Mathematics + Integrated ELD = Access and Deep Understanding

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Access the resources on Sched or on: http://ccss.tcoe.org/

Session Outcomes

Participants will:

- Deepen their understanding of the CA Integrated ELD and Designated ELD.
- Discuss strategies that provide access and support opportunities for English learners while they engage in mathematics.
- Design an Integrated ELD and Math lesson.

Why do our students need to communicate when ***learning mathematics?***

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- How do we support students in becoming better communicators?

Why do our students need to communicate when *learning mathematics?*

- How do we support students in becoming better communicators?
- How do we provide opportunities for students to communicate their thinking?

California Mathematics Framework

"Every teacher must incorporate into his or her curriculum instructional support for oral and written language as it relates to the mathematics standards and content. It is not possible to separate the content of mathematics from the language in which it is discussed and taught."

— Francis et al. 2006a, 38

CA Mathematics Framework

What are *Designated ELD* & *Integrated ELD*?

How do they support student learning?

ELD in the Framework: A Dual Approach

Designated ELD

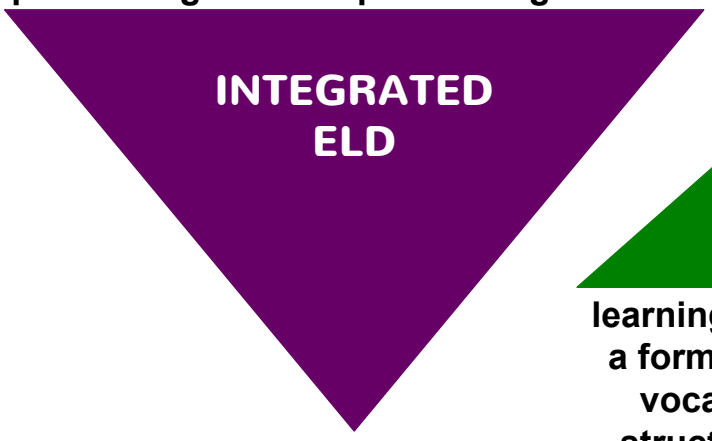
Use the CA ELD standards "as the focal standards in ways that build ***into and from content instruction****" in order to develop language essential to content learning in English.*

Integrated ELD

*ALL teachers with ELs in the classroom use CA ELD "****in tandem with*** *the focal CA [Standards] for ELA/literacy and other content standards."*

