WIDA FOCUS ON

Scaffolding Learning for Multilingual Students in Math

In This Issue

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Students work in their small groups

Introduction

It was midyear at an International Baccalaureate middle school in St. Louis Park, Minnesota, and students in the eighth-grade math class were working on matching three forms that represented the same linear relationship. Each of the 33 students received a card, and their goal was to find the two other students whose cards contained the same linear relationship. The learning target was "I can express linear equations in slope-intercept, point-slope, and standard forms, and convert between these forms" (MN Standard 8.2.4). Students were pointing, drawing, questioning, considering, and making decisions about linear relationships.

The math teacher, Ms. Risatti, and the ESL teacher, Ms. Brunker, moved around the room listening to the conversations. They were asking questions that helped students focus on something they might have missed in their thinking. Once students had found their matches, Ms. Risatti asked Osman, Victoria, and Frederic in turn to show the class the reasoning process they had used to find their matching cards, sometimes pointing to anchor charts on the wall to remind students of resources they could use when they were searching for words to express their ideas.

During the activity described here, students were engaging in shared mathematical reasoning through interactions with peers and teachers. In this classroom, teachers had created a collaborative learning environment, set clear goals for their students, and fostered co-construction of knowledge in small groups. Because learning is a social activity, language and interaction mediate learning and are, therefore, the focus of scaffolding practices. Students talk to learn, but they also need opportunities

> "When children learn language, they are not simply engaging in one kind of learning among many; rather, they are learning the foundation of learning itself." (Halliday, 1993. P. 93).

Theresa Brunker and Alana Risatti Tholen

to learn to talk (Gibbons, 2006). Throughout the school year, as students reasoned together, these two teachers helped their students communicate their ideas by asking them to represent their thinking through graphics, symbols, gestures, visuals, and language. In this bulletin, Ms. Risatti's classroom provides the context for exploring the types of scaffolding practices that support multilingual students' engagement in challenging learning.

The objectives of this Focus Bulletin are to

1. Highlight pedagogical practices that support multilingual students as responsible, collaborative learners and as critical thinkers who are invested in and achieving their learning goals within grade-level curriculum.

2. Inspire teachers to be learners who are responsive to their students' needs and adjust their pedagogical practices as they learn from their students and from each other.

On the next page is a graphic representation of pedagogical practices that scaffold learning for multilingual students (see Figure 2).

The teachers' scaffolding of language and interaction described in the earlier scenario are good examples of a *pedagogy of apprenticeship.* As in any apprenticeship, the relationships between the master teachers and apprentices (in this case, the students) are based on mutual trust and contingency (responsiveness to students' needs; Verenikina, 2008). The teachers were also practicing *contingent teaching;* a practice that is built on Vygotsky's notion of the *zone of proximal development* (ZPD; 1978). This familiar concept expresses the idea that by working collaboratively with others and being guided by responsive feedback in the moment, students are able to develop skills they might not have been able to achieve on their own, which makes it "possible for learners to reach beyond what they are thought to be capable of" (Hammond & Gibbons, 2001, p. 22).

All three of these foundational concepts (pedagogy of apprenticeship, contingent teaching, and the ZPD) support the metaphor of scaffolding. These ideas provide a foundation for understanding that scaffolding practices are much more than providing static supports (Van de Pol, Volman, & Beishuizen, 2012) and define the approach of *scaffolding up.*

Scaffolding up is a pedagogical approach that provides high levels of support for students who are accessing high-challenge content (Mariani, 1997); see Figure 1: Balancing Challenge and Support. *Scaffolding up* happens at two levels: macro and micro (Hammond & Gibbons, 2005). **Macro-scaffolding practices,** also called planned scaffolding, happen before a lesson, at the

FIGURE 1: BALANCING CHALLENGE AND SUPPORT - ADAPTED FROM MARIANI (1997)

