

Come on in! Give this a try:

Zulema tiene una colección de lagartos y escarabajos. Hasta ahorita ella tiene 8 criaturas en su colección. En total tienen 36 piernas. ¿Cuántos de cada criatura tiene Zulema en su colección?

Translanguaging in the Mathematics Classroom: Engaging Emergent Bilinguals in Mathematical Literacies

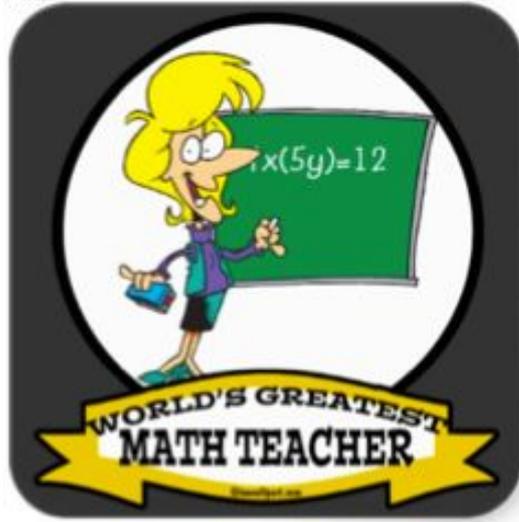
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How did you learn math?



Let's talk about **MATH**...

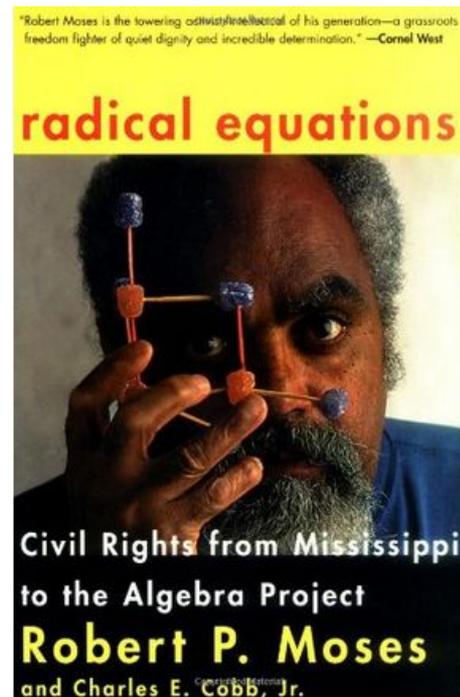
Math Phobias

“Only some people are good in math”

“I was never any good in math”

“I hate math”

“[In our culture,] **illiteracy in math is acceptable the way illiteracy in reading is unacceptable**... not being “good” in math does not in any way imply inferiority, rather, it confirms that you’re just like most everyone else.” (Moses & Cobb, 2002)



Change is necessary...

“NO MATTER HOW LUCIDLY AND PATIENTLY TEACHERS EXPLAIN TO THEIR STUDENTS, THEY CANNOT UNDERSTAND FOR THEIR STUDENTS” (SCHIFTER + FOSNOT, 1993)

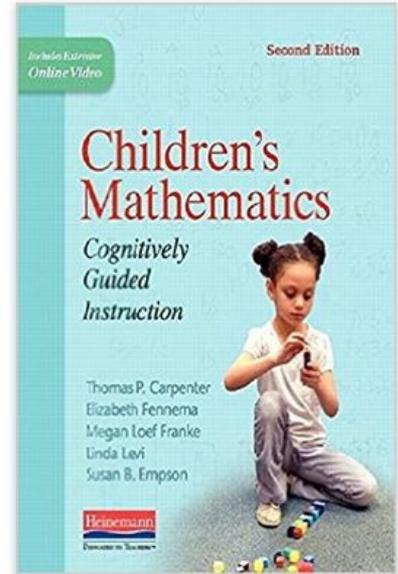
Children come to understand mathematics as they DO mathematics. Doing mathematics means engaging in solving problems.

How children learn and understand mathematics

Children come to school with a rich store of knowledge they can use to solve mathematics problems. (Carpenter, et al., 1989, 1999, 2014)

Cognitively Guided Instruction (CGI):

- emphasizes the importance of understanding student thinking
- uses student thinking to drive math learning
- encourages allowing students to solve problems in their own way



Results of a CGI Kindergarten Study

Robin has 3 packages of gum. There are 6 pieces of gum in each package. How many pieces of gum does Robin have altogether?

