



Project MELD: Mathematics and English Language Development for English Learners

Instructional Methods and Materials

NOVEMBER 2019

Diane August, Ph.D. | Will Johnston, M. Ed. |

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MAKING RESEARCH RELEVANT

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Introduction

Overview

Project MELD (Mathematics and English Language Development) for English Learners is a curriculum-based intervention that enables middle-grade English learners (ELs) to acquire the skills and knowledge they need to meet state standards for mathematics and English language proficiency. Project MELD uses as a base an open-access mathematics curriculum designed for English-proficient students—LearnZillion¹—and adds supports to make the content more accessible for ELs, while simultaneously supporting their language development.

Project MELD introduces students to mathematical concepts that are important for more advanced mathematics courses. There are two units, and each unit is composed of 10–15 lessons. Unit 1 focuses on factors, multiples, and the distributive property, while Unit 2 focuses on ratios. MELD focuses on these skills because research has demonstrated their importance for subsequent math achievement in algebra (Burris, Heubert, & Levin, 2006) and the importance of algebra for secondary and post-secondary achievement (Gamoran & Hannigan, 2000; Long, Conger, & Iatarola, 2012).

This practitioner manual displays and describes the instructional materials and methods used in MELD. Materials include digital teaching cards, teacher guides, student guides and handouts, unit glossaries, supplemental resources, and mini-lessons. A Unit 1 lesson appears in Appendix A. The mini-lessons appear in Appendix B. The mini-lessons facilitate students' acquisition of academic language. These mini-lessons focus on supporting students in using knowledge of cognates and morphology to uncover the meanings of unknown words, and in engaging in academic conversations with classmates.

The manual also explains how MELD engages students in disciplinary practices; develop ELs' foundational conceptual knowledge and skills required for grade-level mathematics, involves students in productive discourse and interactions with others; uses multiple registers and modalities, and leverage home-language resources.

Evidence Base

MELD methods are aligned with promising instructional strategies described in a recent report by the National Academies of Science, Engineering, and Medicine (2018), entitled *English Learners in STEM Subjects*. Findings from this report indicate that promising instructional

¹ LearnZillion is an education software company that develops curricula in the areas of mathematics and English language arts (<https://learnzillion.com/p/>).

strategies include “engaging students in disciplinary practices, engaging students in productive discourse and interactions with others, using multiple registers and modalities to support learning, leveraging home-language resources, and providing an explicit focus on how language functions in the discipline” (pp. 104–122).

The development and pilot testing of MELD was supported through an award from the U.S. Department of Education². Findings from the pilot test indicate that both ELs and English-proficient students who received the MELD intervention made significantly larger gains in grade-level mathematics knowledge and skills, and in academic language associated with mathematics, than similar students in a control group (who were learning the same course content, with a business-as-usual approach).

MELD Instructional Materials

MELD curricular materials consist of digital teaching cards, teacher guides, student guides, student handouts, unit glossaries, supplemental resources, and mini-lessons.

Digital Teaching Cards for Each Lesson

Digital teaching cards (PowerPoint slides) support teacher implementation of each lesson. Abbreviated teacher notes on each card guide teacher instruction.

Teacher Guide

Teacher guides for each lesson are aligned with the digital teaching cards (PowerPoint slides). The teacher guides help teachers prepare for and implement the lessons. The format of these teacher guides is as follows:

- The slide numbers are displayed in the left column.
- Images of the teaching cards (i.e., PowerPoint slides) are displayed in the middle column.
- The teaching notes are displayed in the right column.

For each teaching card, the teacher guides include notes related to pacing and instructions. The teacher notes are framed as directives for teachers (e.g., ask students..., read text on card, think-pair-share, discuss as a class, explain, hand out..., point to...). The guides also include keys for the in-class exit tickets and additional practice exercises. See Exhibit 1 and the model lesson in Appendix A.

² National Center for Education Research Award Number: R305A140199

A common teaching routine is as follows:

- Present: Teacher presents a problem situation.
- Students Think-pair-share: Students think about a question or problem, work in pairs to talk about the question or problem, answer or solve the problem individually or as a pair and share out the answer (if applicable).
- Students Enter: Students enter information in the student guide related to the question or problem.
- Discuss: Teacher engages students in a discussion related to the question or problem.
- Students Correct: Students correct the information they have entered into their student guide.
- Explain: The teacher paraphrases, explains, and/or models as necessary throughout the lesson to support comprehension.

Student Guide and Handouts

There are student guides for each lesson, containing a lesson glossary, interactive notes pages aligned with digital teacher cards (PowerPoint slides), in-class practice handouts consisting of practice problems, lesson closure information, and an exit ticket. There are also additional practice handouts for independent practice or reteaching.

Worked examples, sentence frames, and/or graphic organizers provide additional support for students as they engage in MELD activities.

The format of the student guides is aligned with the digital teaching cards:

- The slide numbers are displayed in the left column.
- The instructions for students are displayed in the middle column.
- The student activities are displayed in the right column.

See Exhibit 2 and the model lesson in Appendix A. Common instructions for students are as follows:

- Read: Read the information in the activity column and on the PowerPoint slide as the teacher reads and/or after the teacher reads.
- Listen: Listen to the teacher's explanation or instructions and to other students' questions and responses.

- Think-pair-share (TPS): Think individually, talk with a partner about a question or problem or work with a partner to answer the question or problem, and share out the answer or solution if requested by the teacher.
- Write: Answer questions or fill in tables (this might be done individually at first, followed by think-pair-share).
- Discuss: Discuss as a class the problems on the slides.
- Complete: Complete additional problems in the activity column or activity sheets.
- Complete with a partner: Work with a partner to complete additional problems.
- Fill out the exit ticket: Complete the exit ticket before leaving class.

Unit Glossaries

While there are glossaries at the beginning of each lesson, there is also a unit glossary at the end of each unit containing all the words that have been taught in the lessons. The words are listed alphabetically. Exhibit 3 displays one row of a glossary. The number refers to the Power Point slide number that displays the card, students repeat the word with the teacher, write the word, listen to the definition and example, and work with a partner to answer the question or solve a problem.

Supplemental Resources

There are supplemental resources to develop and activate students' prior knowledge in advance of a lesson. Supplementary resources that accompany lessons include colored tiles for lessons in Unit 1 (used as array models for factors and multiples); egg cartons, beans, and a mat for Lessons 3a–3d in Unit 2 (used to model ratios); and paper cutouts for Lesson 1 in Unit 3 (used as counters and to model fractions).

Mini-Lessons

There are three mini-lessons. Each includes a teacher guide, a student guide, and student handouts. The mini-lessons focus on helping students use cognate knowledge and knowledge of morphology (base words, prefixes, and suffixes) to uncover the meanings of unknown words and engage in academic conversations. The teacher guides for the three mini-lessons appear in Appendix B.

MELD Promising Methods

The goal of MELD is to enhance outcomes for ELs and for their English-proficient classmates. To accomplish this goal, MELD aligns with the promising instructional practices for educating ELs described in the introduction of this manual. Promising practices include engaging students in disciplinary practices; involving students in productive discourse and interactions with others; using visual and linguistic supports to make core disciplinary content comprehensible to ELs; capitalizing on home language resources, and strategically building ELs' academic language in the context of math instruction.

We have added another practice: the importance of developing ELs' foundational conceptual knowledge and skills. The discipline of mathematics requires students to accumulate knowledge sequentially. Many ELs lack the necessary precursor knowledge and skills to engage in grade-level course content, as evidenced by their mathematics outcomes on standardized assessments (compared with the outcomes of their English-proficient classmates).³

³ National Assessment of Education Progress (NAEP) mathematics results from 2017 indicate that 6% of EL students scored at or above proficient, compared to 36% of their non-EL peers, at the eighth-grade level—a difference of 30 percentage points (National Center for Education Statistics, 2016).

