Differentiating Instruction:

Building Mathematical Academic Language Skills for Culturally and Linguistically Diverse Students

Granite School District

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Granite School District Video
QR Code
Objectives

Content
Learners will become more knowledgeable regarding the necessity to focus on academic language for English Learners (ELs) with the Mathematics Common Core State Standards (CCSS)

Language
Learners will:
› listen to and discuss academic language
› create differentiated math tasks using the WiDA Model Performance Indicators
› connect academic language to mathematical instructional strategies in the classroom
Mathematics Instruction for ELs
What do English Learners need in the Mathematics classrooms? (Moschkovich)

1. Teachers who are prepared to teach math for understanding
2. Participate in mathematical discussions as they learn English
3. Treat everyday language as resource, not as an obstacle
4. Focus on mathematical practices, not “language” as vocabulary, single words, grammar, or a list of definitions
5. Focus on student’s mathematical reasoning, not accuracy in using language
Academic Language in Diverse Classrooms
Margo Gottlieb and Gisela Ernst-Slavit

World Instructional Design and Assessment (WiDA)
Academic Language

› Used for specific purpose and audience in a particular context

› Used in schools to acquire a new or deeper understanding of the content and to communicate that understanding to others

› Increases in complexity from grade to grade and year to year

› For ELs, increasing horizontally from one language proficiency level to the next
Academic Language for ELs

English Language Development instruction ensures that:

› ELs attain English to high levels of proficiency enabling them to meet the same state academic Core Standards as all students are expected to meet

› Students meet both English Social Basic Interpersonal Communication Skills (BICS) as well as Cognitive Academic Language Proficiency (CALP)

› ELD is a daily 45-minute block of time providing explicit language instruction targeted in each language domain: listening, speaking, reading and writing (Genesee, Lindholm-Leary, Saunders & Christian, 2006)
WIDA’s English Language Development Standards

Standard 1
Social & Instructional Language

Standard 2
Language of Language Arts

Standard 3
Language of Mathematics

Standard 4
Language of Science

Standard 5
Language of Social Studies

Academic Language
Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

www.mrsliretteslearningdetectives.com
Model with mathematics.

Mathematical Practice 4

I can recognize math in everyday life and use math I know to solve problems.

I can use....

Rob has 23 crayons. Jill has 46 crayons. How many more crayons does Jill have than Rob?

...to solve everyday problems.

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4th Grade Fractions Unit
Model 4th Grade Math Unit

Content Objective: I can solve and explain problems involving fractional parts
Language Objective: I can describe and compare the use of fractions in a variety of situations

Activity: Students will use real world problems to create and convert recipes using fractions

Assessments:
- Math journal (Do-Talk-Record)
- Use of sentence frames
- Converting recipes (Anchor Chart)
Scrumptious Chocolate Brownies
Serves 16

Ingredients

For the Brownies

- \( \frac{1}{2} \) cup butter
- 1 cup white sugar
- 2 eggs
- 1 teaspoon vanilla extract
- \( \frac{1}{3} \) cup unsweetened cocoa powder
- \( \frac{1}{2} \) cup all-purpose flour
- \( \frac{1}{4} \) teaspoon salt
- \( \frac{1}{4} \) teaspoon baking powder

For the Frosting

- 3 tablespoons butter, softened
- 3 tablespoons unsweetened cocoa powder
- 1 tablespoon honey
- 1 teaspoon vanilla extract
- 1 cup confectioners’ sugar

Directions

Preheat oven to 350 degrees F (175 degrees C). Grease and flour an 8 inch square pan.

In a large saucepan, melt \( \frac{1}{2} \) cup butter. Remove from heat, and stir in sugar, eggs, and 1 teaspoon vanilla extract. Beat in \( \frac{1}{3} \) cup cocoa, \( \frac{1}{2} \) cup flour, salt, and baking powder. Spread batter into prepared pan.

Bake in preheated oven for 25 to 30 minutes. Do not overcook.

To Make Frosting: Combine 3 tablespoons butter, 3 tablespoons cocoa, 1 tablespoon honey, 1 teaspoon vanilla, and 1 cup confectioners’ sugar. Frost brownies while they are still warm. Enjoy!
Multicultural Literature
Identifying Academic Language

“What language will students need to know in order to access grade-level material and demonstrate understanding of the topic and concepts?”
# Dimensions of Academic Language

<table>
<thead>
<tr>
<th>Academic Language</th>
<th>General Areas of Coverage</th>
<th>Mathematic Text Type: Recipes</th>
</tr>
</thead>
</table>
| **Discourse Level** | • Text Type  
• Genres  
• Voice/Perspective  
• Cohesion across sentences  
• Coherence of ideas  
• Organization of text or speech  
• Transitions of thoughts | Directions for a recipe |
| **Sentence Level** | • Types of sentences-simple, compound, complex, compound-complex  
• Types of clauses-relative, coordinate, embedded  
• Prepositional phrases  
• Syntax (forms and grammatical structures) | Imperative verbs: preheat, combine, mix  
Sequential language: first, second, then, next, later, finally |
| **Word/Phrase Level** | • Vocabulary-general, specialized, technical academic words and expressions  
• Multiple meanings/polysemous words  
• Nominalizations  
• Idiomatic expressions  
• Metaphors  
• Double entendres | • Recipe  
• Ingredients  
• Measuring cup  
• Utensils  
• One-half cup  
• Double  
• Halve  
• Teaspoon |
Learning Task

