

What's Important for Math Intervention?



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Introduce yourself.

Describe your role.

Describe the mathematics you support.

What's the
continuum of
mathematics
support?

novice learners or
struggling learners

learners with acquired
knowledge and skills



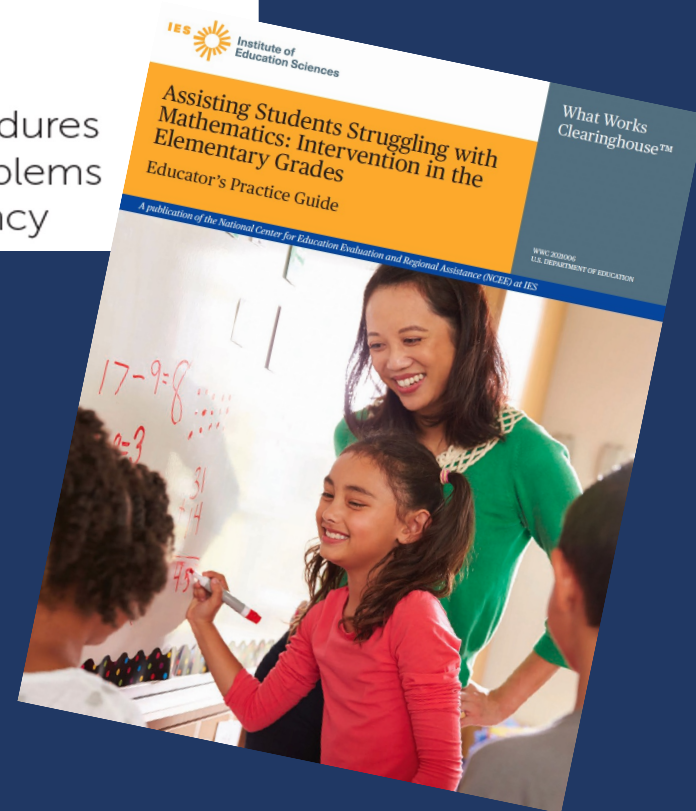
Anita Archer (2019) [facebook.com/watch/?v=320845308601739](https://www.facebook.com/watch/?v=320845308601739)



What's the continuum of mathematics support?

To help students experiencing math difficulty with math proficiency, teachers should²:

1. Use explicit instruction
2. Teach clear and concise math language
3. Use concrete, pictorial, and virtual representations
4. Use number lines for learning concepts and procedures
5. Provide deliberate instruction on solving word problems
6. Use timed activities as one way to build math fluency



Are there Tier 2 mathematics evidence-based programs you would recommend?

Can you please talk about how the approach to intervention is supported in whole-class instruction?

For a school starting out with evidence-based maths instruction, what are your key points – the essentials?

How can I ensure the intervention is targeted to individual student needs?

What are effective routines for structured interventions?

How best to run high quality intervention with ES staff who have limited planning time / experience / knowledge?

Do you have recommendations for screening and programs?

How can parents be involved in this process at home?

I have small groups each week for 30 minute tutor support. What is the most important skills to prioritise in this scenario?



Instructional Platform



evidence-based practice

A practice that
has shown
consistent and
positive results



evidence-based practice



evidence-based intervention

An intervention
(i.e., packaged
program) that
has shown
consistent and
positive results

evidence-based practice



evidence-based intervention

evidence-based strategy

A method or strategy that has shown consistent and positive results



Instructional Platform

INSTRUCTIONAL DELIVERY

Explicit

Language

Multiple
representations

INSTRUCTIONAL STRATEGIES

Fluency

Problem Solving



Explicit

Is it better to stream students and teach them explicitly at the level they are working towards?

Should you start with conceptual understanding and then procedural fluency? At what time do we switch the focus?

What role does direct instruction play in fostering conceptual understanding?



Instructional Platform

INSTRUCTIONAL DELIVERY

Explicit

INSTRUCTIONAL STRATEGIES





Over a half century of research supports explicit (i.e., direct, systematic) instruction.
(Stockard et al., 2018)

When compared to discovery approaches, explicit instruction demonstrates higher outcomes.
(Alfieri et al., 2011; Kroesbergen et al., 2004; Poncy et al., 2010)

Numerous meta-analyses and large-scale studies have identified explicit instruction as essential for the teaching and learning of mathematics.
(Chodura et al., 2015; Ennis & Losinski, 2019; Jitendra et al., 2018; Kong et al., 2021; Morgan et al., 2015; Nelson & McMaster, 2019; Powell et al., 2021).

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

Step-by-step explanation

Planned examples

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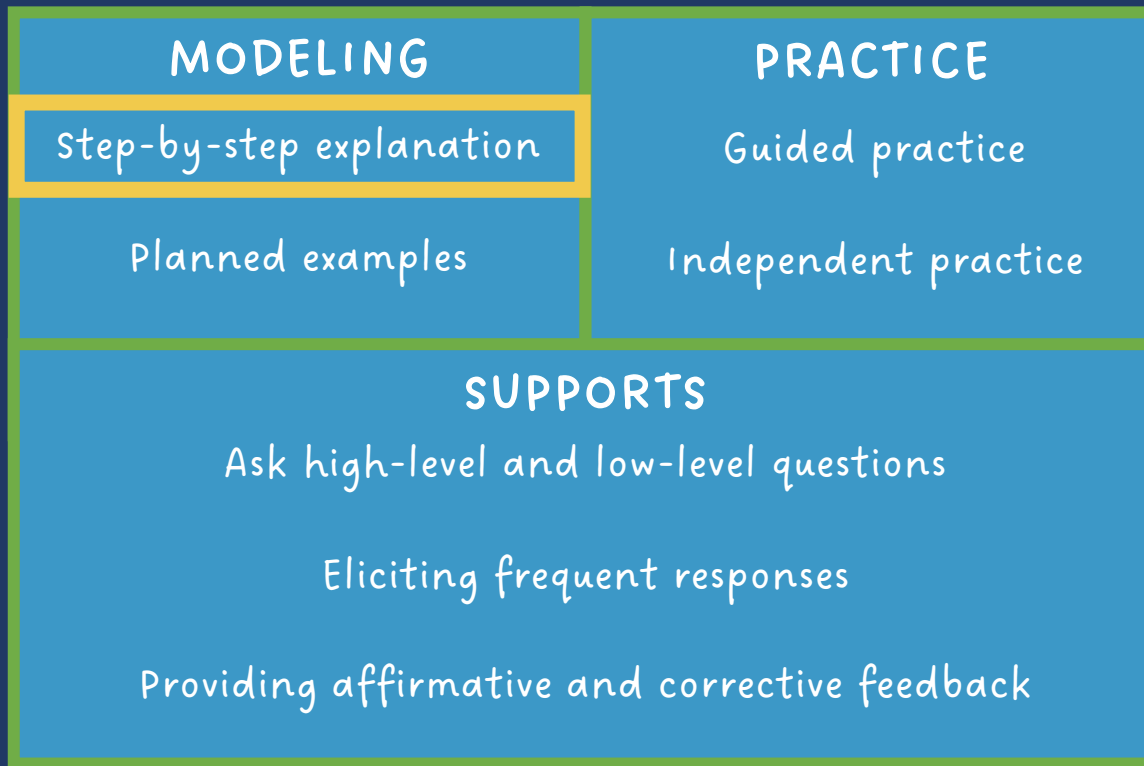
Eliciting frequent responses