References

Burris, C. C., Heubert, J. P., & Levin, H. M. (2006). Accelerating Mathematics Achievement Using Heterogeneous Grouping. *American Educational Research Journal*, 43(1), 137–154. <https://doi.org/10.3102/00028312043001105>

Gamoran, A., & Hannigan, E. C. (2000). Algebra for Everyone? Benefits of College-Preparatory Mathematics for Students with Diverse Abilities in Early Secondary School. *Educational Evaluation and Policy Analysis*, 22(3), 241-254. <https://doi.org/10.3102/01623737022003241>

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Appendix A. Lesson Example

MELD Unit 1 Lesson 2: Overview

This MELD lesson provides opportunities for sixth-grade students to develop conceptual understanding related to number theory, particularly multiples, which is foundational for understanding the math concepts of ratios and proportions. Students develop procedural skills in finding multiples through manipulatives, skip counting, and tables. Students reason about multiples through problem solving and patterning.

Tasks are structured to provide opportunities for productive discourse; teachers question, students partner talk, and teachers lead class discussions building on students' responses.

Throughout this lesson, the linguistic modalities of oral language and text are coordinated to support ELs' comprehension. Other modalities are named when they appear.

While not shown in this lesson example, in the actual MELD curriculum students have access to home-language resources such as bilingual student guides and bilingual in-class and additional practice handouts for all lessons. Students are also encouraged to use their home language during partner talk if it enhances their learning.

We note in this lesson instances of language development at the word level. Language at the discourse level is not explicitly named, but the lesson is crafted to provide opportunities for teachers to model thinking, explain concepts and procedures, and re-voice student contributions. Students have opportunities to participate in partner and whole-class settings, enabling them to "move fluidly" across modalities and registers (National Academy of Sciences, Engineering, and Medicine, 2018, p.109).

Format of the tables that follow. Each table includes three sections. The first section is an overview that describes the activity and types of supports available to ELs; the second section displays the teacher PPT slide and teacher guide associated with the activity; and the third displays the student guide associated with the activity.

Teacher Card/PowerPoint Slide	Teacher Guide
Lesson 2: Finding and Using Multiples of Numbers	Supplementary resources: <ul style="list-style-type: none">• Calculators• Per pair: 30 tiles, 15 in one color and 15 in a different color

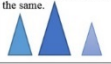
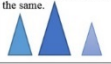
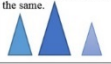

Overview: Teacher provides direct instruction of general and discipline-specific target vocabulary.

Explicit focus on academic language: Student glossary

Multiple modalities: Use of numeric patterns and pictures to help define vocabulary




Productive discourse: Teacher question, think-pair-share, discussion

Leverage home-language resources: Spanish translations

Teacher Card/PowerPoint Slide		Teacher Guide																																		
<p>Lesson 2 Glossary Instructions: Follow glossary routine.</p> <table border="1"> <thead> <tr> <th colspan="5">New Words in this Lesson</th> </tr> <tr> <th>Card number</th> <th>Repeat the word</th> <th>Write the word!</th> <th>Listen to the definition</th> <th>Listen to the example</th> <th>Think-Pair-Share</th> </tr> </thead> <tbody> <tr> <td rowspan="2">10</td> <td>difference</td> <td></td> <td>the answer to a subtraction problem</td> <td>$5 - 3 = 2$</td> <td>What is the difference between 4 and 3?</td> </tr> <tr> <td>diferencia</td> <td></td> <td>la respuesta de un problema de sustracción</td> <td>The difference between 5 and 3 is 2.</td> <td></td> </tr> <tr> <td rowspan="2">10</td> <td>find</td> <td></td> <td>to discover something</td> <td>Marco solves the math problem. He finds a solution.</td> <td>Find the solution to this problem: $6 \times 2 =$</td> </tr> <tr> <td>encontrar</td> <td></td> <td>descubrir algo</td> <td></td> <td></td> </tr> </tbody> </table> <p>2 <i>Teacher notes: Say the word, students repeat the word twice, students write the word in their glossary, review the definition, review the example, students TPS, discuss as a class.</i></p>		New Words in this Lesson					Card number	Repeat the word	Write the word!	Listen to the definition	Listen to the example	Think-Pair-Share	10	difference		the answer to a subtraction problem	$5 - 3 = 2$	What is the difference between 4 and 3?	diferencia		la respuesta de un problema de sustracción	The difference between 5 and 3 is 2.		10	find		to discover something	Marco solves the math problem. He finds a solution.	Find the solution to this problem: $6 \times 2 =$	encontrar		descubrir algo			<p>Suggested pacing: 3 minutes Teacher instructions: For each word, use the following routine: Say the word. Students repeat the word twice. Students write the word in their glossary. Review the definition. Review the example. Students TPS. Discuss as a class.</p>	
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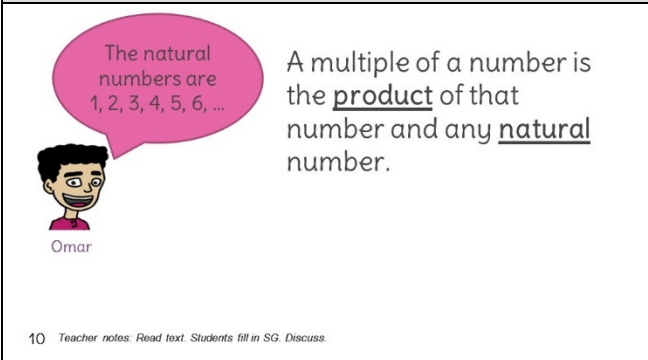
Overview: Teacher introduces lesson objectives and academic language associated with the objectives.
 Explicit focus on academic language: Modeling of academic oral and written language related to math

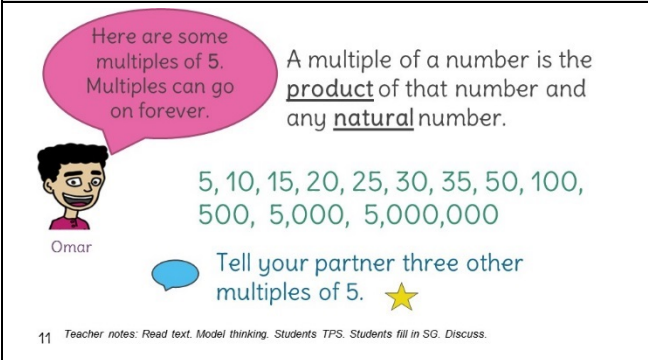

Teacher Card/PowerPoint Slide		Teacher Guide	
<p>At the end of this lesson, I will... ★</p> <ul style="list-style-type: none"> • use multiples to solve problems. • understand that multiples of numbers are found by multiplying by natural numbers. • be able to solve problems using multiples. <p><small>5 Teacher notes: Read text. Students listen and choral read. Students fill in SG.</small></p>		<p>Suggested pacing: 2 minutes</p> <p>Teacher instructions:</p> <p>Read text on card.</p> <p>Students listen, choral read, and fill in blanks in their student guide.</p>	
Student Guide			
<p>Listen, read, and complete student guide.</p>		<p>At the end of this lesson, I will...</p> <p>Use _____ to solve problems.</p> <p>Understand that _____ of numbers are found by _____ by _____ numbers.</p> <p>Be able to solve problems using _____.</p>	

<p>Overview: Teacher reminds students of the meanings of stars and blue bubbles and poses first question of the lesson. Multiple modalities: Illustration</p>	
Teacher Card/PowerPoint Slide	Teacher Guide
<p>When you see a ★, write in your student guide.</p> <p>When you see a , think, pair, and share.</p> <p>6 <i>Teacher notes: Read text.</i></p>	<p>Suggested pacing: 30 seconds</p> <p>Teacher instructions: Read text on card.</p>
<div style="display: flex; align-items: center;">  <div style="border: 1px solid purple; border-radius: 50%; padding: 10px; background-color: #e6e6fa; display: inline-block;"> Muffins come 4 in a box. What numbers of muffins can I buy? </div> <div style="margin-left: 20px; text-align: center;">  <p>Mr. Nelson</p> </div> </div> <p>7 <i>Teacher notes: Read text. Model thinking.</i></p>	<p>Suggested pacing: 30 seconds</p> <p>Teacher instructions: Read text on card.</p>
Student Guide	
<p>Read and listen.</p>	

