Santa Ana Unified School District

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A Framework for Success:

English Learners and the Common Core

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Outcomes

- Review key components of QTEL Approach
- Explore maximally scaffolded mathematics lesson to help English learners meet the demands of the CCSS
- Develop own lesson(s) incorporating Preparing, Interacting, Extending structure

QTEL™ Principles

- Sustain Academic Rigor
- Hold High Expectations
- Infuse Metaprocesses in the Education of ELs
- Engage in Quality Teacher and Student Interactions
- Sustain a Language Focus
- Develop Quality Curriculum

-WestEd, Quality Teaching for English Learners

Instructional Scaffolds

1. Modeling
2. Bridging
3. Contextualization
4. Schema Building
5. Metacognition
6. Text Representation

-Aida Walqui, 2006

Two Elements of Scaffolding

1. Scaffolding as a Structure
   - Purposeful, guided instruction
   - Setting up of tasks

2. Scaffolding as a Process
   - Dynamic and Responsive
   - Teachers provide support

-Aida Walqui, 2006

Examples of Planned Scaffolding

- Choosing texts carefully for specific purposes
- Selecting and sequencing tasks in a logical order (preparing, interacting, extending)
- Including collaborative participation structures
- Constructing text-dependent questions
- Using graphic organizers, videos, or diagrams to enhance access to content
- Providing students with generative language structures and exemplary writing samples

Examples of "in the moment" scaffolding

- **Prompting** a student to elaborate on a response to extend his/her language use and thinking

- **Paraphrasing** a student's response and including target academic language as a model

- **Adjusting** instruction on the spot based on frequent checking for understanding

- **Linking** what a student is saying to prior knowledge or future learning

Instructional Sequence
(Three Moments of the Lesson)

1. Preparing the Learner

2. Interacting with the Text/Concept

3. Extending Understanding

Scaffolding Matrix

"The Teen Brain"

Instructional Sequence	Instructional Scaffolds	Possible Learning Tasks
Preparing the Learner ↓ Interacting w/ the Text ↓ Extending Understanding ↓ Assessing Learning	Modeling →	• *Modeling Academic Language* • *Modeling Strategies/Processes* • *Model of Problem/Solution Writing in Math*
	Bridging →	• *Quick-Write with 3 Step Interview*
	Contextualization →	• *Vocabulary Notebook* • *Viewing with a Focus*
	Schema Building →	• *Collaborative Problem-Solving* • *Viewing with a Focus*
	Metacognitive Development →	• *Reading in Four Voices*
	Text Representation →	• *Storyboard* • *Collaborative & Independent Problem/Solution Writing*

S.M. Gagnon-Adapted from Aida Walqui

Lesson Guide

- Lesson: “Algebraic Expressions” (Grades 4 – 7)

- Activity: Using math to represent relationships and to solve problems.

Claims for Mathematics

- Students will **write** and **interpret** numerical expressions.

- Students will **analyze** patterns and relationships.

- Students will **apply** and **extend** previous understandings of arithmetic to algebraic expressions.

- Students will **reason** about and **solve** one-variable equations and inequalities.

- Students will **solve** real-life and mathematical problems using numerical and algebraic expressions and equations.

Preparing the Learner

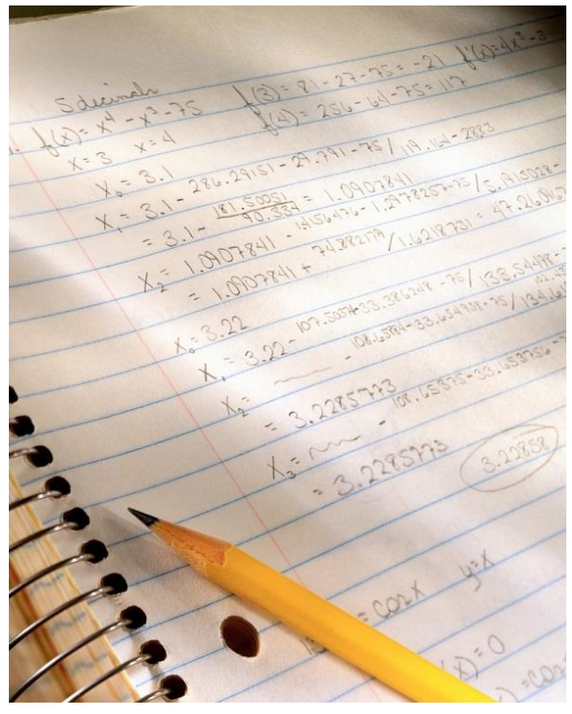
Activate relevant prior knowledge, Focus students' attention on key concept(s) that you will explore, Introduce—in a meaningful context—a few key terms

