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Formative assessment from a translanguaging
perspective in the *NGSS* classroom

By Abigail Schwenger, Scott E. Grapin,
Nicole Altamirano, Alison Haas, and Okhee Lee



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ABSTRACT

The *Next Generation Science Standards* hold promise for cultivating the diverse assets that students bring to science learning. One key asset in linguistically diverse science classrooms is translanguaging, or the use of one's full communicative repertoire that transcends boundaries between named languages (e.g., Spanish and English) and modalities (e.g., linguistic and nonlinguistic). For teachers to harness this asset, they will need to hone their skills at formative assessment, specifically, how they listen and respond to students' thinking communicated in ways that go beyond what has been traditionally privileged in science classrooms (e.g., written English). We refer to this as *formative assessment from a translanguaging perspective*. In this article, we illustrate how one fifth-grade teacher engaged in formative assessment from a translanguaging perspective in her dual language science classroom during a three-day lesson focused on planning and carrying out an investigation of plant growth. Specifically, we illustrate how this teacher used multiple types of formative assessment that cultivated her students' translanguaging and enabled her to stay closely attuned to students' thinking as it developed. We close with recommendations for teachers interested in enhancing their formative assessment in linguistically diverse science classrooms.

Keywords: 3–5; NGSS; assessment; life science; planning and carrying out investigations

The *Next Generation Science Standards* (NGSS) hold promise for cultivating the diverse assets that students bring to science learning. In linguistically diverse science classrooms, one key asset is translanguaging (García and Li 2018), or the use of one's full communicative repertoire that *transcends* boundaries between named languages (e.g., Spanish and English) and modalities (e.g., linguistic and nonlinguistic). Similar to how the NGSS focus on what students *do* with science, not strictly whether they “have” science knowledge, translanguaging focuses on what students *do* with language and other meaning-making resources (e.g., gesture), not strictly whether they “have” language (hence, *linguaging* as a verb).

However, teachers can only harness this asset if they elicit, interpret, and respond contingently to students' thinking communicated in ways that go beyond what has been traditionally privileged in science classrooms (e.g., written English). This is the essence of formative assessment (Fine and Furtak 2020; Torrance and Pryor 2001). Specifically, when teachers engage in *formative assessment from a translanguaging perspective*, they stay closely attuned to students' thinking communicated using their full communicative repertoire and follow the *corriente* (or flow) of that thinking as it develops.

The purpose of this article is to illustrate how one fifth-grade teacher, Ms. Altamirano, engaged in formative assessment from a translanguaging perspective in her dual language science classroom during a three-day lesson focused on planning and carrying out an investigation of plant growth. The article closes with recommendations for teachers interested in enhancing their formative assessment in linguistically diverse science classrooms.

Three Days in a Dual Language Science Classroom

Ms. Altamirano teaches in a two-way dual language program that brings together students who are dominant speakers of

English with students who are dominant speakers of a minoritized language (in this case, Spanish) to learn content and each other's languages (Sánchez, García, and Solorza 2018). Of the 20 students in Ms. Altamirano's fifth-grade science classroom, six are migrant refugees who recently arrived from Latin America. Ms. Altamirano is bilingual in English and Spanish.

The focal lesson is situated within an NGSS-designed unit in which students explain the phenomenon of the tiger salamanders' disappearance from a local ecosystem (www.nyusail.org). At this point in the unit, the class had identified a decrease in plants in the ecosystem as a possible cause of the tiger salamanders' disappearance. Thus, students were planning and carrying out an investigation of various plant systems to figure out where plants get the matter (or materials) they need to grow. The class planned to measure and record (on a coordinate plane) the size of the seeds at the beginning of the investigation, then plant the seeds in plastic bags

Amelia and her group respond orally to the teacher's probing.



representing different conditions (with/without water, soil, and air) and measure again after several days. Based on patterns in the data, students would eventually argue from evidence about what materials plants need to grow.

In what follows, we illustrate how Ms. Altamirano engaged in formative assessment from a translanguaging perspective to stay closely attuned to students' evolving thinking across three days of the lesson. For each day, we highlight Ms. Altamirano's reasons for engaging in formative assessment from a translanguaging perspective, her interpretations of students' thinking, and her responsiveness to that thinking via feedback or other instructional moves.