<p>Overview: Teacher explains the meaning of “multiple.”</p> <p>Explicit focus on academic language: Meaning of “multiple” is reinforced through a second example.</p> <p>Multiple modalities: Illustrations</p> <p>Productive discourse: Teacher question, think-pair-share, discussion</p>	
Teacher Card/PowerPoint Slide	Teacher Guide
<p>4 20</p> <p>8 24</p> <p>12 28 36</p> <p>16 32 40</p> <p>Mr. Nelson</p> <p>What is a multiple? Draw or write.</p> <p>8 <small>Teacher notes: Read text. Model thinking. Students TPS.</small></p>	<p>Suggested pacing: 3 minutes</p> <p>Teacher instructions:</p> <p>Read text on card.</p> <p>Explain: Some multiples of 4 are 4, 8, 12, 16, 20, 24, 28, 32, 36, and 40.</p> <p>Pose question.</p> <p>Students TPS.</p> <p>Students draw a picture or write a sentence in their student guide to define or illustrate the meaning of “multiple.”</p> <p>Discuss as a class.</p>
Student Guide	
<p>Read, listen, TPS, complete student guide, and discuss.</p>	<p>Some multiples of 4 are 4, 8, 12, 16, 20, 24, 28, 32, 36, and 40.</p> <p>What is a multiple? Draw a picture and/or write a sentence.</p>

<p>Overview: Teacher poses a real-life question to reinforce the meaning of “multiple.”</p> <p>Explicit focus on language: Students write responses.</p> <p>Multiple modalities: Illustration</p> <p>Productive discourse: Teacher question, think-pair-share, discussion</p>	
Teacher Card/PowerPoint Slide	Teacher Guide
<p>4 20</p> <p>8 24</p> <p>12 28</p> <p>16 32</p> <p>Mr. Nelson</p> <p>Why does Mr. Nelson need to buy 28 muffins for 25 students?</p> <p>9 <small>Teacher notes: Read text. Model thinking. Students TPS. Students answer problem in SG. Discuss.</small></p>	<p>Suggested pacing: 3 minutes</p> <p>Teacher instructions:</p> <p>Read text on card.</p> <p>Pose question.</p> <p>Students TPS.</p> <p>Students answer question in their student guide.</p> <p>Discuss as a class.</p>
Student Guide	
<p>Read, listen, TPS, complete student guide, and discuss.</p>	<p>Why does Mr. Nelson need to buy 28 muffins for 25 students?</p> <p>Mr. Nelson needs to buy 28 muffins for 25 students because</p> <p>_____</p> <p>.</p>

<p>Overview: Teacher provides a formal definition of “multiple.” Explicit focus on academic language: Meanings of “product” and “natural number” are reinforced in context.</p>	
Teacher Card/PowerPoint Slide	Teacher Guide
	<p>Suggested pacing: 1 minute Teacher instructions: Read text on card. Students fill in the blanks in their student guide. Discuss as a class.</p>
Student Guide	
<p>Read, listen, complete student guide, and discuss.</p>	<p>A multiple of a number is the _____ of that number and any _____ number.</p>

<p>Overview: Teacher poses a question and engages students in a class discussion that elaborates on the concept of “multiple.” Productive discourse: Teacher question, think-pair-share, discussion</p>	
Teacher Card/PowerPoint Slide	Teacher Guide
	<p>Suggested pacing: 3 minutes Teacher instructions: Read text on card. Model thinking. Ask question. Students TPS. Students fill in blanks in their student guide. Discuss as a class. Explain: All multiples of 5 end in 0 or 5.</p>
Student Guide	
<p>Read, listen, TPS, complete student guide, and discuss as a class.</p>	<p>Some multiples of 5 are 5, 10, 15, 20, 25, 30, 35, 50, 100, 500, 5,000, 5,000,000</p> <p> Tell your partner three other multiples of 5.</p> <p>Three other multiples of 5 are _____.</p>

Overview: Teacher uses number sentences to explain how factors and multiples are different.

Explicit focus on academic language: Explanation

Multiple modalities: Symbolic representation

Productive discourse: Teacher question, think-pair-share, discussion

Teacher Card/PowerPoint Slide

Teacher Guide

What is the difference between factors and multiples?

Factors are multiplied to find a product.

3 and 2 are factors of 6.

$3 \times 2 = 6$

Multiples are the products from multiplying factors.

3, 6, 9, and 12 are multiples of 3.

$3 \times 1 = 3$
 $3 \times 2 = 6$
 $3 \times 3 = 9$
 $3 \times 4 = 12$

12 Teacher notes: Read text. Point out factors and multiples.

Suggested pacing: 1 minute

Teacher instructions:

Read text on card.

Explain differences between factors and multiples.

Student Guide

Read and listen.

What is the difference between factors and multiples?

Factors are multiplied to find a product.

3 and 2 are factors of 6.

Omar

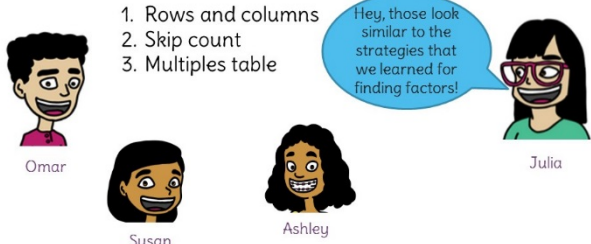
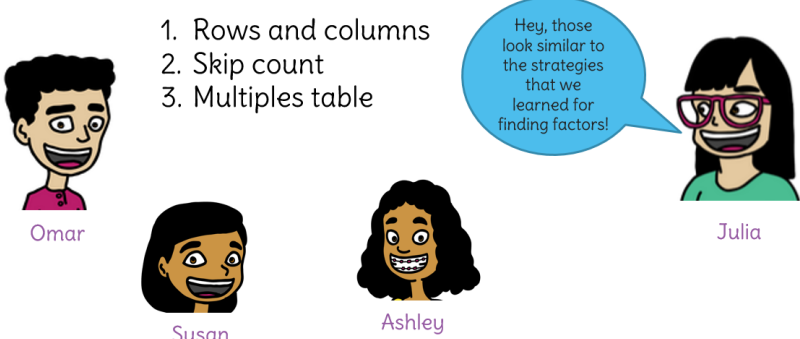
$3 \times 2 = 6$

Multiples are the products from multiplying factors.

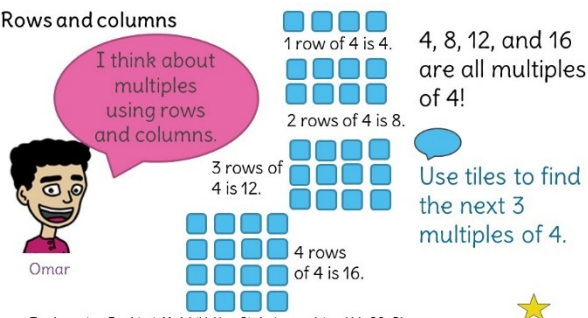

3, 6, 9, and 12 are multiples of 3.