- Vocabulary Notebook
- Quick-write with 3 Step Interview
- Viewing with a Focus (x 2)

Vocabulary Notebook
(Preparing the Learner)

- Focuses on developing essential vocabulary and providing vocabulary instruction in context.

- Serves as a tool students can use across disciplines and can be adapted for some high-stakes exams (glossary).

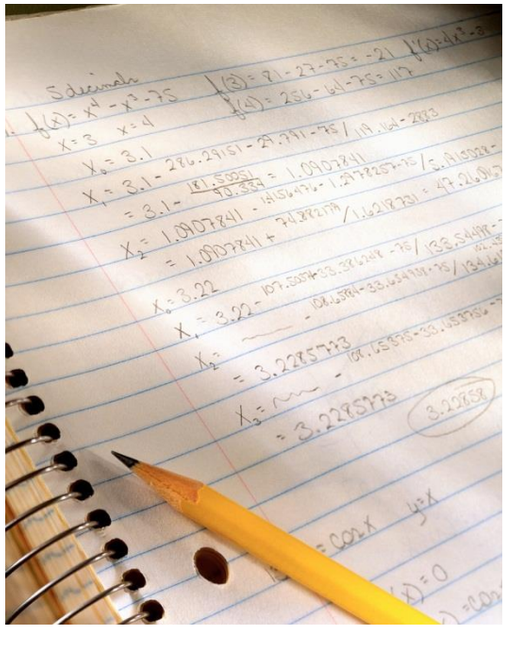


Vocabulary Notebook
(Preparing the Learner)

Components:

- Word and Translation (primary language)
- Picture or Image
- Definition
- Source Sentence
- Original Sentence

NOTE: First column serves as a personal glossary for English learners that they can use on some high-stakes exams.



Vocabulary Notebook
(Preparing the Learner)

Key Words Essential to Understanding

(Words that <u>cannot</u> be deciphered using context clues / High utility)

- Teacher provides the **word** and **image** of some of the words on the handout.
- In table groups, students share any knowledge they already have on these words.
- Teacher circulates the room and notes students' knowledge and/or misconceptions.
- Teacher leads a discussion and guided note-taking on these words while students record the information on their Vocabulary Notebook page (expanded definition, examples, translation…).

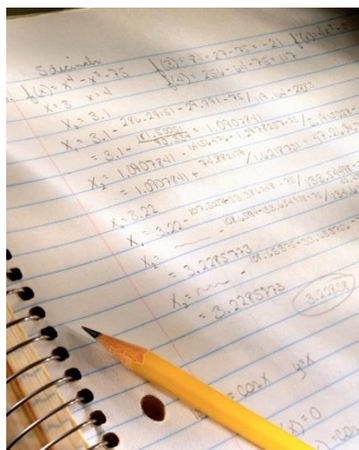
NOTE: Teacher may want to create worksheets or transfer images to PPT

Vocabulary Notebook
(Preparing the Learner)

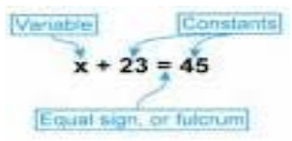
Other Essential Words (from AWL and content-specific)
(Words that <u>can</u> be deciphered using context clues)

- Teacher may use “Wordsift”, www.wordsift.com, to note key vocabulary from Academic Word List (AWL) and content-specific vocabulary
- Students record words in *Vocabulary Notebook,* and during the lesson add: translation (EL students), picture or image, definition, example/ source sentence, original sentence/application/significance.

NOTE: The first column of the Vocabulary Notebook (Word/Translation) is a personal glossary for English learners.