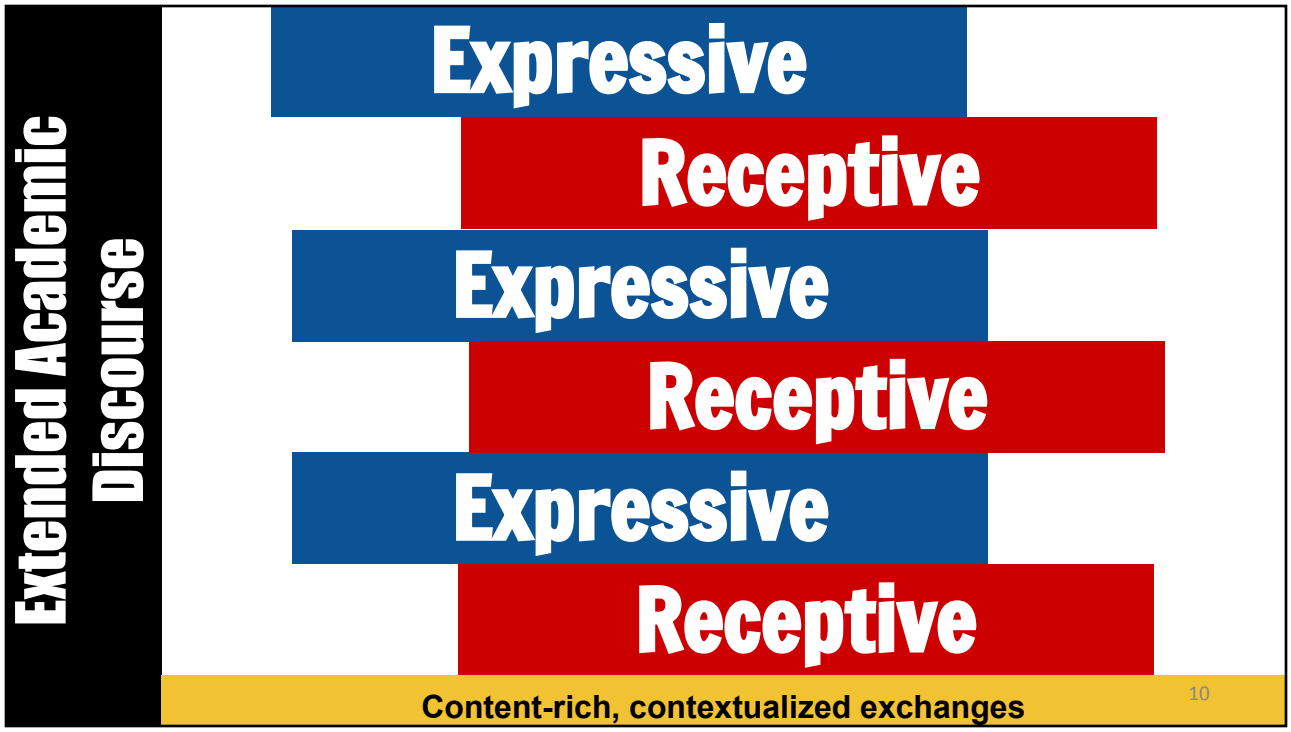
CA ELA/ELD Framework, Ch 2

processing and comprehending content



learning about & practicing a formal English register, vocabulary, language structures, grammar for application

BOTH/AND



Learning Mathematics in Every Classroom, Every Day

productive	receptive
speaking	listening
writing	reading

RECEPTIVE + EXPRESSIVE

=

Understanding

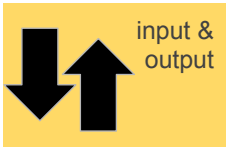
CA ELA/ELD Snapshots

- Read the Designated ELD Connected to Mathematics Snapshots for your grade span.
  - Transitional Kindergarten
  - 2nd Grade
  - 4th Grade
  - 7th Grade
- In what ways does the Designated ELD instruction support students in developing language while relating to the math content they are learning?

What does integrated ELD look like?

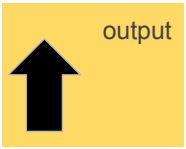
Part I

Collaboration through language



Interpretation of language

Production of language



3 Modes of Communication in Mathematics Sort

- Read the cards in your sort bag.
- Discuss whether each card best reflects an example of the **collaborative**, **interpretive**, or **productive** mode of language.
- Sort into these three groups.

COLLABORATIVE	INTERPRETIVE	PRODUCTIVE

Standards for Mathematical Practices

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.

Collaborative

Interpretive

Productive

ELD Standards - Understanding Part I

Part I: Interacting in Meaningful Ways

A. Collaborative

1. Exchanging information and ideas with others through oral collaborative discussions on a range of social and academic topics
2. Interacting with others in written English in various communicative forms (print, communicative technology and multimedia)
3. Offering and justifying opinions, negotiating with and persuading others in communicative exchanges
4. Adapting language choices to various contexts (based on task, purpose, audience, and text type)

B. Interpretive

5. Listening actively to spoken English in a range of social and academic contexts
6. Reading closely literary and informational texts and viewing multimedia to determine how meaning is conveyed explicitly and implicitly through language
7. Evaluating how well writers and speakers use language to support ideas and arguments with details or evidence depending on modality, text type, purpose, audience, topic, and content area
8. Analyzing how writers and speakers use vocabulary and other language resources for specific purposes (to explain, persuade, entertain, etc.) depending on modality, text type, purpose, audience, topic, and content area

C. Productive

9. Expressing information and ideas in formal oral presentations on academic topics
10. Writing literary and informational text to present, describe, and explain ideas and information, using appropriate technology
11. Justifying own arguments and evaluating others' arguments in writing
12. Selecting and applying varied and precise vocabulary and other language resources to effectively convey ideas.

www.cde.ca.gov

Supporting Sense-Making and Communication

- 5 Practices for Orchestrating Productive Mathematics Discussions
  - Anticipate, Monitor, Select, Sequence, Connect
- Language Scoop
- Talk Moves
  - Revoicing, Repeating, Reasoning, Adding On, Wait Time, Turn-and-Talk, Revise
- Notice/Wonder
- Read and Flip for Math Stories

Raising Money

Louis wants to give $15 to help kids who need school supplies. He also wants to buy a pair of shoes for $39. He gets $5 a week for his allowance. Louis remembers his sister's birthday is next month. He sets a goal of saving $16 for her gift. How many weeks does he have to save his allowance for all three of his goals?