$3 \times 1 = 3$
 $3 \times 2 = 6$
 $3 \times 3 = 9$
 $3 \times 4 = 12$

10 Teacher notes: Read text. Model thinking.

Overview: Teacher previews methods that will be used to find multiples.	
Teacher Card/PowerPoint Slide	Teacher Guide
<p>Today we will learn <u>3 methods</u> for finding multiples.</p> <ol style="list-style-type: none"> 1. Rows and columns 2. Skip count 3. Multiples table  <p>Omar Susan Ashley Julia</p> <p>13 <i>Teacher notes: Read text.</i></p>	<p>Suggested pacing: 30 seconds</p> <p>Teacher instructions: Read text on card.</p>
Student Guide	
<p>Read and listen.</p>	<p>Today we will learn <u>3 methods</u> for finding multiples.</p> <ol style="list-style-type: none"> 1. Rows and columns 2. Skip count 3. Multiples table  <p>Omar Susan Ashley Julia</p> <p>13 <i>Teacher notes: Read text.</i></p>

Overview: Teacher uses repeated rows in an array made of tiles to represent multiples.
 Explicit focus on academic language: Explaining
 Multiple modalities: Manipulatives
 Productive discourse: Teacher questioning and think-pair-share, re-voicing

Teacher Card/PowerPoint Slide	Teacher Guide																																																																																																																																																																																																								
<p>Rows and columns</p>  <p>Omar</p> <p><small>Teacher notes: Read text. Model thinking. Students complete grid in SG. Discuss. ¹⁴ Teacher explanation: Different arrangements make rectangular arrays. For each multiple a new complete row is added. EX2 in TG.</small></p>	<p>Suggested pacing: 1 minute Teacher instructions: Read text on card. Model thinking: Different arrangements make rectangular arrays. For each multiple, a new complete row is added. Students complete the grid and list the next three multiples of 4 in their student guide. Discuss as a class. Explain: The multiples of 4 are 4, 8, 12, 16, 20, 24, 28.</p>																																																																																																																																																																																																								
Student Guide																																																																																																																																																																																																									
<p>Read, listen, TPS, complete student guide, and discuss.</p>	<p>4, 8, 12, and 16 are all multiples of 4.</p>  <p>Use tiles to show the next three multiples of 4. Show your work on the grid.</p> <table border="1" data-bbox="490 982 1258 1375"> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table> <p>Multiples of 4 are 4, 8, 12, 16, _____, _____, _____.</p>																																																																																																																																																																																																								


Overview: Teacher provides a non-example of a multiple using an array of tiles.
 Multiple modalities: Tiles
 Productive discourse: Teacher question, think-pair-share, discussion

Teacher Card/PowerPoint Slide	Teacher Guide
<p>Rows and columns</p> <p>15 <small>Teacher notes: Read text. Model thinking. Students TPS. Students fill in SG. Discuss.</small></p>	<p>Suggested pacing: 2 minutes Teacher instructions: Read text on card. Model thinking: Multiples of a number will have complete rows. Students TPS. Students write a number greater than 20 but not a multiple of 4 in their student guide. Discuss as a class. Explain: Possible answers include 21, 22, 23, 25, 26, 27, 29, 30, 31...</p>
Student Guide	
<p>Read, listen, TPS, complete student guide, and discuss.</p>	What is a number greater than 20 that is not a multiple of 4? A number that is greater than 20 that is not a multiple of 4 is _____.



Overview: Teacher introduces tables of multiples as a way to make lists of multiples.
 Explicit focus on academic language: Explanation
 Multiple modalities: Table
 Productive discourse: Teacher question, think-pair-share, discussion



Teacher Card/PowerPoint Slide	Teacher Guide																								
<p>Multiples Table</p> <p>Multiples of 8</p> <table border="1"> <thead> <tr> <th>number</th> <th>factor</th> <th>multiple</th> </tr> </thead> <tbody> <tr><td>8</td><td>1</td><td>8</td></tr> <tr><td>8</td><td>2</td><td>16</td></tr> <tr><td>8</td><td>3</td><td>24</td></tr> <tr><td>8</td><td>4</td><td>32</td></tr> <tr><td>8</td><td>5</td><td>40</td></tr> <tr><td>8</td><td>6</td><td>48</td></tr> <tr><td>8</td><td>7</td><td>56</td></tr> </tbody> </table> <p>18 <small>Teacher notes: Read text. Model thinking. Point out table organization. Students TPS. Students fill in SG. Discuss using next slide.</small></p>	number	factor	multiple	8	1	8	8	2	16	8	3	24	8	4	32	8	5	40	8	6	48	8	7	56	<p>Suggested pacing: 3 minutes Teacher instructions: Read text on card. Model thinking. Point out the organization of the table. Students TPS. Students write the next three multiples of 8 in their student guide. Discuss as a class. Explain: $8 \times 8 = 64$, $8 \times 9 = 72$, $8 \times 10 = 80$.</p>
number	factor	multiple																							
8	1	8																							
8	2	16																							
8	3	24																							
8	4	32																							
8	5	40																							
8	6	48																							
8	7	56																							
Student Guide																									
<p>Read, listen, TPS, complete student guide, and discuss.</p>	What are the next three multiples of 8 after 56? number x factor = multiple $8 \times \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$ $8 \times \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$ $8 \times \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$																								


Overview: Students check their work and correct if needed.
 Explicit focus on academic language: Illustrating, sentence frame
 Multiple modalities: Table

Teacher Card/PowerPoint Slide		Teacher Guide																														
<p>Multiples Table</p> <p>Multiples of 8 number x factor = multiple</p> <table border="1"> <tr><td>8</td><td>1</td><td>8</td></tr> <tr><td>8</td><td>2</td><td>16</td></tr> <tr><td>8</td><td>3</td><td>24</td></tr> <tr><td>8</td><td>4</td><td>32</td></tr> <tr><td>8</td><td>5</td><td>40</td></tr> <tr><td>8</td><td>6</td><td>48</td></tr> <tr><td>8</td><td>7</td><td>56</td></tr> <tr><td>8</td><td>8</td><td>64</td></tr> <tr><td>8</td><td>9</td><td>72</td></tr> <tr><td>8</td><td>10</td><td>80</td></tr> </table> <p>19 <i>Teacher notes: Read text. Model thinking. Students check their work.</i></p> <div style="border: 1px solid green; border-radius: 50%; padding: 10px; display: inline-block; width: 150px;"> I like to make a table to organize my multiples. I multiply the number by the natural number factors in order. </div> <div style="text-align: center; margin-top: 10px;"> $8 \times 8 = 64$ $8 \times 9 = 72$ $8 \times 10 = 80$  <p>Ashley</p> </div>		8	1	8	8	2	16	8	3	24	8	4	32	8	5	40	8	6	48	8	7	56	8	8	64	8	9	72	8	10	80	<p>Suggested pacing: 3 minutes Teacher instructions: Read text on card. Model thinking. Students check and correct their work in their student guide.</p>
8	1	8																														
8	2	16																														
8	3	24																														
8	4	32																														
8	5	40																														
8	6	48																														
8	7	56																														
8	8	64																														
8	9	72																														
8	10	80																														
Student Guide																																
Read, listen, and correct work.	Correct your work as needed.																															

Overview: The teacher demonstrates the calculator steps for skip counting and developing a multiples table if needed.

Teacher Card/PowerPoint Slide		Teacher Guide
<p>Calculator Reminder</p> <div style="border: 1px solid orange; border-radius: 50%; padding: 10px; display: inline-block; width: 150px;"> It might be faster to do in your head, but you can use a calculator to skip count or make a list of multiples. </div>  <p>Diego</p>  <p>20 <i>Teacher notes: Read text. Demonstrate as needed.</i></p>		<p>Suggested pacing: 30 seconds to 2 minutes Teacher instructions: Read text on card. Demonstrate methods (skip counting or multiplying by natural numbers). Teacher Note: This is a support for those students who have limited fact recall.</p>
Student Guide		
Read and listen.		

