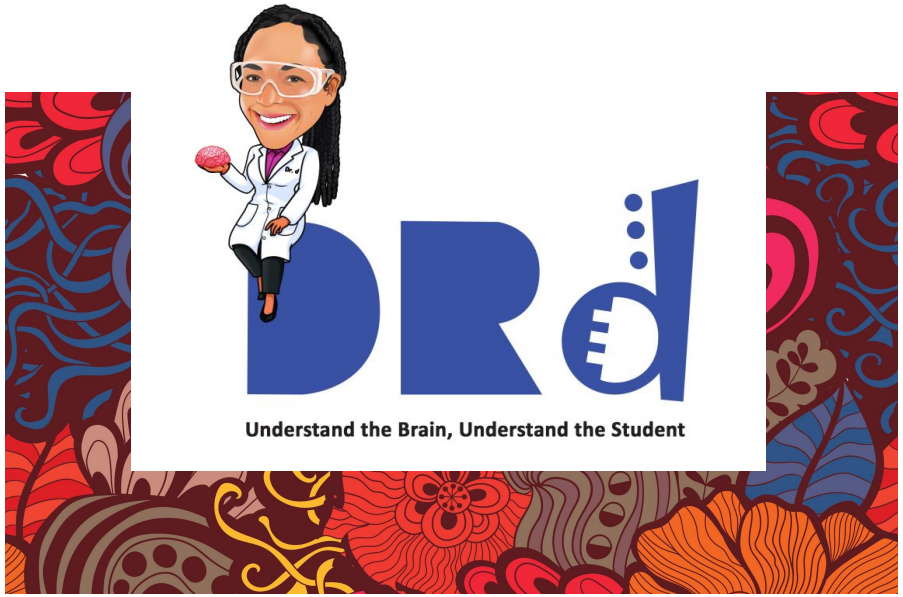

WORD PROBLEMS AND ELLs

Dr. Darlyne de Haan
www.brainbasedscience.com
May 19, 2021

Dr. Darlyne de Haan

Presently the Director of Curriculum and Instruction for Math, Science, STEM and Gifted and Talented.

- Blogger for TESOL- STEM and ELs
- A former forensic scientist and chemist with more than 20 years of experience in STEM,
- A recipient and participant of the coveted Fulbright Administrator Program for Fulbright Leaders for Global Schools, a program sponsored by the U.S. Department of State's Bureau of Educational and Cultural Affairs.
- A strong advocate for changing the face of STEM to reflect the population.
- Brain Based Science enthusiast
- Founder of a nonprofit organization-Mad About Science, Inc.
- Brainbasedscience.com founder
- Neighborhood-science.com founder

STEM in ELT: 3 Ways to Seal the Leaky STEM Pipeline

Posted on 4 May 2021 by Darlyne de Haan

Darlyne de Haan

The "Leaky Pipeline" is a metaphor for students' disproportionate exit from participation in a science, technology, engineering, and mathematics (STEM) content area throughout K–12 school and college, resulting in their underrepresentation in STEM careers. Middle and high school English learners (ELs), students of color, and girls—particularly those from low-income families and schools—are disproportionately excluded or dropped from the STEM pipeline at formative moments in their academic trajectories (Lyon et al., 2012).

In this blog series, over the next year, I will discuss how to seal the Leaky STEM Pipeline and steps to increase the low number of ELs entering the STEM fields.

Here are three ways of sealing the Leaky Pipeline:

Continue reading →

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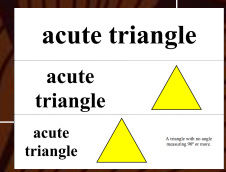
Upcoming Webinars:
5-Strategies to Improve Math Instruction:

1. Auditory/Oral
2. Visual
3. Instructional
4. Scaffolding
5. Assessment

Brainbasedscience.com



5/19/2021

ELLS ARE NOT NECESSARILY STRUGGLING LEARNERS; THEY ARE LEARNING A NEW LANGUAGE…

THEY ARE BECOMING BILINGUAL

Terri Sigueza. Colorín Colorado.org

Today's Agenda:

Working Memory on ELs

A short interactive activity demonstrating what is it and its impact on ELs.