Day 1: Planning the Investigation

On the first day of the lesson, students planned an investigation in small groups (three or four students each) to determine what materials plants need to grow. Ms. Altamirano grouped students heterogeneously based on their comfort in each language. For example, she grouped Amelia (Spanish dominant) with Jack (English dominant) and Elisa (equally comfortable using both languages; all names are pseudonyms). As groups discussed the design of the investigation and their predictions, group members recorded their responses on a handout, which included questions in both

languages and invited students to respond using translanguaging. This formative assessment afforded students the opportunity to translanguage by interacting with peers using oral language and gesture while writing their responses individually in English, Spanish, or both.

After class, Ms. Altamirano reviewed the completed handouts to assess students' understanding of the investigation design and then followed up with students as they carried out the investigation in the next class period. Figure 1 shows the completed handout from Amelia. Her responses indicated understanding of three investigation conditions ("sin sol, sin agua, sin tierra" [without sunlight, without water, without soil]) but did not mention the condition her group would be testing (i.e., sin aire [without air]). Also, Amelia seemed to confuse "soil" and "sol" (Sun in Spanish) and did not list water as an input into the plant system. In the following class period, Ms. Altamirano would follow up with Amelia, particularly about the condition without air and its inputs (see Day 2).

While listening to students discuss their predictions as they completed the handout, Ms. Altamirano noticed that the class did not agree on whether plants would grow without soil. Following the *corriente* of students' thinking, Ms. Altamirano invited the whole class to respond to the

FIGURE 1

Amelia's written responses to the investigation planning handout.

Unit 2: Lesson 3-1 46

Name Nombre _____ Date Fecha _____

Investigation 3-1: Plants Investigación 3-1: Plantas

1. Summarize the plan for the investigation. Resume el plan para la investigación.
We are planning our investigation for plants

2. What inputs are we comparing in our plant systems? ¿Qué entradas estamos comparando en nuestros sistemas de planta?
The inputs are soil, air, sun

3. What data are we observing and recording? ¿Qué datos estamos observando y registrando?
that the plants grow without sun, without water, without soil, and without air

question of whether soil was necessary for plant growth by putting their thumbs up, down, or to the side. After asking individual students to share their predictions, Ms. Altamirano wrapped up the discussion, “I think we’re divided here, vamos a ver” (we’ll see). This informal formative assessment enabled all students to share their thinking using nonlinguistic meaning-making resources (i.e., thumbs up/down/sideways) while enabling Ms. Altamirano to identify a contentious variable (soil) that would motivate the investigation to come.

Day 2: Carrying Out the Investigation

On the second day of the lesson, students carried out the investigation in small groups. Ms. Altamirano circulated around the classroom and used small-group probing (Grapin et al. 2019) to assess whether students understood why they were engaging in the investigation procedures and to get a sense of their evolving predictions about plant growth. As Ms. Altamirano interacted with students, she responded in the language or combination of languages that the students led with and stayed attuned to students’ use of nonlinguistic meaning-making resources (e.g., students gesturing to indicate equal amounts of water in bags with and without soil).

When Ms. Altamirano followed up with Amelia and her group members as they were assembling the condition without air, she probed the group’s thinking: “¿Va a crecer sin el aire? ¿Qué piensan ustedes?” (Will it grow without air? What do you all think?). Amelia shared a revealing prediction while gesturing to the sealed top of her plastic bag: “No, si no aire, no llueve. Si no llueve, no crece” (No, if there’s no air, it can’t rain. If there’s no rain, it won’t grow). Ms. Altamirano’s contingent probing uncovered that Amelia had been making predictions based on the assumption that the condition without air would have *neither* air *nor* water, since water could not be added to a closed bag. This also helped explain why Amelia had not included water as an input in her handout from Day 1. Ms. Altamirano clarified that they would open the bag daily to add water, which allowed Amelia to refine her predictions and continue developing her understanding of fair tests.

Interestingly, Amelia’s prediction revealed an area of uncertainty (Manz and Suárez 2018) in the investigation: Could a condition truly be considered without air if the bag was opened daily to be watered? Again, following the *corriente*, Ms. Altamirano leaned into this uncertainty by bringing the issue to the whole class and facilitating a lively, translanguaged discussion about the limitations of the investigation and its procedures. In this way, Ms. Altamirano’s responsiveness to students’ thinking enabled her to engage the class more authentically in the science and engineering practice of planning and carrying out investigations.

