

When Math Isn't a Universal Language
Teaching Strategies and Resources for ELLs in the Math Class
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Potential differences across Cultures

Numeral formation

Numeration symbols (commas, periods...)

Reading bottom to top, right to left

Mathematical notation (Operation notation, repeating decimals, angle notation, time...)

Algorithms

Mathematical English

- Technical terms (e.g., multiplicand, quadrilateral,)
- Terms which also have unrelated everyday meanings (volume, product)
- Mathematical use of words adapted from similar everyday meanings (e.g., similar, face).
- Specialized syntax (words such as and, a, or if)
- Math homophones and homonyms
- Use of symbols

Specific Strategies for Teaching Math to ELL

1. Write & State the content “and” language objectives
2. Build Background
3. Use cooperative learning
4. Encourage use of Native Language and native language/English terminology resources
Dictionaries—Math picture dictionary, or bilingual math dictionaries for example *Spanish Math Terms: Palabras Fundamentales de matematicas* by Winter and Caruso, or *Mathematics as a Second Language Glossary* (see www.Comap.com); online dictionaries-- <http://www.spanishdict.com/>,
<http://math2.org/math/spanish/eng-spa.htm>;
http://www.aaps.k12.mi.us/aaps/ins.esl/elementary_math_vocabulary
5. Comprehensible Input
 - Speak slower, Repeat ideas
 - “Print” don’t use cursive
 - Avoid idioms and slang
 - Scaffold (make clear connections)
 - Simplify vocabulary & sentence structure.
 - Break a question’s sentences into parts.
 - Ensure that the student understands the parts.
 - Reframe the problem.
 - Emphasize key words.
 - Introduce new vocabulary after the students have learned the concept.
 - Review math vocabulary & concepts with math games (like Tic-Tac-Toe, Bingo, Concentration).
 - Use gestures/hand signs, visual aids, manipulatives (model use of manipulatives and recording/stating results).
 - Allow alternate ways to participate in whole-class discussions and respond to questions, i.e., think/pair/share, flashcards to raise over head, hand &/or body movements, individual chalkboards
 - Increase wait time/pauses
6. Explicitly teach vocabulary, both academic and conversational. (Word Wall, Word Square—see example, Math Vocabulary File Box, Graphic Organizer)

Word Square

Mathematical Term in language they are most comfortable.	Mathematical Term in English
Def'n in student's own words in whatever language they want	Example/drawing

Sample Math Homophones and Homonyms:

Base (baseball, number, geometry)

Even (level, comparable, same measurement, numbers, exact amount)

Left (direction, past tense of leave, amount remaining)

Mean (intention, unkind, average)

Order (place a request, sequence)

Interest (care, earned amount)

Rational (state of being, numbers)

Rows (rose)

Sum (some)

Square (shape, exponent, even)

Draw (make a picture, no winner, select)

Formula (baby milk, method/procedure)

Table (furniture, mathematical chart)

Power (electricity, exponent)

Whole (hole)

Complement (compliment)

• Web Resources

- <http://www.spanishdict.com/>,
- <http://math2.org/math/spanish/eng-spa.htm>;
- http://www.aaps.k12.mi.us/aaps/ins.esl/elementary_math_vocabulary
- http://www.glencoe.com/sec/teachingtoday/subject/help_ELL_math.phtml
- http://www.coursecrafters.com/ELL-Outlook/2007/mar_apr/ELLOutlookITIArticle1.htm
- http://www.csus.edu/indiv/o/oreyd/ACP.htm_files/TODOS.operation.description.pdf
- <http://www.teachhub.com/teaching-math-to-english-language-learners>
- <http://www.scholastic.com/teachers/article/10-ways-help-ells-succeed-math>
- <http://www.colorincolorado.org/article/30570/?print>
- <http://www.purplemath.com/modules/printpage.cgi?path=/modules/translat.htm>
- <http://www.purplemath.com/modules/printpage.cgi?path=/modules/translat2.htm>
- <http://suite101.com/article/teaching-strategies-in-math-for-esl-students-a152018>

Recommended books:

Beyond Good Teaching: Advancing Mathematics Education for ELLs, 2012 (eds. Sylvia Celedón-pattichis & Nora G. Ramirez, Reston, VA: NCTM)

Responding to Diversity: Grades 6-8, 2008. (eds., Mark W. Ellis & Carol E. Malloy), Reston, VA: NCTM.

Lopez, Naoemi. *Todos: Mathematics for All.* Harris County Dept. of Education, Houston, TX

Recommended journal articles from Teaching Children Mathematics:

Is mathematics a universal language? by Tim Whiteford, **Dec 2009/Jan 2010**

Supporting Language Learners, by Jo Ann Cady, Thomas Hodges, & Clara Lee Brown, April 2010

Equity for Language Learners, by Rusty Bresser, Kathy Melanese, & Christine Sphar, October 2009

Helping English Language Learners Develop Computational Fluency, by Rusty Bresser, February 2003

Mathematical Interviews to Assess Latino Students, by Fernandea, A., Cynthia Anhalt, and Marta Civil, Oct. 2009.

Recommended journal articles from Mathematics Teaching in the Middle School:

"Problem Solving and the English Language Learner," by C. Brown, Ann Cady & P. Mark Taylor. May 2009.

"Your Inner English Teacher," by C. Gomez, Terri Kurz, & Margarita Jimenez-Silva November 2011.

"Differentiating Instruction in Mathematics for the English Language Learner," by D. Murrey, October 2008.

Recommended journal article from Mathematics Teacher :

For ELLs: Vocabulary beyond the Definitions, by Nancy Roberts & Mary Truxaw, August 2013

"Bridging the Language Barrier in Mathematics," by M. Winsor. December 2007/January 2008.