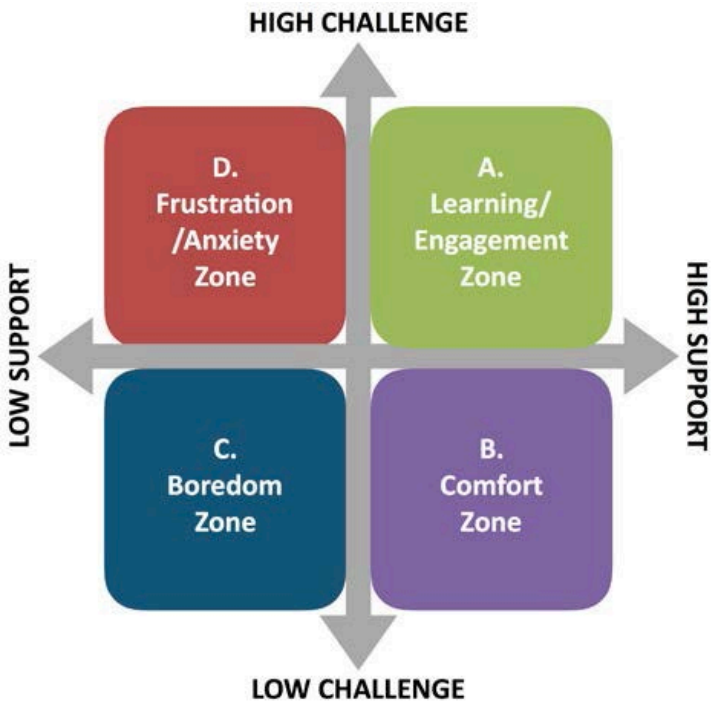
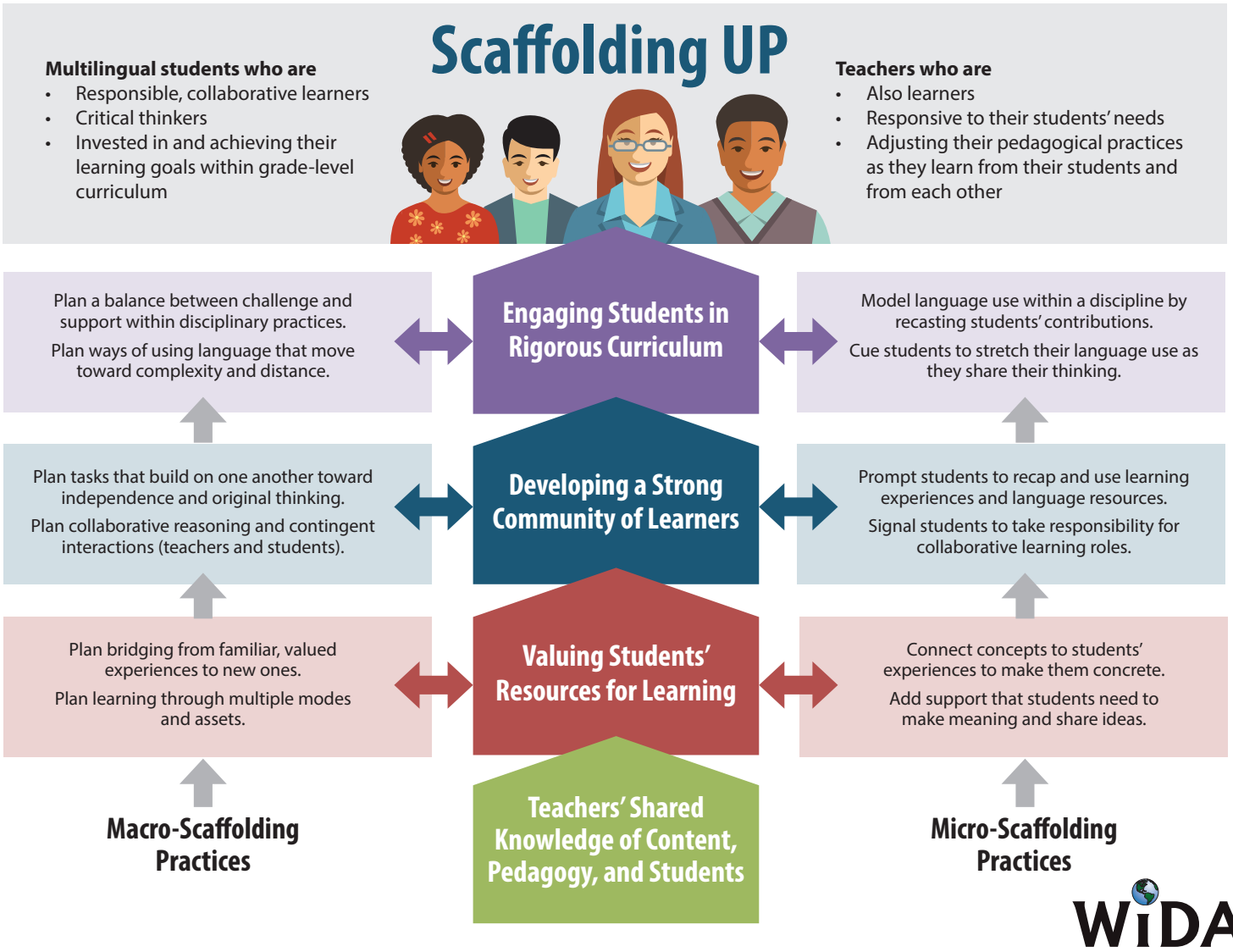