Adapted from Illustrative Mathematics,
https://www.illustrativemathematics.org/content-standards/tasks/1309

Select, Sequence, & Share

Language Scoop

A strategy for listening to students and building upon their language.

- Observe students working together and/or talking about a task.
- Record student conversations (include student names).
- At the end of the lesson, the teacher will have a conversation about the language you hear students using.

Supporting Mathematical Communication

What ideas have you learned for supporting students as they communicate about ***mathematics***?

Supporting Sense-Making and Communication

5 Practices
For Orchestrating Productive Mathematical Discussions

Anticipate
Monitor
Select
Sequence
Connect

Read and Flip
Strategy for Word Problems

Talk Moves

Revoicing
Reasoning
Wait time
Repeating
Adding On
Turn-and-Talk
Revise

Language Scoop

Teachers learn to amplify and enrich--rather than simplify--the language of the classroom, giving students more opportunities to learn the concepts involved.

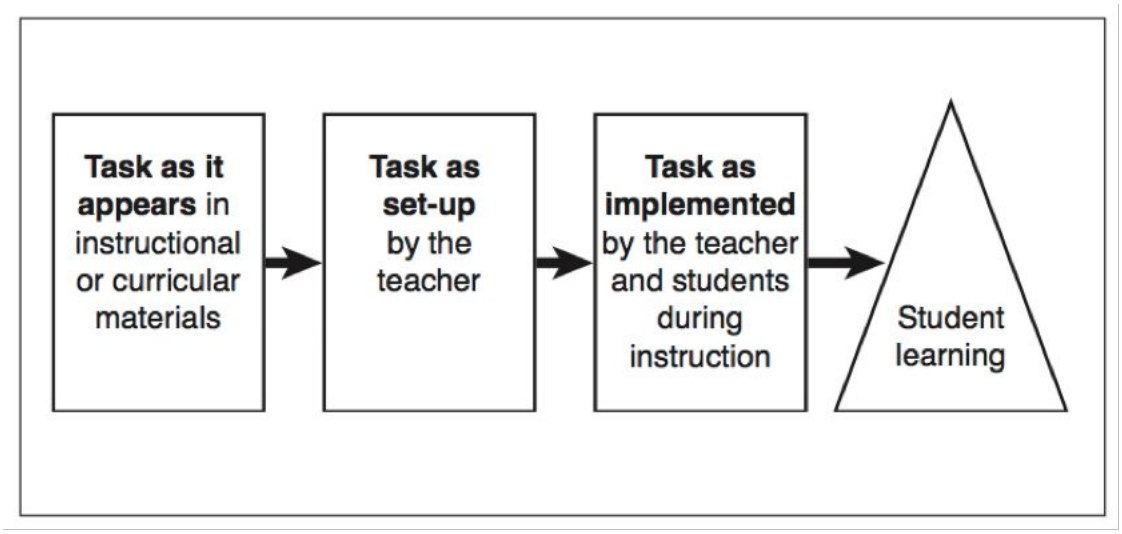
Aida Walqui

Thinking About Language Connected to Mathematics

- How will students interact meaningfully with the mathematics?
- How will students make sense of the language of mathematics (text, diagrams, symbols) and the English language?
- How will students communicate their understanding?

Let's plan an

Integrated ELD & Mathematics lesson



Stein et al., 2000

Collaboratively Plan an Integrated ELD Lesson

Use the provided grade level ELD Standards and Illustrative Task to plan your integrated ELD and mathematics lesson.

- 1st – At the Park, 1.OA.1
- 3rd – Halves, thirds, and sixths, 3.MD.6 3.G.2 3.NF.1 3.NF.3.b
- 6th – Making Hot Cocoa, 6.NS.1
- 9th – Interpreting Functions, F-IF.B.4

Or, design a lesson around a particular concept that you are interested in working on.

1.

What do you want students to do?

(What's the mathematics learning goal?)

