

# Five Essentials for Math Instruction Within Your MTSS Framework



# Sarah R. Powell, Ph.D.

Associate Professor  
The University of Texas at Austin



[srpowell@utexas.edu](mailto:srpowell@utexas.edu)



[@sarahpowellphd](https://www.instagram.com/sarahpowellphd)





Say hello.

Share a bit about yourself and  
the math you support.



# Objectives

Participants will describe the core components of explicit instruction.

Participants will describe why formal math language is important.

Participants will explain different representations that can help students understand concepts and procedures.

Participants will outline ways to build fluency.

Participants will describe two effective practices for word-problem instruction.





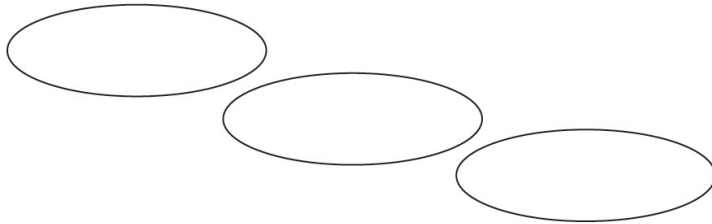


## Five Essentials for Math Instruction Within Your MTSS Framework

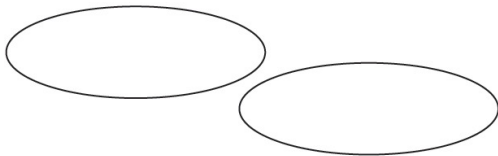
Sarah R. Powell, Ph.D.  
srpowell@utexas.edu  
@sarahpowellhd  
www.sarahpowellphd.com

Instructional Platform

Instructional Delivery



Instructional Strategies



evidence-based practice



evidence-based intervention

evidence-based strategy

promising practice

~~no or negative  
evidence~~



# Instructional Platform

## INSTRUCTIONAL DELIVERY

Explicit  
instruction

Precise  
language

Multiple  
representations

## INSTRUCTIONAL STRATEGIES

Fluency building

Problem solving  
instruction



# Objectives

Participants will describe the core components of explicit instruction.

Participants will describe why formal math language is important.

Participants will explain different representations that can help students understand concepts and procedures.

Participants will outline ways to build fluency.

Participants will describe two effective practices for word-problem instruction.



# Explicit Instruction



# Instructional Platform

## INSTRUCTIONAL DELIVERY

Explicit  
instruction

## INSTRUCTIONAL STRATEGIES



Explicit Instruction

MODELING

PRACTICE

SUPPORTS



## MODELING

Step-by-step  
explanation

Planned examples

## PRACTICE

Guided practice

Independent practice

## SUPPORTS

Ask high-level and low-level questions

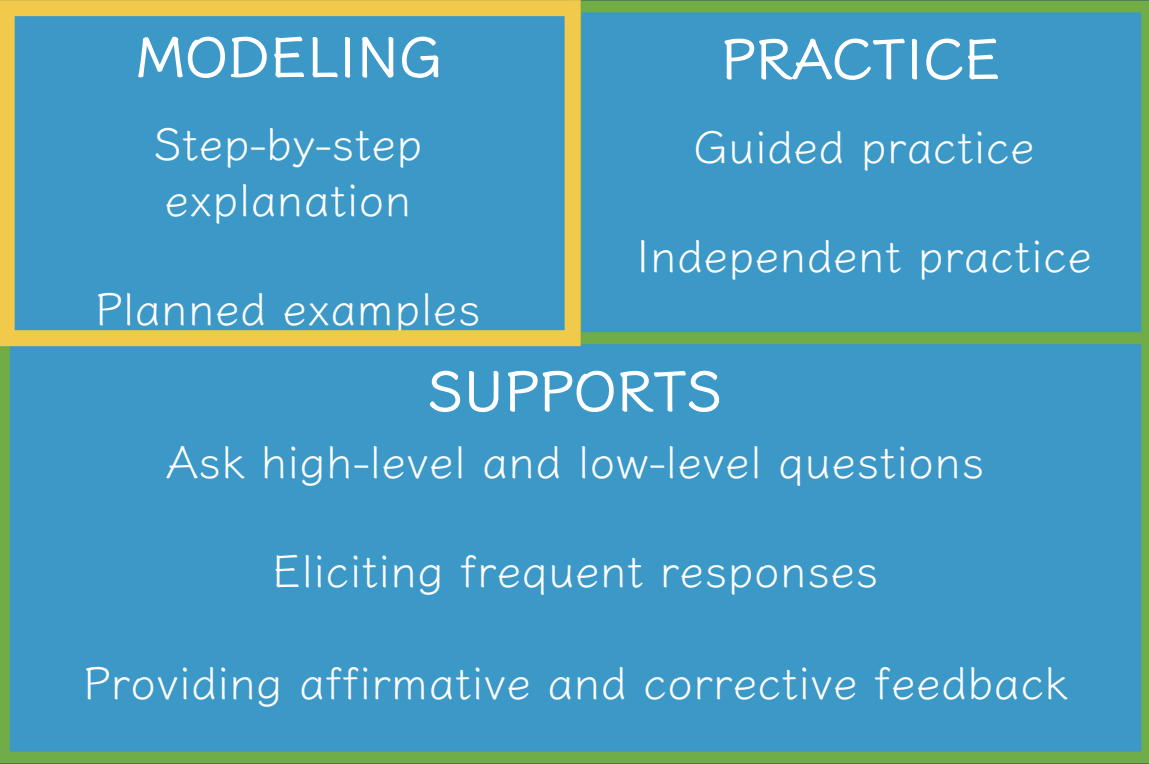
Eliciting frequent responses

Providing affirmative and corrective feedback





Modeling is a dialogue between the teacher and students.



Modeling includes a step-by-step explanation of how to do a math problem.

A teacher may do 1 modeled problem or several.

## MODELING

Step-by-step explanation

Planned examples

## PRACTICE

Guided practice

Independent practice

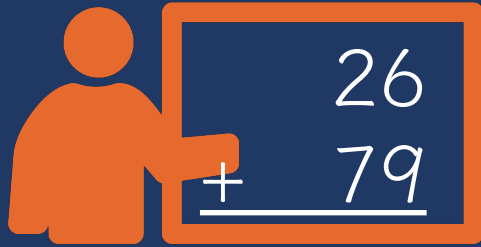
## SUPPORTS

Ask high-level and low-level questions

Eliciting frequent responses

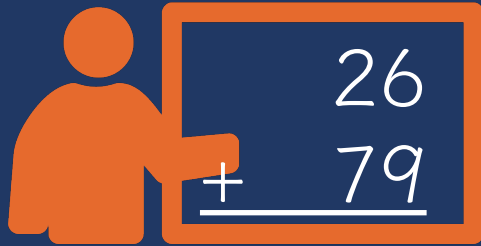
Providing affirmative and corrective feedback





“Today, we are learning about addition. This is important because sometimes you have different amounts – like money – and you want to know how much money you have altogether.”





“Let’s solve this problem. What’s the problem?”

“26 plus 79.”



“To solve 26 plus 79, first decide about the operation. Should we add, subtract, multiply, or divide?”

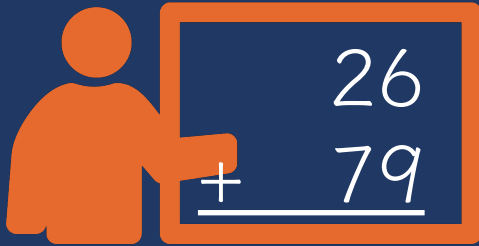
“Add.”



“How did you know we want to add?”

“There’s a plus sign.”





“The plus sign tells us we want to add. To add, let’s use the partial sums strategy. What strategy?”

“Partial sums.”



“With the partial sums strategy, we start adding in the greatest place value. What’s the greatest place value in this problem?”

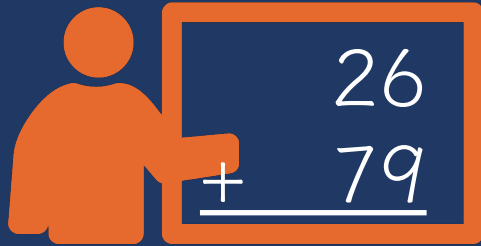
“The tens.”



“So, let’s add the tens. What’s 20 plus 70?”

“90.”





“20 plus 70 equals 90. Let’s write 90 right here below the equal line. What will we write?”

“90.” 

“90 is the partial sum when you add the tens. What does 90 represent?”

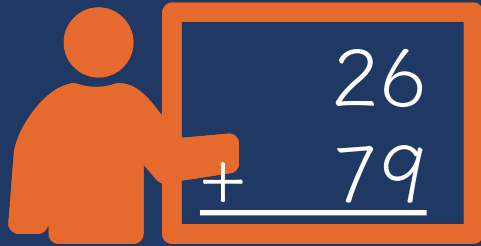
“It’s the partial sum of adding 20 plus 70.”



“Now, let’s add the ones. What should we add?”

“6 plus 9.” 





“6 plus 9 equals what?”

“15.” 

“Let’s write 15 below the 90.  
Where do we write the 15?”

“Below the 90.” 

“15 is the partial sum when you add the ones.  
Now, let’s add the partial sums together. What will we add?”

“90 plus 15.” 





“What’s 90 plus 15?”

“How did you add those numbers?”

“So, when you add 26 plus 79, the sum is 105. Who can share how we solved this problem?”

“105.”



“I added 90 plus 10 then added 5 more.”



“We used the partial sums strategy. We added the tens then added the ones. Then we added the partial sums.”





Modeling needs to include planned examples.

## MODELING

Step-by-step explanation

Planned examples

## PRACTICE

Guided practice

Independent practice

## SUPPORTS

Ask high-level and low-level questions

Eliciting frequent responses

Providing affirmative and corrective feedback

These examples should be sequenced so easier skills lead to more difficult skills.