Day 3: Extending the Investigation

On the third day of the lesson, students extended the investigation. While the class waited for the results, Ms. Altamirano

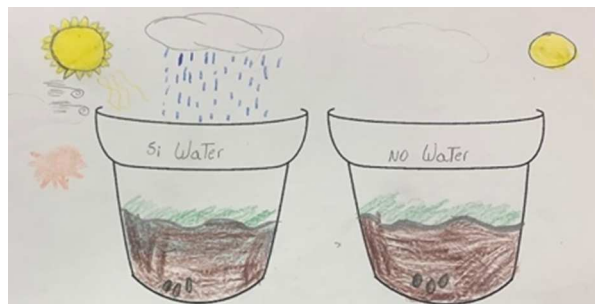
wanted to assess individual students’ progress toward meeting a key lesson goal related to setting up a fair test. Ms. Altamirano designed an assessment task that would allow students to use language they were already familiar with from the class’s investigation of plant growth (e.g., “soil/ tierra” and “sunlight/sol”) to set up their own fair test.

Figure 2 shows Amelia’s multimodal response in which she set up a fair test to determine whether plants need water to grow. Amelia demonstrated her understanding by representing the same components in each pot with the exception of water, which was represented in only one pot (“Sí water” and “No water”). When asked by Ms. Altamirano to describe her setup, Amelia said, “Lo hice para que si hay tres semillas, hay tres semillas. Si hay sol aquí, hay sol acá. Hice la misma cantidad de tierra. Puse la lluvia sobre sólo uno para poder ver si la lluvia es lo que hace que la planta sobreviva” (I did it so that if there are three seeds, there are three seeds. If there is sun here, there is sun there. I did the same amount of soil. I put the rain over only one to be able to see if the water is what makes the plant survive.). As Amelia spoke, she gestured at parts of her drawing to indicate an equal amount of each component (e.g., spreading out her fingers to indicate the same amount of soil in each pot; see Figure 3). In this way, Amelia was able to demonstrate her understanding using *linguistic* meaning-making resources from English and Spanish as well as *nonlinguistic* meaning-making resources, including drawings and gestures.

As Ms. Altamirano circulated the classroom and asked each student to briefly describe (in any language) the setup of their fair test, she documented whether students demonstrated understanding in their drawings (“Drawing Y or N”) and oral responses (“Question Y or N”) and recorded comments on students’ strengths and areas for improvement (see Figure 4). For example, Ms. Altamirano noted that, while Carlos and Maria had also set up fair tests focused on the water variable, they used expressions such as “tiene todo menos agua” (has everything except water) and “had

FIGURE 2

Amelia’s multimodal response to the fair test task.



everything” that could have been more precise about what components were (not) included. In the next class period, Ms. Altamirano would use this documentation to organize students into heterogeneous groups (based on their understanding of a fair test) for a peer feedback activity, thus positioning students such as Amelia as experts in the classroom.

As this lesson was the students’ first experience with fair tests in the school year, Ms. Altamirano did not use the fair test assessment task to assign a grade. Doing so would run counter to her goal of using formative assessment to *understand* students’ thinking, beyond just *evaluating* it (e.g., Torrance and Pryor 2001). However, depending on where students are expected to be in their developing understanding of planning and carrying out investigations, teachers could adapt this formative assessment task to be summative. For example, teachers could co-develop a rubric with students that addresses both science learning and the use of language and other meaning-making resources to communicate that learning.

Recommendations

Over this three-day lesson, Ms. Altamirano used multiple types of formative assessment, including informal (e.g., thumbs up/down/sideways) and formal (e.g., fair test task) assessments, that invited students to communicate their evolving thinking about fair tests and plant growth using a range of meaning-making resources (e.g., gesture, drawing, oral/written English and Spanish). Table 1 summarizes the formative assessments across the three days of the lesson, including what the teacher and students did and what meaning-making resources they used. Had Ms. Altamirano not taken a translanguaging perspective on formative assessment, she would have overlooked the richness of students’ thinking and opportunities to build on that thinking through responsive instruction.

FIGURE 3
Amelia gesturing to Ms. Altamirano about her fair test setup.



FIGURE 4
Ms. Altamirano’s formative assessment documentation from the fair test task.

