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

Brief 4 of 7

LANGUAGE INSTRUCTIONAL SHIFTS

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Enacting instruction aligned to the New York State (NYS) P-12 Science Learning Standards with English language learners (ELLs) requires shifts in how teachers think about language in the science classroom. This brief introduces language instructional shifts, or contemporary ways of thinking about language that depart from more traditional thinking. Traditionally, science instruction with ELLs has emphasized learning discrete elements of vocabulary and grammar. In contrast, contemporary thinking emphasizes using language, in combination with other meaning-making resources, to engage in purposeful communication in the science classroom.

The three language instructional shifts presented in this brief focus on modalities, registers, and interactions. For each shift, we will address (1) what is the shift, (2) what does the shift look like in science classrooms with ELLs, and (3) what can teachers do in their own classrooms to begin enacting the shift.

Each shift is illustrated 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. Throughout this brief, we will refer to this unit as "the garbage unit." The complete unit is available at nyusail.org for teachers to download and use.

AT A GLANCE

MODALITIES

Modalities refer to the multiple and diverse channels through which communication occurs. In the science classroom, students use both visual and linguistic modalities to engage in science practices. ELLs in particular benefit from using multiple modalities to communicate their ideas.

REGISTERS

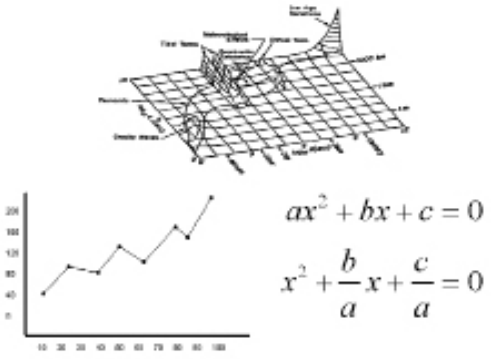
Registers refer to ways of using language in different contexts or for different purposes. In the science classroom, students use both everyday and specialized registers to engage in science practices. ELLs in particular benefit from using everyday language as they begin making sense of phenomena.

INTERACTIONS

Interactions refer to the setting and participants involved in communication. In the science classroom, students participate in different types of interactions (one-to-one, one-to-small group, one-to-many) with varying communicative demands. ELLs in particular benefit from one-to-one interactions in which they can use gesture and resources in the situation to communicate their ideas.

MODALITIES

Modalities refer to the multiple and diverse channels through which communication occurs. These include the linguistic modalities of listening, speaking, reading, and writing as well as visual modalities, such as drawings, symbols, graphs, and tables. Engaging in science practices called for by the NYS P-12 Science Learning Standards involves using multiple modalities to communicate ideas. For example, students develop explanatory models of science phenomena using a combination of drawings, symbols, and written language.

Linguistic	Visual
	

What is the shift?

Traditionally, nonlinguistic modalities (e.g., visuals) have been thought of as scaffolds for ELLs until these students develop English proficiency. For example, ELLs may be asked to draw their understanding of science ideas but only until they can communicate those ideas using linguistic modalities (e.g., a written explanation). Contemporary thinking suggests that nonlinguistic modalities are essential to engaging in science practices and especially beneficial to ELLs. In other words, drawings, symbols, graphs, and tables are not just scaffolds toward language; they are essential meaning-making resources of science disciplines. Thus, using multiple modalities to communicate ideas is important for all students in the science classroom and can be particularly beneficial to ELLs at the beginning levels of English proficiency.

TRADITIONAL THINKING

Nonlinguistic modalities are scaffolds for ELLs until these students develop English proficiency.

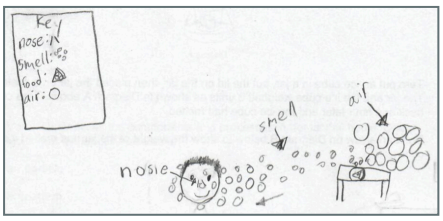
CONTEMPORARY THINKING

Nonlinguistic modalities are essential to engaging in science practices and especially beneficial to ELLs.