## MODELING

Step-by-step  
explanation

Planned examples

## PRACTICE

Guided practice

Independent practice

## SUPPORTS

Ask high-level and low-level questions

Eliciting frequent responses

Providing affirmative and corrective feedback



## MODELING

Step-by-step  
explanation

Planned examples

## PRACTICE

Guided practice

Independent practice

Practice continues as a dialogue between the teacher and students.

## SUPPORTS

Ask high-level and low-level questions

Eliciting frequent responses

Providing affirmative and corrective feedback



## MODELING

Step-by-step explanation

Planned examples

## PRACTICE

Guided practice

Independent practice

## SUPPORTS

Ask high-level and low-level questions

Eliciting frequent responses

Providing affirmative and corrective feedback

Guided practice is practice in which the teacher and students practice problems together.



“Let’s work on a problem together.”



## MODELING

Step-by-step  
explanation

Planned examples

## PRACTICE

Guided practice

Independent practice

## SUPPORTS

Ask high-level and low-level questions

Eliciting frequent responses

Providing affirmative and corrective feedback

Independent practice is practice in which the students practice independently with teacher support.



“Now, you’ll practice a problem on your own. Use your attack strategy!”



## MODELING

Step-by-step  
explanation

Planned examples

## PRACTICE

Guided practice

Independent practice

## SUPPORTS

Ask high-level and low-level questions

Eliciting frequent responses

Providing affirmative and corrective feedback



## MODELING

Step-by-step  
explanation

Planned examples

## PRACTICE

Guided practice

Independent practice

## SUPPORTS

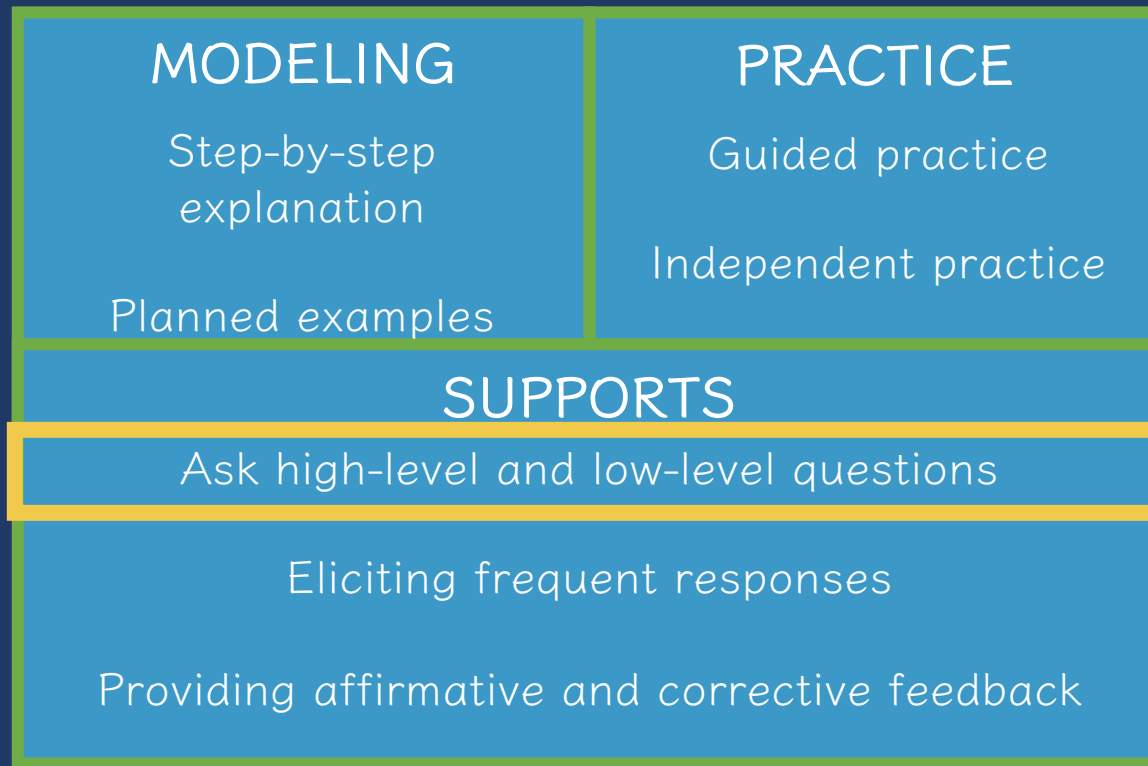
Ask high-level and low-level questions

Eliciting frequent responses

Providing affirmative and corrective feedback

These **Supports** should be used in  
both **Modeling** and **Practice**.





During **Modeling** and **Practice**, it is essential to engage students and check for understanding.





## MODELING

Step-by-step  
explanation

Planned examples

## PRACTICE

Guided practice

Independent practice

## SUPPORTS

Ask high-level and low-level questions

Eliciting frequent responses

Providing affirmative and corrective feedback



“What is 7 times 9?”

“63.”



## MODELING

Step-by-step  
explanation

Planned examples

## PRACTICE

Guided practice

Independent practice

## SUPPORTS

Ask high-level and low-level questions

Eliciting frequent responses

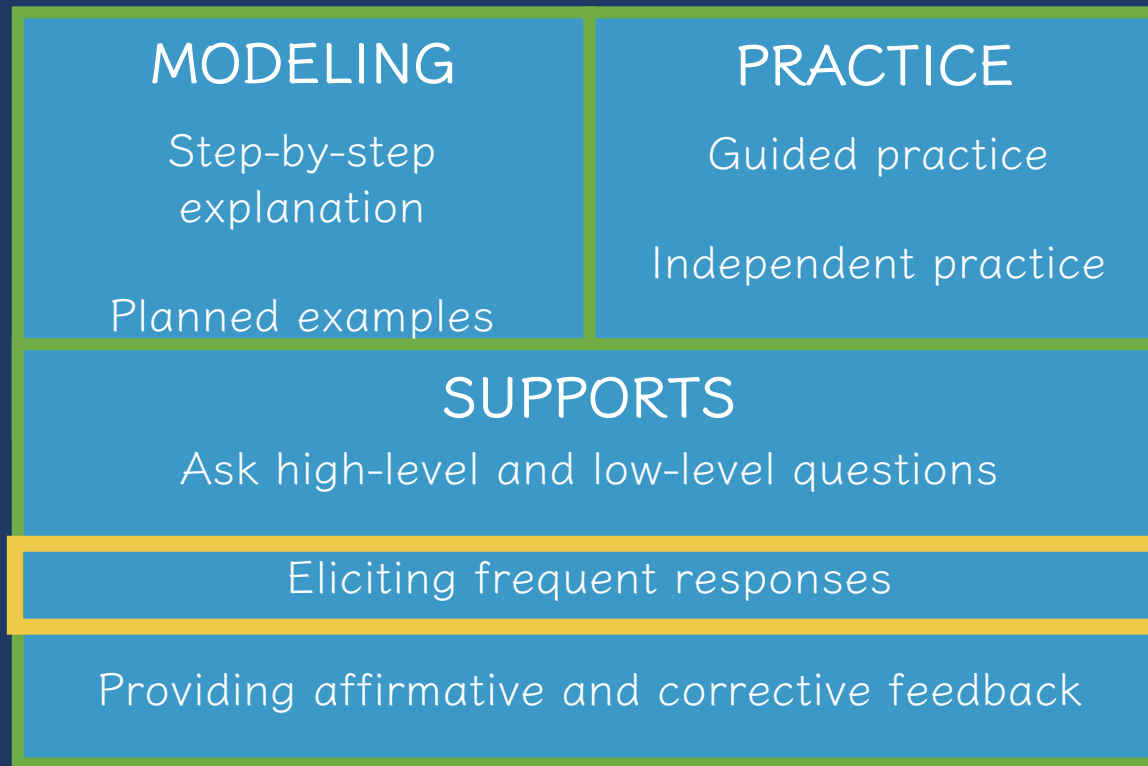
Providing affirmative and corrective feedback



“Why do you use zero pairs?”

“Because a positive 1 and a negative 1 equal 0. I use the zero pair to help me subtract.”





During **Modeling** and **Practice**, students should frequently respond. The frequent responses keeps student attention and keeps student learning active.