Providing affirmative and corrective feedback



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

A teacher may do 1 modeled problem or several.



Modeling
needs to
include
planned
examples.

MODELING

Step-by-step explanation

Planned examples

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



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Practice continues as a dialogue between the teacher and students.

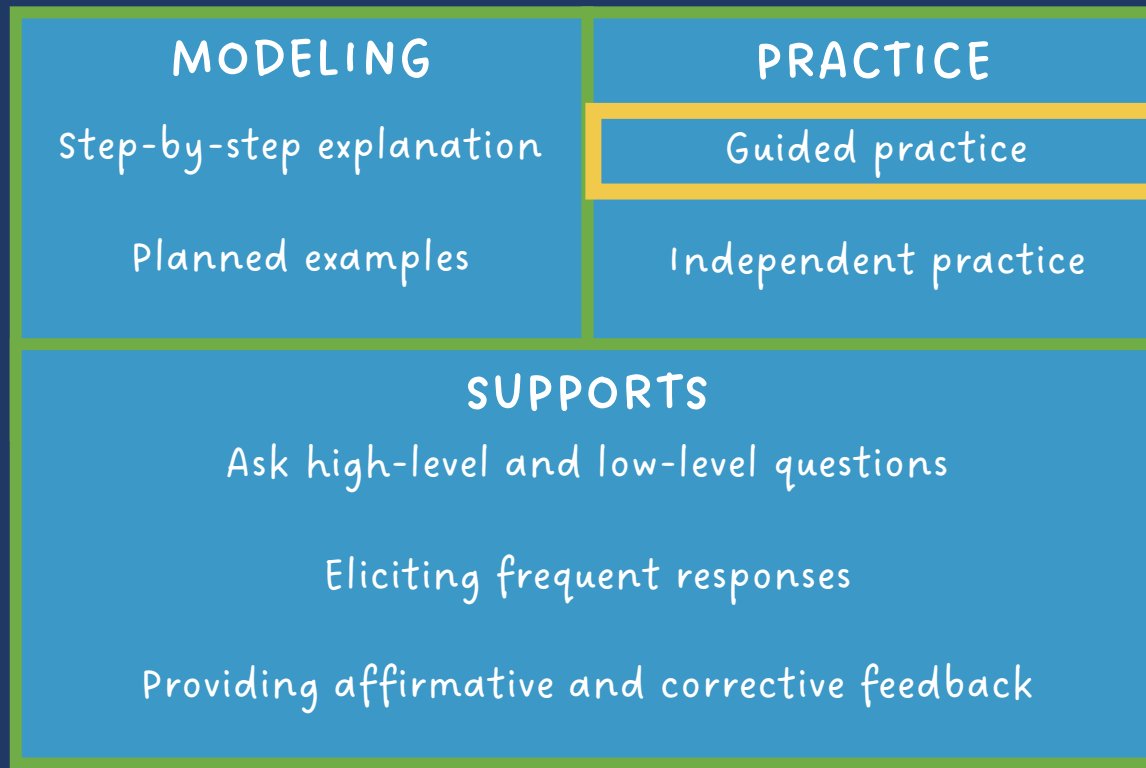
SUPPORTS

Ask high-level and low-level questions

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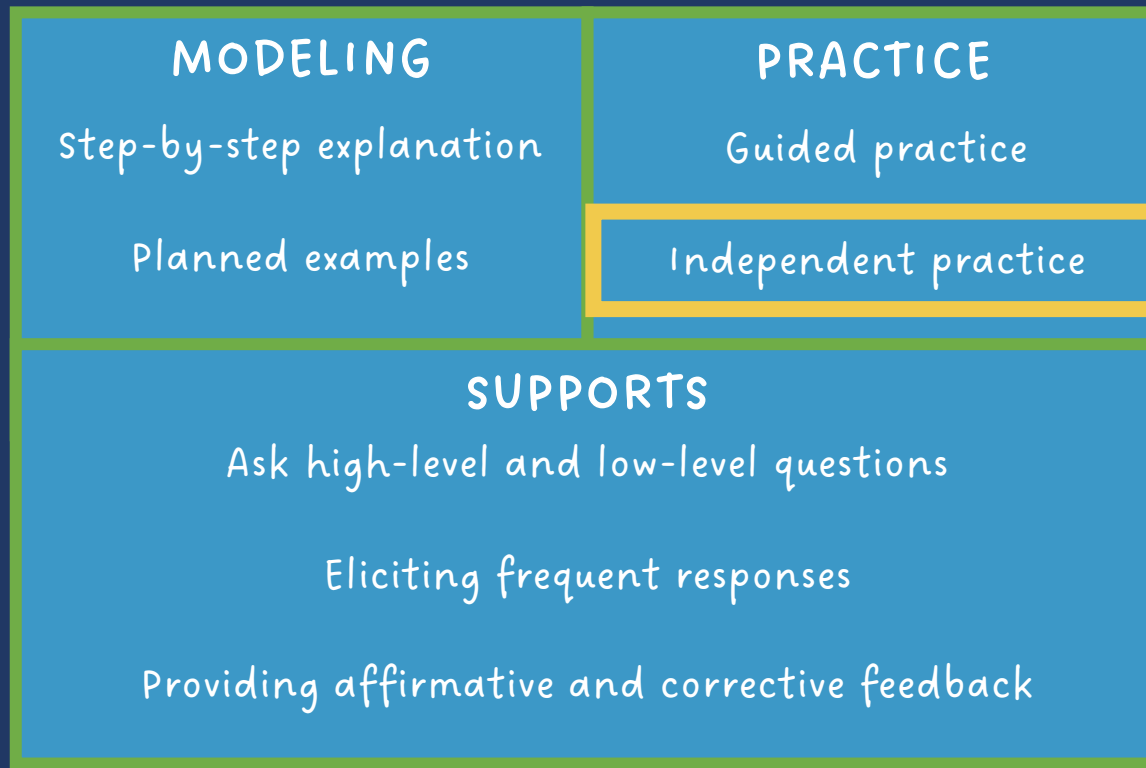


Guided practice is practice in which the teacher and students practice problems together.