Comprehension Difficulties in Word Problems

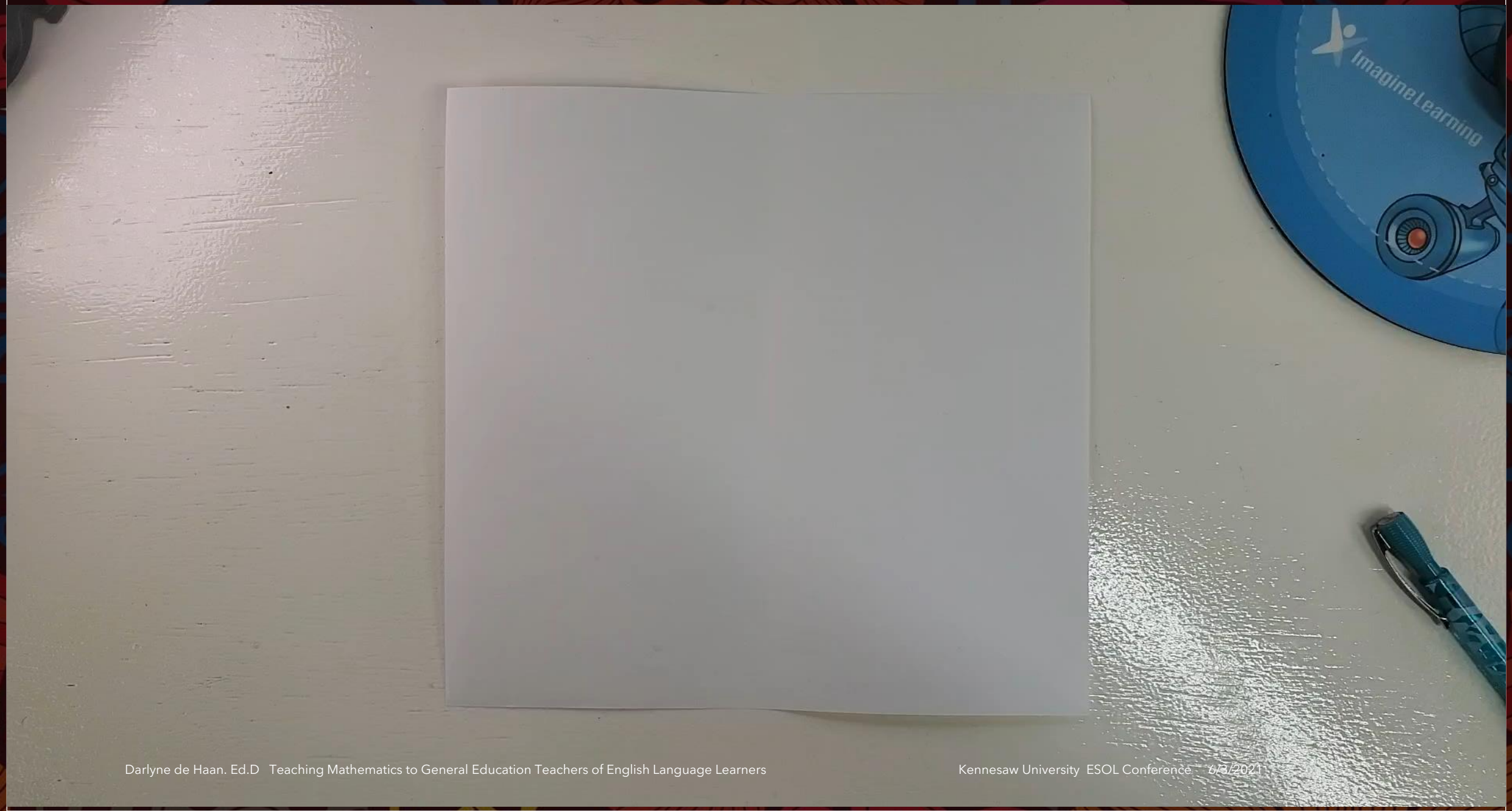
Practice and implement strategies in small groups: manipulating word problems and removing the question.

Reflecting on the impact this can make for your EL.

Developing a Critical Eye to Word Problems

Putting it all Together

Q & A


ImagineLearning

Working Memory- It's Impact on ELs

Approximate Age in Range in Years	Capacity of Working Memory in Number of Chunks		
	Minimum	Maximum	Average
Younger than 5	1	3	2
Between 5 and 14	3	7	5
14 and Older	5	9	7

How the Brain Learns, 3rd Edition, David Sousa

https://pollev.com/darlynedehaa860

Working Memory- It's Impact on EBs

All writing utensils are DOWN!

NBCUSALSDFBIMPH

Working Memory- It's Impact on EBs

Check how you performed.

NBCUSALSDFBIMPH

https://pollev.com/darlynedehaa860

Working Memory- It's Impact on EBs

All writing utensils are DOWN!

