

These resources can be used with Grades K-5, Grades 6-8, and Grades 9-12. Websites and examples have been reviewed for appropriate use for English language learners and students who have been classified as Fluent English Proficient (FEP) Year 1 and Year 2.

English Language Development Strategies in Mathematics **Grouping Structures**

It is important for teachers to incorporate different grouping structures in the classroom. Possible grouping structures include partners, triads, and small groups of 4-5 students. The choice of structure will depend upon the purpose of the lesson/activity. Partners can be very powerful when students are involved in problem-solving. Grouping should be based on both math and language abilities. Think-pair-share is a simple structure for students to learn and practice. Each student thinks individually about the problem or question. This think time allows students an opportunity to gather their thoughts so they can contribute to a later conversation with ideas or questions. After think time, students pair with a peer to discuss their ideas and reconcile their understandings. Using this structure allows teachers to pair students of different language development levels to work together on a common task and work toward achieving specific language objectives. Small groups can accomplish the same language goals of reading, writing, listening, and speaking by working together on tasks. Students can be assigned various roles of facilitator, recorder, or reporter. Grouping structures provide additional rehearsal for ELL students.

The use of manipulatives while simultaneously demonstrating a concept can be very powerful. If text is involved during small group, do a “concept” walk through the material being covered and purposefully discuss and demonstrate/solve illustrations.

Understanding the Problem/Reading the Story

Students should be encouraged to think of word problems as short stories. Thus, they can apply the same reading strategies they use for making meaning from other texts. Engaging students in asking questions and discussing the word problems is very beneficial for English Language Learners (ELLs). Pertinent questions would be: What do I know for sure? What do I want to know or do? Are there any special conditions I need to consider? Another important step is to encourage students to make connections to prior experience, to the world, and to their important mathematical ideas. After the students have made sense of the problem, they must plan how to solve it. Guiding students to consider different representations (manipulative, pictures, graphs, written language, symbols, tables, equations, action movement, oral language, or mental images of real world situations) will be especially beneficial for ELLs (Hyde, 2006).

Writing Problems

Giving students opportunities to write their own problems, specifically word problems, will support numerous writing skills. When students engage in writing problems, they demonstrate their understanding of the mathematics but also their understanding of sentence structure, vocabulary, grammar, and punctuation. Writing problems demands clear, concise, and complete

ideas. After writing problems, their peers should read them to make sure they are complete and make sense. Students can then revise their problems based on that feedback.

Deciphering the Language of Mathematics

Language can be confusing because some words are used in both everyday English and mathematics (square, similar, range). Also, certain terms learned together can be challenging (equation and expression, hundreds and hundredths, intersect and intercept). One strategy to use with students is a partnering activity where students study the terms and uncover the differences between them. They focus on these differences and create a poster, skit, web page, or other product that highlights what each term means and how the terms are different. Some type of visual artifact may be posted on a word wall for future reference (Hunsader, Kersaint, Richards, Rubenstein, and Thompson, 2008).

Teach Key Mathematics Vocabulary

- Addition: increased by; more than; combined together; total of; sum; added to, multiplication, division
- Subtraction: less than, fewer than, reduced by, decreased by, difference of
- Multiplication: of, times, multiplied by
- Division: per, a; out of; ratio of, quotient of; percent (divide by 100)

Teach Steps to Solve Word Problems

- Read the entire problem
- Look for key words to indicate specific operation
- Translate the wording into a numeric equation
- List information and the variables you identify
- Define what answer you need (including unit of measure)
- Solve the equation.

Use of Graphic Organizers

Graphs to use with One Independent Variable and One Dependent Variable

- Simple Bar Graph
- Horizontal Bar Graph

- Range Bar Graph
- Histogram

Graphs to use with Two or More Independent Variables and One Dependent Variable

- Grouped Bar Graph
- Composite Bar Graph

Website for Free Graphs

Download and create a variety of free graphs at:

http://www.shodor.org/interactivate/activities/PieChart/?version=1.6.0_11&browser=MSIE&vendor=Sun_Microsystems_Inc.&flash=10.0.22Pie.

Word Walls

Word walls come in many different formats. Classroom word walls are developed by identifying the important vocabulary, making strips with the vocabulary words listed, posting these strips on the wall, and referring to these posted words when the terms are introduced. For ELLs, adding a visual to these strips is important. Students can create word walls in their individual notebooks which are specific to their needs. Using the Frayer Model as a graphic organizer in the individual word walls may help with consistency from student to student.