“Let’s work on a problem together.”





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!”



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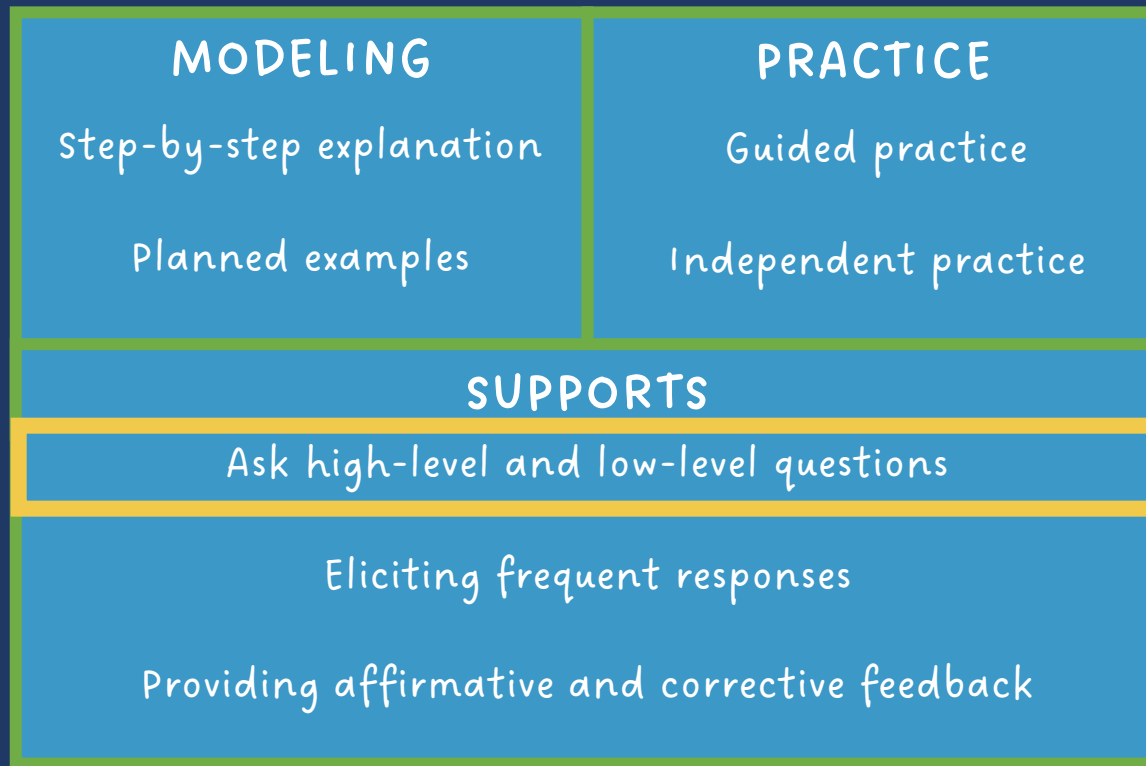
Ask high-level and low-level questions

Eliciting frequent responses

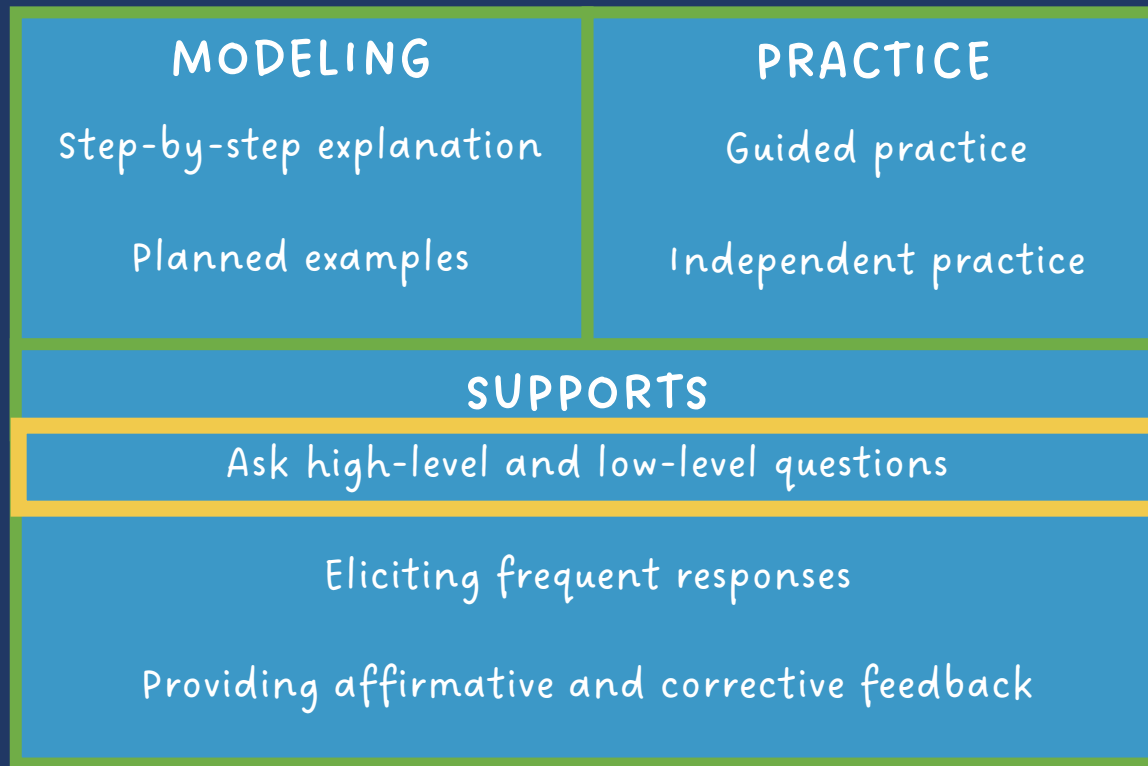
Providing affirmative and corrective feedback

These Supports should be used in both
Modeling and Practice.