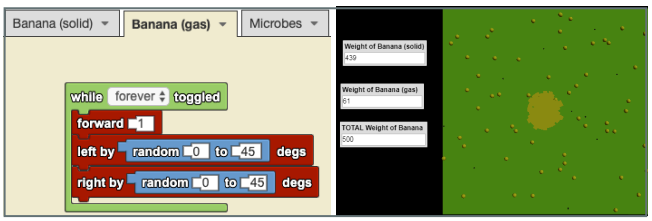
What does the shift look like in the classroom?

In the garbage unit, students make observations of garbage materials over time. When they start to notice an unpleasant smell coming from the decomposing food materials, students wonder, "What is that smell?" and "How does it get to my nose?" As they engage in investigations to answer these questions, students use multiple modalities to communicate their emerging ideas. Alicia uses a combination of drawings, symbols, and written language to develop a model of smell made of gas particles. Isabel, a former ELL, writes a computer program that instructs gas particles from a decomposing banana to move freely around in space. Samuel, an ELL, uses gesture to communicate the dynamic process of particle movement. In all of these examples, students are engaging in science practices (e.g., developing models) and using multiple modalities to communicate their understanding of a key physical science idea (i.e., particulate nature of gas). While important for all students, using multiple modalities is especially beneficial to ELLs such as Samuel, who often have sophisticated science ideas but are still developing the language to communicate those ideas in English.

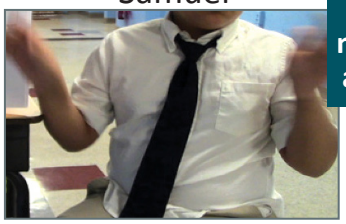
Alicia



Isabel



Samuel



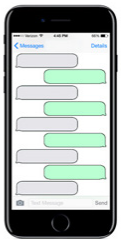
What can teachers do to enact the shift?

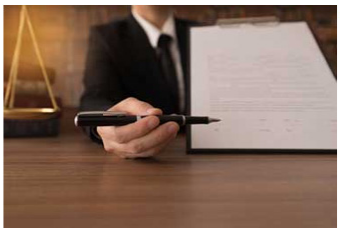
Recommendation 1: Provide opportunities for students to engage in science practices using multiple modalities.

Recommendation 2: Guide students in using modalities strategically to communicate their ideas.

REGISTERS

Registers refer to ways of using language in different contexts or for different purposes. Registers exist on a continuum from everyday to specialized. Everyday language is the language used in daily life, for example, when grabbing a cup of a coffee with a friend or writing a text message. Specialized language is the language used among members of a particular community to carry out their collective work, for example, the language used by sports announcers when calling a baseball game or by lawyers when drafting a contract. This specialized language affords the precision necessary to communicate ideas with exactness. As students engage in science practices called for by the NYS P-12 Science Learning Standards, they use registers ranging from everyday to specialized in their science classroom communities.



Everyday language — Specialized language

What is the shift?

Traditionally, specialized language has been thought of as a precursor or prerequisite to learning science. For example, ELLs may be expected to master specialized science vocabulary (e.g., "particles") at the beginning of a lesson or unit before they are deemed ready to engage in rigorous grade-level science instruction. However, this traditional thinking can exclude ELLs from the very opportunities for sense-making and interaction that they need to develop specialized language. Contemporary thinking suggests that, rather than being a precursor or prerequisite, specialized language is actually a product of learning science. In other words, as students develop more sophisticated science understanding over the course of instruction, they also develop the specialized language to communicate their ideas with precision.

TRADITIONAL THINKING

Specialized language is a prerequisite or precursor to learning science.

CONTEMPORARY THINKING

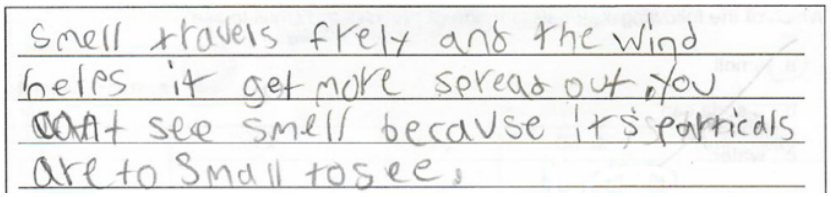
Specialized language is a product of learning science.