<p>Overview: Students summarize the lesson. Explicit focus on academic language: Naming of methods Multiple modalities: Three representations of multiples</p>										
Teacher Card/PowerPoint Slide	Teacher Guide									
<p>Lesson Summary: Today we will learned <u>3 methods</u> for finding multiples.</p> <p>1. Rows and columns  2 rows of 4 is 8.</p> <p>2. Skip count 9, 18, 27, 36, 45, 54, 63, ...</p> <p>3. Multiples table</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="3">number x factor = multiple</th> </tr> </thead> <tbody> <tr> <td>8</td> <td>1</td> <td>8</td> </tr> <tr> <td>8</td> <td>2</td> <td>16</td> </tr> </tbody> </table> <p style="text-align: right;"></p> <p><small>21 Teacher notes: Read text. Students fill in SG. Discuss. Students choral read.</small></p>	number x factor = multiple			8	1	8	8	2	16	<p>Suggested pacing: 2 minutes Teacher instructions: Read text on card. Students fill in the blanks to complete the statements in their student guide. Students choral read. Discuss as a class.</p>
number x factor = multiple										
8	1	8								
8	2	16								
Student Guide										
<p>Listen, read, complete student guide, and discuss</p>	<p>Today we learned three methods for finding multiples:</p> <p>1. _____</p> <p>2. _____</p> <p>3. _____</p>									

<p>Overview: Students complete in-class practice with teacher support available. Productive discourse: Partner work Leverage home-language resources: Bilingual in-class practice handouts</p>	
Teacher Card/PowerPoint Card	Teacher Guide
<p style="text-align: center;">Go to In-class Practice</p> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: 80%;"> <p style="text-align: right;">Name _____</p> <p>In-class Practice Grade 6, Unit 1, Lesson 2</p> <p>Example: Juice boxes come in packages of 4. What numbers of juice boxes can Diego buy? How many packages will he need to buy to serve 18 people? <i>Solution:</i> Multiples of 4 are 4, 8, 12, 16, 20, 24, 28, 32. 18 is more than 16 and less than 20 so Diego needs to buy 4 packages.</p> <p>1. List the first 5 multiples of 7. _____</p> <p>2. Circle all the choices that are multiples of 6. a. 12 b. 16 c. 26 d. 36 e. 48 f. 58</p> </div> <p style="text-align: right;"></p> <p><small>22 Teacher notes: Students work together to complete.</small></p>	<p>Suggested pacing: 8–10 minutes + Teacher instructions: Students complete the in-class practice in their student guide. Discuss as a class. Teacher Note: Allow students to work in pairs and use their home language(s) as necessary.</p>
Student Guide	
<p>Complete in-class practice handout.</p>	<p>Find multiples and use multiples to solve problems.</p>

In-Class Practice Handout


Example: Juice boxes come in packages of 4. How many packages will he need to buy to serve 15 people?

Solution: Multiples of 4 are 4, 8, 12, 16, 20, 24, 28, 32.

15 is more than 12 and less than 16, so Diego needs to buy 4 packages.

1. List the first five multiples of 7. _____, _____, _____, _____, _____
2. Circle all the choices that are multiples of 6.
a. 12 b. 16 c. 26 d. 36 e. 48 f. 58
3. Ashley buys stickers for her little sister. There are 15 stickers on each page. Ashley makes a list of the number of stickers she can buy using multiples. What are the first six multiples of 15? _____, _____, _____, _____, _____, _____

4. Hamburger buns come in packages of 8. What numbers of buns can Jack buy? Write the first five multiples.
_____, _____, _____, _____, _____
_____, _____, _____, _____, _____
5. Jack needs buns for 30 hamburgers. How many packages should he buy? Jack should buy _____ packages.

<p>Overview: Students reflect on the three methods of finding multiples developed in the lesson.</p> <p>Explicit focus on academic language: Students explain favorite method</p> <p>Multiple modalities: Strategy options displayed as visuals, numerical patterns, and a table</p>																
Teacher Card/PowerPoint Slide	Teacher Guide															
<p>Reflection: ★ Today we will learned <u>3 methods</u> for finding multiples. What is your favorite strategy? Why?</p> <p>1. Rows and columns</p> <p> 2 rows of 4 is 8.</p> <p>3. Skip count 4. Multiples table</p> <p>9, 18, 27, 36, 45, 54, 63, ...</p> <table border="1" style="display: inline-table; margin-left: 100px;"> <tr> <td style="padding: 2px;">number</td> <td style="padding: 2px;">x</td> <td style="padding: 2px;">factor</td> <td style="padding: 2px;">=</td> <td style="padding: 2px;">multiple</td> </tr> <tr> <td style="padding: 2px;">8</td> <td style="padding: 2px;">1</td> <td style="padding: 2px;">8</td> <td style="padding: 2px;"></td> <td style="padding: 2px;">8</td> </tr> <tr> <td style="padding: 2px;">8</td> <td style="padding: 2px;">2</td> <td style="padding: 2px;">16</td> <td style="padding: 2px;"></td> <td style="padding: 2px;"></td> </tr> </table> <p><small>23 Teacher notes: Read text. Students write a reflection. Discuss.</small></p>	number	x	factor	=	multiple	8	1	8		8	8	2	16			<p>Suggested pacing: 2 minutes</p> <p>Teacher instructions: Read text on card. Students complete the self-reflection by filling in the blanks in their student guide. Discuss their reflections as a class.</p>
number	x	factor	=	multiple												
8	1	8		8												
8	2	16														
Student Guide																
<p>Read, listen, and complete student guide.</p>	<p>My favorite method for finding multiples is _____</p> <p>Because _____</p> <p>_____</p>															

<p>Overview: Students complete independent practice.</p> <p>Home-language resources: Bilingual additional practice handout</p>	
Teacher Card/PowerPoint Slide	Teacher Guide
<p style="text-align: center;">Go to Additional Practice</p> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: 80%;"> <p style="text-align: center;">Name _____</p> <p>Additional Practice Grade 6, Unit 1, Lesson 2</p> <p><small>Example: Juice boxes come in packages of 4. What numbers of juice boxes can Diego buy? How many packages will he need to buy to serve 15 people? Solution: Multiples of 4 are 4, 8, 12, 16, 20, 24, 28, 32. 15 is more than 12 and less than 16 so Diego needs to buy 4 packages.</small></p> <p>1. List the first 5 multiples of 8. _____</p> <p>2. Circle all the choices that are multiples of 3.</p> <p>a. 12 b. 13 c. 15 d. 21 e. 23 f. 29</p> </div> <p style="text-align: right; margin-top: 10px;">★</p> <p><small>25 Teacher notes: Students work together to complete.</small></p>	<p>Suggested pacing: 5–10 minutes +</p> <p>Teacher instructions: Teacher Note: There are two ways to use this additional practice. Method 1. Divide the class into two groups. Students who have mastered content in this lesson can work through the additional practice items on their own. The teacher works with students who have not mastered the content. Method 2. Students work on this as their homework.</p>
Student Guide	
<p>Complete additional practice handout.</p>	<p>Find multiples and use multiples to solve problems.</p>
<p>The additional practice handout is similar to the in-class practice handout.</p>	

Appendix B. Mini-Lessons

Teacher Guide MELD Mini-Lesson: Academic Conversations

Lesson Overview

Introduction: This lesson focuses on prompt and response frames that help students elaborate, clarify, and provide a rationale for what they said or did. Prompt frames are question starters to help students ask questions. Response frames are statement starters to help students answer questions. Although this lesson focuses on the one routine (elaborate, clarify, and provide a rationale), Resource #1 provides additional routines that might also be taught (Zwiers & Crawford, 2011).

The lesson begins with a review of standards and objectives (Resource #2). Next, the teacher reviews conversation norms using a video for students who have not yet learned these norms (Resource #3). This activity is optional. The lesson ends with teacher modeling and student practice using a math problem (Resource #4) and prompt and response frames to discuss it (Resource #6). A student handout accompanies this lesson.

Preparation: Make sufficient copies of the **Student Handout** for each student.