Tad had 15 guppies. He put 3 guppies in each jar. How many jars did Tad put guppies in?

Mr. Gomez had 20 cupcakes. He put the cupcakes into four boxes so that there was the same number of cupcakes in each box. How many cupcakes did Mr. Gomez put in each box?

19 children were going to the circus. 5 children can ride in each car. How many cars will be needed to get all 19 children to the circus?

Maria had 3 packages of cupcakes. There were 4 cupcakes in each package. She ate 5 cupcakes. How many are left?

19 children are taking a mini-bus to the zoo. They will have to sit either 2 or 3 to a seat. The bus has 7 seats. How many children will have to sit 3 to a seat, and how many can sit 2 to a seat?

What accounts for these results?

Young children naturally use informal knowledge of a problem situation (sharing toys, putting cards into boxes, etc.) to Direct Model a solution.

Story problems (versus number sentences with no context) give children access to mathematics & help them engage in sensemaking.

Javier, Kindergarten

Javier tiene 15 canicas. Quiere compartir con 3 amigos.
¿Cuántas canicas le toca a cada niño?

Ariana, 1st grade

Paco tiene 13 galletas. Se comio 6 galletas. ¿Cuántas galletas tiene Paco ahora?

Student-Centered Mathematics Classrooms

- Students need to participate in a community of practice
- Centered around a purposeful mathematical task or activity
- Students need opportunities to engage in mathematical discussions around reasoning to solve problems, and making conjectures and connections
- Teacher in role of facilitator - understanding student's thinking, use of questioning and listening

Students' whole selves are welcomed and valued during math class.

What does this mean for the dual language classroom?

Discourse is important. So is academic language.

However, “Although it is crucial that students who are learning English have opportunities to communicate mathematically, this is not primarily a matter of learning vocabulary... Learning to communicate mathematically involves, in part, sorting out differences in meanings of words and phrases that are used both in mathematical and everyday settings.” (Moschkovich, 2010)

How do you understand language?

...is it a system?

Or a set of communicative practices?



The “Practice Turn” in Applied Linguistics...

Bilingual Languageing? Translanguaging!