Vocabulary Notebook

Word & Translation	Picture/Image or Example	Definition	Application or Significance
Algebra	 math.pppst.com	The branch of mathematics that uses numbers and letters to describe the relationship between things.	What is the purpose of **algebra**? *Algebra aims to solve real-life problems by using equations.*
Expression	4X - 3 (compare this to the "equation" below: 4X-3 = 9)	A combination of numbers, variables and symbols to be calculated. Think about an expression as a mathematical "phrase" that stands for a single number.	Write the phrase (one part of the statement) of the following mathematical **expression**: 4X -3 *Four times an unknown number minus three*
Equation	 appfinder.lisisoft.com	The state of being equally balanced. A mathematical statement that two expressions are equal. Think about an equation as a mathematical "sentence" that says that two things are equal.	Write a complete sentence that expresses the following mathematical **equation**: 4x – 3 = 9. *Four times an unknown number minus three equals nine.*
Variable	X  www.algebrahelp.com	The unknown number or quantity. A quantity that can assume any of a set of values. (math) Something that is likely to vary or change.(general)	How are **variables** expressed in a mathematical statement? Why are letters used as **variables** in math? *In a mathematical statement, letters such as "X" and "Y" are used to represent the unknown variables.*
Constant	 http://dictionary.reference.com/browse/hubble's+constant	A quantity that does not change or vary.	Who or what are the constants in your life? Explain why. *The search for knowledge and my mom's support are two constants in my life because I am always looking for answers and my mom never lets me down.* *What is an example of a constant in mathematics?* *Numbers, = 3.4*

Quick-write with 3 Step Interview
(Preparing the Learner)

- This task helps to bridge the students' personal experiences and prior knowledge to the concept of mathematics as a symbolic language.

Quick-write with 3 Step Interview
(Preparing the Learner)

- Step One – Student A interviews Student B, and Student C interviews Student D. Student A and Student C must listen carefully to the responses because they will have to repeat their partner's response to the table group.

- Step Two – Student B interviews Student A, and Student D interviews Student C. Student B and Student D must listen carefully to the responses because they will have to repeat their partner's response to the table group.

- Step Three – Each person shares his/her partner's response, round robin format to the table group.

Quick-write Prompt
(Preparing the Learner)

- Before responding in writing, provide students with some independent thinking time to reflect on the following prompt (teacher models first).

- Quick-write Prompt:
  - *What are some symbols that you know or have used? What do these symbols represent? Why do we use symbols, in other words, what is the rationale?*

Possible Language Supports

- *My partner stated that _____ is a symbol for _____. S/he believes symbols are used because...*

- *My partner shared a very interesting symbol. S/he explained that _____ represents _____. S/he believes symbols are used to ...*

- *My partner explained that _____ and ___ are symbols that represent... In his/her opinion, the use of symbols allow us to...*

Viewing with a Focus
(Preparing the Learner)

- This task helps to build students' background knowledge on the reason why symbols (letters) are used in math.

Viewing with a Focus
(Preparing the Learner)

- From "Why All the Letters in Algebra?"

- <u>Focus Question</u>:

  Why do we use letters in math, that is, what is the rationale?

What is the question asking you to do (i.e., describe, compare, contrast, sequence, express cause/effect…)?

Which graphic organizer would help you organize your thinking and take notes on the details surrounding this question?

Viewing with a Focus
(Preparing the Learner)

- Introduce prompt
- Walk students through selecting appropriate note-taking structure
- Students view video clip
- Provide time for note-taking
- Students share responses with partner/small group and reach consensus
- Teacher pre-selects or randomly calls on group rep to share

Extension Question: How is the rationale for using symbols in math similar to the rationale you wrote about in the previous quick-write?

NOTE: Teacher may want to chart responses for future reference or to add new information as the lesson progresses.

Possible Language Supports

- *Based on the video (and our prior knowledge), we believe that letters are used in math because…*

- *We have come to the conclusion that letters are used in math to express/show…*

- *I will report my group's rationale for why letters are used in math. First of all,… Second,… Lastly,…*

Viewing with a Focus 2
(Preparing the Learner)

From " Representing a Relationship with a Simple Equation"

<u>Focus Questions:</u>

- What does each variable and constant represent in the equation "? + 3 = 10"?
- Translate the equation into a complete sentence.
- How did the speaker solve this mathematical equation? What rationale did he give?