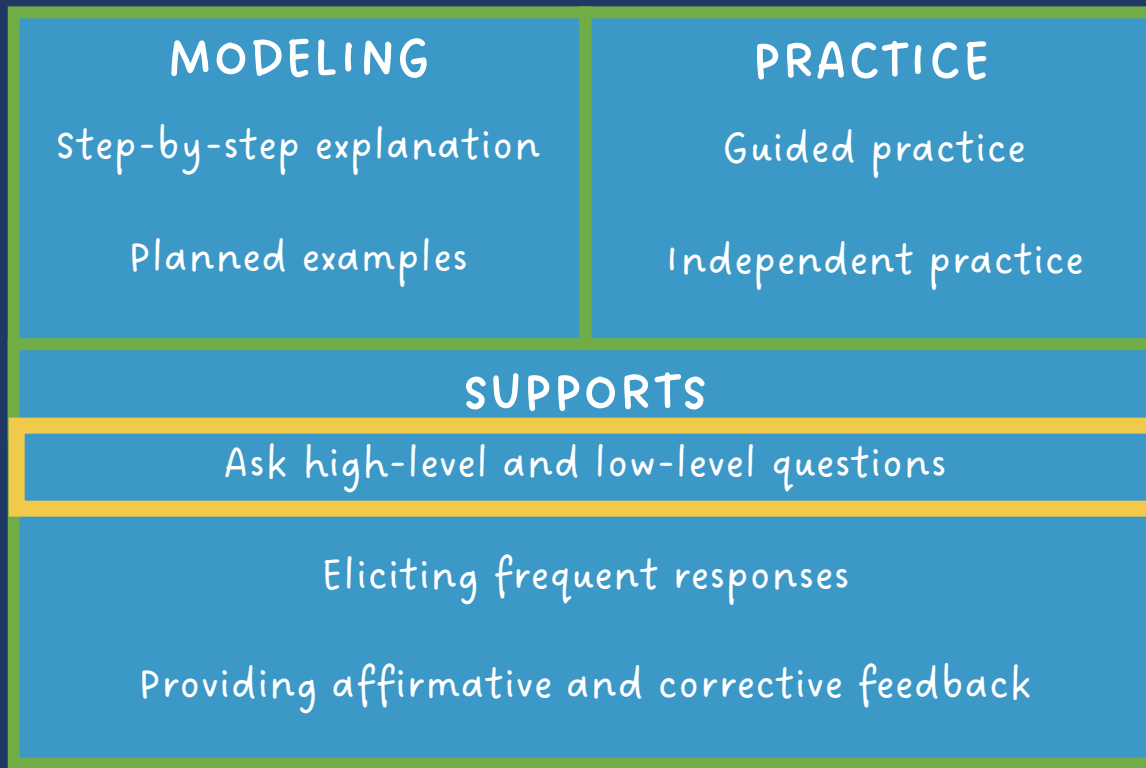
During Modeling and Practice, it is essential to engage students and check for understanding.



“What is 7 times 9?”

“63.”