Integrated ELD & Math Lesson

Mathematics Content	Mathematical Practices	ELD Standards
Language & Learning Objective:		
Launch		
Explore		
Summarize		

2.

For what purpose will students use language? What will it look and sound like?

(What is the language function? What are the language demands?)

Language Functions

As part of meaning-making, this is the WHY of using language.

- What do students do with language as they engage with content and interact with others?
- How do students represent the active use of language for a particular everyday purpose?

In an academic setting, students use language functions in order to express ideas, communicate with others, and demonstrate their understanding of content.

Language Functions

Refer to Language Functions Handout

- Describe
- Compare & Contrast
- Cause & Effect
- Sequence
- Problem-Solution
- Express Opinions or Persuade (Thinking)
- Explain
- Classify & Categorize

Language Demands

Mathematics:

- Superlatives (ex. biggest)
- Words converted into numbers
- Complex words or phrases
- Infinitives (ex. to convert fractions . . .)
- Comparatives
- Adverbial clauses
- Negotiations in questions
- Word order
- Change in verbs to adjust to different tenses
- Mathematical symbols
- Reordering language to go from “question form” to “answer form”
- Language required to explain and elaborate
- Multiple meaning words

Writing A Language Objective

Language objectives "articulate for learners the academic language functions and skills that they need to master to fully participate in the lesson and meet the grade-level content standards" (Echevarria, Vogt, and Short 2008).

Language Objective = Language functions & skills + Mathematics Content & Practice Standards

CA Mathematics Framework

Integrated ELD & Math Lesson

Mathematics Content	Mathematical Practices	ELD Standards
Language & Learning Objective:		
Launch		
Explore		
Summarize		

Begin thinking about your language objective . . .

4. Which ELD standard(s) are you going to teach?

(Which standards support the mathematics being taught?
Which standards reflect the language functions of the lesson?)

ELD Standards - Understanding Part I

California Department of Education
English Language Development Standards for Grade 6

Section 1: Goal, Critical Principles, and Overview	
Goal: English learners read, analyze, interpret, and create a variety of literary and informational text types. They develop an understanding of how language is a complex, dynamic, and social resource for making meaning, as well as how content is organized in different text types and across disciplines using text structure, language features, and vocabulary depending on purpose and audience. They are aware that different languages and variations of English exist, and they recognize their home languages and cultures as resources to value in their own right and also to draw upon in order to build proficiency in English. English learners contribute actively to class and group discussions, asking questions, responding appropriately, and providing useful feedback. They demonstrate knowledge of content through oral presentations, writing, collaborative conversations, and multimedia. They develop proficiency in shifting language use based on task, purpose, audience, and text type.	
Critical Principles for Developing Language and Cognition in Academic Contexts: While advancing along the continuum of English language development levels, English learners at all levels engage in intellectually challenging literacy, disciplinary, and disciplinary literacy tasks. They use language in meaningful and relevant ways appropriate to grade level, content area, topic, purpose, audience, and text type in English language arts, mathematics, science, social studies, and the arts. Specifically, they use language to gain and exchange information and ideas in three communicative modes (collaborative, interpretive, and productive), and they apply knowledge of language to academic tasks via three cross-mode language processes (structuring cohesive texts, expanding and enriching ideas, and connecting and condensing ideas) using various linguistic resources.	
Part I: Interacting in Meaningful Ways	**Corresponding Common Core State Standards for English Language Arts***
A. Collaborative	
1. Exchanging information and ideas with others through oral collaborative discussions on a range of social and academic topics	• SL.6.1,6; L.6.3,6
2. Interacting with others in written English in various communicative forms (print, communicative technology, and multimedia)	• W.6.6; WHST.6.6; SL.6.2; L.6.3,6
3. Offering and justifying opinions, negotiating with and persuading others in communicative exchanges	• W.6.1; WHST.6.1; SL.6.1,4,6; L.6.3,6
4. Adapting language choices to various contexts (based on task, purpose, audience, and text type)	• W.6.4-5; WHST.6.4-5; SL.6.6; L.6.1,3,6
B. Interpretive	
5. Listening actively to spoken English in a range of social and academic context	• SL.6.1,3,6; L.6.1,3,6
6. Reading closely literary and informational texts and viewing multimedia to determine how meaning is conveyed explicitly and implicitly through language	• RL.6.1-7,9-10; RI.6.1-10; RH.6.1-10; RST.6.1-10; SL.6.2; L.6.1,3,6
7. Evaluating how well writers and speakers use language to support ideas and arguments with details or evidence depending on modality, text type, purpose, audience, topic, and content area	• RL.6.4-5; RI.6.4,6,8; RH.6.4-6,8; RST.6.4-6,8; SL.6.3; L.6.3,5-6
8. Analyzing how writers and speakers use vocabulary and other language resources for specific purposes (to explain, persuade, entertain, etc.) depending on modality, text type, purpose, audience, topic, and content area	• RL.6.4-5; RI.6.4-5; RH.6.4-5; RST.6.4-5; SL.6.3; L.6.3,5-6
C. Productive	
9. Expressing information and ideas in formal oral presentations on academic topics	• SL.6.4-6; L.6.1,3
10. Writing literary and informational texts to present, describe, and explain ideas and information, using appropriate technology	• W.6.1-10; WHST.6.1-2,4-10; L.6.1-6
11. Justifying own arguments and evaluating others' arguments in writing	• W.6.1,8-9; WHST.6.1,8-9; L.6.1-3,6
12. Selecting and applying varied and precise vocabulary and language structures to effectively convey ideas	• W.6.4-5; WHST.6.4-5; SL.6.4,6; L.6.1,3,5-6