FIGURE 2: SCAFFOLDING UP



global level, when teachers develop a long-term vision with clear learning goals for their students and sequence lessons that build students' cumulative and coherent body of knowledge. **Micro-scaffolding** practices happen during a lesson in the interactions between teacher and students. Both macro- and micro-scaffolding practices are integral to *scaffolding up*—rather than *differentiating down*—in order to engage multilingual learners within challenging curriculum.

When Do Scaffolding Practices Happen?

Macro-scaffolding practices—Instructional planning before a lesson

Micro-scaffolding practices—Interactions with students during a lesson

It is important to situate scaffolding practices within a pedagogy that values and affirms students. For example, within the discipline of mathematics, attention to language development must focus on the ways that language serves as a tool that students use in order to reason together, to critique or support a line of reasoning, to develop models, and to investigate and solve problems.

Drawing on the sociocultural view of learning, where learning is seen as a product of social endeavor, knowledge is not only a possession of the teachers but also the creation and shared property of learning communities. This vision of knowledge creation includes "ways of knowing" that students and their families bring to the table. From this perspective, scaffolding practices are future-oriented: they bridge multilingual students' current resources and assets with the new learning.

Teachers' Shared Knowledge of Content, Pedagogy, and Students

Ms. Brunker and Ms. Risatti develop a trusting relationship with their students. They believe that each student can accomplish the goals set before them, provided they experience the right kinds of supports at the right time. In addition to building trust and contingent support, these teachers use every opportunity to collaborate and to build shared knowledge of math and its pedagogy. This collaboration has allowed them to focus on both content and language in an integrated way.

In the next three sections, we illustrate three essential ways of scaffolding up:

- Valuing students' resources for learning
- Developing a strong community of learners
- Engaging students in rigorous curriculum

In each section, these ideas come to life through the macro- and micro-scaffolding practices of Ms. Risatti and Ms. Brunker as they plan and facilitate learning in the eighth-grade math classroom. Each section concludes with a summary of these practices.

Valuing Students' Resources for Learning

In the eighth-grade classroom, there were 14 students who were identified as ELLs and they all had very different stories. Three of them were newcomers (N) from Kenya, Pakistan, and the Democratic Republic of Congo. Two students had experienced interrupted schooling (IS), and all of the others had been born in the U.S. and attended school in this district since preschool. These students spoke Spanish, Swahili, Urdu, Oromo, Afar, French, and other languages, and their ELD levels ranged from Emerging to Expanding (Table 1). There were also two students in monitor status and three former ELs in the class.