What are the questions asking you to do (i.e., describe, compare, contrast, sequence, express cause/effect…)?

Which graphic organizer would help you organize your thinking and take notes on the details surrounding these questions?

Possible Language Supports

Possible language supports for sharing group's ideas:

- *In the mathematical equation "? + 3 = 10", the "?" represents _____ and the numbers "3" and "10" are_____.*
- *Another way to express "? + 3" = 10 is to say…*
- *In the video, the speaker solves the mathematical equation in ____ steps.*

  First, … Next, … Finally, …

Interacting with the Text / Concept

Deconstruct the text, Reconstruct the text connecting ideas emerging from reading of the text, Take a critical stance toward these ideas

- Reading in Four Voices
- Storyboard
- Collaborative Problem Solving

Reading in Four Voices
(Interacting with Text / Concept)

- This task helps students understand information in meaningful chunks. It requires students to pause and reflect on meaning.

Reading in Four Voices
(Interacting with Text / Concept)

- Each group member selects ONE FONT TYPE

  (i.e., plain, **bold**, italics, or <u>underline</u>) to read aloud.

- Table groups read the math problem aloud (in four voices) TWICE .
- No discussion at this time!
- Independently, students write down their initial understanding of the math problem.

Mathematical Situation #1

(Video Game)

Lucas is excited to go to the store and buy a new video game. *He pays $50 for a new video game* after a discount of $20. ***What is the original price of the video game?***

Storyboard
(Interacting with Text/Concept)

- This task enables students to re-present key understandings of the math word problem in a novel format.
- The task promotes the development of metacognitive skills.

Storyboard
(Interacting with the Text/ Concept)

- In dyads, students share initial understanding of scenario and reach a consensus.
- Students highlight key details (constants & variables) and label.
- In dyads, students create a 4 scene storyboard - labeling key details.

Model Storyboard
(Interacting with the Text/Concept)

Collaborative Problem Solving
(Interacting with the Text/Concept)

- This task enables students to re-present key understandings of the math word problem in a novel format.

- The task promotes the development of metacognitive skills.

Collaborative Problem Solving
(Interacting with the Text/Concept)

Step 1: Reflect back on the video and discuss how to solve "this" problem. Discussion only!

Step 2: Write a mathematical equation and use any symbol to represent the unknown variable.

Step 3: Solve the equation to discover the original price of the video game.

Teacher pre-selects or randomly selects dyads to share explanation.

Extending Understanding

Connect new concept to a larger body of knowledge, Take a critical stance of the text in relationship to other ideas, Apply newly gained knowledge

- Problem / Solution Writing
- Creating and Solving Mathematical Situations

Problem-Solution Writing
(Extending Understanding)

- This task helps to build metacognitive skills by requiring the student to explain, in writing, how they solved the mathematical situation.

- This task also helps to develop students' academic language to express mathematical concepts.

Problem / Solution Writing – Purpose (Extending Understanding)

- To communicate mathematical reasoning & ideas clearly to another
- To communicate to the reader WHY and HOW you arrived at a solution
- To convince the reader that <u>your</u> reasons and means to the solution are correct

(Dr. Kevin P. Lee, UC Davis)

Problem / Solution Writing
(Extending Understanding)

Typical Structure

- **State** problem and its significance
- **Explain** steps to carry out solution

  (Define variables and formulas)
- **State** the solution
- **Explain** the rationale for approach / method

Problem / Solution Writing – Language Features
(Extending Understanding)

Typical Language Features

- First Person (I / We)
- Complete Sentences / Paragraphs
- Formulas & Equations in complete sentences with proper punctuation
- Important or long formulas written on separate lines
- Use words / symbols appropriately
- Do not use the 2 column method
- Use precise language (avoid “it” and “that)

Dr. Kevin P. Lee, UC Davis

Possible Language Supports

State the Problem

- *I/We will determine/analyze/explain…*
  - ***We will determine*** *the original prices of discounted products by using algebraic equations.*
  - ***We will explain*** *how the use of an algebraic equation can help us solve…*