NBCUSALSDFBIMPH

chart

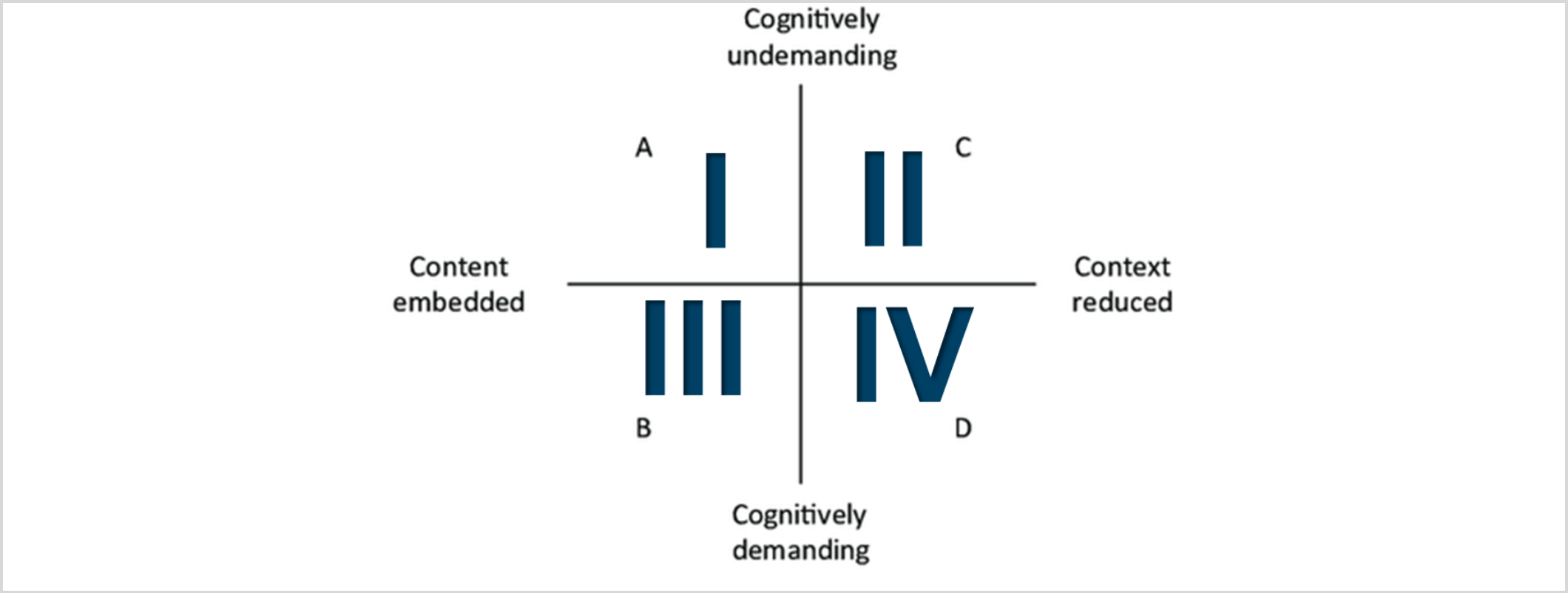
Working Memory- It's Impact on EBs

Working Memory on EBs

What is it and its impact on EBs.
Interactive Activity

Letters next

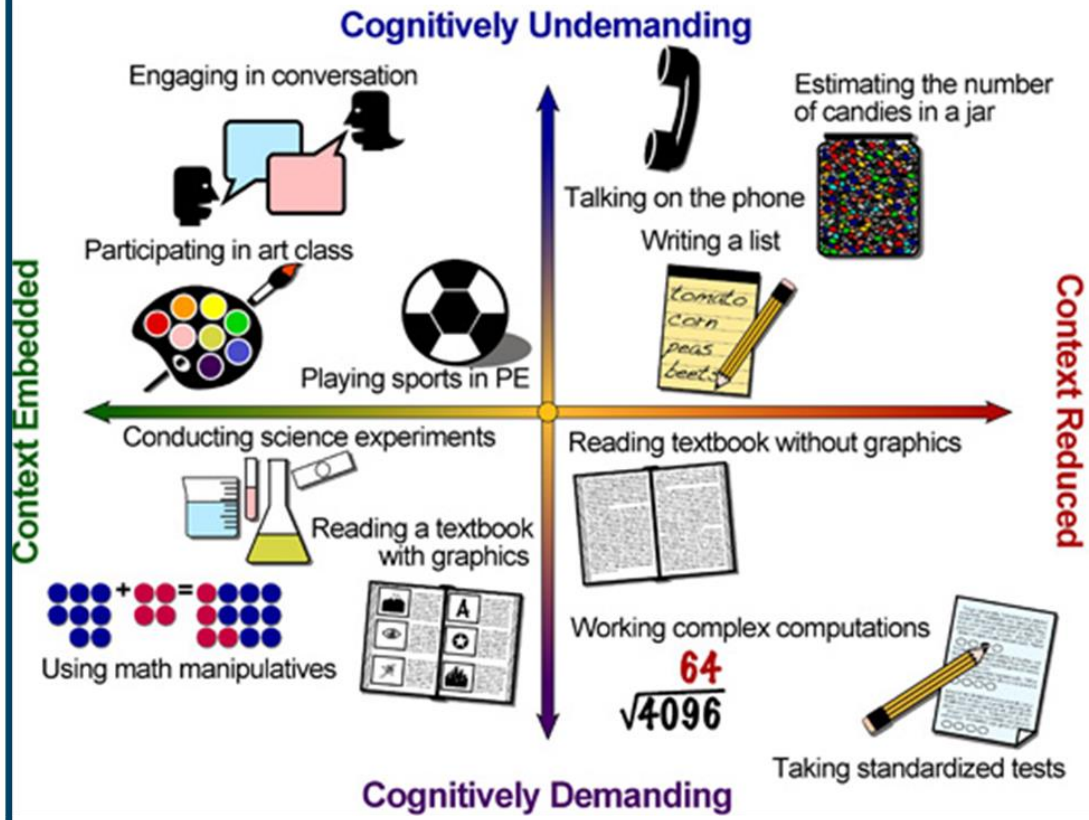
Cummins' Quadrant



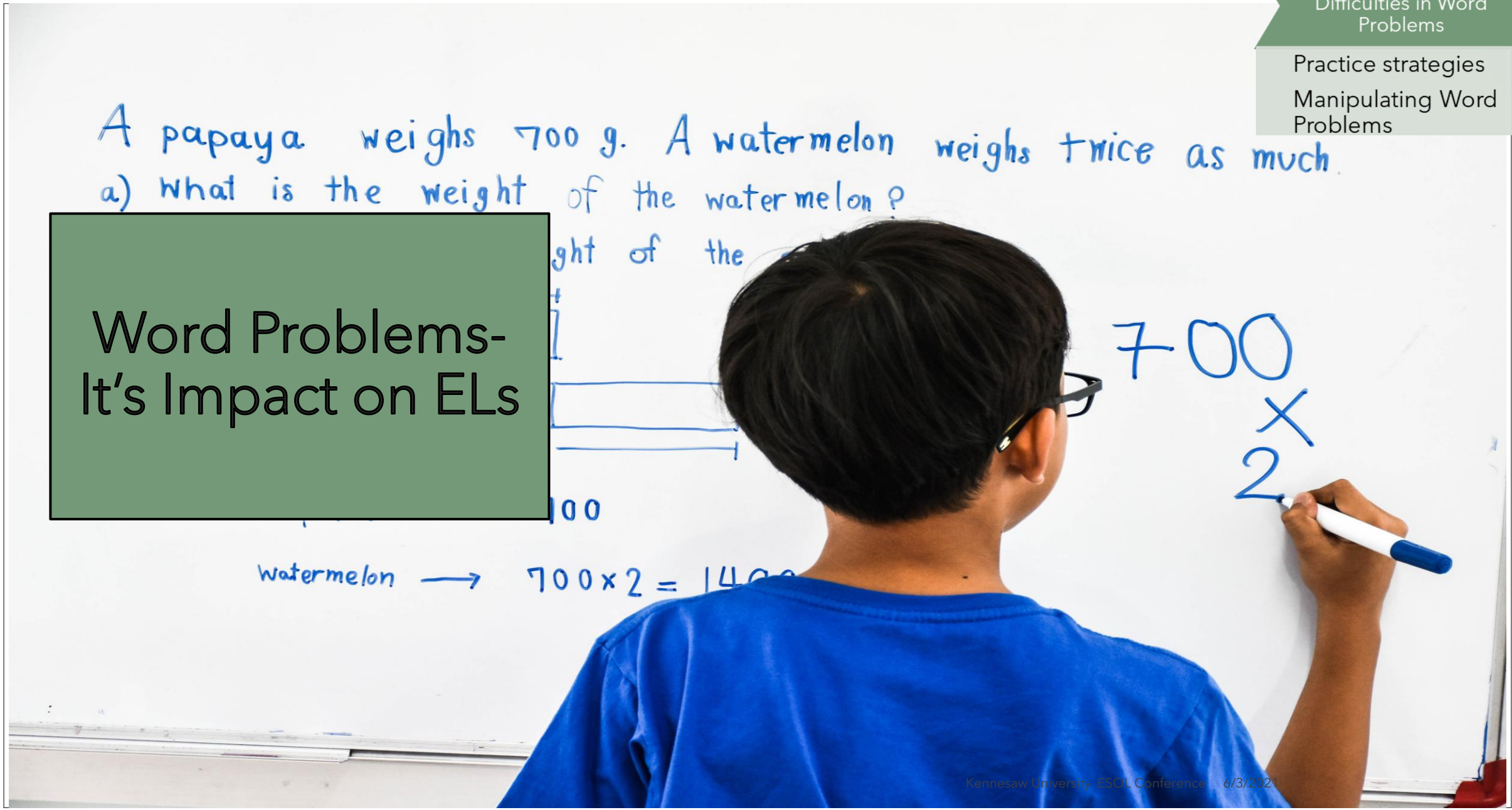
BICS are cognitively *undemanding* activities

A	C
Following directions Face-to-face conversation Buying lunch at school Music, Art, PE classes	Note on the refrigerator Written directions (no visuals) Telephone conversation Oral presentation
Context Embedded	**Context Reduced**
Demonstrations/Experiments Audio-visual assisted lessons Basic math computations Projects and activities Making models/charts/graphs	Standardized Tests Reading/Writing in content areas Math concepts and applications Lecture with few illustrations Textbooks
B	D

