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What is the sum?

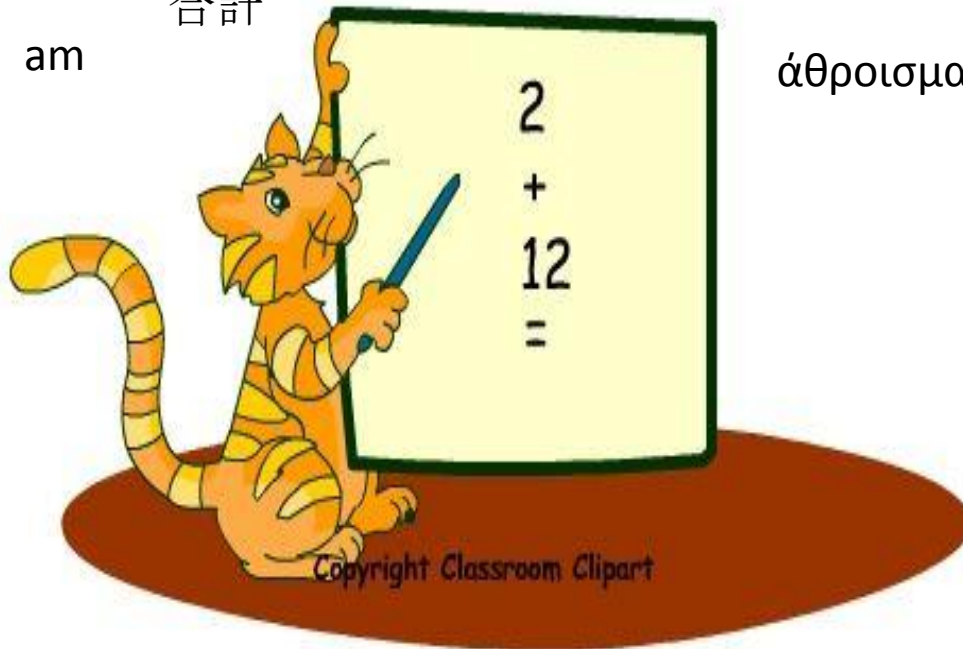
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Math Instruction with ELLs in Mind

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Before you begin with an ELL you need to know:

- Are they ESL or ELD?
- What was their prior schooling experience?
- Are they literate in any language?
- How was math taught in their country of origin – ie expectations for showing work and problem solving?
- What skills do they have in terms of vocabulary and numeracy?

ESL or ELD?

ESL – ELLs in this program usually have been in school consistently in their country of origin and have experienced mathematics before. In many countries math is more highly valued than any other subject, therefore students may be very competent in mathematics when they arrive and need only to overcome the language barrier in order to succeed in class.

ELD – ELLs in this program have significant gaps in their education and are not literate. ELD students may never have had the opportunity to study math and/or have experienced a very limited curriculum which has not prepared them for grade appropriate material. These ELLs will need a lot of support to catch up to the curriculum.

Prior Schooling:

SYMBOLS

ELLs may have the skill but not recognize
your notation

3.4=

3*4=

3x4=

12

$$18/3=$$

$$18 \div 3 =$$

6

Number Sense – Place Value and Decimals

1.000.000,00 Spanish, French and other
European Countries

1,000,000.00 English

Literacy

- If students are not literate in English you will need to support them in acquiring translation of instructional words and math terms. A good online translator is <http://translator.speedymarks.com/>
- If students are not literate in any language they will need support through visuals and demonstration/modeling to ensure they understand what they need to do (example http://www.mathplayground.com/howto_fractions_diffden.html)

How They Were Taught:

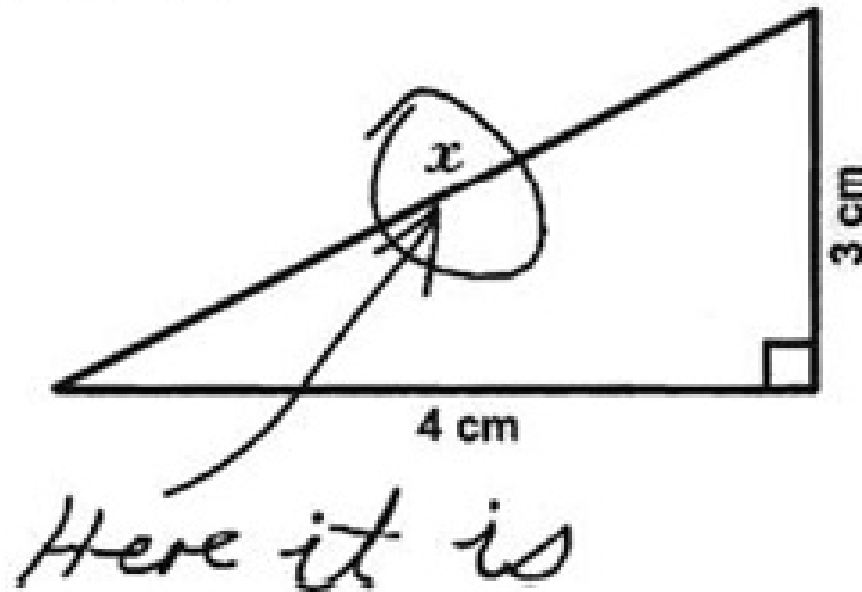
Teacher Expectations vary from country to country. One major difference that can negatively impact an ELL entering the Canadian classroom is :