<http://www.longwood.edu/staff/jonescd/projects/educ530/aboxley/graphicorg/fraym.htm>.

Modeling of Think Alouds

Teachers should use the strategy of thinking aloud as they read through a problem so students can experience the thought processes. Think-alouds are nothing more than making an invisible mental process visible. Math think-alouds engage students and help them make their way step-by-step through a solution process. Students are also exposed to how math concepts are used and applied in everyday life. After the teacher models it several times, students can practice a think aloud with a partner. Students will be supported not only in the problem-solving process but also in the ability to express themselves.

Think-aloud Ideas

Elapsed time/future time: Use the classroom clock as a visual and count by fives, tens or by the hour. State the specific time of the special and demonstrate that you can count the minutes on the clock by five as you count towards the time.

- The number of minutes until lunch/specials
- The number of minutes or hours since the school day began
- The number of minutes in a class

- The total number of hours spent at school in a day

Money

Think aloud about how much money you will spend if you want to buy six candy bars that cost 50 cents each. You would say out loud what you are thinking mentally. You know that one candy bar is 50 cents so two candy bars would be 1.00 and if you grouped the candy bars by two's until you had six, you would know that you would need \$3.00. You would discuss with your students if

Comparison

Think aloud about how to compare how many more blue cubes you have than your friend, when comparing classmates who is taller and how do you know. How many less students buy their lunch when compared to those buying?

Estimation

Think aloud about how to estimate the number of tiles on the ceiling or how many cubbies are on the wall. Estimate and then, as a class, count. Was the estimate close? Explain. As a class, estimate how much of all items are needed for a class ice cream sundae party, i.e. bowls, spoons, bananas, M&M's, bottles of toppings, cartons of ice cream, etc.

Learning Journals

Learning logs can be beneficial in helping students to explain their thinking, use new mathematical vocabulary, and demonstrate their learning. ELLs may need some scaffolding by providing them with writing frames to assist them with organization. When introducing any new tool, it is important for the teacher to model its use. If students have difficulty organizing their thoughts before writing, the teacher can initiate a discussion time first. Often if students discuss what they want to write first, they are more confident and successful in transferring their thoughts to paper.

When children write in journals, they examine, express, and keep track of their reasoning, which is especially useful when ideas are too complex to keep in their heads. By reading their journals, a teacher can evaluate their progress and recognize their strengths and weaknesses.

How you use the math journal will depend on your purpose, preferences, and particular age, language abilities and needs of your students. In some classes, students do all of their work in journals. Some teachers have children write entries at the end of math class to reflect on the math concept of the day while others have students use their journals only for particular class assignments—when they give students a problem to do or a question to reflect on.

There are many ways to motivate children to write: problem solving, process prompts, language experience, and class discussion. In problem solving, students work through particular problems

by writing about them. Process prompts are given to students to help them reflect on what they are doing.

Some example process prompts are:

- What I know about _____ so far is _____.
- What I'm still not sure about is _____.
- What I'd like to know more about is _____.

Language experience involves having children write down the difficulties they are having and then reading their thoughts back to you.

In class discussion, students are asked to describe what they did in an activity, rather than describe how they thought about a problem. For students, describing a process is much easier than describing what they think about a problem.

Academic Language Scaffolding

Language Scaffolding is a step-by-step process of building student's ability to complete tasks on their own. Students identify mathematics vocabulary by participating in an introductory activity. Scaffolding consists of several strategies used in conjunction to "shelter" curriculum content for ELLs. These strategies include modeling the use of academic or technical language; contextualizing academic or technical language through the use of visuals, gestures, graphic organizers, and demonstrations; and using hands-on learning activities that involve the use of academic or technical language.

Directed Reading-Thinking Activity

This activity engages students in the processes of reading and is applicable when reading a mathematics textbook. Students take a quick look at the titles, captions, charts, pictures, or graphs in the lesson. Students predict what they think the main ideas of the lesson will be. Then students read the text of the lesson to determine how accurate their predictions were. This strategy enables students to get personally involved with the text and gives them a purpose for reading.

Uses for Manipulatives

- Beans for counters
- Small props for acting out word problems
- Geometric shapes cut into fractional parts
- Colored linking cubes for building patterns
- Measuring cups and containers for studying measurement
- Plastic coins for counting/individual clocks for student use

- Materials to sort and sorting mats/containers