TABLE 1: STUDENTS BY ENGLISH LANGUAGE DEVELOPMENT (ELD) LEVELS

ELD Level 1 Entering	ELD Level 2 Emerging	ELD Level 3 Developing	ELD Level 4 Expanding	ELD Level 5 Bridging	ELD Level 6 Reaching
N/A	Osman (IS)	Assir Maria Alejandro Camila Gabriela Areesha (N) Katie (IS) Frederic (N)	Victoria Matias Adimu (N) Mohamed Emiliano	N/A	N/A

The individual, family, and community histories of multilingual students enrich their learning and their ideas about how the world works. The ways they use language every day fuel their inquiry into academic concepts. When teachers take the time to learn everything they can about their students, the experiences, capabilities, and interests of their students can serve as valuable resources. Ms. Risatti has high expectations for her math students and she invests in building warm relationships with them. She finds out as much as she can about their lives, and she makes sure that they each feel heard and noticed "in a different light" than just through their efforts in math, particularly when they are struggling and need a personal connection.

Reflecting on High Expectations

Ms. Risatti: As a school, we need 85% of our students to pass [the unit test on linear relationships], but I don't tell my students that. I just say 100% of you will pass it. And for the past two years, we've done it, and I don't see that this year will be any different. I don't let them think that there's another option for them.

Students' experiential knowledge of the world grounds their learning. For example, Ms. Risatti used the idea of melting snow during early March, when it was on everyone's minds, to illustrate the concept of negative constant rate of change. Students posed questions such as "There's 12 inches of snow on the ground that is melting 1/2 inches per day (Y= -1/2x + 12), so how much snow will there be after 6 days?" Students worked together to write the equation and solve the problem.

Teachers also draw on their multilingual students' experience with soccer as a context for understanding math concepts. Because both male and female students played soccer and were familiar with what "intercept" meant on the soccer field, teachers explained the "y-intercept" in soccer terms. They compared the point where a line crosses the vertical y-axis to the point when a player intercepts a ball from their opponent. Their familiarity with the word "intercept" in real-life terms helped students relate to the way the term is used in math.

Ms. Brunker drew on her students' social media skills to make a point about the need to think and communicate with precision in math; this involved a focus on language and experiential grounding. She asked students to show her how to send a text message on her phone, a task which she knew almost all of them knew how to do. As they gave her instructions, she purposely left her phone powered off. She responded to them, "I don't understand, what do you do first?" After some confusion, the students realized that they needed to begin with the first step of turning the phone on. She tied that to the idea of communicating your thinking process carefully, so that someone else can follow the steps and understand the reasoning process, and decide whether they agree with it or would like to challenge it.

Careful sequencing of instruction, a key macro-scaffolding practice, is central to scaffolding math learning. Sequencing describes the way students experience learning over the course of an academic year as well as in a single unit or a lesson. During the first two weeks in Ms. Risatti's class, students were introduced to linear relationships by learning through many different situations to recognize whether relationships were linear or nonlinear. Looking on a graph, students would identify either a straight or a curved line. This extended experience with recognizing linear relationships in a variety of contexts enabled students to build on their early success and continue with confidence throughout the year.

Sequencing learning at the unit and lesson level often includes drawing on previous experiences to scaffold new learning, so the students can bring established ways of working and thinking together to the challenges of the day. These familiar routines make students comfortable sharing their thinking with peers. Ms. Risatti described a 5-minute warm-up problem that students tackle each day, after which the whole class considers solutions that were posted by rotating student volunteers. She said that students are used to participating and to probing one another's thought process, and that these discussions at the beginning of class are when "prior knowledge returns" and students can help each other put the pieces of a puzzle together.

This familiar way of puzzling things out together enriched students' engagement in the activity described on page 1. The target concept was this: The same linear relationship can be described in different forms, or expressions. Students not only found their matching cards but also connected their experience to a generalization about linear relationships in multiple forms. As a general practice, the two teachers planned support for students to learn and communicate using multiple modes (talking, drawings, equations, writing, graphs, gestures, metaphors, and simulations). Students drew from their previous experiences to make connections to ideas in math.

Valuing Students' Resources for Learning

In order to scaffold up, it is essential to value students' existing resources through the following macro- and micro-scaffolding practices:

Macro-scaffolding practices

- Plan bridging from familiar, valued experiences to new ones.
- Plan learning through multiple modes and assets.

Micro-scaffolding practices

- Connect concepts to students' experiences to make them concrete.
- Add support that students need to make meaning and share ideas. (See Figure A.)