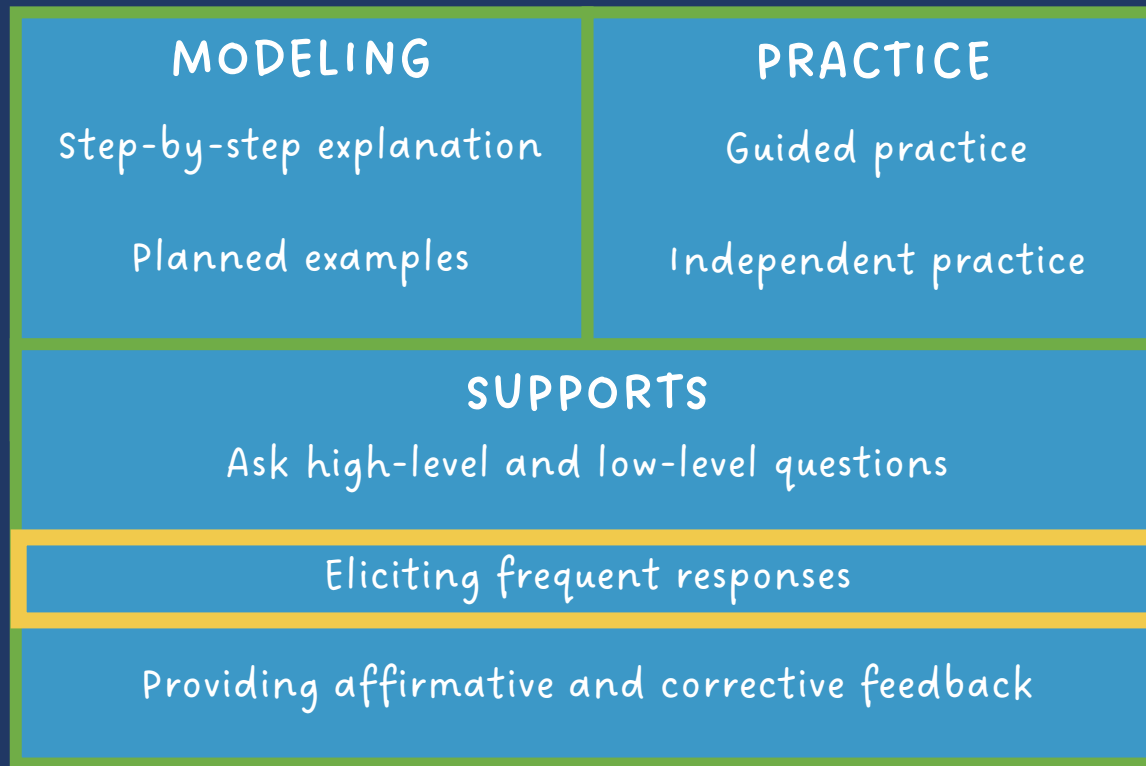




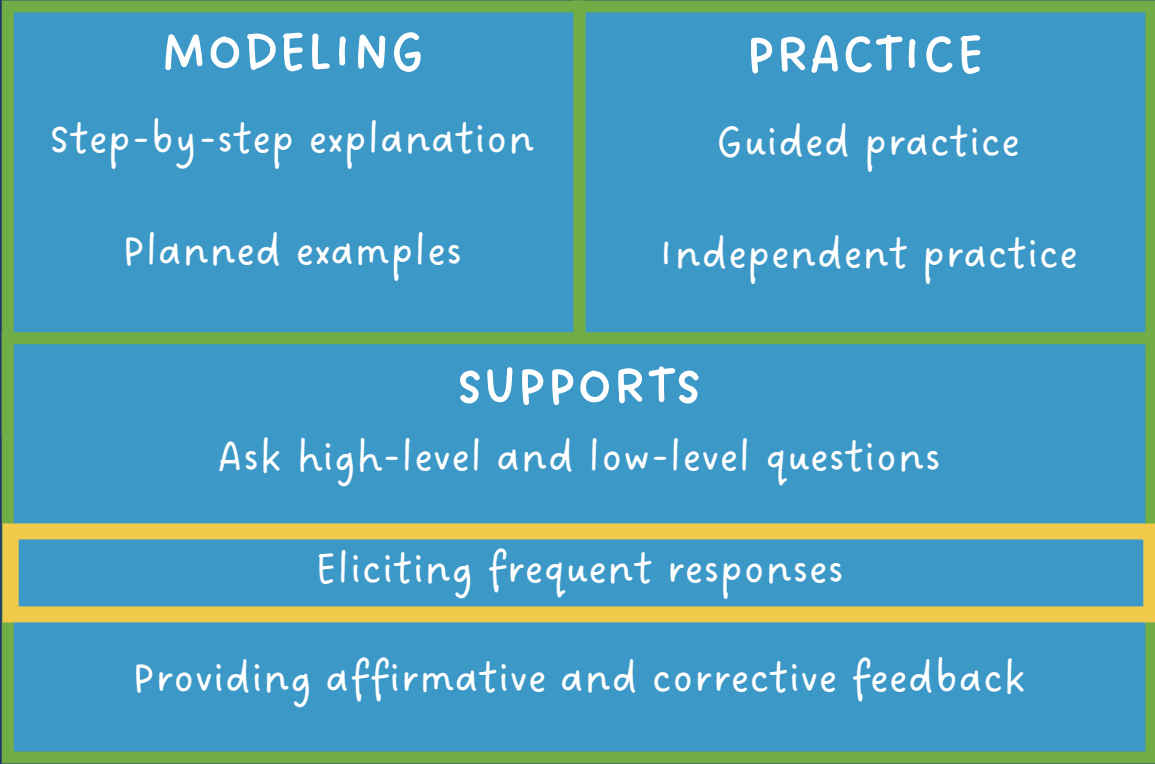
"Why do you use zero pairs?"

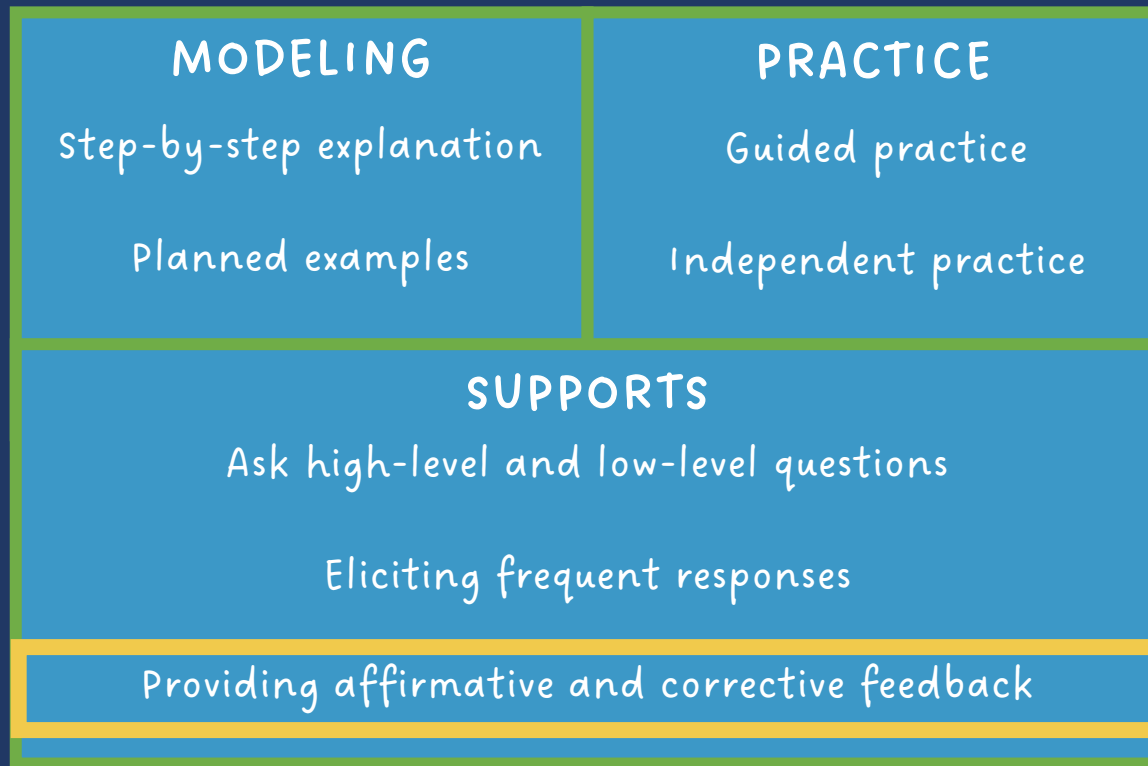
"Because a positive 1 and a negative 1 equal 0. I use the zero pair to help me subtract."





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





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

MODELING

Step-by-step explanation

Planned examples

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Ask high-level and low-level questions

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"Nice work using your word
problem attack strategy."



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



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When is explicit instruction important?

Why might students benefit from explicit instruction?



Language



Is there a developmental sequence to which language concepts need to be explicitly taught first?

What are supports for language learners at the emerging stages?