Teacher Fair Test Individual Check			
Student Name	Drawing Y or N	Question Y or N	Comments
★ [redacted]	Y	Y	"otras cosas (falta) mas agua" - no labels on model
[redacted]	Y	N	
[redacted]	Y	Y	some # of seeds used "same amount"
★ [redacted]	Y	N	
[redacted]	Y?	N	forget "sunlight" in model
[redacted]	Y	Y	- clear explanation
[redacted]	Y	Y	- included "photosynthesis"
[redacted]	Y	Y	- need to be more specific
★ [redacted]	N	N	wrote "had everything"
[redacted]	N	N	- put "no tierra"
★ [redacted]	N	Inc.	- model hard to understand
[redacted]	Y		- minimal labels - no seed(s)
[redacted]	Y	Y	- Inc. Key
[redacted]	Y	Inc.	
[redacted]	Y	N	- labels in
[redacted]	Y	Y	- used "CO2"
[redacted]	Y	Y	- no labels/key

★ = New Arrival - (Spanish dominant)

TABLE 1

Summary of formative assessments.

Formative assessment	What the teacher and students did	What meaning-making resources they used
Investigation Planning Handout (Day 1)	Teacher... – Grouped students in linguistically heterogeneous groups. Students... – Discussed the design of the investigation and recorded responses in a handout.	– Oral Spanish and English – Written Spanish and English
Whole-Class Prediction Check (Day 1)	Teacher... – Posed a question to the class about whether soil was necessary for plant growth. Students... – Gave thumbs, up, down, or sideways and shared individual predictions.	– Gesture – Oral Spanish and English
Small-Group Probing (Day 2)	Teacher... – Circulated the classroom and asked probing questions of individual students and groups. Students... – Interacted with peers and the teacher as they carried out the investigation in small groups.	– Oral Spanish and English – Gesture
Fair Test Task (Day 3)	Teacher... – Designed a task to document whether and how students demonstrated understanding of fair tests. Students... – Responded to the task individually and met with the teacher to describe the setup of their investigation.	– Drawing – Written Spanish and English – Oral Spanish and English – Gesture

We close by offering recommendations for teachers interested in enhancing their formative assessment in linguistically diverse science classrooms. We frame the three recommendations as responses to “But ...” statements that underscore challenges commonly encountered by teachers when engaging in formative assessment from a translanguaging perspective.

1. *“But I don’t speak (all of) my students’ languages!”* Beyond leveraging the multimodal aspects of translanguaging (e.g., gesturing at drawings), teachers can use online translation tools and seek out colleagues or community members who can help interpret student work. Even if the interpretations are not entirely accurate, making the effort opens up a dialogue with students and communities and sends a message that their ideas are valued and worth making sense of.
2. *“But I want students to learn English!”* So does Ms. Altamirano, as one goal among many! The issue is that when we restrict assessment to English, we don’t know whether the results reflect students’ developing English proficiency, their science understanding, or some combination. Ultimately, *how* we assess depends on *what* we are trying to assess, so when Ms. Altamirano engages in formative assessment, she asks herself, “Do I want to know what students can do, or do I want to know if they can do it in English?”
3. *“But my school has this policy...!”* English-only policies at the school level may require that teachers go beyond their classroom walls to recruit administrators as valued partners who can advocate for the benefits of formative assessment from a translanguaging perspective (Sánchez et al. 2018).

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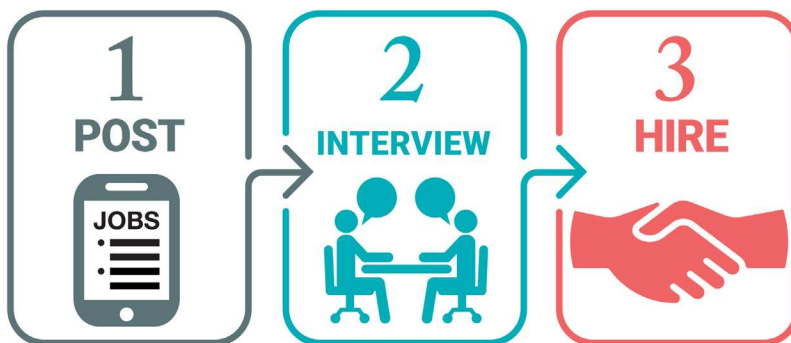
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