Possible Language Supports

Explain the steps to carry out the solution

- *In order to determine…*
- *To carry out the solution…*
- *First,… Next,… Then,…*
- *It follows that…*
- *After factoring…*
- *Where (X) is/equals…*
- *Let (X) be…*
- *In the equation / formula,*
- *Since, because, for this reason, therefore*

Explaining steps to carry out a solution

Example:

In order to determine the original price of the video game, **we use the equation**

x - 20 = 50,

where X is the original price of the video game, 20 is the discount in dollars of the video game, and 50 is the amount in dollars paid for the game. **In the equation**, we need to place a minus sign in front of the discount because a discount means less than the original amount. **Since** we want to solve for X **in the equation**, we add 20 to both sides of the equation and now have

X - 20 (+20) = 50 (+20).

After factoring, this becomes

X = 70.

Possible Language Supports

State the Solution

- *To conclude,*
- *We conclude that…,*
- *In conclusion,*
- *As a result…*
- *It follows then…*

***To conclude**, we discover that the original price of the video game is 70 dollars.*

Possible Language Supports

Explain the Rationale for the Approach/Method

- *I used this approach / method because...,*
- *This approach/method is effective because...,*
- *This method approach is more effective than ____ because...,*
- *Unlike ___, this method/ approach allows for...*
- *For example, …*
- *As an illustration, …*
- *To illustrate this point, …*
- *In other words, …*
- *This is to say, …*
- *Therefore, …*
- *For this reason, …*
- *Thus, …*

Explain rationale of the approach/method

Example:

This approach is effective in solving the problem **because** we can substitute any discounted price, paid amount, or original amount into the same type of equation. **For example**, if there is a $40 discount on an item and the customer pays $100 for it, the equation will become

$$X - 40 = 100.$$

On the other hand, if we already know that the original price is $75 and the paid amount is $50, then the equation will read

$$75 – Y = 50.$$

In other words, the equation becomes

$$X – Y = Z,$$

where X represents the original price, Y is the discount, and Z is the paid amount. **Thus,** this equation and approach allow us to solve problems in many different situations, not just the video game scenario.

Creating & Solving Mathematical Situations
(Extending Understanding)

- This task extends students' understanding by requiring them to think about a real-life problem that could be solved using an equation.

Creating & Solving Mathematical Situations
(Extending Understanding)

- One envelope (containing 4 different equations) is provided at each table.
- Each member takes a card (WITHOUT showing it to their team members).
- Independently, students write a possible situation for his/her equation.
- Students then exchange cards with a classmate and independently write the steps to solve it.

Writing Cycle
(Extending Understanding)

DEVELOPING KNOWLEDGE OF TOPIC & TEXT

Analysis of Mathematical Situation #1 and engagement in various meaning-making tasks

DECONSTRUCTING THE GENRE

Purpose, Structure, and Language Features of Problem/Solution writing in math

MODELED/GUIDED CONSTRUCTION OF THE GENRE

Using Mathematical Situation #1, model/guide students in how to write (the process) a problem/solution text

COLLABORATIVE CONSTRUCTION OF GENRE

Students work in pairs/groups to solve mathematical situations, and use problem/solution writing to explain the steps taken and the rationale for this approach.

INDEPENDENT CONSTRUCTION OF GENRE

Students independently solve mathematical situations, and use problem/solution writing to explain the steps taken and the rationale for this approach.

Sonja Munévar Gagnon-Adapted from Pauline Gibbons' Curriculum Cycle

Scaffolding Matrix

"The Teen Brain"

Instructional Sequence	Instructional Scaffolds	Possible Learning Tasks
Preparing the Learner ↓ Interacting w/ the Text ↓ Extending Understanding ↓ Assessing Learning	Modeling →	• *Modeling Academic Language* • *Modeling Strategies/Processes* • *Model of Problem/Solution Writing in Math*
	Bridging →	• *Quick-Write with 3 Step Interview*
	Contextualization →	• *Vocabulary Notebook* • *Viewing with a Focus*
	Schema Building →	• *Collaborative Problem-Solving* • *Viewing with a Focus*
	Metacognitive Development →	• *Reading in Four Voices*
	Text Representation →	• *Storyboard* • *Collaborative & Independent Problem/Solution Writing*

S.M. Gagnon-Adapted from Aida Walqui

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