Writing about math is frequently expected of students - is that necessary? Do you have recommendations for practice?

Would love to know if you have a yearly vocabulary scope and sequence?



Instructional Platform

INSTRUCTIONAL DELIVERY

Explicit

Language

INSTRUCTIONAL STRATEGIES





Significant correlation ($r = .49$) between mathematics vocabulary and mathematics performance. Mathematics vocabulary appears most important for word-problem performance ($r = .58$).

(Lin et al., 2021)

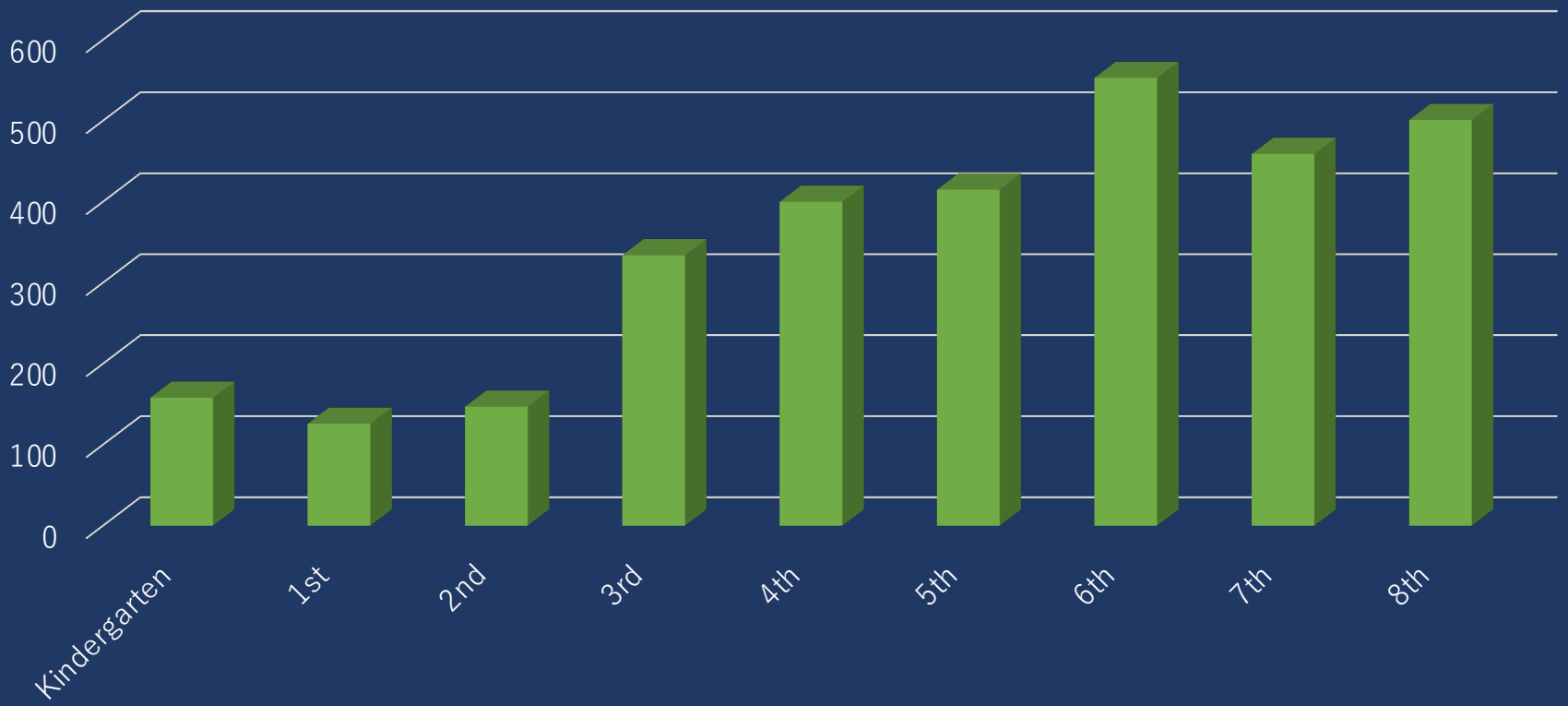
Early mathematics vocabulary related to mathematics and literacy.

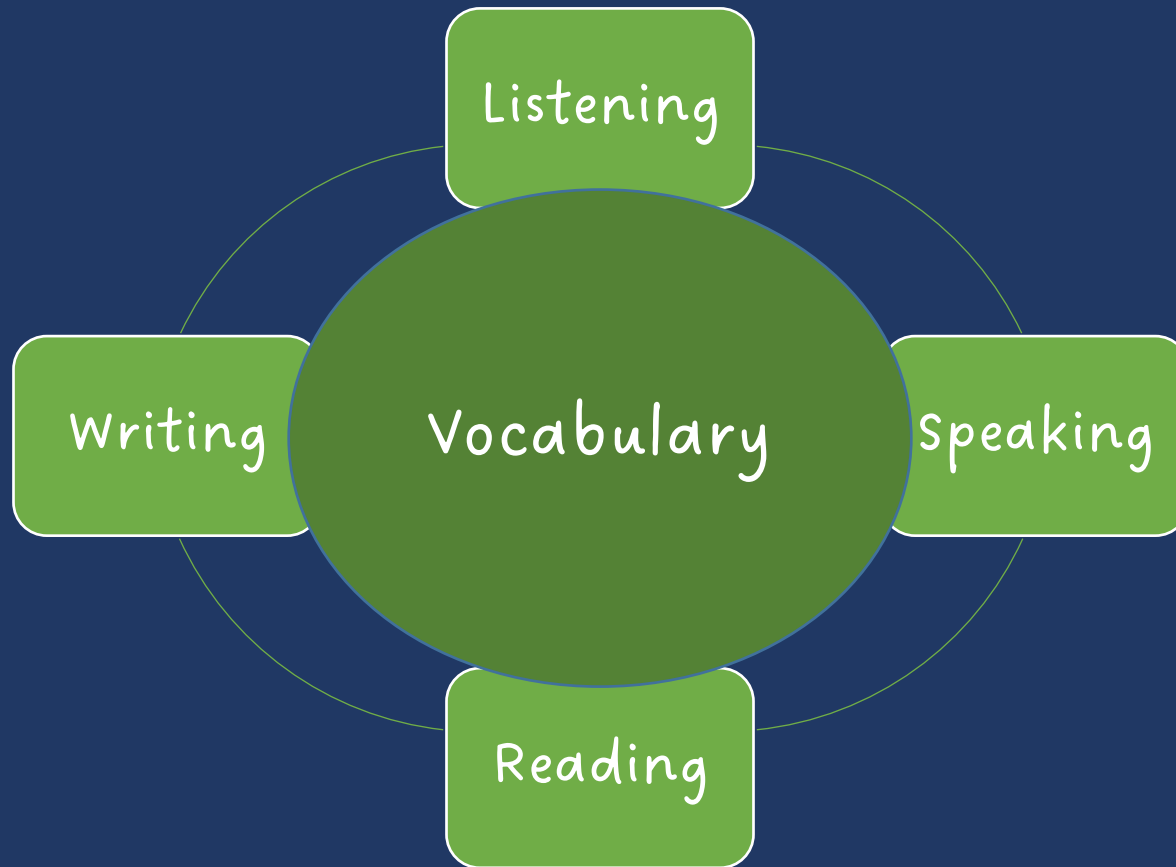
(Hornburg et al., 2018; Purpura et al., 2017)