What does the shift look like in the classroom?

In the garbage unit, students notice an unpleasant smell coming from the decomposing food materials. As students make their initial observations of smell, they use everyday language and home language to communicate their ideas. For example, they observe, "Something is coming out," "It's going everywhere," and "¡Es invisible!" The opportunity to use their full range of linguistic resources allows all students, and especially ELLs, to participate meaningfully from the very beginning of science instruction.

As students develop more sophisticated science understanding, they begin to use more specialized language to communicate their ideas. The precision afforded by the specialized register includes science vocabulary (e.g., "particles") but also goes beyond the individual word level. For example, students use the expression "travels freely" to communicate precisely about the movement of smell and "too small to see" to communicate precisely about the scale at which gas particles can be observed. Precision is not the same as linguistic accuracy, as ELLs can construct precise explanations through their emerging English.

¡Es invisible!



Everyday language — Specialized language

What can teachers do to enact the shift?

Recommendation 1: Provide opportunities for students to engage in science practices using all of their linguistic resources. Everyday language is a crucial resource for all students, and ELLs in particular, as they begin making sense of phenomena. Introducing more specialized language too early in instruction could short-circuit opportunities for sense-making and lead students to adopt specialized language without having developed understanding of the underlying science ideas.

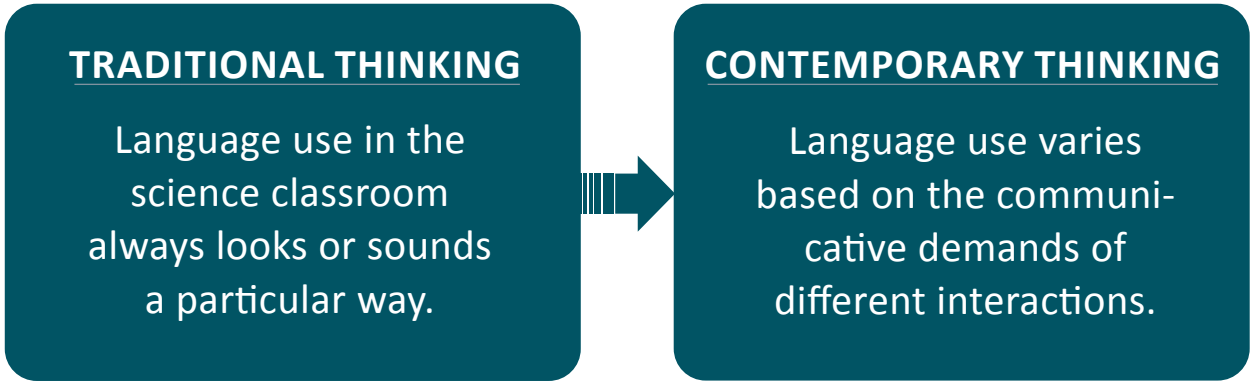
Recommendation 2: Guide students in using specialized language to communicate their ideas with precision. As students' science understanding becomes more sophisticated, teachers can introduce and model specialized language in context when that language becomes useful for furthering the class's sense-making. As students approximate this specialized register to varying degrees, teachers should keep the focus on *what* students are communicating, not just *how* they are communicating. For example, teachers should not let grammatical inaccuracies distract from the content of students' contributions. This is particularly important with ELLs, who often have sophisticated science ideas but may communicate those ideas using less-than-perfect English.

INTERACTIONS

Interactions refer to the setting and participants involved in communication. In science classrooms that embrace the vision of the NYS P-12 Science Learning Standards, students work together as a community toward the common goal of explaining phenomena. In this classroom community, students engage in a range of different interactions. These include one-to-one interactions (e.g., one student talking to a partner), one-to-small group interactions (e.g., one student talking to a small group), one-to-many interactions (e.g., one student talking to the class), and small group-to-many interactions (e.g., a small group talking to the class). Each of these interactions requires students to use modalities and registers differently. For example, one-to-many interactions may require greater explicitness to communicate beyond the "here" and "now," since students can rely less on a shared frame of reference.

What is the shift?