## MODELING

Step-by-step  
explanation

Planned examples

## PRACTICE

Guided practice

Independent practice

## SUPPORTS

Ask high-level and low-level questions

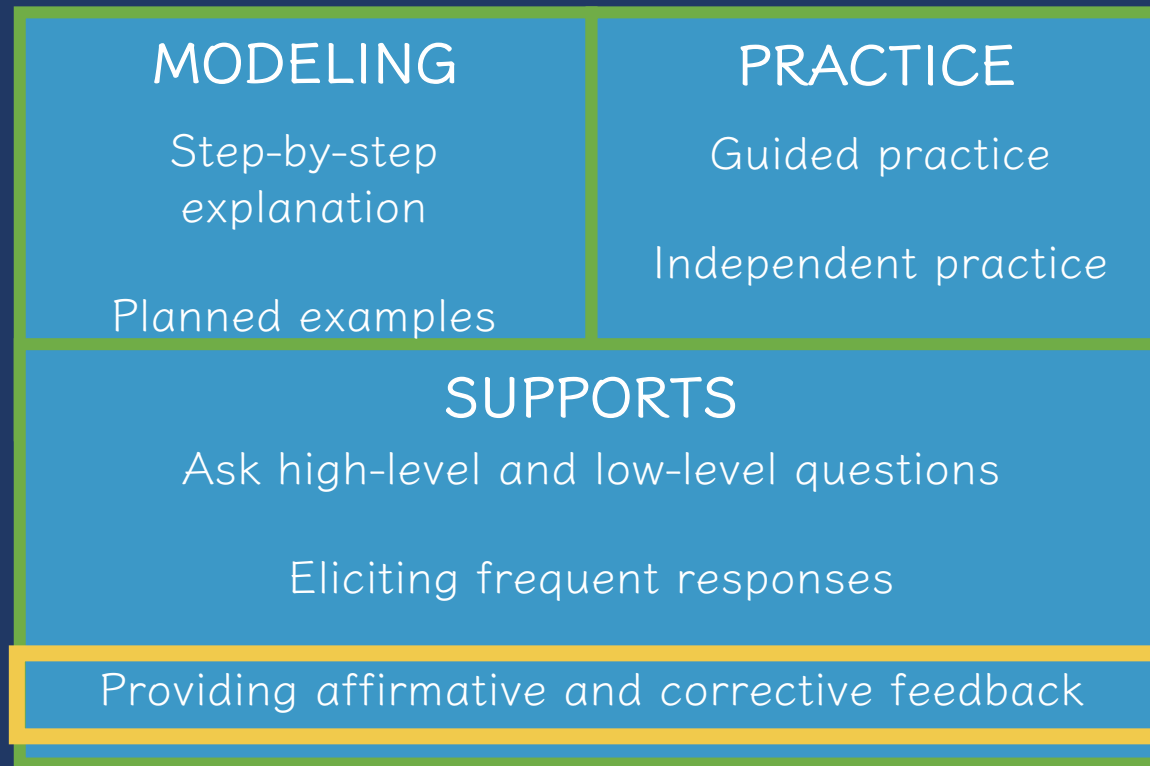
Eliciting frequent responses

Providing affirmative and corrective feedback



- Oral
- Written
- With manipulatives
- With drawings
- With gestures





During **Modeling** and **Practice**, students should receive immediate feedback on their responses.



## MODELING

Step-by-step  
explanation

Planned examples

## PRACTICE

Guided practice

Independent practice

## SUPPORTS

Ask high-level and low-level questions

Eliciting frequent responses

Providing affirmative and corrective feedback



“Nice work using your  
word problem attack  
strategy.”



## MODELING

Step-by-step  
explanation

Planned examples

## PRACTICE

Guided practice

Independent practice

## SUPPORTS

Ask high-level and low-level questions

Eliciting frequent responses

Providing affirmative and corrective feedback



“Let’s look at that again. Tell me how you added in the hundreds column.”



## MODELING

Step-by-step  
explanation

Planned examples

## PRACTICE

Guided practice

Independent practice

## SUPPORTS

Ask high-level and low-level questions

Eliciting frequent responses

Providing affirmative and corrective feedback





## MODELING

Step-by-step explanation

Planned examples

## PRACTICE

Guided practice

Independent practice

## SUPPORTS

Ask high-level and low-level questions

Eliciting frequent responses

Providing affirmative and corrective feedback



What are your strengths with explicit instruction?

What are opportunities for growth with explicit instruction?



# Objectives

Participants will describe the core components of explicit instruction.

Participants will describe why formal math language is important.

Participants will explain different representations that can help students understand concepts and procedures.

Participants will outline ways to build fluency.

Participants will describe two effective practices for word-problem instruction.



# Mathematical Language



# Instructional Platform

## INSTRUCTIONAL DELIVERY

Explicit  
instruction

Precise  
language

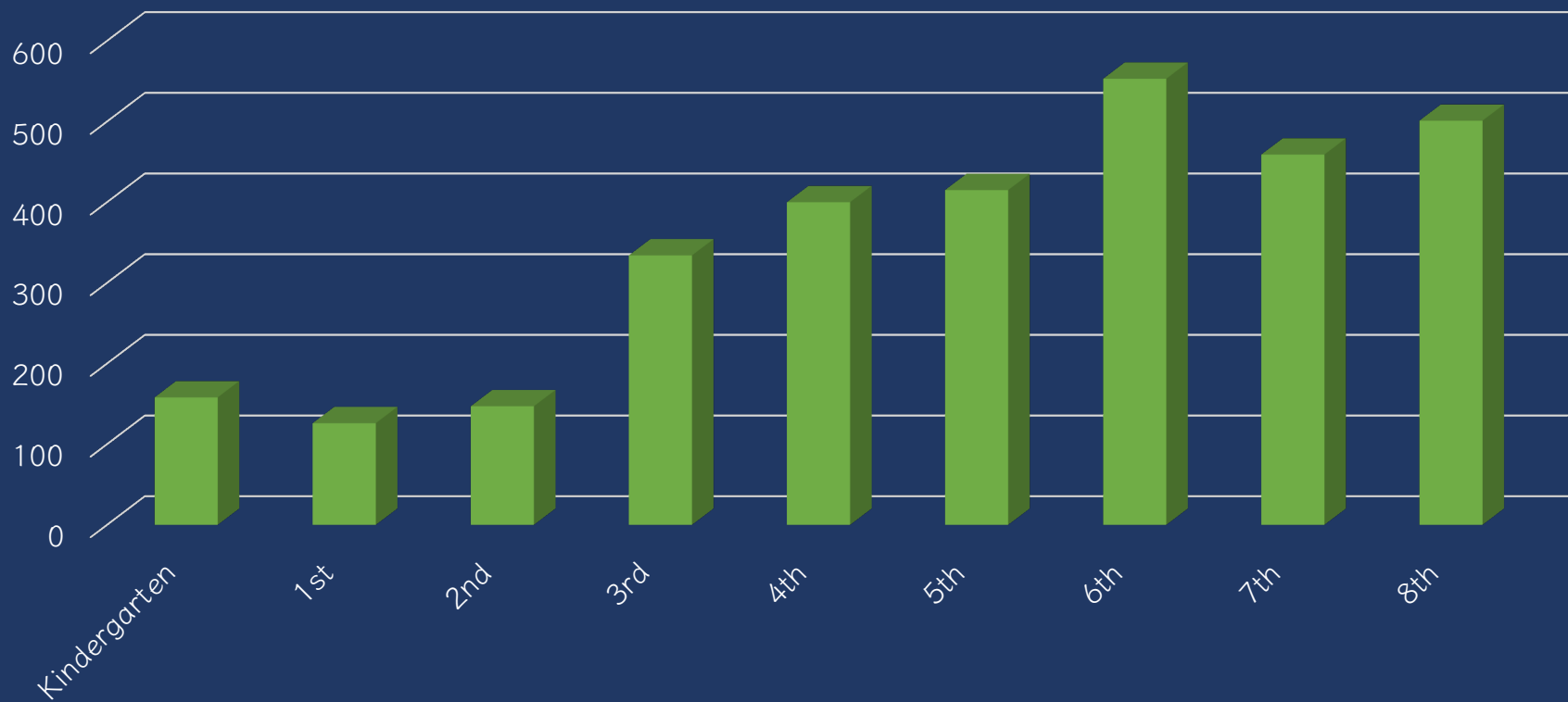
## INSTRUCTIONAL STRATEGIES

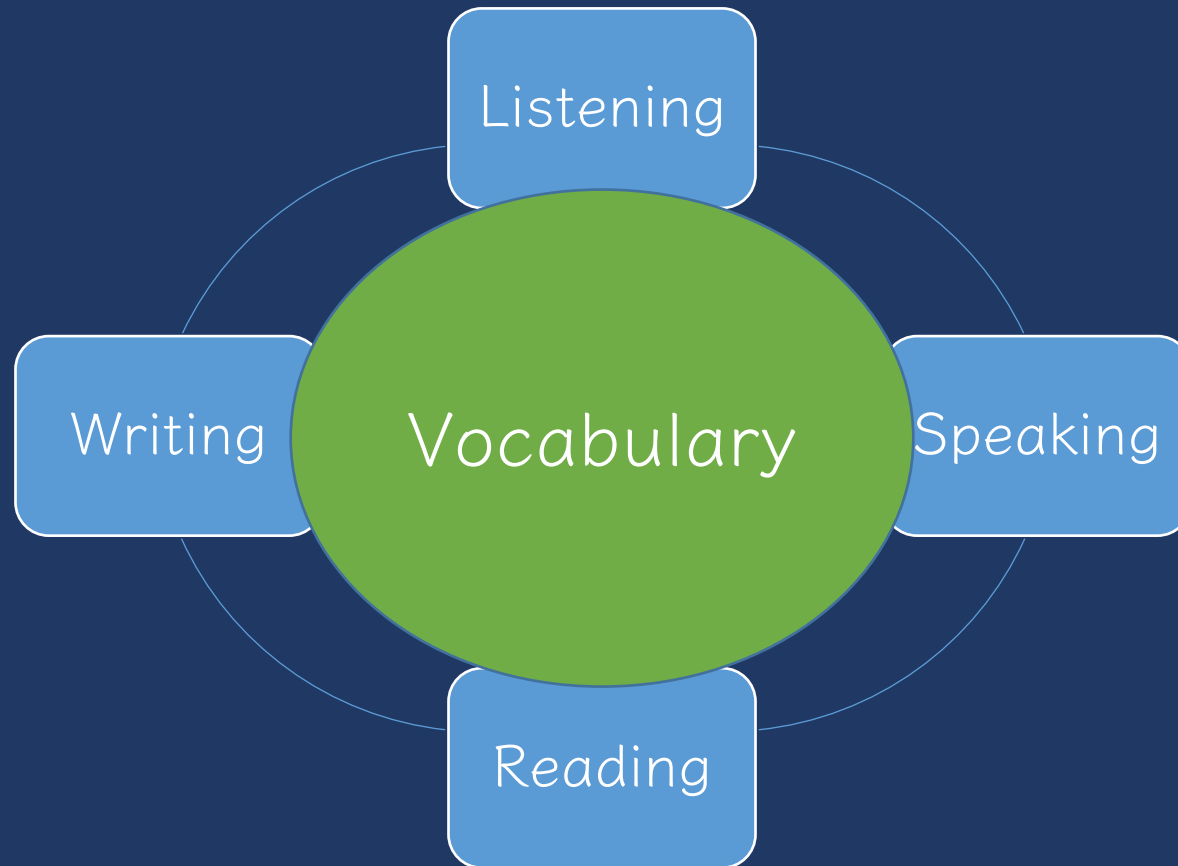


## Mathematical Language

Instead of that...	Say this...








