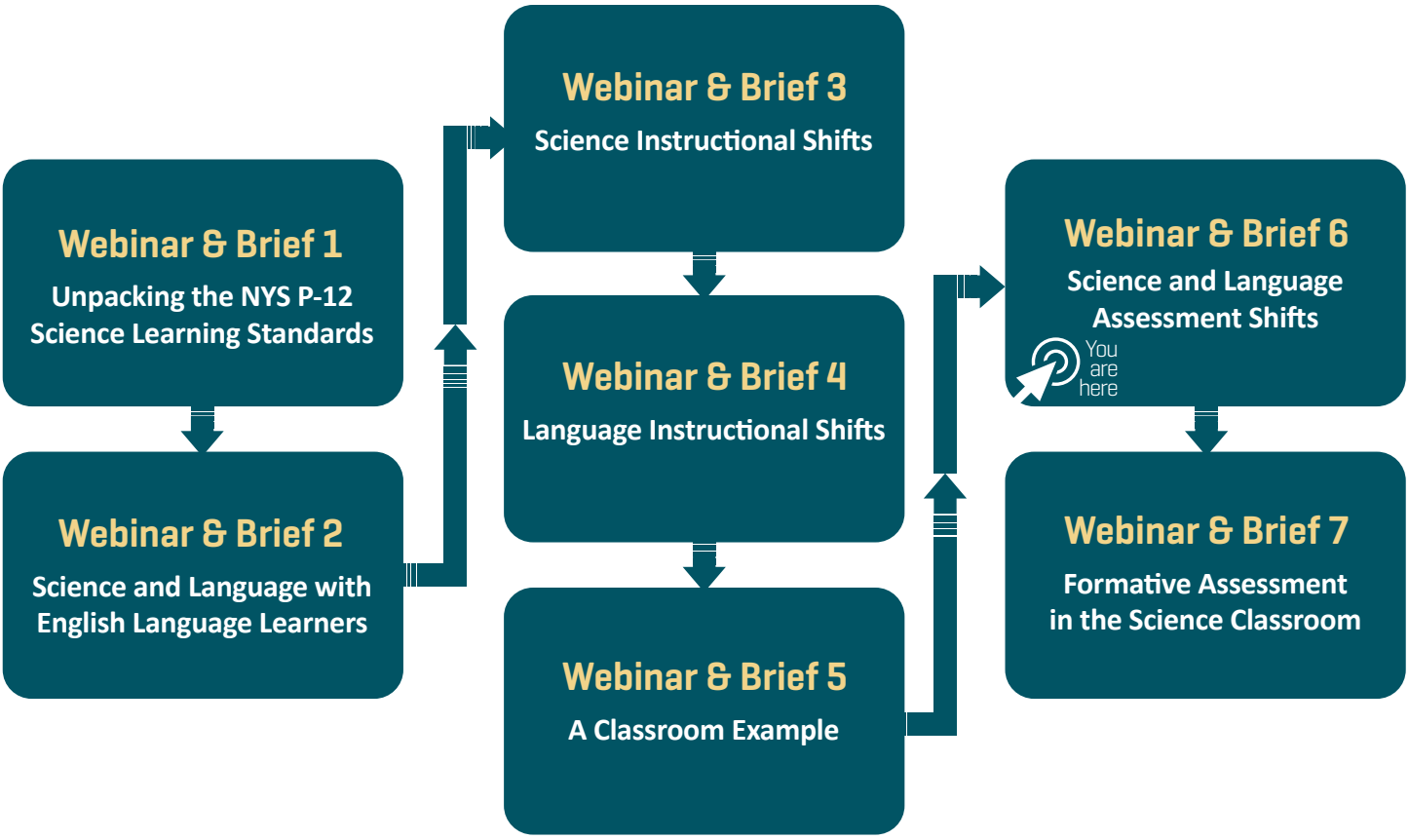
To respond to this task, the student engages in a one-to-many interaction in visual and written modalities. In the visual modality, the student communicates explicitly by including a key (top right) that explains the meaning of the dots and arrows in the model.

Formative assessment tasks throughout a unit could also include opportunities for students to interact with the teacher, small groups, and the whole class using visual as well as oral and written linguistic modalities.

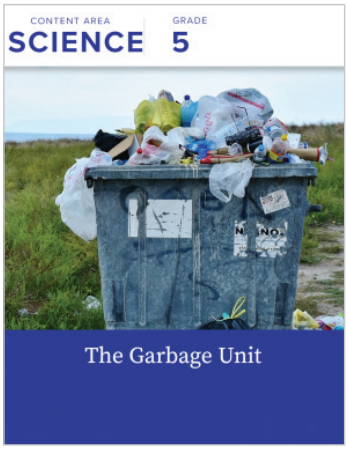
Conclusion

Enacting the NYS P-12 Science Learning Standards in the classroom requires shifts in instruction, which in turn require shifts in assessment. As the focus of instruction shifts from teaching science information to promoting students' engagement in three-dimensional learning for the purpose of explaining phenomena, so does the focus of assessment. This means that assessment tasks in the science classroom are likely to elicit open-ended responses with multiple steps. Even though these types of tasks may present some challenges to ELLs (compared to multiple-choice items, for example), research indicates that ELLs may benefit from open-ended tasks that allow them to express themselves using multiple registers and modalities in different types of interactions. These types of tasks also allow all students to engage in literacy practices that are essential to science and across content areas.

Map of brief and webinar series on integrating science and language with ELLs



Additional Resources



Science And Integrated Language (SAIL)

NYU

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