Students who experience difficulty with mathematics demonstrate lower mathematics vocabulary performance.

(Hughes et al., 2020; Powell & Nelson, 2017; Powell et al., 2017; Unal et al., 2021)







Use formal math language

Use terms precisely

Regroup
 Value
 Less
 Ones
 Hundreds
 Greater
 Tens
 Balance
 Place
 Digit



Supporting Clear and Concise Mathematics Language

Instead of That, Say This

Elizabeth M. Hughes, Sarah R. Powell, and Elizabeth A. Stevens

TEACHING Exceptional Children, Vol. 46, No. 1, pp. 2-12, Copyright 2018 The Author(s). DOI: 10.1177/0048801818079160




Math Language in Middle School

Be More Specific


Sarah R. Powell, Elizabeth A. Stevens, and Elizabeth M. Hughes

TEACHING Exceptional Children, Vol. 41, No. 4, pp. 286-295, Copyright 2014 The Author(s). DOI: 10.1177/0048801814079160





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

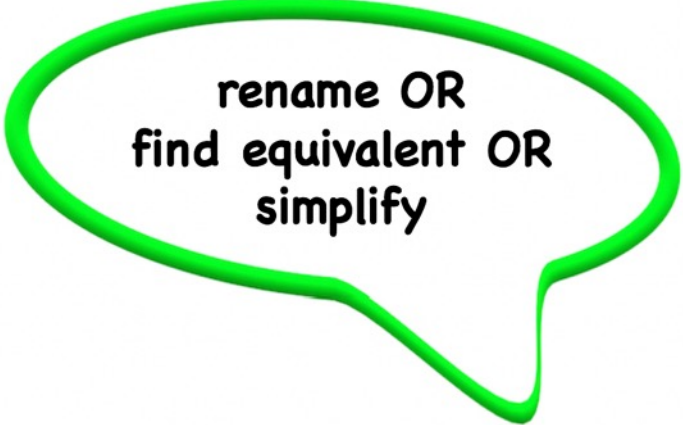

Why this is important...

- 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.

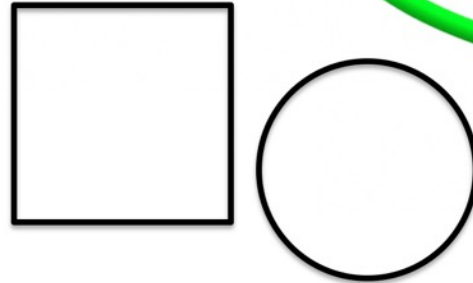




box OR ball



square OR
circle

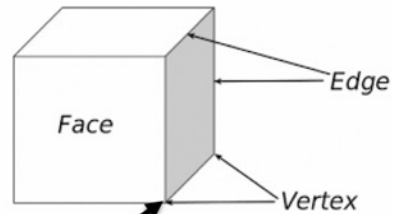


Why this is important...

- 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.





What are 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

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

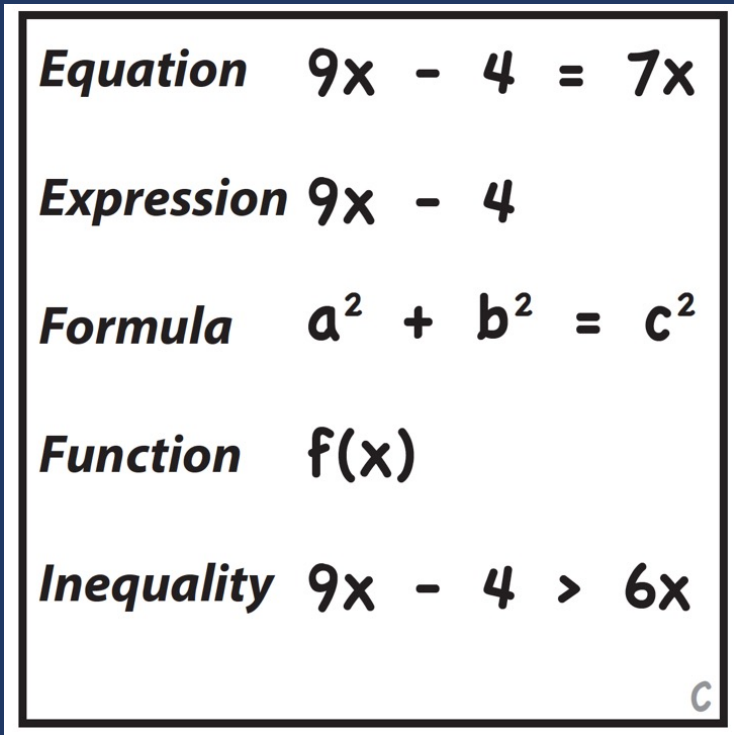
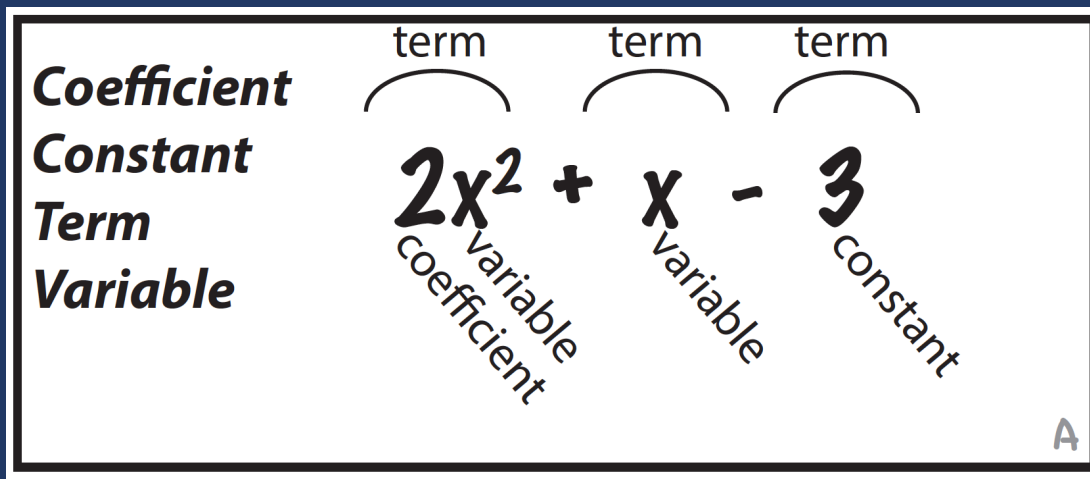
Ratio