Developing a Strong Community of Learners

Because learning is a social activity, the organization of the learning environment and the customs that make up the classroom culture are critical to students' academic success. In the eighth-grade math classroom, students were seated in table groups of four, and they knew that the makeup of these groups changed often. Some students showed more willingness to work hard and stay engaged in this classroom than they did in other classrooms. Ms. Risatti and Ms. Brunker believe that the students' motivation comes from their sense of being supported as they think through difficult problems.

When students in Ms. Risatti's classroom share their thinking about what they are seeing and what it means, they can use whatever language, gestural, or visual resource they need, in order to communicate their thinking. Students were often asked to read, or re-read, carefully, like a mathematician would, looking for meaning contained in symbols or words, in order to notice and use these details. Both teachers actively questioned students to prompt increased precision in thinking and shifts in strategy and to expand their resources for making ideas clear to others.

These eighth-grade students are being pushed and stretched to become thinkers and doers in math. Both teachers make decisions about when to restate students' contributions using more precise language and when to prompt them to draw on their own previous work and try again. They also plan interactive tasks and develop a climate that is supportive of student's increasing responsibility for their learning and for the ways that they work together to engage in problem-solving.

Developing a Strong Community of Learners

In order to scaffold up, it is essential to develop a strong community of learners through the following macro- and micro-scaffolding practices:

Macro-scaffolding practices

- Plan tasks that build on one another toward independence and original thinking.
- Plan collaborative reasoning and contingent interactions (teachers and students).

Micro-scaffolding practices

- Prompt students to recap and use their shared learning experiences and language resources.
- Signal students to take responsibility for their collaborative learning roles. (See Figure A.)

Reflecting on Prompting Students to Notice and Use Details

Ms. Risatti: We asked the students, "What do you notice first?" That's when we introduced that language of noticing things in math, and from those noticings, deciding where to go from there.

Ms. Brunker: So, one of the first things we wanted them to do was to read, we are not even talking about words, we could be talking about equations. We said, "Read the equation carefully. What do you notice about it?" When they aren't accustomed to stopping and actually reading through the equation, and reading it as a mathematician, they miss a lot of these little nuances that are important in working through to a solution.

Ms. Risatti: At this point in the year, our students are getting better at understanding what questions are asking them to do. We've been very purposeful in highlighting how students understand what they are being asked to do. I ask them to read the question to me and ask themselves questions like these: "What am I supposed to do?" and "Now if I know what I'm supposed to do, where do I start in that instance?"

Ms. Brunker: We have emphasized the need for careful reading. One example I remember was when students were given a set of problems to simplify. We were doing simplifying expressions and then we moved to simplifying equations, and these two things (simplifying expressions and simplifying equations) require very different actions. So if they read the directions and skipped the word "expression" or "equation" because it looked hard or big or they weren't familiar with it, they needed to go back and reread the directions. They are learning to ask themselves, "What was that word? What does that mean again? Does that mean that it has an equals sign?" They are learning to put their heads back in the text to understand what it means. It so often happens that then they discover the next step. They have learned that when they read things out loud, even just to themselves, they're saying the words out loud and they're also hearing those words. So it's another input into the sensory system that helps them understand the task.