Background: According to Zwiers and Crawford (2011, p. 1), “[A]cademic conversations are exchanges between people who are trying to learn from one another and build meanings they did not have before. Partners take turns talking, listening and responding to each other’s comments. They are sustained and purposeful conversations about school topics.”

Reference

Zwiers, J., & Crawford, M. (2011). *Academic conversations*. Portland, ME: Stenhouse Publishers. *Note.* Examples of prompt and response frames appear on pages 30–31.

Additional Prompt and Response Frames			
Routine	Prompt Frames	Response Frames	Glossary
Elaborate, clarify, and provide a rationale	What do you mean by ___? Can you tell me more about ___? What did you do? Why did you ___?	I mean that _____. First I _____, second I _____. I _____ because _____.	elaborate: add more information clarify: make something easier to understand rationale: reason support an idea: give more information about an idea evidence: facts build on: add to challenge: to question if something is right paraphrase: to say something
Support ideas with examples and evidence	Can you give me an example of _____? What is the evidence for _____?	An example of _____ is _____. The evidence is that _____. In the text it said that _____.	
Build on and/or challenge a partner’s idea	Do you agree that _____? Can you add to this idea? Do you have another idea for how to solve this problem?	No, I don’t agree because _____. Yes, my idea is _____. Yes, I would add that _____. Yes, I would solve this problem by _____.	
Paraphrase	What do we know so far? What did you hear me say?	We know that _____. I heard you say that _____.	
Synthesize conversation points	What are the main points? What is the key idea?	The main points are _____. The key idea is _____.	

Review Objectives

Background for Teachers: This lesson helps English learners meet the following Texas Essential Knowledge and Skills English language proficiency standards:

3(E): share information in cooperative learning interactions.

3(F): ask and give information ranging from using a very limited bank of high-frequency, high-need, concrete vocabulary, including key words and expressions needed for basic communication in academic and social contexts, to using abstract and content-based vocabulary during extended speaking assignments.

Instructions for Teachers

- Read the objectives to the students.
- Tell students that boldfaced words are defined in the glossary.
- Ask students to talk with a partner about what the objectives mean.
- Call on a pair to share out.

Instructions for Students

- Listen as the teacher reviews the lesson objectives.
- If you have questions about what they mean, use the glossary to help you.
- Talk to a partner about what they mean.
- Listen as one or two classmates share out.

Resource #1

Student Objectives

I will use **prompt frames** to ask for **clarification** and **elaboration**.

I will use **response frames** to **clarify** what I have done or said.

Glossary

prompt frames: question starters like “What do you mean by...?”

clarification: language that is easier to understand

elaboration: more information

response frames: statement starters like “I mean that...”

clarify: to make easy to understand

Review Classroom Norms

Instructions for Teachers

- Review the conversation norms poster with students.
- Have students review the YouTube video demonstrating a classroom discussion that uses the norms elaborated in the poster: <https://www.youtube.com/watch?v=0MOjnm5i6E4> (stop video at 2:22).
- In pairs, ask students to discuss the YouTube video by focusing on what helped classroom conversations.
- Discuss as a class.

Instructions for Students

- Look at the poster and listen as the teacher discusses conversation norms.
- Watch the YouTube video.
- Talk with a partner about what you saw in the video that helped classroom conversation and what you saw in the video that hurt classroom conversation.
- Listen as one or two classmates share out.

Resource #2: Classroom Norms Poster

We listen to each other.

We share our own ideas and explain them.

We respect one another's ideas, even if they are different.

We respectfully disagree and try to see the other point of view.

We let others finish explaining their ideas without interrupting.

We try to come to some agreement in the end.

We take turns and share air time.

Engage in Academic Conversations

Instructions for Teachers

- Explain the use of prompt and response frames, focusing on the *elaborate, clarify, and provide a rationale* prompt and response frames.
 - Highlight that **prompt frames** help students ask questions. **Response frames** help students answer questions.
 - Explain that there are different kinds of prompt and response frames depending on the skill. The focus of this lesson is on elaborating, clarifying, and providing a rationale.
 - Ask students what it means to elaborate, clarify, and provide a rationale. (It means asking one another for more information, making that information easier to understand, and giving an explanation for that information.)
- Demonstrate the use of prompt and response frames.
 - Ask students to read the math problem.
 - Select two students to help you model the *elaborate, clarify, and provide a rationale* prompt and response frames.
- Have student pairs practice using the same prompt and response frames to discuss the math problem and its solution.
 - Ask students to engage in two rounds of conversation so each student has an opportunity to use both prompt and response frames:
 - Student B uses prompt frames to question Student A.
 - Student A uses response frames to respond to Student B.
 - Circulate to support students.
- Debrief with the class. Consider the following questions:
 - Did you use the prompt and response frames?
 - How did using them help or hurt your conversation?
 - How might you use these frames in our class discussions?

Resource #3a: Math Problem**Instructions for Students**

- Listen as your teacher explains prompt and response frames.
- Work with a partner to review the math problem and solution.
- Watch as two students model prompt and response frames.
- Work with your partner to use the prompt and response frames to discuss the same math problem and solution. Make sure you have a chance to be Student A and Student B.
- Debrief with your class.

Math problem:



Susan can buy fidget spinners in packages of 4.

Susan wants more than 20 fidget spinners but fewer than 30 fidget spinners.

How many packages of fidget spinners should Susan buy to have enough fidget spinners for all her friends?

Steps	What did I do?	Why did I do it?															
<p>1.</p> <table border="1" data-bbox="203 947 704 1341"> <thead> <tr> <th>Number in a package</th> <th>Times the number of packages</th> <th>= multiple</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>5</td> <td>20</td> </tr> <tr> <td>4</td> <td>6</td> <td>24</td> </tr> <tr> <td>4</td> <td>7</td> <td>28</td> </tr> <tr> <td>4</td> <td>8</td> <td>32</td> </tr> </tbody> </table>	Number in a package	Times the number of packages	= multiple	4	5	20	4	6	24	4	7	28	4	8	32	<p>1. I found the multiples of 4 by counting by 4s: 0, 4, 8, 12, 16, 20, 24, 28, 32.</p>	<p>1. I know that fidget spinners only come in packages of 4, so I have to buy them in groups of 4. Groups of 4 reminds me of multiples.</p>
Number in a package	Times the number of packages	= multiple															
4	5	20															
4	6	24															
4	7	28															
4	8	32															
<p>2. $4 \times 6 = 24$ and $4 \times 7 = 28$</p>	<p>2. I chose the number of packages Susan should buy so that she has more than 20 fidget spinners and fewer than 30 fidget spinners. She should buy 6 or 7 packages.</p>	<p>2. I chose 6 packages because 4 (fidget spinners per package) $\times 6$ (packages) = 24 fidget spinners (which is more than 20 fidget spinners but fewer than 30 fidget spinners). I chose 7 packages because 4 (fidget spinners per package) $\times 7$ (packages) = 28 (which is more than 20 but fewer than 30).</p>															

Resource #3b Prompt and Response Frames**Frame 1**

Prompt	<p><i>Use the prompt to ask your partner to clarify a statement.</i></p>
Response	<p><i>Use the response frame below to clarify and explain your ideas.</i></p>

Frame 2

Prompt	<p><i>Use the prompt below to ask your partner to elaborate.</i></p>
Response	<p><i>Use the response frame to elaborate by providing more information.</i></p>

Frame 3

Prompt	<p><i>Use the prompt to ask your partner to provide a rationale for what he/she did.</i></p>
Response	<p><i>Use the response frame to provide a rationale for what you did.</i></p>

Teacher Guide

MELD Mini-Lesson: Cognates

Lesson Overview

Introduction: This lesson introduces students to cognates. Begin by reviewing lesson objectives with students (Resource #1). Introduce students to the concept of cognates and false cognates. Instruct students to identify cognates in a sample paragraph (Resource # 2). Model how to evaluate and record whether the words are cognates based on the meaning, sound, and appearance. Resource #3 is a completed table and Resource #4 provides English definitions for the cognates. A sample solution to the math problem posed in the paragraph is provided (Resource #5). A student handout accompanies this lesson.