Use formal math language


Use terms precisely







What number is in the tens place?




What digit is in the tens place?  
What is the value of the digit in the tens place?

135


**Why this is important...**

- A number refers to the entire amount.
- The 3 in the tens place value is not a number, but rather a digit in the number 135.
- Reinforces conceptual understanding of place value.
- Emphasizes that 3 is part of the number 135 with a value of 30.





The alligator eats the  
bigger number



is less than  
OR  
is greater than

**Why this is important...**

- Students must learn how to read and write the inequality symbols.
- Students must learn to read equations correctly from left to right because  $<$  and  $>$  are two distinct symbols.





carry OR borrow





regroup OR  
trade OR  
exchange

$$\begin{array}{r} 167 \\ + 294 \\ \hline \end{array}$$

**Why this is important...**

- “Carry” or “borrow” is procedural.
- The other terms reinforce the conceptual understanding or regrouping ones into tens, tens into hundreds, and so on (i.e., the total amount does not change) *or* ungrouping hundreds into tens, tens into ones, and so on.



top number and  
bottom number



numerator and  
denominator

**Why this is important...**


- Identifying that there are two separate (whole) numbers suggests that whole number properties can be applied to fractions.
- Emphasizing that a fraction is ONE number with ONE magnitude on a number line that is communicated with a numerator and denominator is important.







reduce the fraction




rename OR  
find equivalent OR  
simplify

**Why this is important...**

- Reducing suggests that the quantity or magnitude of the new number will be less than the original number.





Four point seven  
Four point oh seven



Four and seven tenths  
Four and seven hundredths

4.7  
4.07

**Why this is important...**

- Accurately shares the magnitude of the decimal.
- Emphasizes place value.

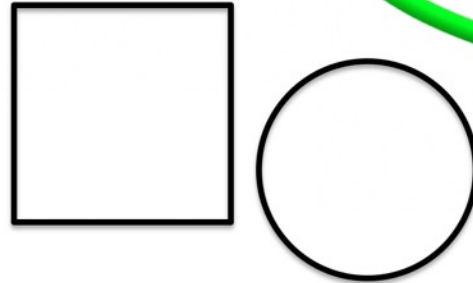




box OR ball



square OR  
circle

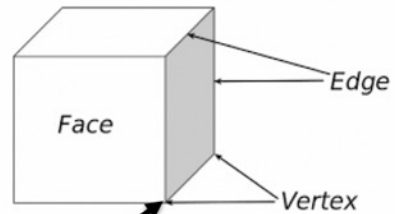


**Why this is important...**

- Use the formal language of shapes to confirm informal language.

point

vertex



**Why this is important...**

- This is the endpoint where two or more line segments or rays meet.



## Mathematical Language

Instead of that...	Say this...



Identify examples of  
“Instead of \_\_\_\_\_, say  
\_\_\_\_\_.”

Use formal math language

Use terms precisely



## **Factor**

$$1 \times 8 = 8$$

$$2 \times 4 = 8$$

factor factor

## **Multiple**

$$8 \times 1 = 8$$

$$8 \times 2 = 16$$

multiples of 8

E

## **Improper fraction**

$$\frac{8}{5}$$

## **Mixed number**

$$1\frac{3}{5}$$

## **Proper fraction**

$$\frac{2}{9}$$

## **Proportion**

$$\frac{2}{5} = \frac{8}{20}$$

## **Ratio**

$$4:3$$

## **Unit fraction**

$$\frac{1}{6}$$

D



**Equation**  $9x - 4 = 7x$

**Expression**  $9x - 4$

**Formula**  $a^2 + b^2 = c^2$

**Function**  $f(x)$

**Inequality**  $9x - 4 > 6x$

C

**Coefficient**

**Constant**

**Term**

**Variable**

term

term

term

$2x^2 + x - 3$

variable coefficient    variable    constant

A



# Quadrilaterals

**Kite**



**Parallelogram**



**Rectangle**



**Rhombus**



**Square**

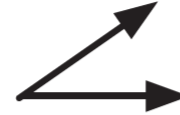


**Trapezoid**

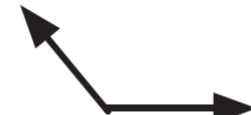


A

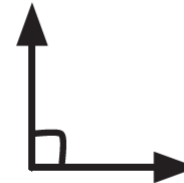
**Acute angle**



**Obtuse angle**



**Right angle**

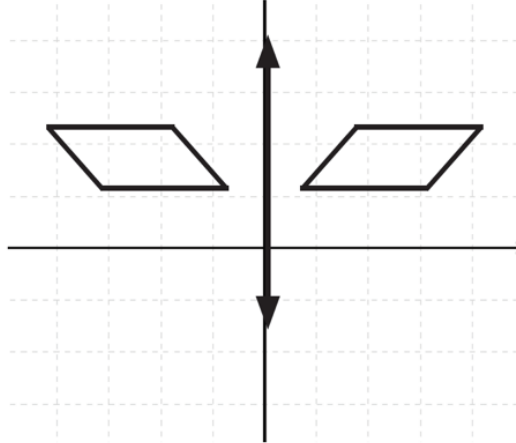


**Straight angle**

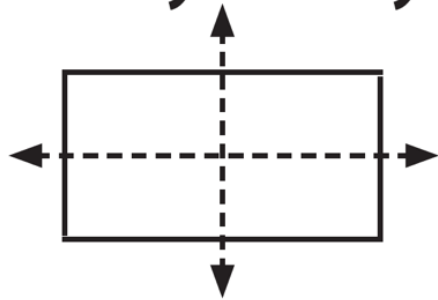


B

## Line of reflection

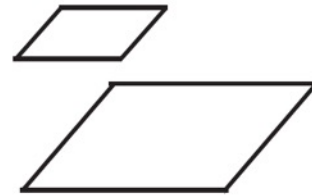


## Line of symmetry



F

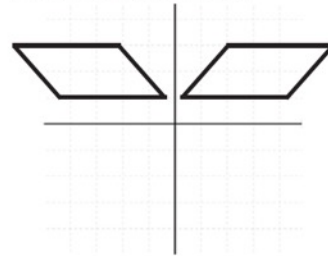
## Dilation



## Scale factor

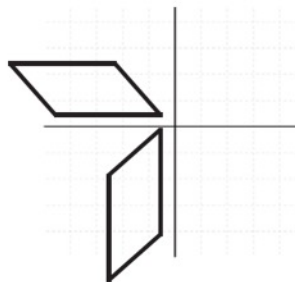
← scale factor  
is 1:2

## Reflection

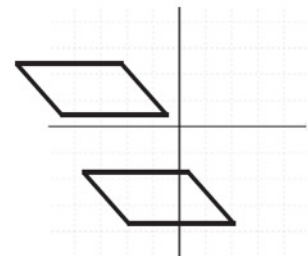


## Transformation

## Rotation

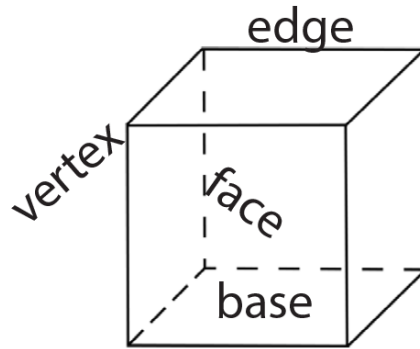
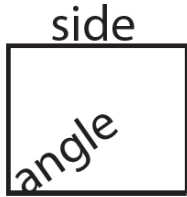


## Translation

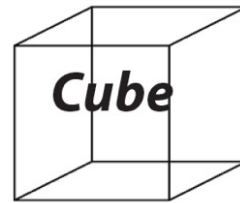


G

**Angle**  
**Base**  
**Edge**  
**Face**  
**Side**  
**Vertex**



#



I



Use formal math language

Use terms precisely



What are your strategies for focusing on math language?





# Objectives

Participants will describe the core components of explicit instruction.

Participants will describe why formal math language is important.

Participants will explain different representations that can help students understand concepts and procedures.

Participants will outline ways to build fluency.

Participants will describe two effective practices for word-problem instruction.



