Giving Voice to English Language Learners in Mathematics

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Mathematics teachers need to recognize the tremendous challenges that English language learners (ELLs) face in learning English while learning content. Short and Fitzsimmons (2007) observe that the workloads of ELLs are double those of non-ELLs. "It should be understood that adolescent ELLs are second language learners who are still developing their proficiency in academic English. Moreover, they are learning English at the same time they are studying core content areas through English. Thus, English language learners must perform *double the work* of native English speakers in the country's middle and high schools. And, at the same time, they are being held to the same accountability standards as their native English-speaking peers" (p. 1).

If your mathematics classes include English language learners, you too must perform double the work. You should base your instruction on content objectives *and* language objectives. In addition, you must teach your students to talk about mathematics, allowing them to describe and explain concepts and ideas, compare and contrast two or more equations or graphs, sort and categorize objects, and justify and defend solutions. It is essential to incorporate classroom routines that allow ELLs a variety of opportunities to listen, speak, read, and write about mathematics.

Classroom instruction should support bilingual students by engaging them in mathematics conversations that go beyond the translation of vocabulary to include authentic communication about mathematical concepts. One of the goals of mathematics instruction for bilingual students should be to support the participation of all students, regardless of their proficiency in English, in discussions about mathematical ideas.

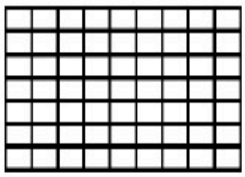
Moving toward Mathematical Language

"Mathematically Speaking" is an engaging activity that you can use to give students experience in using a target mathematics vocabulary to describe and explain their work. The activity is appropriate for practice or assessment after you have provided instruction that includes the modeling of correct usage of the target vocabulary. You can target vocabulary used in textbooks, determined by individual teachers or groups of teachers, or drawn from district mathematics instructional guides. In using the vocabulary to describe a mathematical task, students may need to use a different form of a particular word—for example, *multiplying* for *multiply*, or *substitution* for *substitute*.

The materials for "Mathematically Speaking" are minimal. Simply prepare a worksheet with two problems of equal content and difficulty, and identify the target mathematics vocabulary that you have modeled and want students to use. Two sample worksheets are shown.

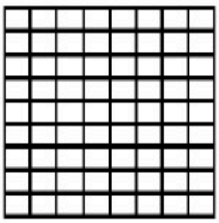
Fact Families

Problem 1
The figure below is a model for multiplication and division sentences.



Write two multiplication sentences and two division sentences.

Problem 2
The figure below is a model for multiplication and division sentences.



Write two multiplication sentences and two division sentences.

Mathematically Speaking!

Write your name and your partner's name.

Partner #1 explains your answers for problem one to partner #2. Partner #2 should make a tally mark on the chart each time a vocabulary word is used. Encourage your partner to keep on talking until he or she has used all the mathematics vocabulary words. Then partner #2 should explain how to solve the second problem while #1 marks on the chart.

Mathematics Vocabulary	#1	#2
commutative property of multiplication		
dividend		
division		
divisor		
factor		
multiply		
quotient		
product		

The Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Problem 1 – Write in standard form and solve using the quadratic formula.

$2x^2 = 4x + 30$

Problem 2 – Write in standard form and solve using the quadratic formula.

$2q^2 - 6 = -4q$

Mathematically Speaking!

Write your name and your partner's name.

Person #1 explains how to solve the first problem to person #2. Person #2 should mark a tally mark on the chart each time a vocabulary word is used. Encourage your partner to keep on talking until he or she has used all the target words. Then person #2 should explain how to solve the second problem while #1 marks on the chart.

Mathematics Vocabulary	#1	#2
coefficient		
discriminant		
formula		
identify		
opposite		
quadratic		
radical		
roots		
second degree polynomial		
square root		
standard form		
substitute		

"Mathematically Speaking" Examples

The left side of the sheet displays the mathematical tasks, and the right side shows the language tasks. The target vocabulary words appear in the first column on the right. Older students can enter the words themselves; you can fill them in for younger students. Assign a partner to each student, and have both students in each pair write their names across the top of the sheet. After all students complete both mathematical tasks, have one student in each pair explain a task or problem as the other student tallies each use of a target word in the explanation. The first student should keep talking until he or she has used all the target words. Then the students should switch roles, allowing the second student to explain the other task and also use all the vocabulary words.

Regular use of this activity and others like it can help teachers move toward the goal of providing opportunities for bilingual students to participate fully in mathematical discussions. Close observation of English language learners in such activities can help teachers achieve another important goal—recognizing the resources that bilingual students use to express mathematical ideas (Moschkovich 2002, p. 208).

References

Moschkovich, Judit. "A Situated and Sociocultural Perspective on Bilingual Mathematics Learners." *Mathematical Thinking and Learning* 4, nos. 2 and 3 (2002): 189–212.

Short, Deborah J., and Shannon Fitzsimmons. *Double the Work*. Carnegie Corporation of New York: New York. Alliance for Excellent Education, 2007. www.all4ed.org/files/DoubleWork.pdf.