Don't Forget Part II...

Students need equal attention to ***learning about how the language of English works.***

They use language as a meaning-making resource and make decisions about how pieces of language work together.

* Browse Part II of the ELD Standards:

A. **Structuring Cohesive Texts**, standards 1-2

B. **Expanding & Enriching Ideas**, standards 3-5

C. **Connecting & Condensing Ideas**, standards 6-7

How might any of these connect to learning in <u>your</u> classroom?

ELD Standards - Understanding Part II

California Department of Education
English Language Development Standards for Grade 6

Part II: Learning About How English Works	Corresponding Common Core State Standards for English Language Arts*
A. Structuring Cohesive Texts	
1. Understanding text structure	• RL.6.5; RI.6.5; RH.6.5; RST.6.5; W.6.1-5,10; WHST.6.1-2,4-5,10; SL.6.4
2. Understanding cohesion	• RI.6.5; RH.6.5; RST.6.5; W.6.1-5,10; WHST.6.1-2,4-5,10; L.6.1,3-6
B. Expanding and Enriching Ideas	
3. Using verbs and verb phrases	• W.6.5; WHST.6.5; SL.6.6; L.6.1,3-6
4. Using nouns and noun phrases	• W.6.5; WHST.6.5; SL.6.6; L.6.1,3-6
5. Modifying to add details	• W.6.4-5; WHST.6.4-5; SL.6.6; L.6.1,3-6
C. Connecting & Condensing Ideas	
6. Connecting ideas	• W.6.1-5; WHST.6.1-2,4-5; SL.6.4,6; L.6.1,3-6
7. Condensing ideas	• W.6.1-5; WHST.6.1-2,4-5; SL.6.4,6; L.6.1,3-6
Part III: Using Foundational Literacy Skills	•RF.K-1.1-4; RF.2-5.3-4 (as appropriate)

* The California English Language Development Standards correspond to California's Common Core State Standards for English Language Arts (ELA) and, for grades 6–12, Literacy in History/Social Studies, Science, and Technical Subjects. English learners should have full access to and opportunities to learn ELA, mathematics, science, history/social studies, and other content at the same time they are progressing toward full proficiency in English.

Integrated ELD & Math Lesson

Mathematics Content	Mathematical Practices	ELD Standards
Language & Learning Objective:		
Launch		
Explore		
Summarize		

Complete your language objective.

5.

How are students using language expressively and receptively throughout the lesson?