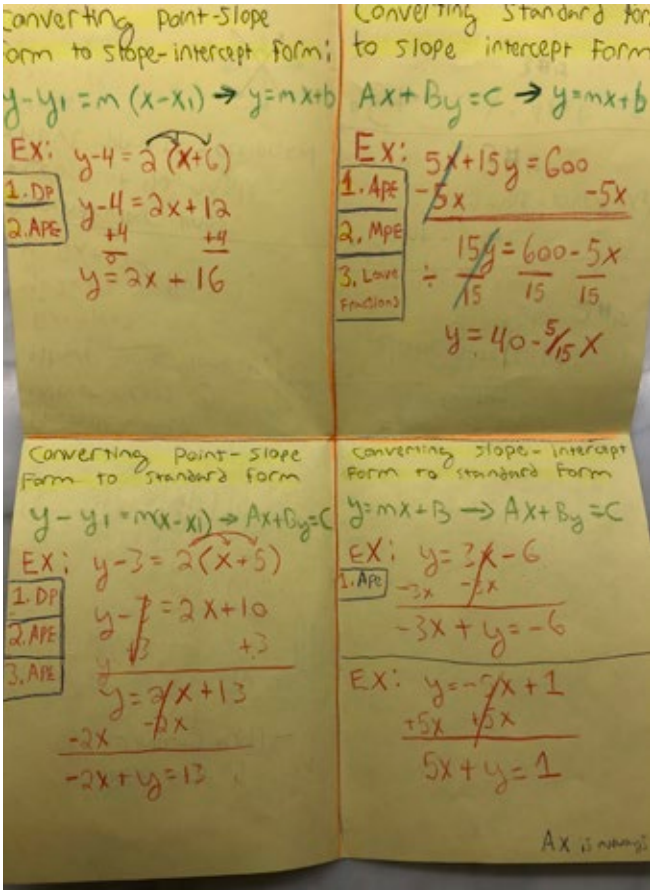
Engaging Students in Rigorous Curriculum

> "Changes in reasoning can often be attributed to changes in language use and changes in language use can often be attributed to changes in reasoning." (Joswitch, 2017, p. 604)

The essence of scaffolding up is balancing the challenge students experience as they engage in disciplinary learning (in math or any other subject area) with the support needed for them to engage and develop as thinkers and doers within that discipline (Gibbons, 2006). As they maintain this balance, teachers can consider which part of a unit students are engaging in: the beginning, the middle, or the end. Since students are building toward independence in the concepts and practices required for success with the learning goals, students need to be apprenticed into these over the course of the unit. This means that some supports may be gradually reduced. Part of being apprenticed into the discipline is analyzing and practicing using language together. It is important to note that teachers' responses should focus on meaning first and should only highlight language use to students as it supports their engagement in math learning.

Ms. Risatti has emphasized to her students that learning math is a process, as is writing and communicating about math. Her students are encouraged to combine written information and drawings in "doodle notes" and to use these as resources to support their thinking and talking about math throughout the unit. Figure 3 shows an example. The class has studied exemplars of clear communication about solving a problem so that they can notice how language is used effectively to convey a thought process to others. Working together in math engages students in multiple modes of meaning-making. In the written mode, students develop precision as they focus on conveying ideas to others, both inside and outside of their work group.

FIGURE 3 STUDENT'S DOODLE NOTES ON CONVERTING LINEAR RELATIONSHIPS



Reflecting on Using Feedback

Ms. Risatti: I actually try to get writing back to students as soon as possible with comments so that they can receive meaningful feedback. I always let students re-do assignments that involve writing so that they have the opportunity to continue to see growth right away versus having to wait for another new assignment. I have noticed that when students are asked to write about something in the beginning of the unit, they are far more likely to go back and redo the assignment after they have learned the new concepts in the unit. It's actually really fun to watch students re-read what they originally wrote because often times they say, "What was I thinking?!" We stress that learning math and writing is an interrelated process, and I think that encourages students to take ownership and re-show what they know later on.

The social nature of learning is also why expanding students' language resources directly supports their learning and thinking. Several of Ms. Brunker's students report that being able to recount their steps for solving a problem using precise language actually increased their own understanding of the equation and its solution (Brunker, 2017). Fostering a student's precise language use not only helps others to follow her line of reasoning, but it can deepen her own understanding as well (Joswitch, 2017). One of Ms. Risatti's students, Camila, shared with her that writing down how she solved a problem had helped her remember how she had solved it.

In their math classroom, three wall posters provide support for precise communication about math: Precise Math Words, Math Action Words, and Sequence Words. These posters are refreshed as needed through the course of a unit. It is important to note that students can use everyday words to signal precise relationships in math, and so words like "steeper than" and "negative" or even locally developed terms like "one over" (when dividing exponents) can be considered precise within the context of communicating ideas at their table. However, when communicating their solutions to students who aren't in their small group, students may need to express their ideas in more specific ways. Sometimes one teacher adds to the posters while the other teacher is talking to students, and as students report on their findings to each other, they draw on the posters for the words and phrases they need. There were times when Ms. Risatti restated, or recasted, a student's contribution more clearly. She always made sure that the students confirmed that she had phrased their ideas correctly. Other times, she chose to prompt students' own restatement of their ideas in a more precise way.