› Choral read

Think:

- “What language will students need to know in order to comprehend the recipe text?”
Granite School District
Vocabulary Cards

http://www.graniteschools.org/DEPART/TEACHINGLEARNING/CURRICULUMINSTRUCTION/MATH/
Anchor Charts

Divide Fractions

I can... divide a fraction by a fraction, a whole # by a fraction, and a fraction by whole #.

Step #1: Convert whole numbers to fractions, OR change mixed #s to improper fractions.

\[
\begin{align*}
\frac{3}{4} \div \frac{1}{4} & \quad \frac{3}{1} \div \frac{1}{4} \\
\frac{1}{4} \div \frac{3}{1} & \\
\end{align*}
\]

Step #2: Find the reciprocal of the divisor.

\[
\begin{align*}
\frac{3}{4} \div \frac{1}{4} & \quad \frac{3}{1} \div \frac{4}{1} \\
\frac{1}{4} \div \frac{3}{1} & \\
\end{align*}
\]

Step #3: Replace the division symbol with a multiplication symbol.

\[
\begin{align*}
\frac{3}{4} \times \frac{4}{1} & \quad \frac{3}{1} \times \frac{4}{1} \\
\frac{1}{4} \times \frac{1}{3} & \\
\end{align*}
\]

Step #4: Multiply the fractions across.

\[
\begin{align*}
\frac{3}{4} \times \frac{4}{1} & = \frac{12}{4} \\
\frac{3}{1} \times \frac{4}{1} & = \frac{12}{1} \\
\frac{1}{4} \times \frac{1}{3} & = \frac{1}{12} \\
\end{align*}
\]

Step #5: Simplify. If needed, convert to mixed number or whole number.

\[
\begin{align*}
\frac{12}{4} & = 3 \\
\frac{12}{1} & = 12 \\
\frac{1}{12} & \\
\end{align*}
\]

Keep -> Change -> Flip

First Symbol Second Fraction

Fraction divided by a Fraction

Whole # divided by a fraction

Fraction divided by a whole number
Do-Talk-Record

Students:
1. Work with a general idea
2. Talk about how they solved the problem or what strategies were used
3. Write down the steps in solving the problem

Do you know HOW?

Compare. Write >, < or = for each □.

1. \[ \frac{3}{5} \quad \text{□} \quad \frac{4}{5} \]
2. \[ \frac{1}{4} \quad \text{□} \quad \frac{2}{3} \]
Sentence Starters:

- I think ___ because.....
- My first step is...
- I learned ___ when ___.....
- If ___ then.....
- The answer is ___ because.....
- A better strategy would be ___ because...
- I solved the problem by...
- I agree/disagree because...
- I solved the problem by...

Sentence Frames:

- _____ is the numerator.
- _____ is the denominator.
- _____ can be simplified to _____.
- ___ is greater than/ less than ____.
- I divided the ______ into _______
Differentiated Tasks Using WIDA
Student Supports

Figure 3G: Examples of Sensory, Graphic and Interactive Supports

<table>
<thead>
<tr>
<th>Sensory Supports</th>
<th>Graphic Supports</th>
<th>Interactive Supports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real-life objects (realia)</td>
<td>Charts</td>
<td>In pairs or partners</td>
</tr>
<tr>
<td>Manipulatives</td>
<td>Graphic organizers</td>
<td>In triads or small groups</td>
</tr>
<tr>
<td>Pictures &amp; photographs</td>
<td>Tables</td>
<td>In a whole group</td>
</tr>
<tr>
<td>Illustrations, diagrams &amp; drawings</td>
<td>Graphs</td>
<td>Using cooperative group structures</td>
</tr>
<tr>
<td>Magazines &amp; newspapers</td>
<td>Timelines</td>
<td>With the Internet (Web sites) or software programs</td>
</tr>
<tr>
<td>Physical activities</td>
<td>Number lines</td>
<td>In the native language (L1)</td>
</tr>
<tr>
<td>Videos &amp; Films</td>
<td></td>
<td>With mentors</td>
</tr>
<tr>
<td>Broadcasts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Models &amp; figures</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 3H: Specific Examples of Sensory Supports