# Multiple Representations



# Instructional Platform

## INSTRUCTIONAL DELIVERY

Explicit  
instruction

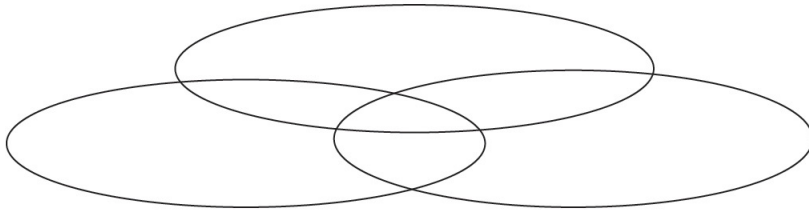
Precise  
language

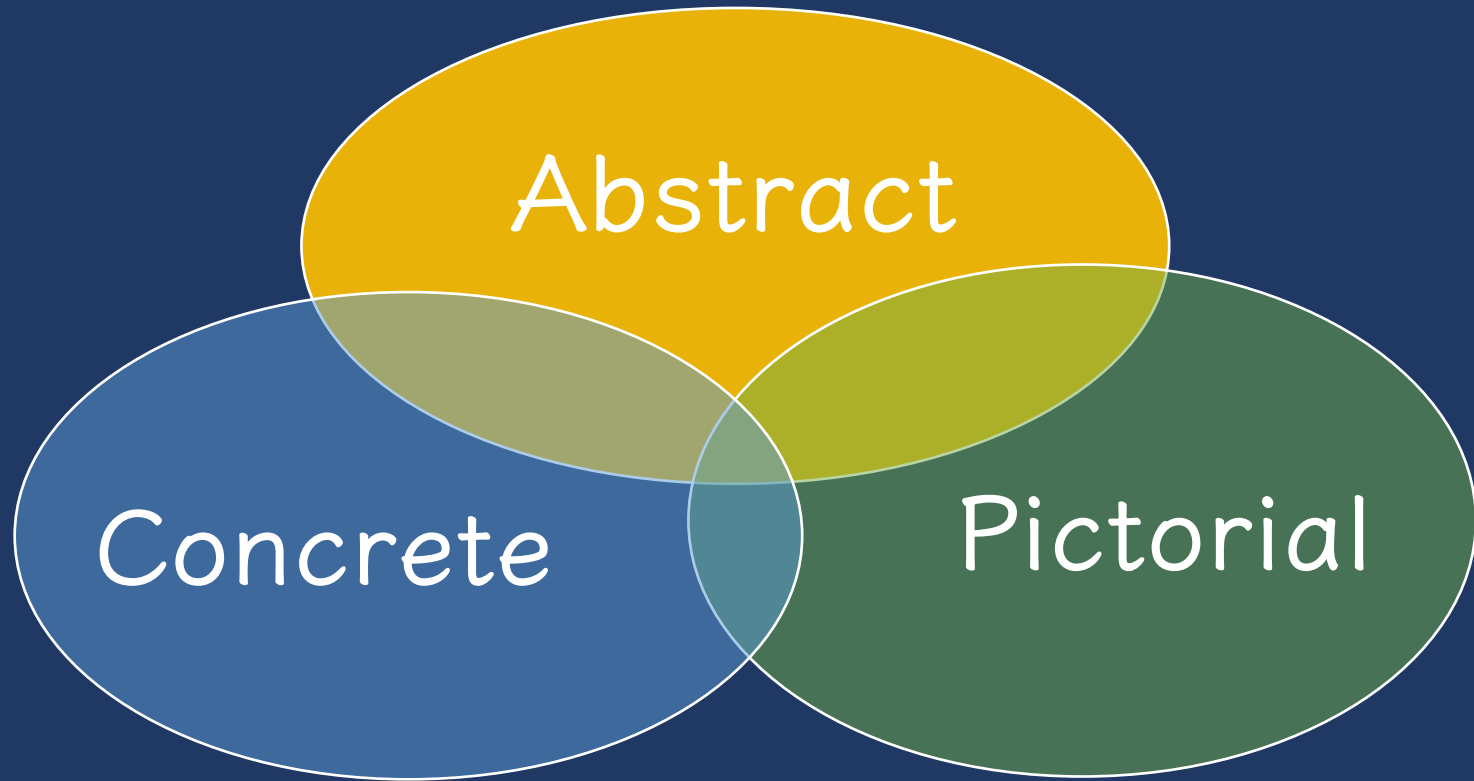
Multiple  
representations

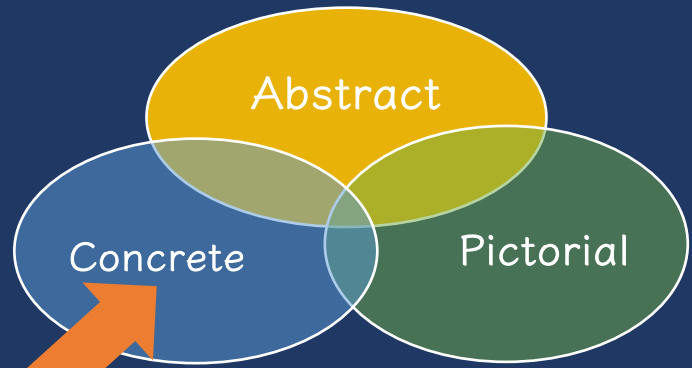
## INSTRUCTIONAL STRATEGIES



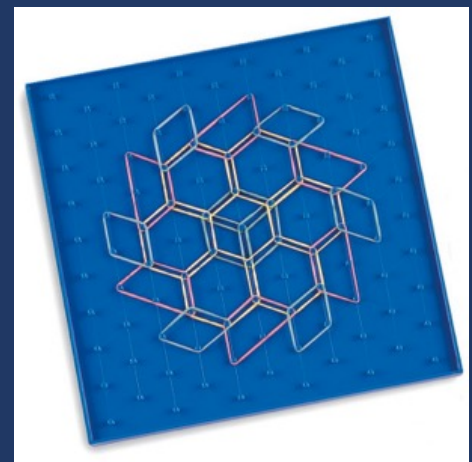
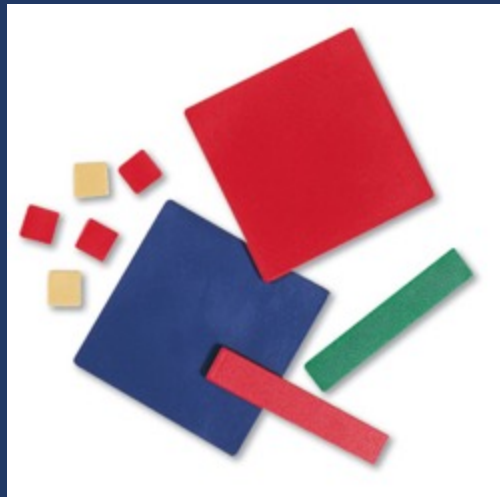
## Multiple Representations

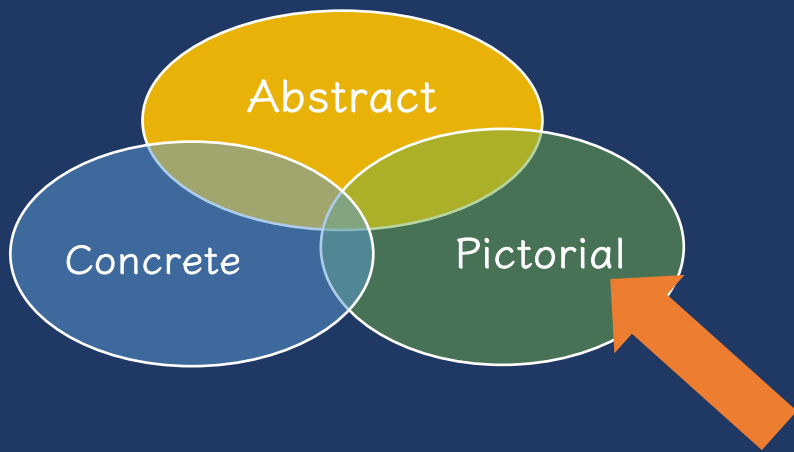




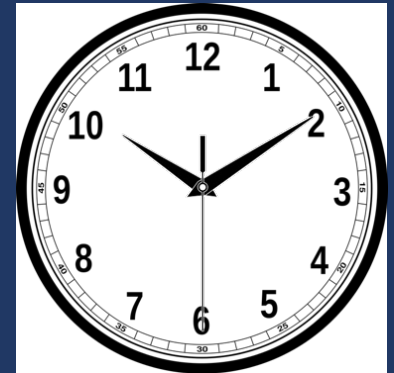
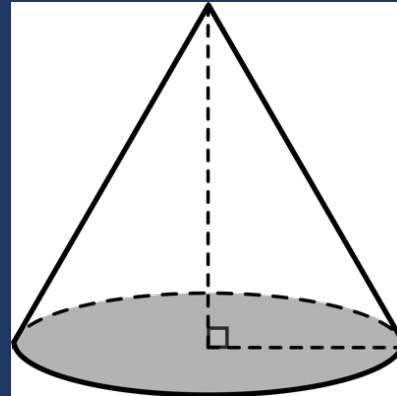
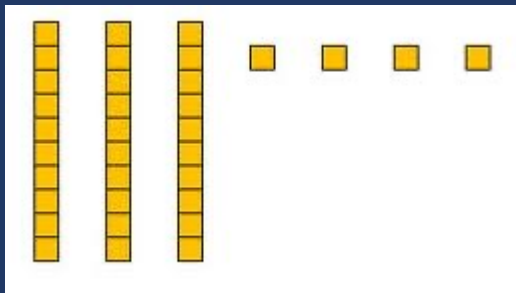