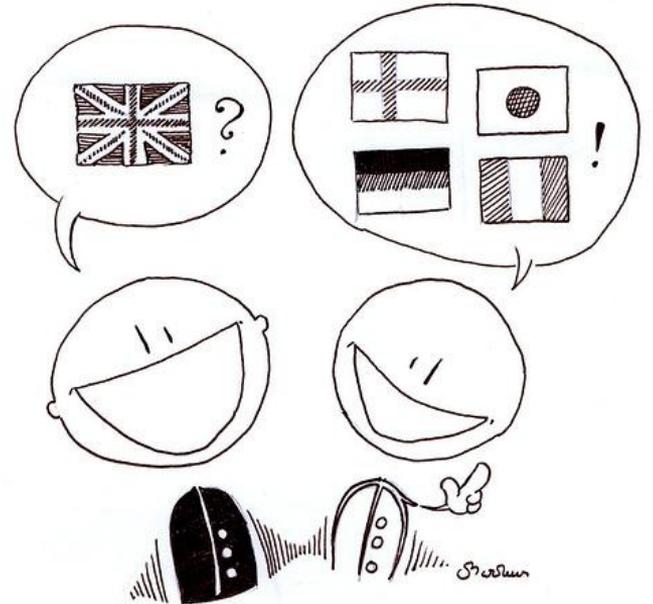
Hybrid language practices

Translanguaging

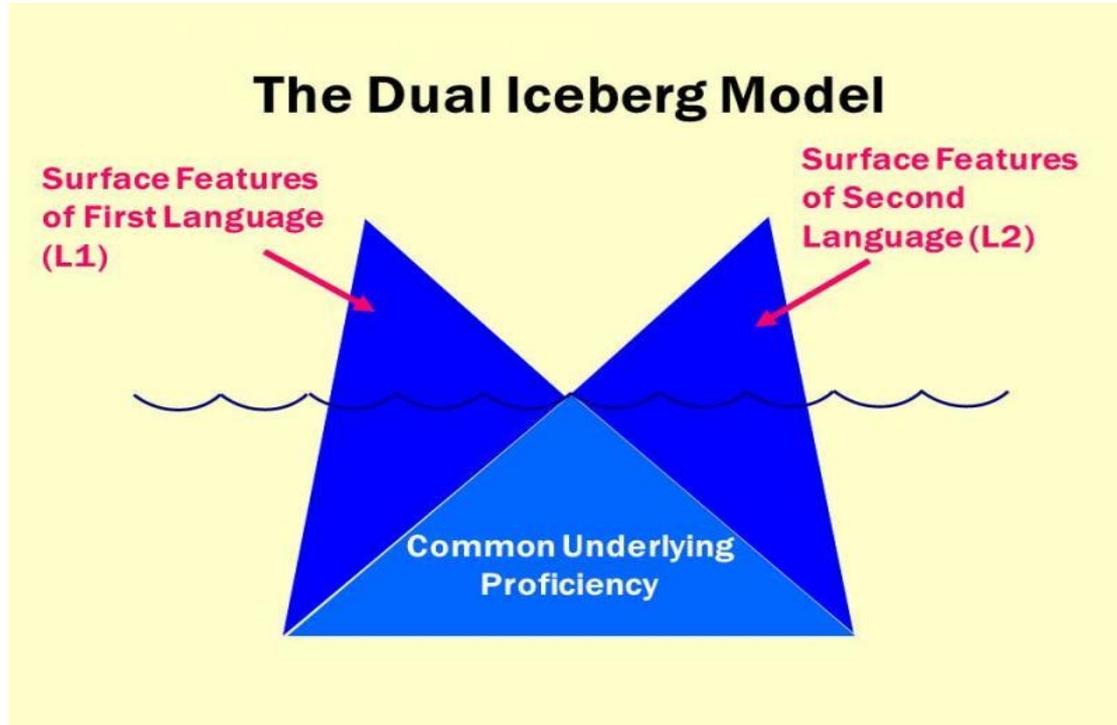
Polylanguageing

Codemeshing/Codeswitching

Spanglish



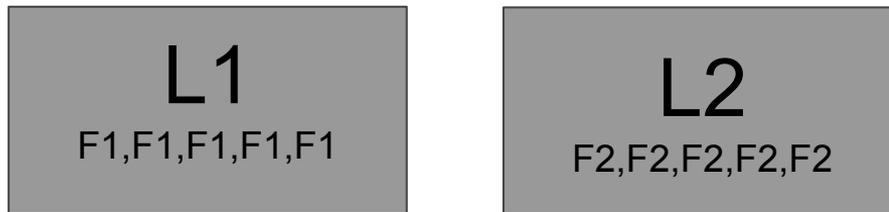
Cummins' Dual Iceberg Model: L1 and L2 are "interdependent"



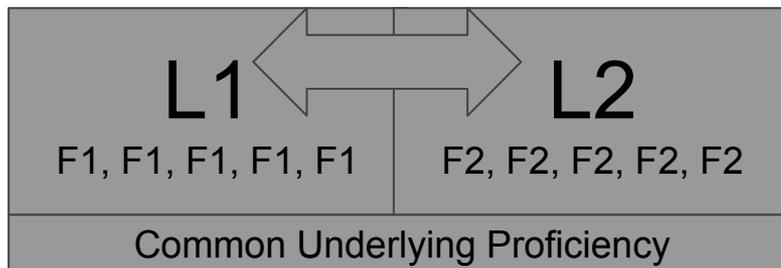
“CUP”

Traditional view of bilingualism:

Dual Monolingualism
Separate Underlying Proficiency (SUP)



Cummins' Linguistic Interdependence (CUP)



Dynamic Bilingualism: Translanguaging



(García & Wei, 2014, p.14)

Dynamic Bilingualism

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“...goes beyond the notion of two autonomous languages, of an L1 and an L2, and of additive or subtractive bilingualism. Instead, dynamic bilingualism suggests that the language practices of all bilinguals are complex and interrelated; they do not emerge in a linear way.” García & Sylvan, 2011, p.388



¿Y qué piensan del problema que resolvieron al principio?