Note that after each teacher activity, the instructions for students and student worksheets appear.

This activity can be implemented in classrooms with monolingual English speakers if the monolingual English speakers are paired with students whose first language shares cognates with English.

Teacher Preparation: Make copies of the **Student Handout** for each student.

Background: Cognates can be an important tool for learning new words, especially for romance languages like Spanish, which share thousands of cognates with English. Linguists estimate that about one half to one third of words in English share cognate status with Spanish (Nash, 1997). Moreover, research has shown that children benefit from instruction that makes them aware of cognates (Graves, August, & Mancilla Martinez, 2013).

References

Graves, M., August, D., & Mancilla Martinez, J. (2013). *Teaching vocabulary to English-language learners*. New York, NY: Teachers College Press.

Nash, R. (1997). *NTC's dictionary of Spanish cognates: Thematically organized*. Chicago, IL: NTC Publishing Group.

Review Objectives

<p>This lesson helps English learners meet the following English language proficiency standard: learn relationships between sounds and letters of the English language and decode (sound out) words using a combination of skills such as recognizing sound-letter relationships and identifying cognates, affixes, roots, and base words.</p> <p>This lesson helps students meet the following English language arts standard: determine the meaning of grade-level academic English words derived from Latin, Greek, or other linguistic roots and affixes.</p>	
<p>Instructions for Teachers</p> <ul style="list-style-type: none"> ▪ Read the objectives to the students. ▪ Tell students that boldfaced words are defined in the glossary. ▪ Ask students to talk with a partner about what the objectives mean. ▪ Call on a pair to share out. 	
<p>Instructions for Students</p> <ul style="list-style-type: none"> ▪ Listen as the teacher reviews the lesson objectives. ▪ If you have questions about what they mean, use the glossary to help you. ▪ Talk to a partner about what they mean. 	
<p>Resource #1</p>	
<p>Student Objectives</p> <p>I will use cognate knowledge to expand my vocabulary.</p>	<p>Glossary</p> <p>cognates: words between two languages that share similar meanings, look alike, and sound alike</p> <p>expand: increase</p>

Develop Knowledge of Language—Cognates

Instructions for Teachers

- Tell students they will listen to a passage read aloud and then work with a partner to find cognates in the passage. Remind students of the definition of cognates.
- Read the passage aloud to students.
- Review the first two rows of the table explaining to students why *superintendent* is a cognate and *pie* is a false cognate.
- Have students work with a partner to find additional words that are cognates. For each English word they think is a cognate, they should underline it, write the word in Spanish, and check if the meaning, sound, and spelling in English are more or less the same as in Spanish. If they are, the word is a cognate.
- Review student answers.

Resource #2 Cognate Text—Vehicles



The *superintendent* of highways is *interested* in the numbers of *commercial* vehicles that *frequently* use the county's highways. He *obtains information* from the *Department* of Motor Vehicles for the month of *September*. He finds that for every 14 noncommercial vehicles, there were 5 commercial vehicles.

There are 108 more noncommercial vehicles than commercial vehicles. How many of each type of vehicle frequently use the county's highways during the month of September?

Resource #3: Cognate Table (for Teacher Use Only)

English Word	Spanish Word	Means the Same?	Sounds the Same?	Looks the Same?	Cognate?
superintendent	superintendente	yes	yes	yes	yes
pie	pie	no	no	yes	no
interested	interesado	yes	yes	yes	yes
commercial	comercial	yes	yes	yes	yes
vehicles	vehiculos	yes	yes	yes	yes
frequently	frecuentemente	yes	yes	yes	yes
use	usa	yes	yes	yes	yes
obtains	obtiene	yes	yes	yes	yes
information	informacion	yes	yes	yes	yes
department	departamento	yes	yes	yes	yes
motor	motor	yes	yes	yes	yes
September	septiembre	yes	yes	yes	yes
question	pregunta	yes	no	no	no

Resource #4: Glossary

English Word	Definition
superintendent	a person who manages or directs an organization
interested	having interest or curiosity about something
commercial	having to do with business
vehicles	forms of transportation including cars, trucks, and buses
frequently	often, many times
use	to utilize
obtains	to get
information	knowledge or facts about anything
department	a part of a school, government, business, or organization
motor	a machine that causes motion or power
September	the month that comes after August
question	a sentence that asks for an answer

Resource #5 Problem Solutions (Optional)**Solution method 1**

Because there are 14 noncommercial vehicles for every 5 commercial vehicles, there are 9 more noncommercial vehicles than commercial vehicles. Make a table to show the given information.

Noncommercial vehicles	14	
Commercial vehicles	5	
How many more noncommercial vehicles	9	108



108 is 12×9 , so the between relationship is 12. So each row is multiplied by 12.

Noncommercial vehicles	14	$14 \times 12 = 168$
Commercial vehicles	5	$5 \times 12 = 60$
Noncommercial – commercial vehicles	9	108

There are 60 commercial vehicles and 168 noncommercial vehicles.

Check: Are there 108 more noncommercial vehicles than commercial vehicles?

$$168 - 60 = 108$$

Solution method 2

Build-up method: Use multiples until one gets a difference of 108.

		$\times 2$	$\times 5$	$\times 10$	$\times 11$	$\times 12$	
Noncommercial vehicles	14	28	70	140	154	168	
Commercial vehicles	5	10	25	50	55	60	
Difference	9	18	45	90	99	108	

The last column shows there are 60 commercial vehicles and 168 noncommercial vehicles.

Check: Are there 108 more noncommercial vehicles than commercial vehicles?

$$168 - 60 = 108$$

Instructions for Students

- Listen as your teacher explains the meaning of cognates and reads the passage.
- Complete the first two rows of the table with your class.
- Work with a partner to underline words in the passage that look like cognates.
- For each word you think is a cognate, write the English word and write the Spanish word. Then check if the word has at least one meaning that is the same in English and Spanish, and check if it sounds and looks alike in both languages. Review the answers with the class.
- *Note.* If students finish early and they have learned how to answer this kind of question, then ask if they can explain how the answer was calculated.

Student Activity

The superintendent of highways is interested in the numbers of commercial vehicles that frequently use the county’s highways. He obtains information from the Department of Motor Vehicles for the month of September. He finds that for every 14 noncommercial vehicles, there were 5 commercial vehicles.

Question: There are 108 more noncommercial vehicles than commercial vehicles in September. How many of each type of vehicle frequently use the county’s highways during the month of September?

Answer: There are 60 commercial vehicles and 168 noncommercial vehicles on the road in September.

English Word	Spanish Word	Means the Same?	Sounds the Same?	Looks the Same?	Cognate?
vehicles	<i>vehículos</i>				
pie	<i>pie</i>				

Teacher Guide

MELD Mini-Lesson: Morphology

Lesson Overview

Below are three lesson components that focus on base words, prefixes, and suffixes. These can be taught individually or together. The students first review the objectives associated with this mini-lesson (Resource #1). The first mini-lesson (Resource #2) serves as an introduction to suffixes, the second mini-lesson (Resource #3) serves as an introduction to prefixes, and the third provides practice with prefixes and suffixes (Resource #4).

Teacher Preparation: Make copies of the **Student Handouts**. Cut out one set of affix and base word cards for all student pairs (Resource #5).

Background: In linguistics, morphology refers to the study of words, how they are formed, and their relationship to other words in the same language. Linguists analyze the structure of words and parts of words such as affixes. In the English language, affixes can appear at the beginning of a base word, like “re-,” or at the end, like “-ing” or “-ment.” The former is a prefix, the latter two are suffixes.