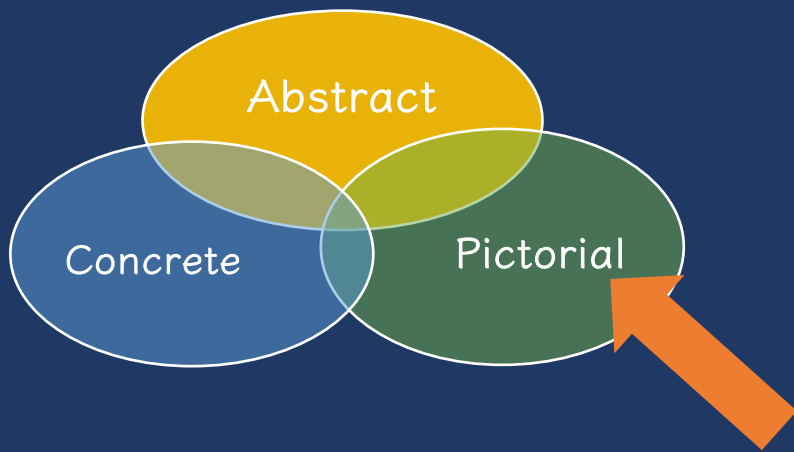
Three-dimensional objects



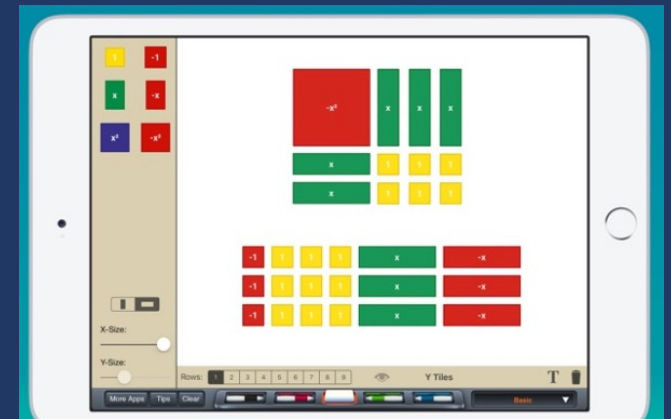
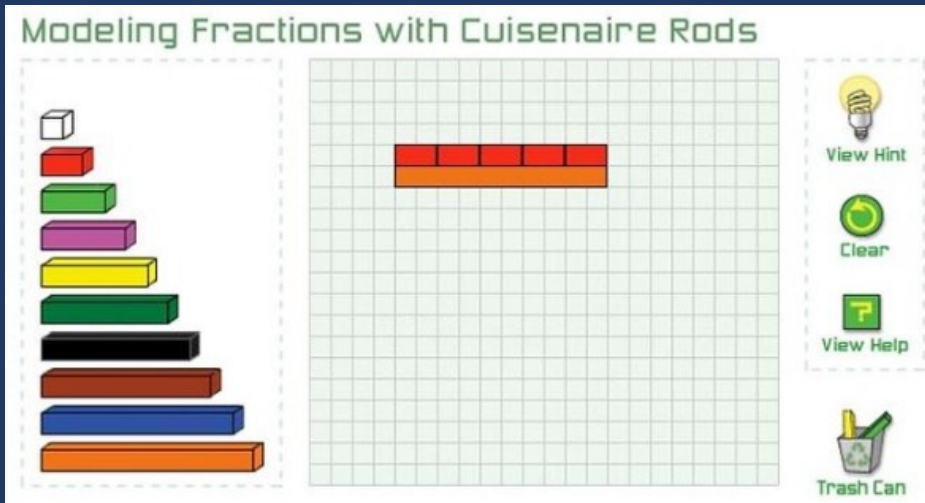
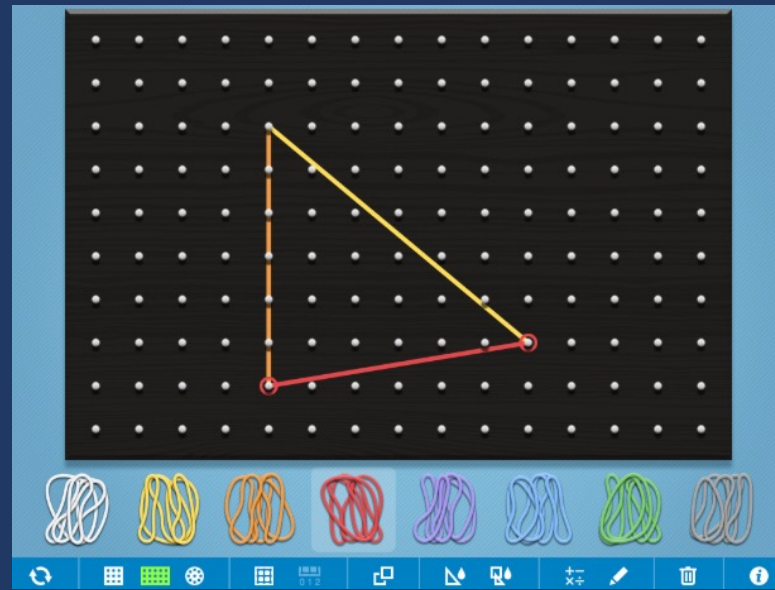


## Two-dimensional images

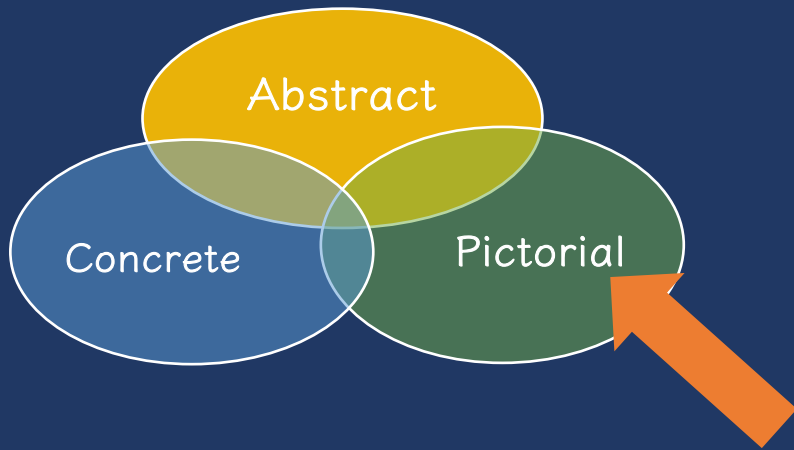




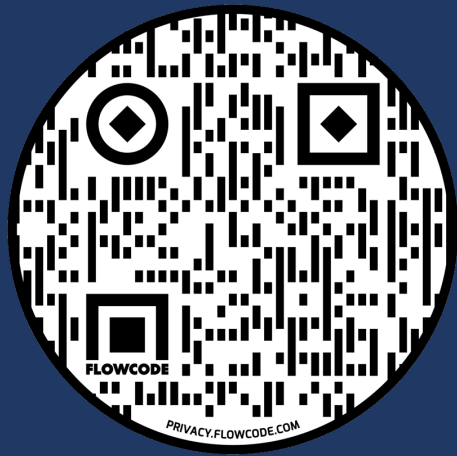
Two-dimensional images







Two-dimensional images



[bit.ly/srpowell](https://bit.ly/srpowell)

## Virtual Manipulatives

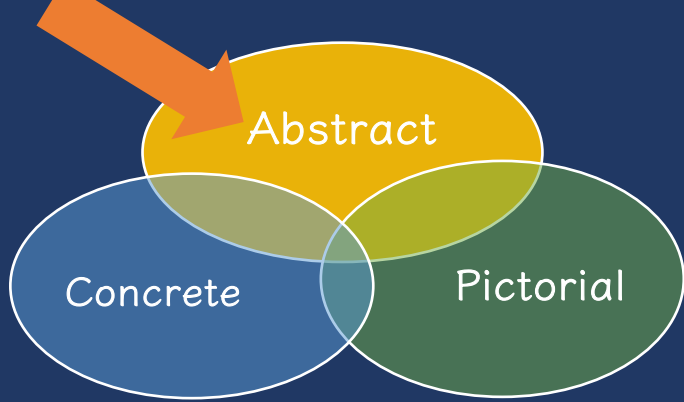
Help students see and learn math using different tools!

Number & Operations	Place Value
Fractions & Decimals	Integers & Algebra
Geometry	Time & Money
Data & Probability	Extras

Sarah R. Powell, Ph.D.  
srpowell@utexas.edu  
www.sarahpowellphd.com  
@sarahpowellphd

Fractions & Decimals				





Numerals and symbols and words

$$2 + 8 = 10$$

$$34 = 3 \text{ tens and } 4 \text{ ones}$$

$$x - 6 = 8$$

$$\begin{array}{r} 4,179 \\ + \quad 569 \\ \hline \end{array}$$





Explore 3 virtual manipulatives.

Share with a partner.



# Objectives

Participants will describe the core components of explicit instruction.

Participants will describe why formal math language is important.

Participants will explain different representations that can help students understand concepts and procedures.

Participants will outline ways to build fluency.

Participants will describe two effective practices for word-problem instruction.



# Building Fluency



# Instructional Platform

## INSTRUCTIONAL DELIVERY

Explicit  
instruction

Precise  
language

Multiple  
representations

## INSTRUCTIONAL STRATEGIES

Fluency building



Fluency



# Building Fluency

Fluency is doing mathematics easily and accurately.

Fluency in mathematics makes mathematics easier.

Fluency provides less stress on working memory.

Fluency helps students build confidence with mathematics.

With fluency, it is important to emphasize both conceptual learning and procedural learning.





Addition	Subtraction
Multiplication	Division

Counting

Comparing numbers

Counting coins

Telling time

Identifying equivalent fractions

Identifying shapes

Knowing multiples

Knowing formulas



Addition	Subtraction
Multiplication	Division

Build fluency with math facts.

- Addition: single-digit addends
- Subtraction: single-digit subtrahend
- Multiplication: single-digit factors
- Division: single-digit divisor

$$\begin{array}{r} 5 \\ + 8 \\ \hline \end{array}$$

$$\begin{array}{r} 9 \\ - 4 \\ \hline \end{array}$$

$$\begin{array}{r} 6 \\ \times 7 \\ \hline \end{array}$$

$$\begin{array}{r} 56 \\ \div 8 \\ \hline \end{array}$$



Addition	Subtraction
Multiplication	Division

Build fluency with whole-number computation

$$\begin{array}{r} 15 \\ + 28 \\ \hline \end{array}$$

$$\begin{array}{r} 23 \\ \times 9 \\ \hline \end{array}$$

$$\begin{array}{r} 1009 \\ - 724 \\ \hline \end{array}$$

$$\begin{array}{r} 7250 \\ \div 15 \\ \hline \end{array}$$



Addition	Subtraction
Multiplication	Division

Build fluency with rational-number computation

$$\begin{array}{r} 1.4 \\ + 3.9 \\ \hline \end{array}$$

$$\frac{2}{3} \times \frac{3}{4}$$

$$\frac{9}{4} - \frac{3}{8}$$

$$\begin{array}{r} 7.892 \\ \div 0.14 \\ \hline \end{array}$$



Addition	Subtraction
Multiplication	Division

Build fluency with integer computation

$$\begin{array}{r} 1.4 \\ + -3.9 \\ \hline \end{array}$$

$$\begin{array}{r} 6 \\ \times -12 \\ \hline \end{array}$$

$$-14 - (-7) =$$

$$-135 \div 2 =$$



Addition	Subtraction
Multiplication	Division



Describe the fluency needs of your students.