... and CALP are cognitively *demanding*



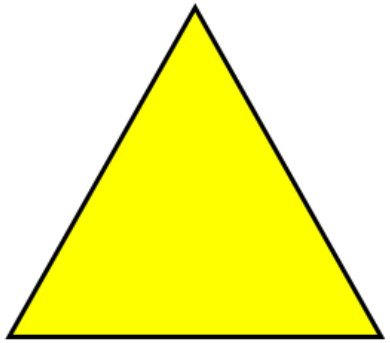
Word Problems- It's Impact on ELs



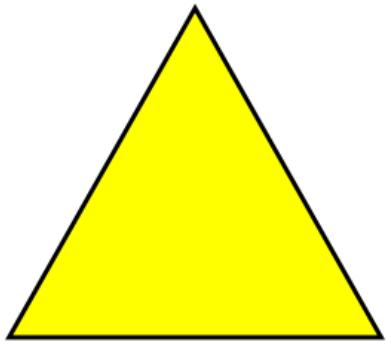
VISUALIZATION

acute triangle

acute triangle



acute triangle



A triangle with no angle measuring 90º or more.

Vocabulary

"Only confusion will result when the name is demanded before the idea is mastered. Definitions alone rarely throw much light on the ideas they represent. They are usually the end product of much exploration and careful thought."

Joan Countryman,
Writing to Learn Mathematics, 1992

STEP 1

DESCRIBE
Teacher provides an explanation

STEP 2

RESTATE
Student restates the explanation

STEP 3

DRAW
Students construct a non-linguistic representation

STEP 4

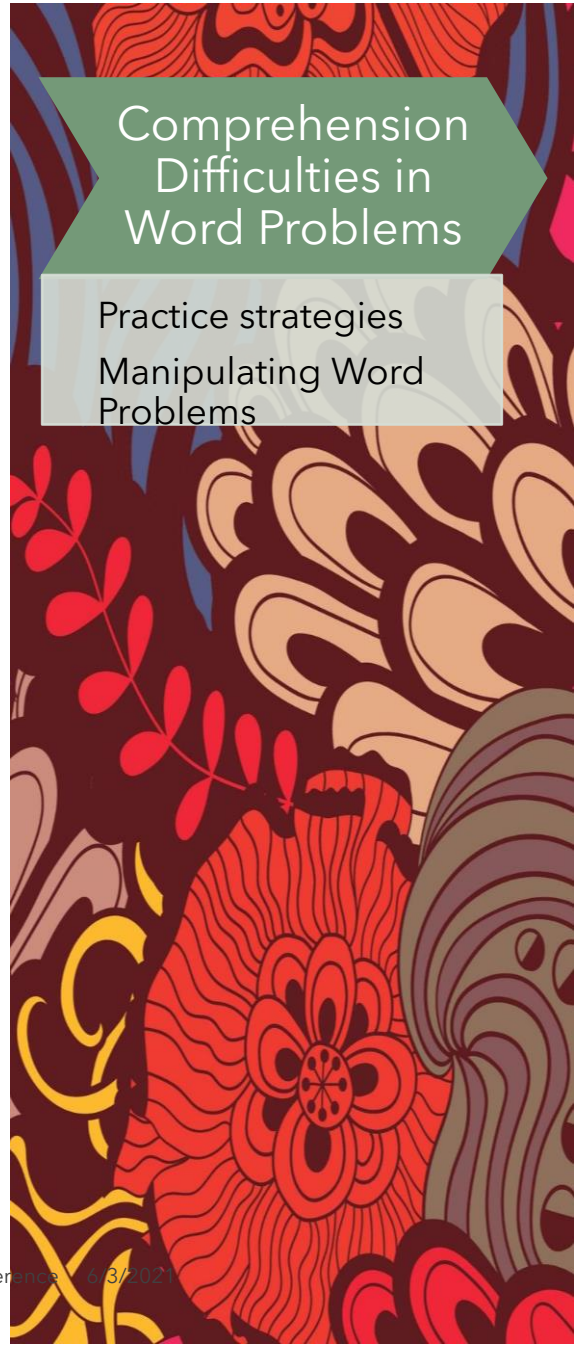
ACTIVITIES
Engage students in activities that add to their knowledge about the word