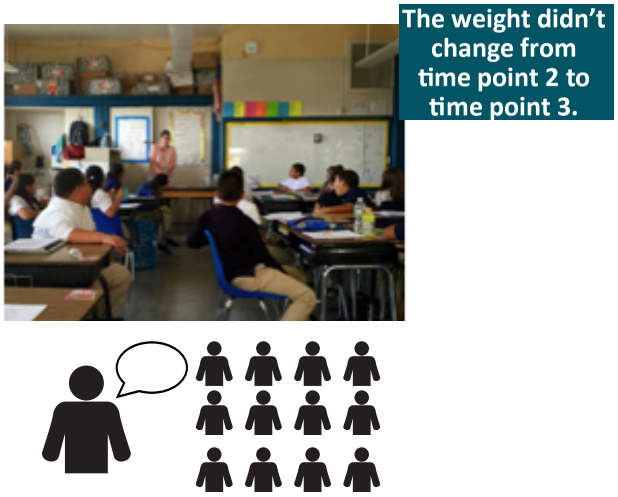
Traditionally, language use in the science classroom has been thought of as looking or sounding a particular way. For example, the "language of science" is typically described as requiring greater explicitness than language used in everyday settings. Contemporary thinking suggests that language use varies based on the communicative demands of different interactions. In other words, whether a particular combination of modalities and registers is appropriate or effective depends on the setting and participants involved.



What does the shift look like in the classroom?

In the garbage unit, students work in small groups to investigate what happens to garbage materials over time. Specifically, they make observations of the properties of garbage materials in open and closed landfill bottle systems at multiple time points. As Sara weighs her closed system, she points at the measurement scale and observes, "It's the same as before." In this one-to-small group interaction, the everyday register in combination with gesture is effective for communicating Sara's intended meaning. This type of interaction is particularly beneficial to ELLs, who can use gesture and resources in the situation to communicate their observations. However, when Sara reports the results of her investigation to the class, she transitions to a more specialized register, "The weight didn't change from time point 2 to time point 3." Because there is no shared frame of reference in this one-to-many interaction,

Sara needs to be more explicit about what exactly is the same (i.e., the weight) and when (i.e., from time point 2 to time point 3). Sara's language use is different between these two interactions but equally effective, as it responds to each interaction's communicative demands.



Typically, writing is thought of as requiring greater explicitness than speaking. However, different types of interactions can occur within each modality, thus demanding different levels of explicitness.