Learning Mathematics in Every Classroom, Every Day

productive	receptive
speaking	listening
writing	reading

Supporting Sense-Making and Communication

5 Practices
For Orchestrating Productive Mathematical Discussions

Anticipate
Monitor
Select
Sequence
Connect

Read and Flip
Strategy for Word Problems

Talk Moves

Revoicing
Reasoning
Wait time
Repeating
Adding On
Turn-and-Talk
Revise

Language Scoop

“Teach Explicitly, Practice Abundantly”

Word Banks
Practice the proficient use of language
Classification
Structured discourse frames

Structured Discourse Frames

Compare:
_____ has more than _____ because . . .
____ and _____ are similar because…
____ and _____ both have…
Both ____ and ____ are…
One thing ____ and ____ have in common is…

Expressive & Receptive Language in Mathematics

- Consider how and when students will read, listen, write, and speak throughout the lesson?
- What is the purpose of each of these opportunities to use language?
- How can you use these opportunities to build language?

Integrated ELD & Math Lesson

Mathematics Content	Mathematical Practices	ELD Standards
Language & Learning Objective:		
Launch		
Explore		
Summarize		

Planning Mathematics Instruction and *Integrated ELD*

Table UA-3. Recommendations for Connecting Mathematical Content to Language

1. Focus on students' mathematical reasoning, not accuracy in using language.
2. Shift to a focus on mathematical discourse practices; move away from simplified views of language.
3. Recognize and support students to engage with the complexity of language in math classrooms.
4. Treat everyday language and experiences as resources, not as obstacles.
5. Uncover the mathematics in what students say and do.

Source: Moschkovich 2012a, 5–8.

From *CA Mathematics Framework, p. 685*

Planning Mathematics Instruction and *Integrated ELD*

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3. Recognize
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5. Uncover t

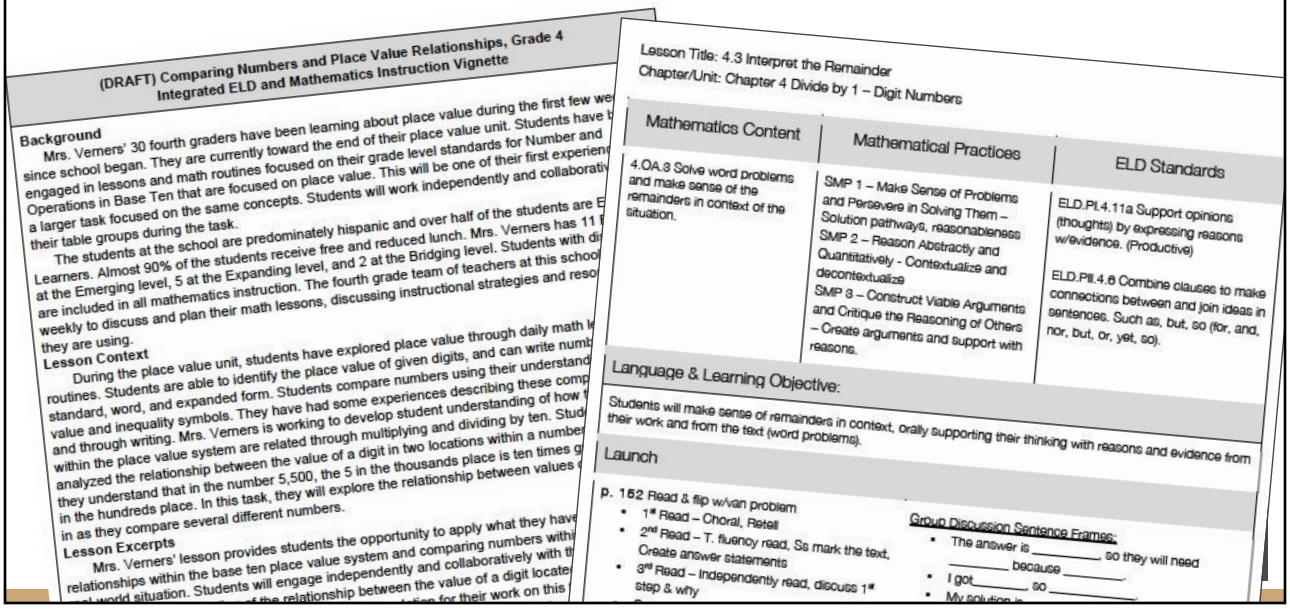
Source: Moschkovi

Effective instructional experiences for ELs throughout the day and across the disciplines:

- Are interactive and engaging, meaningful and relevant, and intellectually rich and challenging
- Are appropriately scaffolded in order to provide strategic support that moves learners toward independence
- Develop both content knowledge and academic English
- Value and build on primary language and culture and other forms of prior knowledge