# Objectives

Participants will describe the core components of explicit instruction.

Participants will describe why formal math language is important.

Participants will explain different representations that can help students understand concepts and procedures.

Participants will outline ways to build fluency.

Participants will describe two effective practices for word-problem instruction.



# Word-Problem Solving





# Instructional Platform

## INSTRUCTIONAL DELIVERY

Explicit  
instruction

Precise  
language

Multiple  
representations

## INSTRUCTIONAL STRATEGIES

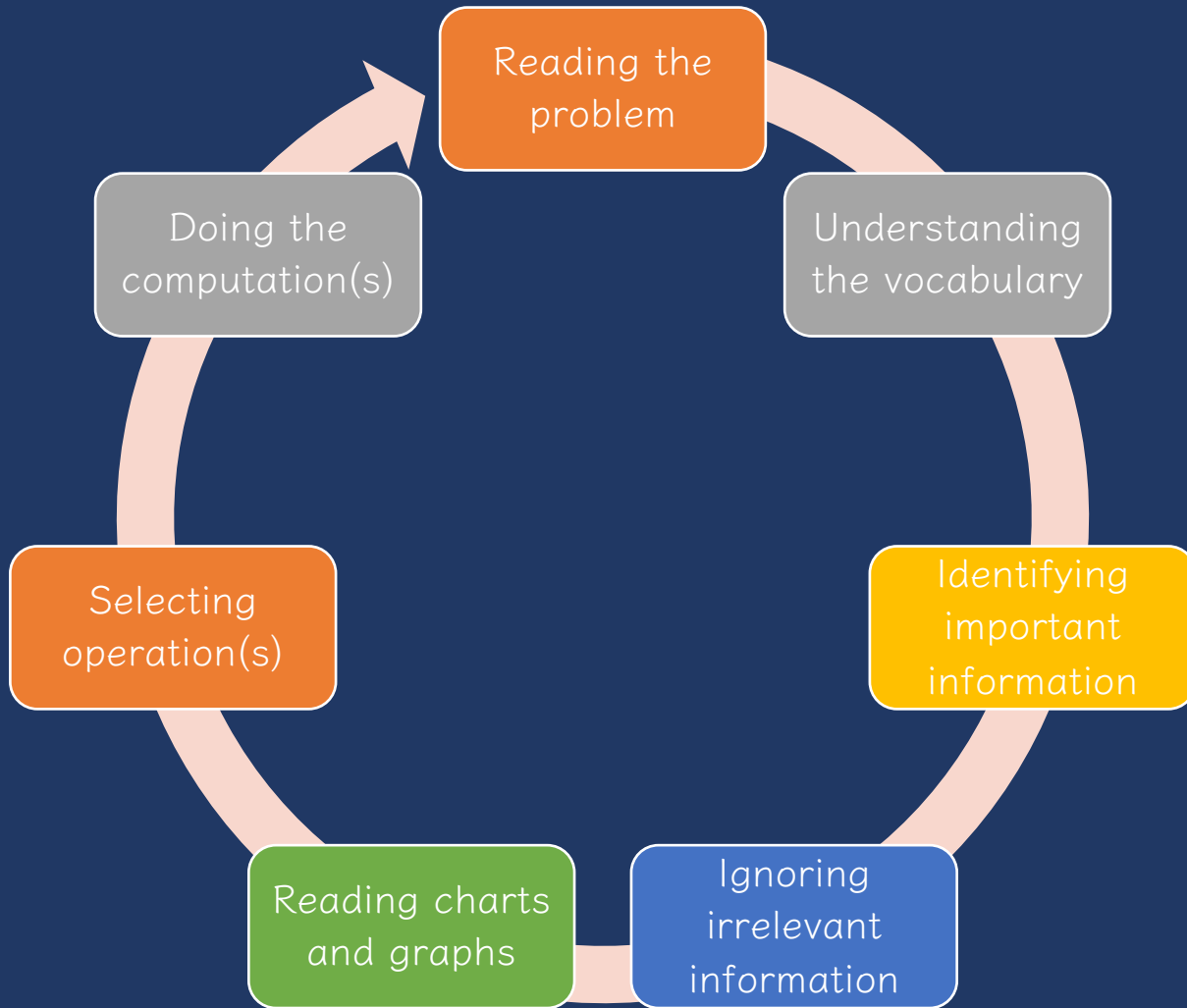
Fluency building

Problem solving  
instruction



## Word-Problem Solving







# 1. Keywords tied to operations



Lincoln had 8 pencils **fewer** than Roscoe. If Roscoe had 18 pencils, how many pencils did Lincoln have?

Lincoln had 8 pencils **fewer** than Roscoe. If Lincoln had 18 pencils, how many pencils did Roscoe have?

### Key Words Used in Math Word Problems

Addition Words	Subtraction Words
<ul style="list-style-type: none"> <li>add</li> <li>all together or altogether</li> <li>and</li> <li>both</li> <li>combined</li> <li>how many in all</li> <li>how much</li> <li>in all</li> <li>increased by</li> <li>plus</li> <li>sum</li> <li>together</li> <li>total</li> </ul>	<ul style="list-style-type: none"> <li>change</li> <li>decreased by</li> <li>difference</li> <li>fewer or fewer than</li> <li>how many are left (or have left)</li> <li>how many did not have</li> <li>how many</li> <li>how much taller, heavier, less or less</li> <li>lost</li> <li>minus</li> <li>need to</li> <li>reduce</li> <li>remain</li> <li>subtract</li> <li>take away</li> </ul>

**+**

### OPERATION cue words

ADDITION	SUBTRACTION
<ul style="list-style-type: none"> <li>and</li> <li>total</li> <li>join</li> <li>more than</li> <li>in all</li> <li>sum</li> <li>altogether</li> <li>increased</li> </ul>	<ul style="list-style-type: none"> <li>less than</li> <li>decreased</li> <li>remaining</li> <li>left</li> <li>fewer</li> <li>take away</li> <li>difference</li> <li>minus</li> </ul>
MULTIPLICATION	DIVISION
<ul style="list-style-type: none"> <li>product</li> <li>times</li> <li>as many as</li> <li>of</li> <li>by</li> <li>equal groups</li> </ul>	<ul style="list-style-type: none"> <li>quotient</li> <li>each</li> <li>broken into</li> <li>distributed evenly</li> <li>parts</li> </ul>

### KEY WORDS

ADDITION	MULTIPLICATION
<ul style="list-style-type: none"> <li>-sum</li> <li>-total</li> <li>-more than</li> <li>-plus</li> </ul>	<ul style="list-style-type: none"> <li>-both</li> <li>-combined</li> <li>-increased by</li> <li>-perimeter</li> <li>-product</li> <li>-per</li> <li>-double</li> <li>-every</li> <li>-each</li> <li>-by</li> </ul>
SUBTRACTION	DIVISION
<ul style="list-style-type: none"> <li>-difference</li> <li>-remain</li> <li>-left</li> <li>-less than</li> <li>-minus</li> <li>-how many more</li> </ul>	<ul style="list-style-type: none"> <li>-quotient</li> <li>-divide by</li> <li>-into</li> <li>-split</li> <li>-out of</li> <li>-shared</li> <li>-per</li> <li>-every</li> <li>-each</li> <li>-evenly</li> <li>-equal groups</li> <li>-half</li> </ul>



### Problem Solving Key Words

Addition	Subtraction
<ul style="list-style-type: none"> <li>add</li> <li>together</li> </ul>	<ul style="list-style-type: none"> <li>are not</li> <li>decrease</li> <li>difference</li> <li>fewer, larger, shorter</li> <li>left</li> <li>less than</li> <li>minus</li> <li>remain</li> <li>take away</li> </ul>

### Key Words for All Operations

Addition	Subtraction
<ul style="list-style-type: none"> <li>Sum</li> <li>Total</li> <li>Plus</li> <li>In all</li> <li>And</li> <li>Join</li> <li>Altogether</li> <li>Perimeter</li> <li>Together</li> </ul>	<ul style="list-style-type: none"> <li>Fewer</li> <li>Exceed</li> <li>Are not</li> <li>Minus</li> <li>Difference</li> <li>How many more</li> <li>Take away</li> <li>Left over</li> </ul>

### Math Key Words

Addition	Subtraction	Multiplication	Division
<ul style="list-style-type: none"> <li>plus</li> <li>sum</li> <li>add</li> <li>total</li> <li>all together</li> <li>increase</li> <li>more</li> <li>combine</li> </ul>	<ul style="list-style-type: none"> <li>subtract</li> <li>minus</li> <li>difference</li> <li>left</li> <li>left over</li> <li>decrease</li> <li>take away</li> <li>fewer</li> </ul>	<ul style="list-style-type: none"> <li>times</li> <li>product</li> <li>factor</li> <li>double</li> <li>groups</li> <li>each</li> <li>area</li> <li>rows</li> </ul>	<ul style="list-style-type: none"> <li>quotient</li> <li>split</li> <li>share</li> <li>divide</li> <li>separate</li> <li>each</li> <li>average</li> <li>equal groups</li> </ul>

### key words

combined

addition: sum, both, in all, together, total, plus, add

subtraction: fewer, larger, shorter, left, less than, minus, remain, take away

more than

triple, factor, product, multiply, each, per, in all, multiple, area, double, times

average

division: equal groups, half, split, shared, evenly, quotient, divide, each

distribute

### Math Operation - Key Words

Addition	Subtraction
<ul style="list-style-type: none"> <li>add</li> <li>altogether</li> <li>and</li> <li>both</li> <li>in all</li> <li>sum</li> <li>total</li> <li>increase</li> </ul>	<ul style="list-style-type: none"> <li>difference</li> <li>fewer than</li> <li>gave/take away</li> <li>decreased by</li> <li>how many more</li> <li>show much longer/smaller/shorter</li> <li>minus</li> <li>remaining</li> </ul>
Multiplication	Division
<ul style="list-style-type: none"> <li>area</li> <li>product</li> <li>Each</li> <li>by - of - per</li> <li>Times</li> <li>double, twice, triple</li> <li>total</li> <li>increase</li> </ul>	<ul style="list-style-type: none"> <li>quotient</li> <li>divide</li> <li>into</li> <li>equal parts/share equally</li> <li>per</li> <li>amount of each</li> </ul>