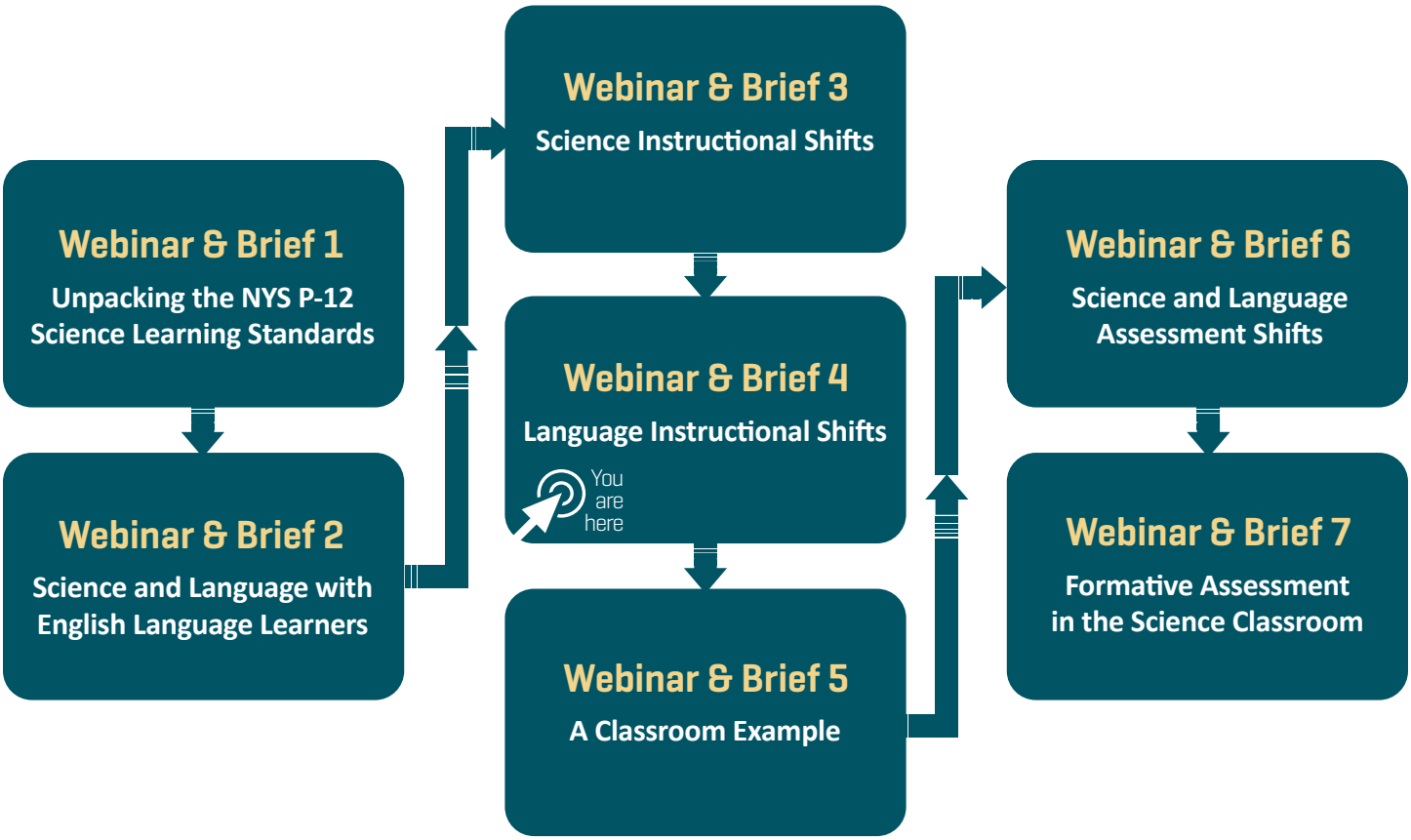
	One-to-one	One-to-many
Speaking	Carrying out an investigation with a partner	Presenting a model to the class
Writing	Recording observations for oneself in a science notebook	Constructing an explanation for the school community

What can teachers do to enact the shift?

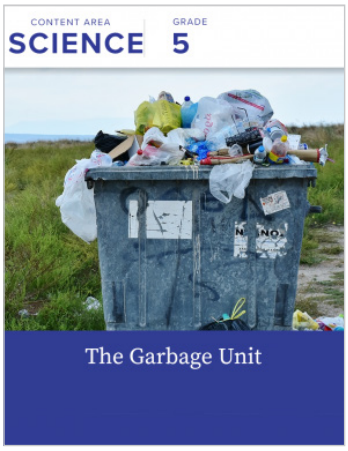
Recommendation 1: Provide opportunities for students to engage in a range of meaningful and purpose-driven interactions. This starts with anchoring science instruction in local phenomena that students are compelled to figure out, which gives them a purpose to communicate and a context in which to express their emerging ideas. As the class works toward explaining phenomena, teachers can provide opportunities for students to engage in different types of interactions. For example, students can carry out an investigation with a partner, develop a model with a small group, engage in a whole-class discussion in which they critique each other's models, and then return back to their small group to revise their models.

Recommendation 2: Guide students in adapting their language use to meet varying communicative demands. This guidance may be particularly crucial as students move from one-to-one interactions, where they can use everyday expressions such as "this one" and "over there" (in combination with gesture), to one-to-many interactions, where there are more stringent requirements for explicitness. As students move across these different interactions, teachers should keep the focus on how students get things done with language in ways appropriate to the situation rather than strictly enforce the specialized register regardless of the type of interaction.

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



Additional Resources



Science And Integrated Language (SAIL)

NYU

Visit our research team's website and access the unit:
www.nyusail.org

NYS P-12 Science Learning Standards:
http://www.nysed.gov/curriculum-instruction/science

NYSED Office of Curriculum and Instruction:
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Office of Bilingual Education and English as a New Language:
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