Showing their work – in many countries students are expected to give only the answer. Computation is expected to be done in their head or on a rough piece of paper which is not submitted to the teacher. Showing how they solved a problem may result in punishment – loss of marks so students learn to value the submission of a clean worksheet with only questions and answers on the page.

Vocabulary/Numeracy:

The following example, used in a presentation by Dr. Judit Moschkovich of the University of California at Santa Cruz, underscores why vocabulary must be introduced within the context of the content (Moschkovich, 2008):

3. Find x .



In this problem, the student is instructed to "find x ." The student obviously knew the meaning of the word "find" because he/she "found" it on the page and circled it. The student even put a note on the page to help the teacher in locating the lost " x ". The student understood the meaning of "find" in one context, but not in the appropriate mathematical context.

Leading
MATH
Success

TIPS

for English Language
Learners in Mathematics

Grades 7, 8, 9 Applied, 10 Applied

Developing Mathematical Literacy for All

Research-Based Messages

- 1. Make Sure They're Ready**
- 2. Incorporate Identity**
- 3. Make It Language Rich**
- 4. Make It Comprehensible**
- 5. Make It Explicit**
- 6. Engage the Senses**
- 7. Assess with Sensitivity**

Oral Strategies

- ❑ When speaking, simplify sentence structure and provide direct instructions.
- ❑ Use jargon, idiomatic speech, and figurative language sparingly, and explain the meaning when you do use it.
- ❑ Model language/vocabulary you expect students to use.
- ❑ Explain homophones that are used, e.g., pi/pie, plane/plain, rows/rose, sine/sign, sum/some.
- ❑ Provide opportunities for students to practise mathematics vocabulary using a variety of strategies. (See *Think Literacy: Cross-Curricular Approaches: Mathematics.*)

Visual Strategies

- Write key words on the board or on a flip chart while discussing them.
- Connect verbal, written, and pictorial representations of the same word.
- Identify language that might confuse English language learners because the words mean one thing in everyday conversation and another in mathematics, e.g., create a table, determine the volume, and review those terms prior to teaching the math lesson.
- Make available vocabulary/language supports that make use of first language, e.g., charts, dictionaries, Word Walls.
- Have English language learners keep a personal word study notebook that includes key words from each lesson. Drawings, symbols, and words in their first language are appropriate additions to the vocabulary list.
- Explain structural patterns found in expository text, e.g., sequence, problem/solution.
- Teach strategies in reading mathematics text, e.g., directionality.
- Guide students through text before reading and have them focus on headings, subheadings, charts, graphs, visuals, symbols, etc.
- Point out contextual clues that help with meaning, e.g., words such as *table and operation have a different meaning from everyday language.*

Instructional Strategies

- ❑ Teach key vocabulary explicitly and reinforce it on an ongoing basis.
- ❑ Post symbols with word definitions and examples to clarify meaning.
- ❑ Explain strategies and steps for completing instructional tasks and check for student understanding before students start the task independently. Present numerous examples of concepts being taught.
- ❑ To reinforce concepts and vocabulary:
 - ✓ – incorporate the systematic use of visuals and graphic organizers, e.g., Frayer
 - ✓ -model for definitions, T-charts and Venn diagrams for relationships;
 - ✓ – move from concrete to visual to abstract representations when teaching and
 - ✓ when asking students to present their solutions.
- ❑ Make strategic use of the learner's first language to set the context for introducing new concepts.
 - ✓ – If possible, have a peer or resource teacher use levels of English with which students are fluent, while simultaneously using the students' first language.
 - ✓ – Provide access to materials written in their first language, where possible, to support English language learners' literacy and cognitive development (Hakuta 2001).

Scaffolding Strategies

Scaffold for English language development as well as for development of mathematical skills and concepts, remembering that language goals and curriculum expectations are for the end of the stage or program, and that it is possible to nurture incremental movement towards the goals. See Scaffolding, p. 31, from *TIPS4RM*.