### Math Key Words

Addition	Subtraction	Multiplication	Division
<ul style="list-style-type: none"> <li>plus</li> <li>sum</li> <li>add</li> <li>total</li> <li>all together</li> <li>increase</li> <li>more</li> <li>combine</li> </ul>	<ul style="list-style-type: none"> <li>subtract</li> <li>minus</li> <li>difference</li> <li>left</li> <li>left over</li> <li>decrease</li> <li>take away</li> <li>fewer</li> </ul>	<ul style="list-style-type: none"> <li>times</li> <li>product</li> <li>factor</li> <li>double</li> <li>groups</li> <li>each</li> <li>area</li> <li>rows</li> </ul>	<ul style="list-style-type: none"> <li>quotient</li> <li>split</li> <li>share</li> <li>divide</li> <li>separate</li> <li>each</li> <li>average</li> <li>equal groups</li> </ul>



# Math Words Poster Set

★★★★★ (4.1)

75%

[7 Reviews](#)  
[Write a Review](#)

Dependents would recommend this to a friend

Do you want to know about this product?

Answer in about 48 hours

with 3 monthly payments of just \$4.33. No fees.

[Learn more](#)

1 post

Quantity

-

1

Ready to buy

 Add to Wish list





*Description of Single-Step Word Problems (n = 132)*

Schema	Occurrence of schema		Any keyword		Schema-specific keywords <sup>a</sup>		Multiple keywords <sup>a</sup>		Keyword(s) led to correct solution <sup>a</sup>	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Total	27	20.5	26	96.3	23	88.5	5	19.2	21	80.8
Difference	17	12.9	17	100.0	14	82.4	2	11.8	12	70.6
Change	11	8.3	7	63.6	5	71.4	5	71.4	2	28.6
Equal groups	29	22.0	26	89.7	22	84.6	18	69.2	8	30.8
Comparison	10	7.6	9	90.0	9	100.0	4	44.4	5	55.6
Ratios or proportions	29	22.0	23	79.3	9	39.1	9	39.1	6	26.1
Product of measures	9	6.8	9	100.0	8	88.9	1	11.1	5	55.6

<sup>a</sup>When a problem featured a keyword.







*Description of Multi-Step Word Problems (n = 84)*

Schema	Occurrence of schema <sup>a</sup>		Any keyword		Keyword(s) led to correct solution <sup>b</sup>	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Total	40	47.6	39	97.5	3	7.7
Difference	11	13.1	11	100.0	1	9.1
Change	21	23.8	19	95.0	1	5.3
Equal groups	49	58.3	48	98.0	1	2.1
Comparison	7	8.3	7	100.0	0	0.0
Ratios or proportions	22	25.0	16	76.2	1	6.3
Product of measures	7	8.3	7	100.0	2	28.6

<sup>a</sup>Sum across schemas does not equal 100 because each word problem featured more than one schema.

<sup>b</sup>When a problem featured a keyword.



Keywords are important to identify and understand

Keywords are the mathematical vocabulary that help an students understand what the story is about and what they need to do

Talk about keywords  
("What does *more than* tell you about?")



*But, do not tie a keyword to a specific operation!*





## 2. Presenting problems by operation



Name: \_\_\_\_\_

Date: \_\_\_\_\_

## Addition Word Problems

Solve the word problems. Show your work.

1. Noah had 12 books. He got 5 more books. How many books did Noah have in all?
2. Bonnie found 8 rocks on her front yard and 7 rocks in her backyard. How many rocks did she find in all?
3. Edward had 5 toy cars. He got 3 more toy cars. How many toy cars did Edward have in all?
4. Mariela collected 11 feathers. She found 3 more feathers. How many feathers did she have in all?
5. LaMonte made 14 cookies. He made 7 more cookies. How many cookies did LaMonte have in all?

## Division Word Problems

1. Zookeeper Al had 567 bananas. He gave an equal number of bananas to 9 monkeys in the zoo and 567 bananas. How many bananas did each monkey get? And how many are left over?
2. Betty has 427 oranges. She wants to pack them up equally in 23 boxes. How many oranges will she have in each box and how much does she have left over?
3. Mr. King has 1376 pages of paper. He wants to give 32 pages to each student. How many students can he give paper to? How many extra pages will he have left over?
4. Mr. King has 1376 pages of paper. He wants to give 32 pages to each student. He instead gives 30 pages to each student. Will there be enough paper for all the students. How many extra pages does he have left over?



Teach an attack strategy

Teach about schemas



# RIDE

**R**ead the problem.

**I**dentify the relevant information.

**D**etermine the operation and unit for the answer.

**E**nter the correct numbers and calculate, then check the answer.

# RIDGES

Read the problem.

I know statement.

Draw a picture.

Goal statement.

Equation development.

Solve the equation.



## STAR

**S**top and read the problem carefully.

**T**hink about your plan and the strategy you will use.

**A**ct. Follow your plan and solve the problem.

**R**eview your answer.

## RICE

**R**ead and record the problem.

**I**llustrate your thinking.

**C**ompute.

**E**xplain your thinking.



## SUPER

Slowly read the story problem twice.

Underline the question and circle the numbers you need.

Picture it. Draw the scenario to show what is happening.

Explain the problem with a number sentence.

Rewrite the answer in a sentence.

## SHINES

Slowly and carefully read the problem.

Highlight or underline key information.

Identify the question by drawing a circle around it.

Now solve the problem. Show your work.

Examine your work for precision, accuracy, and clarity.

Share your answer by writing a sentence.





## SOLVE

**S**tudy the problem.

**O**rganize the facts.

**L**ine up the plan.

**V**erify the plan with computation.

**E**xamine the answer.

## R-CUBES

Read the problem.

Circle key numbers.

Underline the question.

Box action words.

Evaluate steps.

Solve and check.



# UPS✓

## UNDERSTAND

Read and explain.

## PLAN

How will you solve the problem?

## SOLVE

Set up and do the math!

## ✓CHECK

Does your answer make sense?

Created by: Sarah Powell (srpowell@austin.utexas.edu)





Share your favorite attack strategy.



Teach an attack strategy

Teach about schemas



Total

Difference

Change

Equal Groups

Comparison

Ratios/Proportions



Total

Part-part-whole  
Combine

**Parts** put together into a **total**

Daniela saw **3** canoes and **8** kayaks.  
How many boats did Daniela see?

Total

Daniela saw **11** boats. If **3** of the boats  
were canoes, how many were kayaks?

Part

Daniela saw **11** boats. **8** of the boats  
were kayaks, how many were canoes?

Part



# Difference Compare

**Greater** and **lesser** amounts compared for a **difference**

Adrianna has **10** pencils. Tracy has **4** pencils. How many more pencils does Adrianna have?

Difference

Adrianna has **6** more pencils than Tracy. If Tracy has **4** pencils, how many does Adrianna have?

Greater amount

Tracy has **6** fewer pencils than Adrianna. Adrianna has **10** pencils. How many pencils does Tracy have?

Lesser amount



# Change

Join

An amount that **increases** or **decreases**

Nickole had **6** notebooks. Then, she bought **3** notebooks. How many notebooks does Nickole have now?

End amount

Nickole had **6** notebooks. Then, she bought a few more notebooks. Now, Nickole has **9** notebooks. How many notebooks did she buy?

Change amount

Nickole had some notebooks. Then, she bought **3** notebooks. Now, Nickole has **9** notebooks. How many notebooks did she have to start with?

Start amount





# Change

Separate

An amount that increases or **decreases**

Samantha baked **20** cookies. Then, she ate **3** of the cookies. How many cookies does Samantha have now?

End amount

Samantha baked **20** cookies. Then, she ate some of the cookies. Now, she has **17** cookies. How many cookies did Samantha eat?

Change amount

Samantha baked some cookies. She ate **3** of the cookies and has **17** cookies left. How many cookies did Samantha bake?

Start amount



# Equal Groups

Array  
Vary

**Groups** multiplied by **number in each group** for a **product**

Toni has **2** boxes of crayons. There are **12** crayons in each box. How many crayons does Toni have altogether?

Product

Toni has **24** crayons. They want to place them equally into **2** boxes. How many crayons will Toni place in each box?

Number in each group

Toni has **24** crayons. They put them into boxes with **12** crayons each. How many boxes did Toni use?

Groups



# Comparison

**Set** multiplied by a number of **times**  
for a **product**

Brooke ran **6** minutes. Shaleeni ran **4** times longer than Brooke. How many minutes did Shaleeni run?

Set

Number of  
times

Product



# Ratios/Proportions

Description of **relationships** among quantities

Melissa baked cookies and brownies. The ratio of cookies to brownies was **3:5**. If she baked **25** brownies, how many cookies did she bake?

Emma typed **56** words in **2** minutes. At this rate, how many words could Emma type in **7** minutes?



Total

Difference

Change

Equal Groups

Comparison

Ratios/Proportions



Teach an attack strategy

Teach about schemas



# Objectives

Participants will describe the core components of explicit instruction.

Participants will describe why formal math language is important.

Participants will explain different representations that can help students understand concepts and procedures.

Participants will outline ways to build fluency.

Participants will describe two effective practices for word-problem instruction.



# Sarah R. Powell, Ph.D.

Associate Professor  
The University of Texas at Austin



[srpowell@utexas.edu](mailto:srpowell@utexas.edu)



[@sarahpowellphd](https://www.instagram.com/sarahpowellphd)