STEP 5

DISCUSS
Students discuss terms with each other

STEP 6

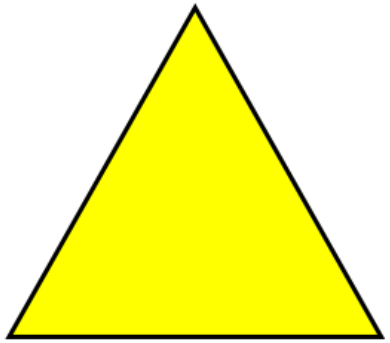
GAMES
Involve students in games



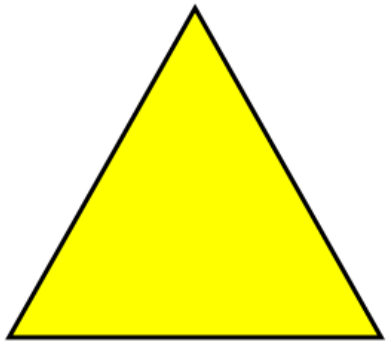
VISUALIZATION

acute triangle

acute triangle



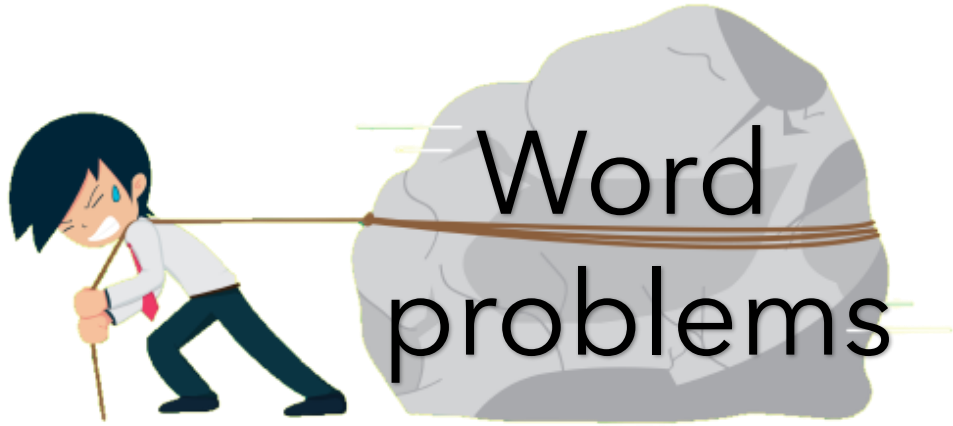
acute triangle



A triangle with no angle measuring 90º or more.

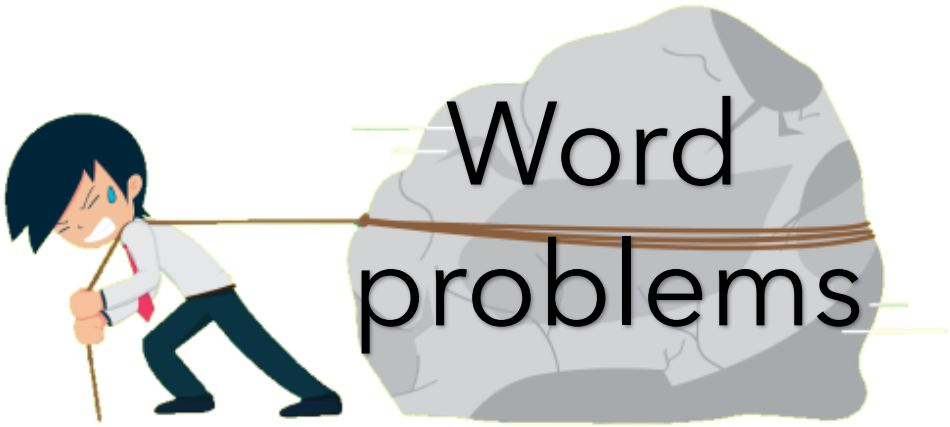

90%


95%


Word problems

Word problems in mathematics often pose a challenge because they require that students:

- Read and comprehend the text of the problem,
- Identify the question that needs to be answered, and finally;
- Create and solve a numerical equation.



Vocabulary and Grammar Look-outs

Quantitative Relationships

- Hardly, higher, last, least, **less**, **many**, most, next, **older**, rarely, scarcely, and **younger**

Logical Relationships

- Alike, almost, always, because, different from, exactly, **if...then**, never, not quite, opposite of, probably, same, since, unless, and whether

Explain these words using visual aids and manipulatives whenever possible.

Vocabulary and Grammar Look-outs

Relationships between two words

- As old as…
- Younger than…
- Greater/less than…
- By what percent is…

Relationships between two words

- *x* times as much as…
- **Passive voice** (The bagel was eaten by John…)
- Divided by vs. divided into ex.
- divide 2 by 4 (1/2) vs Divide 2 into 4 (2)

Explain these words using visual aids and manipulatives whenever possible.

Vocabulary and Grammar Look-outs

Pronouns

- If ELLs can't figure out who the pronoun refer back to, they miss out on how the sentences relate to each other.
- The students know all the words, yet not comprehend the meaning.

Juan has 16 action figures. He gave 9 of them away. How many action figures does he have now?

Ellipsis

Ellipsis is when words are left out to tighten the problem.

All numbers greater than six… is short for
All numbers (that are) greater than six.

John earns twice as much money as Robert is short for:
John earns twice as much money as Robert (earns).

Continually look for words that you can replace with Higher frequency words.

Original	New
1.Mass	1.Weight
2.Estimate	2.Guess
3.Sight	3.See
4.How much did she return with?	4.How much did she have left?