Student Voices: How does writing about my math process help me understand math better?

- **Victoria:** *It helps me rethink what I did.*
- **Adimu:** *When I explain through writing I get to understand better.*
- **Mohamed:** *It helps me understand math because I'm writing the steps and I can look back at it when I don't know.*

Engaging Students in Rigorous Curriculum

In order to scaffold up, it is essential to engage students in rigorous curriculum through the following macro- and micro-scaffolding practices:

Macro-scaffolding practices

- Plan a balance between challenge and support within disciplinary practices.
- Plan ways of using language that move toward complexity and distance.

Micro-scaffolding practices

- Model language use within a discipline by recasting students' contributions.
- Cue students to stretch their language use as they share their thinking. (See Figure A.)

Call to Action

Educators need to value and build on students' resources for learning, develop a strong community of learners, and engage students in rigorous curriculum through an apprenticeship approach to teaching and learning. When scaffolding up becomes established professional practice, multilingual students experience success and grow in confidence as responsible, self-directed, collaborative learners and critical thinkers. Their successes propel them to invest deeply in achieving new learning goals within grade-level content. Multilingual learners benefit when teachers share knowledge of their content, pedagogy, and students with one another. Teachers must also learn with humility from students and their families and respond to students' needs by adjusting their pedagogical practices. When teachers engage in reflective teaching and develop scaffolding practices, both macro and micro, their commitment to balancing challenge and support increases equity and opportunity for multilingual students.

Reflection Tool: Developing Scaffolding Practices Over Time

Suggested Use: As you are planning a new unit in math—or in any other discipline—select a question or two to reflect on at the end of the unit. Select another question for the next unit and keep a log of your reflections throughout the year.

A. Did I value my students' resources for learning during this unit?

- ❑ How did I learn about the experiences each student has had that supported their learning during this unit?
- ❑ How did I draw on the cultural-historical and linguistic resources my students brought to the learning every day (home and community funds of knowledge)?
- ❑ When did my students have opportunities to pose and pursue questions of interest to them?
- ❑ When did my students look for connections to a coherent line of reasoning during this unit?
- ❑ What evidence showed that my students recognized that I see them as thinkers who are using their various resources to learn?
- ❑ When did I provide feedback to my students that supported them in expanding their familiar ways of expressing ideas and relating to others?
- ❑ What were some instances in which my students used language as a resource for thinking and learning (meaning-making)?

B. Did I develop a strong community of learners during this unit?

- ❑ How did I plan for students to understand how both their individual and shared experiences connect to future curricular goals within this unit?
- ❑ What was challenging for my students, and what support did they experience to balance that challenge?
- ❑ In what ways did my unit plan build on and expand students' familiar ways of using language through an intentionally sequenced variety of text types?
- ❑ How did I communicate expectations and processes for engaging in group discussions?
- ❑ When did I signal to students that I expected them to take over the thinking and learning?
- ❑ What were some examples of students calling up familiar tools and routines to support new learning, whether individually or to help each other move forward?
- ❑ When did I focus students' attention on their collaborative skills during their small group work and classroom discussions?

C. Did I engage students in rigorous curriculum during this unit?

- ❑ How did I prepare for the unit by studying the texts in the unit—specifically, how language choices served to accomplish the speakers' or writers' purposes?
- ❑ How did I plan to make specific patterns of language use visible to students and available for them to critique and practice?
- ❑ (a) When were opportunities planned for students to report on the discoveries they made in small groups? (b) What were the focus areas for language development that I selected for focus as I guided their reporting?
- ❑ When did I make time to facilitate analysis of text and joint practice creating text with my students during this unit?
- ❑ When did I focus students' attention on language use as a resource for thinking and learning (meaning-making)?
- ❑ When did students have opportunities to adjust their language based on feedback?
- ❑ How did students notice their growth in using language in ways that support their achievement of content learning goals?

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