- Have students restate other students' comments, asking a question, or adding their own idea;
- Demonstrate your thought process using vocabulary English language learners understand;
- Post sentence prompts for English language learners to use as they learn new academic language;
- Have students use manipulatives and technology as thinking tools;
- Have students use word maps, Word Walls, personal word study notebooks, posters, and labels;
- Use questions to help English language learners sort out what they understand and what they need to learn next;
- Encourage English language learners to use graphic organizers, diagrams, gestures, and sketches to aid in thinking and communicating with others;
- Correct errors judiciously and give positive feedback using prompts, gestures, encouragement, and praise;
- Provide handouts that help students structure and guide their work, e.g., skeleton notes and summaries.

Assessment Strategies

- Gather as much data as possible about students' prior knowledge and experiences
- to help them make connections to new learning.
- Take into account specific gaps that might exist in English language learners'
- mathematical knowledge and experience.
- Prepare students for lessons by incorporating strategies that activate and assess
- prior knowledge, e.g., brainstorming, providing analogies, organizers such as
- K-W-L (Know-Wonder-Learned) charts, T-charts, Venn diagrams, flow charts.
- Check for accuracy of prior knowledge.
- Recognize that concepts or ideas learned in any language can be transferred to
- English.
- Connect new knowledge to previously acquired skills and concepts.
- Help students use mathematical tools with which they might be unfamiliar, such as
- calculators, rulers, and computer software programs.
- Check for understanding by observing their body language and facial expressions.

Apply assessment practices that are good for all students, and that can be adjusted for English language learners:

- ✓ – Use a wide variety of assessment strategies, such as performance tasks and conferences, that allow students to demonstrate their understanding in ways other than through reading and writing.
- ✓ – Observe students as they work in groups and provide encouragement for interaction and contribution.
- ✓ – Conduct frequent briefing sessions to discuss difficulties resulting from a lack of understanding of the language, e.g., clarity of directions.
- ✓ – Use assessment information to guide further instruction to help students acquire the language skills needed to understand the math.

Provide timely and frequent feedback on their growth in language.

Teach self-evaluation strategies and involve students in self-monitoring their own learning.

Guide students in acquiring self-monitoring skills that help them identify difficulties they have in understanding what they know, need to know, and do.

Differentiate assessment by adjusting assessment tools and strategies to meet the needs of English language learners.

Provide alternatives to written tests, e.g., oral tests.

Have English language learners complete graphic organizers and cloze activities for assessment tasks that depend heavily on proficiency in written English.

Provide bilingual dictionaries (first language/English), or allow English language learners to use their personal word study notebook, when taking tests.

Provide alternatives to oral presentations, e.g., using presentation software.


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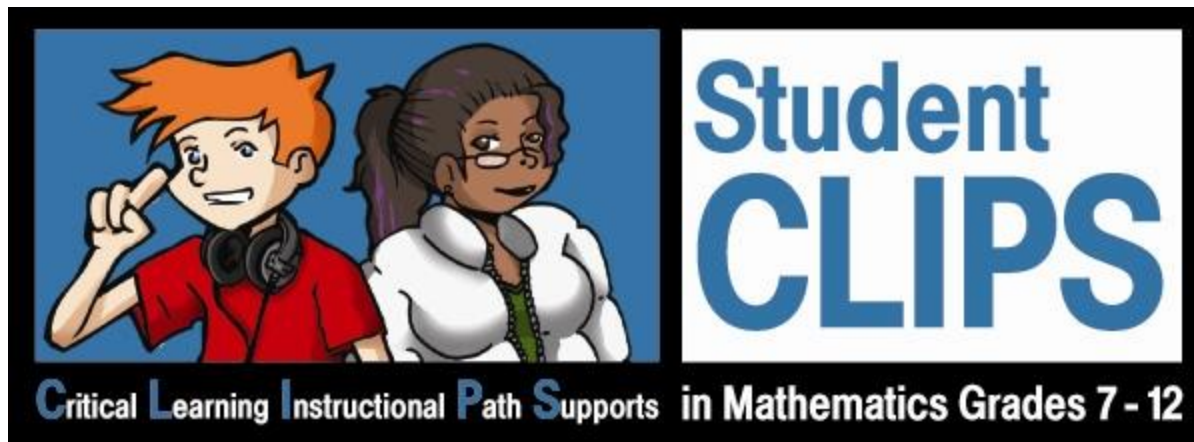
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<http://www.oame.on.ca/CLIPS/>



CLIPS

- accessible to all Grades 7-12 students and teachers to:
 - close gaps in all key concepts
 - provide alternate approaches to meeting selected curriculum expectations

Critical Learning Instructional Paths Supports

Student CLIPS

START 



in Mathematics
Grades 7 - 12

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Version 0.1

Final Thoughts

- “All students can learn mathematics – with enough support, resources, and time – and we must ensure that they do.”

Leading Math Success p. 11

- “Teachers of mathematics are best positioned to deliver the supports students need for developing and practicing the academic language needed for learning mathematics.”

TIPS for English Language Learners in Mathematics p. 1