Rewording of word problems:

Examples of Grammar and vocabulary issues:

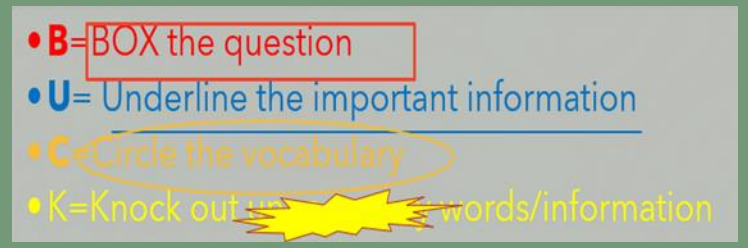
- **If** Peter can type one page of his homework on his computer in 17 minutes, how much time will it take him to type three pages?
- A father is 4 times **as old as** his son. In 20 years, the father will be **twice as old as** his son.
- A sewing machine can sew a set of curtains in ¾ of an hour. It takes a person 6 ½ hours to do this same job. How much **less** time is required to do the job by machine?

Another good tool is to teach them to draw or model the problems

BUCK $YSTEM:

- **B**=BOX the question
- **U**= Underline the important information
- **C**=Circle the vocabulary
- K=Knock out unnecessary words/information

Using journals/graphic organizers to define/draw the meaning of the words.



BUCK $YSTEM: EXAMPLE

At a shop on Times Square three "I ❤ NY" t-shirts sell every 10 minutes for $19.95 each. Every 45 minutes one Yankee hat sells for $24.95. The shop is open from 9 am – 9pm everyday. How many t-shirts are sold in a week?

You practice.

Pg.3

- **B**=BOX the question
- **U**= Underline the important information
- **C**=Circle the vocabulary
- K=Knock out [illegible] words/information

BUCK $YSTEM: EXAMPLE

At a shop on Times Square three "I ❤ NY" t-shirts sell every 10 minutes for $1[illegible]ch. Every [illegible] minutes one Yan[illegible]hat sells for $[illegible]. The shop is open from 9 am – 9pm everyday. How many t-shirts are sold in a week.

NEW WORD PROBLEM

At a shop on Times Square three "I ❤ NY" t-shirts sell every 10 minutes The shop is open from 9 am – 9pm everyday. How many t-shirts are sold in a week.

Practice Rewording Problems:

Handout

- Group 1: Problem 1 OR 2
- Group 2: Problem 3 OR 4
- Group 3: Problem 5 OR 6
- Group 4: Problem 7 OR 8

Pgs. 4-6

https://padlet.com/darlynedehaan/xru6rh30gzuzbjld

REWRITING WORD PROBLEMS IN MATHEMATICS activity.pdf

Lena has $3.10, Saimeen has $17.85, and Tarrence has $27.68

Model of Less than or More than.

Possible Questions:

1. Who has more money?
2. Put them in order of **least amount** of money to **greatest amount** of money.

a. Saimeen has _____ ¢ **more than** $17.
b. Lena spends **half of her money**. Lena has $ ____.____ **left**.
c. Saimeen has **7 times as much money as** his brother. Saimeen's brother has $ _____._____
d. Tarrence uses all of his money to by 8 cupcakes. Each cupcake costs the same amount. How much do 5 cupcakes cost? (Draw another model)

Lena has $3.10, Saimeen has $17.85, and Tarrence has $27.68

Possible Questions:

1. Who has more money?
2. Put them in order of **least amount** of money to **greatest amount** of money.

Looking for	Solution
Gi	
Re	

SENTENCE FRAMES

i KNOW:
Samuel will charge $15 per day to tutor
1 week

i Need to KNOW:
$___ if he tutors for 2 weeks

PLAN AND WORK:

$ charged	15	× 14	= 210
number of days	1	× 14	= 14

1 week = 7 days
2 weeks = 14 days

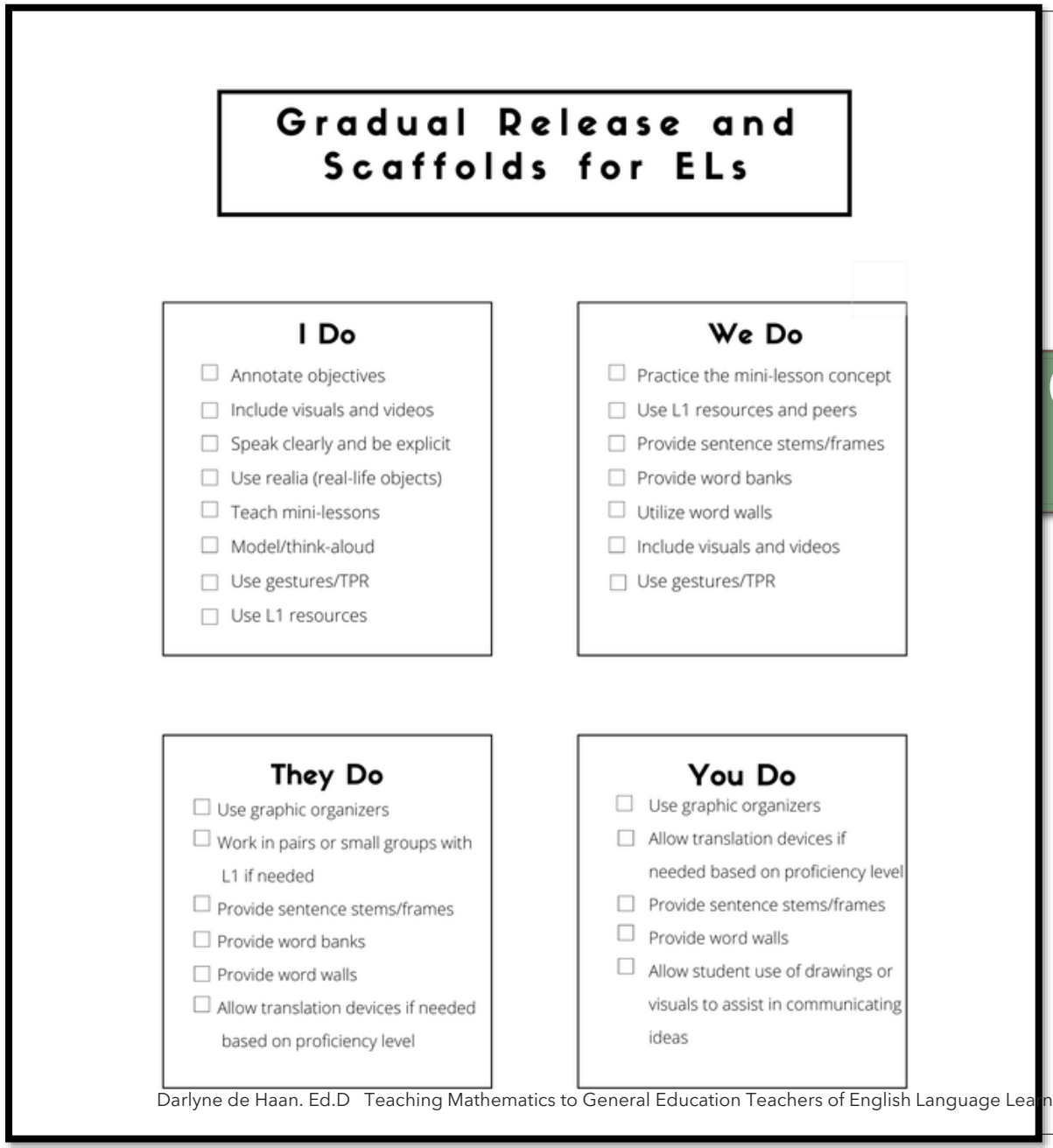
SOLUTION:
Samuel will charge $210 to tutor for 2 weeks.

MANEUVERING THE MIDDLE

in 4.0 seconds?

peed $= \frac{d}{t} = \frac{112.0\text{ m}}{4.0\text{ sec}} = \frac{28\text{ m}}{\text{sec}}$

eed of the cheetah is 28 meters per second.



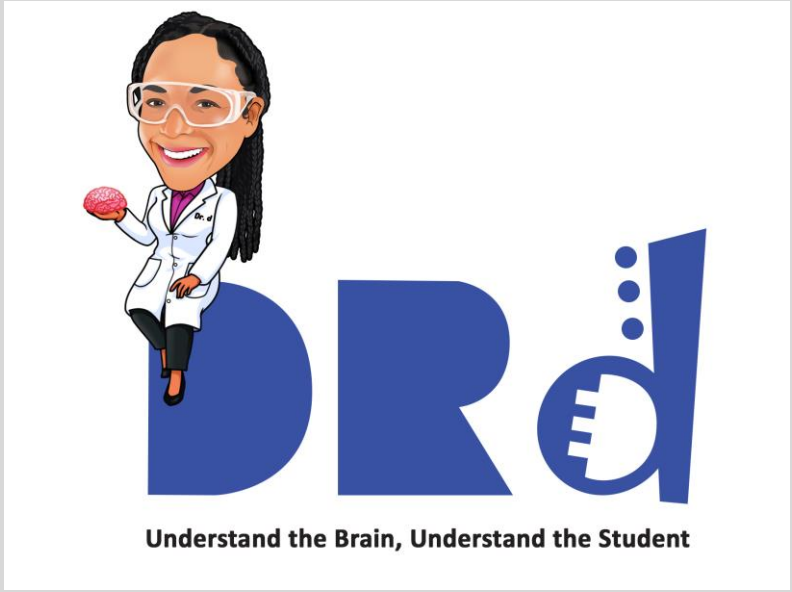
Gradual Release and Scaffolds for ELs.

Word Problems:

Story problems are just math problems with words. But for a student who is learning a second (or third) language, words in that new language can create a barrier to understanding. By explicitly teaching English in math class, teachers can help remove the roadblock that often prevents English language learners from making sense of a math word problem and, thus, from solving it. In fact, the challenges that vocabulary, grammar, and syntax pose to English learners can become English language development opportunities in math class.

Always look for opportunities to use strategies, such as repeating, rephrasing, visuals, and offering prompts, that clarify language and make math content accessible.

Thank you! Darlyne de Haan, Ed.D



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Putting it all Together

Developing a Critical Eye to Word Problems

Q & A

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