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Process versus Product: Learning mathematics as Process

Students **do** need to produce monolingual oral or written language performances in school.

When?

Where?

Why?

Process versus Product: Learning mathematics as Process

Students do need to produce monolingual oral or written language performances.

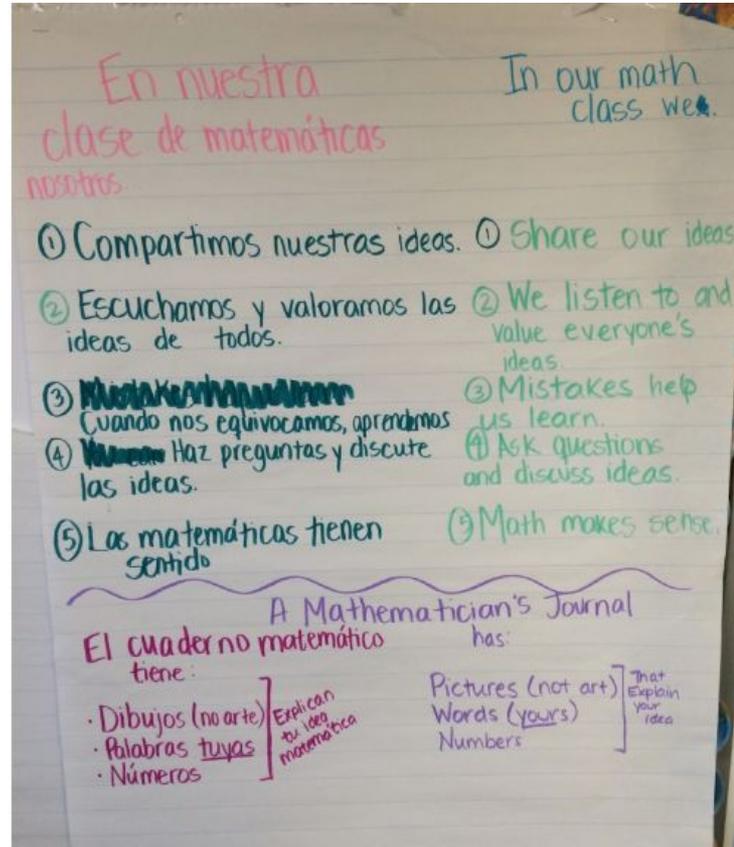
When?

Where?

Why?

We contend that during math class in a bilingual or dual language classroom, WHEN THE GOAL IS DEEP MATHEMATICAL UNDERSTANDING, there is rarely an occasion that requires a monolingual language product or performance.

Ms. Adams' Dual Language mathematics classroom



Math Identities and Stories

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Study conducted in 2014 with my class of 4th grade emerging bilinguals.

The intent was to use students' math stories to better understand the math identity they were developing.

Math Identities *Students' "beliefs about their ability to perform in mathematical contexts, their beliefs about the instrumental importance of math knowledge, and their resulting motivations and strategies to learn or do math," (Martin, 1997).*

Math stories *The stories of others can "allow us to see how the world looks behind someone else's spectacles. They challenge us to wipe off our own lenses and ask, 'Could I have been overlooking something all along?'" (Delgado, 1989)"*

Math Identities and Stories

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Language and Math

Identities of failure

Sonia's Positive memory:

“Me gustó las matemáticas en español porque antes en puro inglés no le entendía mucho. Me gustó también que hicieron matemáticas en español y enseñan otras maneras de hacerle matemáticas. Se me hizo más fácil sacar una respuesta y me gustó porque me la explico mejor.”

Translanguaging in a Unit of Study on Time

Highly abstract concept

Linguistic resources

Ocho en punto vs. eight o'clock

Ocho y media vs. eight thirty

medio-día vs. noon

¿Qué hora es? vs what time is it?