From *CA Mathematics Framework, p. 685*

Additional Sample ELD & Mathematics Lessons



(DRAFT) Comparing Numbers and Place Value Relationships, Grade 4
Integrated ELD and Mathematics Instruction Vignette

Background

Mrs. Verners' 30 fourth graders have been learning about place value during the first few we
since school began. They are currently toward the end of their place value unit. Students have b
engaged in lessons and math routines focused on their grade level standards for Number and
Operations in Base Ten that are focused on place value. This will be one of their first experienc
a larger task focused on the same concepts. Students will work independently and collaborati
their table groups during the task.

The students at the school are predominately hispanic and over half of the students are E
Learners. Almost 90% of the students receive free and reduced lunch. Mrs. Verners has 11 t
at the Emerging level, 5 at the Expanding level, and 2 at the Bridging level. Students with di
are included in all mathematics instruction. The fourth grade team of teachers at this school
weekly to discuss and plan their math lessons, discussing instructional strategies and reso
they are using.

Lesson Context

During the place value unit, students have explored place value through daily math l
routines. Students are able to identify the place value of given digits, and can write numb
standard, word, and expanded form. Students compare numbers using their understand
value and inequality symbols. They have had some experiences describing these comp
and through writing. Mrs. Verners is working to develop student understanding of how t
within the place value system are related through multiplying and dividing by ten. Stud
analyzed the relationship between the value of a digit in two locations within a number
they understand that in the number 5,500, the 5 in the thousands place is ten times g
in the hundreds place. In this task, they will explore the relationship between values
in as they compare several different numbers.

Lesson Excerpts

Mrs. Verners' lesson provides students the opportunity to apply what they have
relationships within the base ten place value system and comparing numbers withi
real world situation. Students will engage independently and collaboratively with th
of the relationship between the value of a digit locate
tion for their work on this

Lesson Title: 4.3 Interpret the Remainder
Chapter/Unit: Chapter 4 Divide by 1 – Digit Numbers

Mathematics Content	Mathematical Practices	ELD Standards
4.OA.3 Solve word problems and make sense of the remainders in context of the situation.	SMP 1 – Make Sense of Problems and Persevere in Solving Them – Solution pathways, reasonableness SMP 2 – Reason Abstractly and Quantitatively - Contextualize and decontextualize SMP 3 – Construct Viable Arguments and Critique the Reasoning of Others – Create arguments and support with reasons.	ELD.PI.4.11a Support opinions (thoughts) by expressing reasons w/evidence. (Productive) ELD.PII.4.6 Combine clauses to make connections between and join ideas in sentences. Such as, but, so (for, and, nor, but, or, yet, so).

Language & Learning Objective:

Students will make sense of remainders in context, orally supporting their thinking with reasons and evidence from their work and from the text (word problems).

Launch

p. 152 Read & flip w/van problem
- 1st Read – Choral, Retell
- 2nd Read – T. fluency read, Ss mark the text, Create answer statements
- 3rd Read – Independently read, discuss 1st step & why

Group Discussion Sentence Frames:
- The answer is _____, so they will need _____ because _____.
- I got_____, so _____
- My solution is

Next Steps

- Write down a next step for your work with Integrated ELD and mathematics.
- *Share these* with your table.

Resources

- TCOE Common Core Connect Website
- CA Mathematics Framework
- CA ELA/ELD Framework
- *5 Practices for Orchestrating Productive Mathematics Discussions*, Mary Kay Stein, Margaret Schwan Smith
- *Intentional Talk: How to Structure and Lead Productive Mathematical Discussions*, Elham Kazemi, Allison Hintz
- *Powerful Problem Solving Activities for Sense Making with the Mathematical Practices*, Max Ray-Riek
- Notice and Wonder, Math Forum @ NCTM

Thank you! Enjoy the rest of your conference.

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Access the resources on Sched or on: http://ccss.tcoe.org/

Your feedback is appreciated.

Send your text message to: 37607

Type: 580394 SPACE (0-3)(0-3)(0-3) SPACE other comments or feedback in words

Well prepared and knowledgeable

Engaging and effective

Session matched description

Strongly Disagree 0	Disagree 1	Agree 2	Strongly Agree 3