<table>
<thead>
<tr>
<th>Supports related to the language of Language Arts</th>
<th>Supports related to the language of Mathematics</th>
<th>Supports related to the language of Science</th>
<th>Supports related to the language of Social Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illustrated word/phrase walls</td>
<td>Blocks/Cubes</td>
<td>Scientific instruments</td>
<td>Maps</td>
</tr>
<tr>
<td>Felt or magnetic figures of story elements</td>
<td>Clocks, sundials and other timekeepers</td>
<td>Measurement tools</td>
<td>Globes</td>
</tr>
<tr>
<td>Sequence blocks</td>
<td>Number lines</td>
<td>Physical models</td>
<td>Atlases</td>
</tr>
<tr>
<td>Environmental print</td>
<td>Models of geometric figures</td>
<td>Natural materials</td>
<td>Compasses</td>
</tr>
<tr>
<td>Posters or displays</td>
<td>Calculators</td>
<td>Actual substances, organisms or objects of investigation</td>
<td>Timelines</td>
</tr>
<tr>
<td>Bulletin boards</td>
<td>Protractors</td>
<td></td>
<td>Multicultural artifacts</td>
</tr>
<tr>
<td>Photographs</td>
<td>Rulers, yard-meter sticks</td>
<td></td>
<td>Arial &amp; satellite photographs</td>
</tr>
<tr>
<td>Cartoons</td>
<td>Geoboards</td>
<td></td>
<td>Video clips</td>
</tr>
<tr>
<td>Audio books</td>
<td>Counters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Songs/Chants</td>
<td>Compasses</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Calendars</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coins</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Using WIDA to Differentiate Instruction

I can Identify and solve fractional part problems with a partner using models.

<table>
<thead>
<tr>
<th>Language Functions</th>
<th>Content Stems</th>
<th>Student Supports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1 &amp; 2 Listen/Speak</td>
<td>- Using the four operations with whole numbers to solve problems</td>
<td>- Blocks/Cubes</td>
</tr>
<tr>
<td>- Answer questions</td>
<td>- Factors and multiples</td>
<td>- Number Lines/Timelines</td>
</tr>
<tr>
<td>- Determine</td>
<td>- Patterns</td>
<td>- Models/ Figures</td>
</tr>
<tr>
<td>- Find</td>
<td>- Place value for multi-digit whole numbers</td>
<td>- Calculators</td>
</tr>
<tr>
<td>- Follow one-step commands</td>
<td>- Multi-digit arithmetic</td>
<td>- Protractors</td>
</tr>
<tr>
<td>- Generate</td>
<td>- Fraction equivalence and ordering</td>
<td>- Rulers, yard/ meter sticks</td>
</tr>
<tr>
<td>- Identify _____</td>
<td>- Fractional parts</td>
<td>- Geoboards</td>
</tr>
<tr>
<td>- Match _____</td>
<td>- Decimal notation for fractions</td>
<td>- Counters</td>
</tr>
<tr>
<td>- Mimic _____</td>
<td>- Compare decimal fractions</td>
<td>- Compasses</td>
</tr>
<tr>
<td>- Point to _____</td>
<td>- Measurement and conversion of measurements from a larger unit to a smaller unit</td>
<td>- Calendars</td>
</tr>
<tr>
<td>- Produce phrases/ words</td>
<td>- Data</td>
<td>- Coins</td>
</tr>
<tr>
<td>- Repeat _____</td>
<td>- Decimals: addition and subtraction</td>
<td>- Clocks, timers</td>
</tr>
<tr>
<td>- Respond to questions</td>
<td>- Concepts of angle and measure angles</td>
<td>- Bilingual dictionaries</td>
</tr>
<tr>
<td>- Seek information</td>
<td>- Lines and angles, and classify shapes by properties of their lines and angles</td>
<td>- Charts/ Tables/ Graphs/</td>
</tr>
<tr>
<td>- Select</td>
<td>1. Make sense of problems and persevere in solving them</td>
<td>- Cooperative groups: Pairs, Partners, Triads</td>
</tr>
<tr>
<td>- Sequence</td>
<td>2. Reason abstractly and quantitatively</td>
<td>- Group/ partner reading</td>
</tr>
</tbody>
</table>

Using WIDA to Differentiate
4th Grade CCSS for Mathematics

Language Functions
- Level 1 & 2
  - Level 1-3: Read/Write
    - Solve
    - Answer questions
Learning Task 4: Using WIDA MPIs

› Do-Talk: With a partner, create 1 differentiated learning task using listening, speaking, reading, and writing for proficiency levels 1 and 2

› Record: Write the task using a complete sentence
Take Away

› Find a partner
› Answer the following questions:
  – What squared with me?
  – What questions are still circling around?
  – What key points would I like to implement? How will I start?
Objectives

Content
Learners will become more knowledgeable regarding the necessity to focus on academic language for English Learners (ELs) with the Mathematics Common Core State Standards (CCSS)

Language
Learners will:
› listen to and discuss academic language
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› connect academic language to mathematical instructional strategies in the classroom
Thank you for joining us today!

Contact us at:

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Launa Harvey  llharvey@graniteschools.org
Sara Moore   smmoore@graniteschools.org
Model with mathematics.

I can recognize math in everyday life and use math I know to solve problems.

I can use...

\[
\begin{array}{c}
46 - 23 \\
\hline
23
\end{array}
\]

(Words)

(Julie has 13 crayons, Jill has 15 crayons. How many more crayons does Jill have than Julie?)

(Objects)

(Pictures)

...to solve everyday problems.

equivalent fraction

Fractions that have the same value.