Question Phrasing

Centering student language and ideas as mathematical tools

Gestures and Body Language



Translanguaging in a Unit of Study on Time

Meaningful observations and who they come from

Examples:

Andres' trocitos de naranja

Eugenio's pedazos de pizza

Genesis' tortillas de harina

Talk moves that help elicit student language:

respond in the language they spoke in

rephrase or have a student rephrase in the other

Language

use student ideas and language to drive

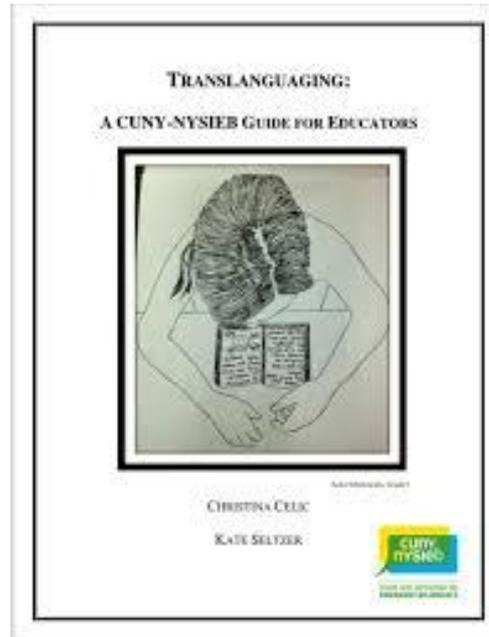
discussion

give them ownership of their ideas and language



Classroom Translanguaging Strategies

TRANSLANGUAGING: A CUNY-NYSIEB GUIDE FOR EDUCATORS



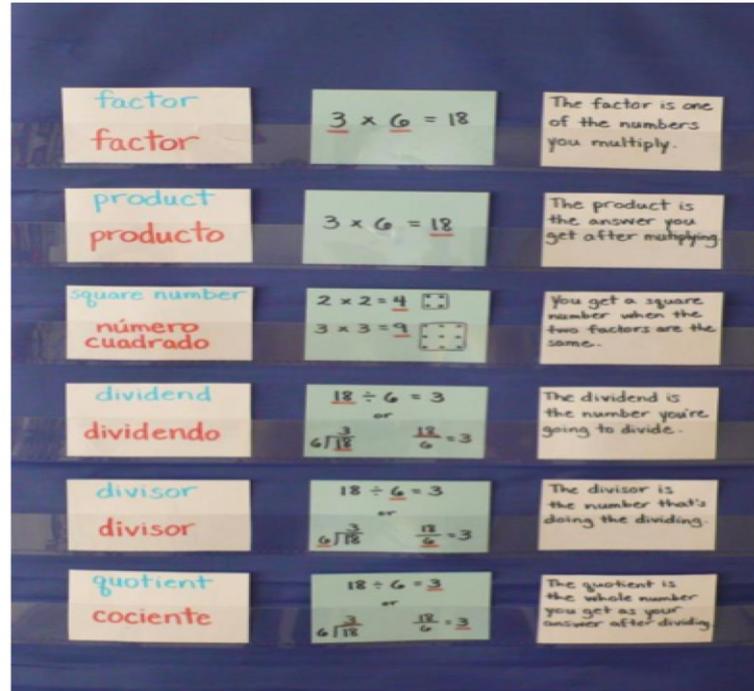
Translanguaging Strategies: Jigsaw/Share

Look through the strategies in your assigned section.

Together, select **ONE** to share with the group.

[One Minute Per Group]

Multilingual Word Walls



Cognate Charts

horizontal	horizontal
hour	hora
line	línea
mathematics	matemáticas
minute	minuto
multiply	multiplicar
number	número

-sion -ción -xión	-tion -sion
la fracción → las fracciones	la función → las funciones
la división → las divisiones	the fraction → the fractions
la multiplicación → las multiplicaciones	the division → the divisions
la estimación → las estimaciones	the multiplication → the multiplications
la colección → las colecciones	the estimation → the estimations
la operación → las operaciones	the collection → the collections
la reflexión → las reflexiones	the operation → the operations
	the reflection → the reflections
	the function → the functions

Multilingual Collaborative Work

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Discuss/Reflect/Negotiate content in any language & Share out in English