Derivational suffixes can transform a base word into a different part of speech, like “-ly,” which transforms an adjective into an adverb, or the suffix “-ment,” which is used to produce a noun.

Inflectional suffixes do not change the grammatical category of a base word but generally give grammatical information in terms of number, tense, case, and gender. For example, the plural “-s” is inflectional. This mini-lesson focuses on derivational suffixes.

For more information, visit:

<http://www.ello.uos.de/field.php/Morphology/MorphologicalProcessesDerivationVerusInflection>

Review Objectives

Background for Teachers

This lesson helps English learners meet the following Texas Essential Knowledge and Skills English language proficiency standard:

4(A): learn relationships between sounds and letters of the English language and decode (sound out) words using a combination of skills such as recognizing sound-letter relationships and identifying cognates, affixes, roots, and base words.

This lesson helps students meet the following Texas Essential Knowledge and Skills English language arts standard:

b2(A): determine the meaning of grade-level academic English words derived from Latin, Greek, or other linguistic roots and affixes.

Instructions for Teachers

- Read the objectives to students.
- Tell students that boldfaced words are defined in the glossary.
- Ask students to talk with a partner about what the objectives mean.
- Call on a pair to share out.

Instructions for Students

- Listen as the teacher reviews the lesson objectives.
- If you have questions about what they mean, use the glossary to help you.
- Talk to a partner about what they mean.

Resource #1: Student Objectives

Student Objectives

I will use common, grade-appropriate Greek or Latin **affixes** and **base words** as clues to the meaning of new words.

Affixes are **prefixes** and **suffixes**.

I will look for and make use of **structures** in math words.

Glossary

affixes: parts that can be added to the beginning or end of a word

base word: a word that can have a suffix or prefix added to it

prefix: letters you add to the beginning of a base word to change the word's meaning

suffix: letters you add to the end of a base word to change the word's meaning

structures: the way that prefixes, suffixes, and base words are connected

Part 1. Introduce Suffixes

Instructions for Teachers

- Explain that knowing about base words, suffixes, and prefixes will help students understand the meanings of words.
- Work through the example with students. Ask them to fill in the blank.
- Have students work in pairs to complete sentences 1–3.
- Review answers with students.
- After Student Activity 1 is complete, ask students how they can use roots and suffixes to help them understand new words.

Instructions for Students

- Listen while your teacher explains the meaning of “suffix.”
- Complete blanks in the example and sentences 1–3.
- Listen as your teacher reviews the answers with the class.
- Ask a partner: How can I use this information to learn new words?

Resource #2: Base Word and Suffix Chart

Example: Marco likes to compare prices when he buys a new video game to make sure that he gets the best deal. Marco makes a _____ to get the best deal.

Base Word	Base Word Definition	Suffix	New Word	New Word Definition
compare	to say what is the same or different about two or more things	-sion (act of)	comparison	The act of comparing

1. Juliana makes a _____ that her favorite team will win the championship.

Base Word	Base Word Definition	Suffix	New Word	New Word Definition
predict	to guess about a future outcome	-tion	prediction	The act of telling what you think will happen in the future

2. Four times four (4×4) is the _____ of two times eight (2×8).

Base Word	Base Word Definition	Suffix	New Word	New Word Definition
equal	the same value	-valent	equivalent	Having the same value

3. Omar is making _____ designs out of tiles.

Base Word	Base Word Definition	Suffix	New Word	New Word Definition
rectangle	a shape with four sides	-ular	rectangular	something that has the shape of a rectangle

Part 2. Introduce Prefixes

Instructions for Teachers

- Explain that knowing about base words, suffixes, and prefixes will help students understand the meanings of words.
- Work through the example with students. Ask them to fill in the blank.
- Have students work in pairs to complete sentences 1–3.
- Review answers with students.
- After Student Activity 2 is complete, ask students how they can use roots and suffixes to help them understand new words.

Instructions for Students

- Listen while your teacher explains the meaning of “prefix.”
- Complete blanks in the example and sentences 1–3.
- Listen as your teacher reviews the answers with the class.
- Partner talk: How can I use this information to learn new words?

Resource #3: Base Word and Prefix Chart

Example: Tonight, we can only see half of the moon; it looks like a _____.

Base Word	Base Word Definition	Prefix	Prefix Definition	New Word	New Word Definition
circle	a shape	semi-	half	semi-circle	half of a circle

1. In our math class, we have _____ quizzes every other Friday.

Base Word	Base Word Definition	Prefix	Prefix Definition	New Word	New Word Definition
weekly	every week	bi-	two	biweekly	every other week

2. The United States is located in the northern _____.

Base Word	Base Word Definition	Prefix	Prefix Definition	New Word	New Word Definition
sphere	a ball	hemi-	half	hemisphere	the shape of half of a ball

3. Maria did not ask Juan what movie he wanted to go see. She made a _____ decision that they would see the movie that she picked.

Base Word	Base Word Definition	Prefix	Prefix Definition	New Word	New Word Definition
lateral	side	uni-	one	unilateral	one sided

Part 3. Practice: Base Words, Prefixes, and Suffixes

Instructions for Teachers

- Prepare envelopes for each pair or group by cutting up the affixes and base words.
- Explain the game.
- Divide students into pairs or small groups.
- Give each group an envelope.
- Using a document camera, model how to form several new words using the prefixes, base words, and suffixes.
- Give each pair or small group 10 minutes to create as many words as they can and record and define them on their student handout.
- After 10 minutes, have teams share their words.
- Teams receive one point for each word that is a real word.

Instructions for Students

- Use the affix and base word cards to form new words.
- Make as many words as you can.
- Match new words to definitions. Use the glossary to help you.

Resource #4: New Words**New Words and Definitions**

New Words	Definitions
1.	to remove the cover from
2.	a one-wheeled vehicle
3.	an assistant who helps in some task or activity
4.	a flat, closed figure that has three straight sides
5.	the state or quality of being unhappy
6.	unable to take care of oneself
7.	a unit of length equal to one hundredth of a meter
8.	of more than average height
9.	one half of a circle
10.	a train in a city that carries passengers and travels under the ground

Glossary Affix and Base Word Meanings

Prefixes	Meanings
centi-	100
semi-	half, partial
sub-	under
tri-	three
un-	not, opposite of
uni-	one

Suffixes	Meanings
-est	most
-ness	state of, condition of
-less	without
-er	more, a person
-ful	full

Base Words	Meanings
cover	to put something over something else
help	to assist
circle	a line that curves so one end meets the other
way	path from one place to another
angle	where two lines connect at a single point
tall	above average height
meter	unit of measurement
cycle	circle

Student Activity 3**New Words and Definitions**

New Words	Definitions
1.	to remove the cover from
2.	a one-wheeled vehicle
3.	an assistant who helps in some task or activity
4.	a flat, closed figure that has three straight sides
5.	the state or quality of being unhappy
6.	unable to take care of oneself
7.	a unit of length equal to one hundredth of a meter
8.	of more than average height
9.	one half of a circle
10.	a train in a city that carries passengers and travels under the ground

Glossary Affixes and Base Words

Prefixes	Meanings
centi-	100
semi-	half, partial
sub-	under
tri-	three
un-	not, opposite of
uni-	one

Suffixes	Meanings
-est	most
-ness	state of, condition of
-less	without
-er	more, a person
-ful	full

Base Words	Meanings
cover	to put something over something else
help	to assist
circle	a line that curves so one end meets the other
way	path from one place to another
angle	where two lines connect at a single point
tall	above average height
meter	unit of measurement
cycle	circle

Resource #5: Base Word and Affix Cards

centi-	cover	-ment
pre-	help	-est
re-	circle	-able
		-tion,
semi-	way	-sion,
		-ition
sub-	angle	-ness
tri-	tall	-less
un-	meter	-er
uni-	happy	-ful



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