Brainstorm in any language & Write in English

Preview in home language & then Collaborate in any language

Listen in English & Discuss in any language

Research/Plan in any language & Present in English

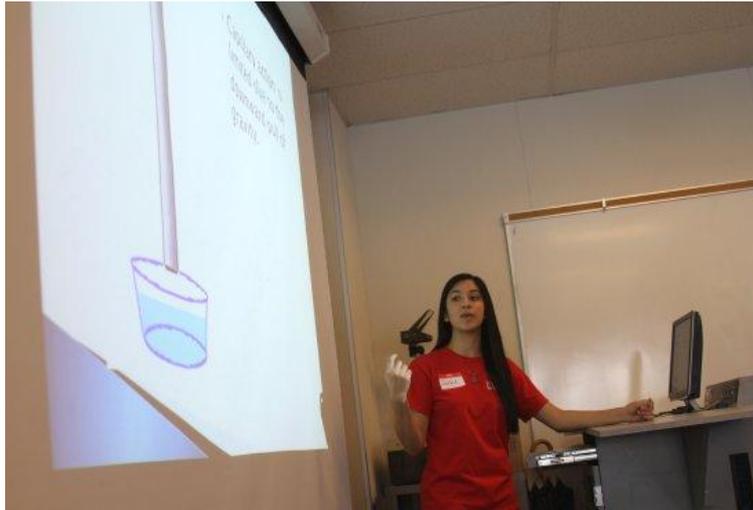
Present in one language & Analyze in another

*** These same strategies can be applied to math reading and writing activities.***

Multilingual Collaborative Work

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In an 8th grade math class, students created a PowerPoint written in English about the rules they had learned about exponents. When sharing this information in front of the class, students presented their PowerPoint in English, and then discussed the exponent concepts more in-depth using Spanish. This can also be done where students present in English and do the PowerPoint in a home language.

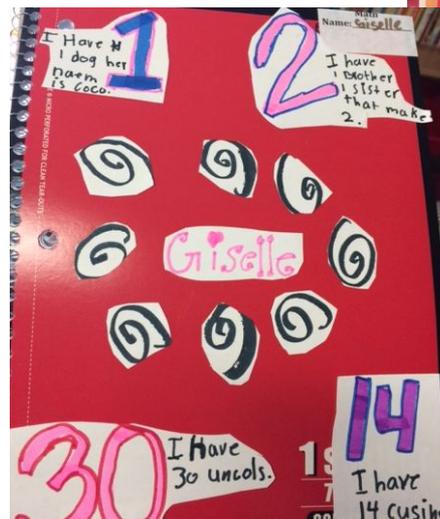
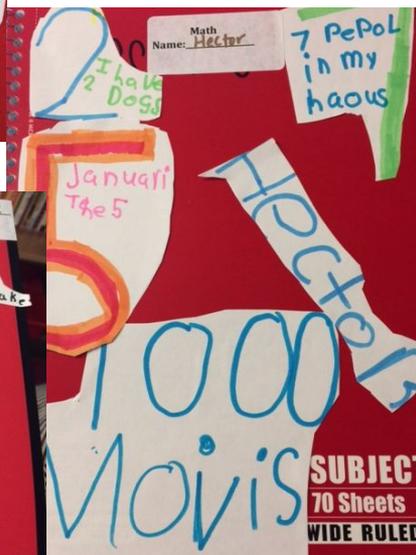
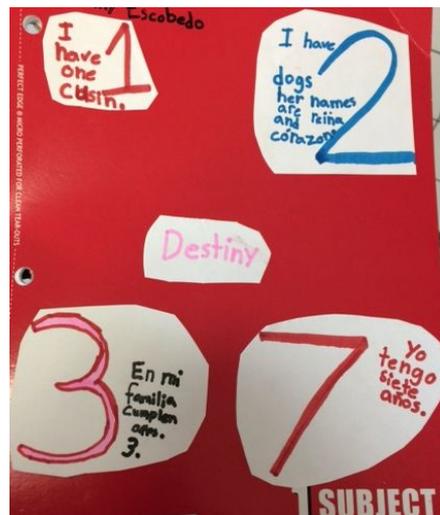


Math Language Portfolio

Give students a place to reflect on their experiences with language specific to math.

Students can track skills in both languages and reflect/recognize the value of drawing on our entire linguistic repertoires.

This can be to track math language as well as bring awareness to our bilingual skills for different math tasks (i.e. reading word problems, processing, counting)



Questions? ¿Preguntas?

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