$$4:3$$

Unit fraction

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

D



Rubenstein & Thompson (2002)



Quadrilaterals

Kite



Rhombus



Parallelogram



Square




Rectangle




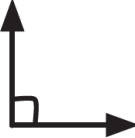
Trapezoid




A


Acute angle



Obtuse angle



Right angle



Straight angle



B


Acute triangle


Obtuse triangle


Right triangle


Equilateral triangle


Isosceles triangle


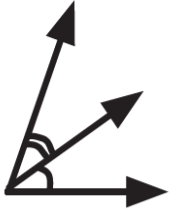
Scalene triangle


C

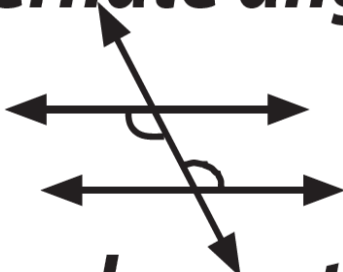
Rubenstein & Thompson (2002)



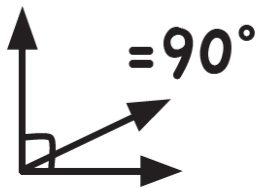
Adjacent angles



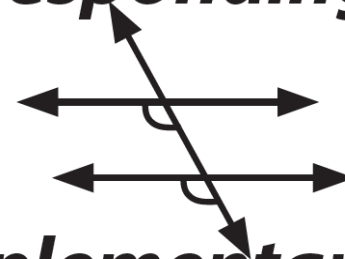
Alternate angles



Complementary angles



Corresponding angles

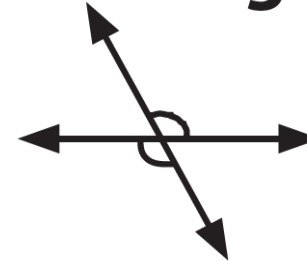


Supplementary angles

= 180°

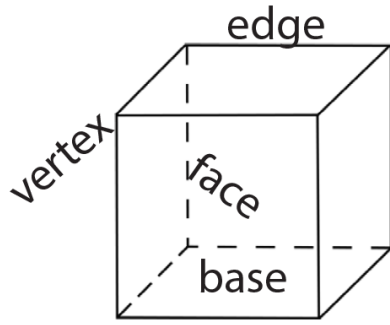
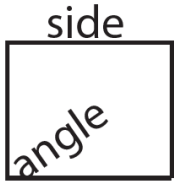


Vertical angles

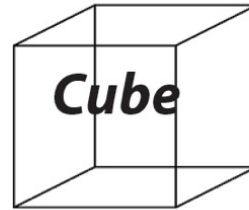


D

Angle
Base
Edge
Face
Side
Vertex



#



I





Which terms do students not use precisely?

Use formal math language

Use terms precisely



Use explicit instruction.
(Powell & Driver, 2015; Stevens et al., 2022)

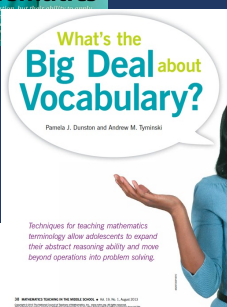
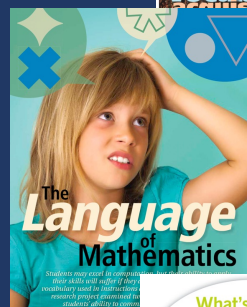
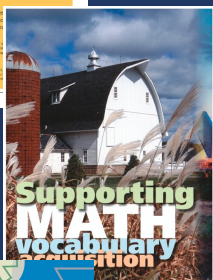
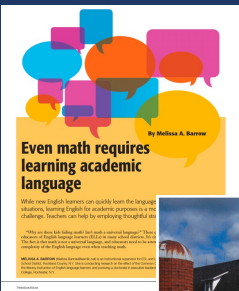
Use semantic maps.
(Stevens et al., 2022)

Use visuals.
(Powell & Driver, 2015)

Use flashcards with spaced
practice.
(Petersen-Brown et al., 2019)

Use read-alouds.
(Purpura et al., 2017)

Use explicit instruction.
Use multiple
representations.
Create opportunities
for discussion and
feedback.
Monitor student
progress.
Coordinate vocabulary
instruction across
settings.
Create additional
practice opportunities.
(Nelson et al., 2020)





Why is the language of math important?

What are ways teachers can support students with the language of math?

Multiple Representations



What are your top tips for supporting students with activities that require manipulatives? How to play properly, pack up etc.

Have you researched or yourself or experienced using just one manipulative to explicitly teach all whole number operations?

What are the most effective maths manipulatives?

What are the manipulatives to use during intervention sessions?



Instructional Platform

INSTRUCTIONAL DELIVERY

Explicit

Language

Multiple
representations

INSTRUCTIONAL STRATEGIES



Hands-on manipulatives contribute to increases in mathematics performance.

(Bouck & Park, 2018; Carbonneau et al., 2013; Namkung & Bricko, 2021; Sherman & Bisanz, 2009; Strickland & Maccini, 2012)

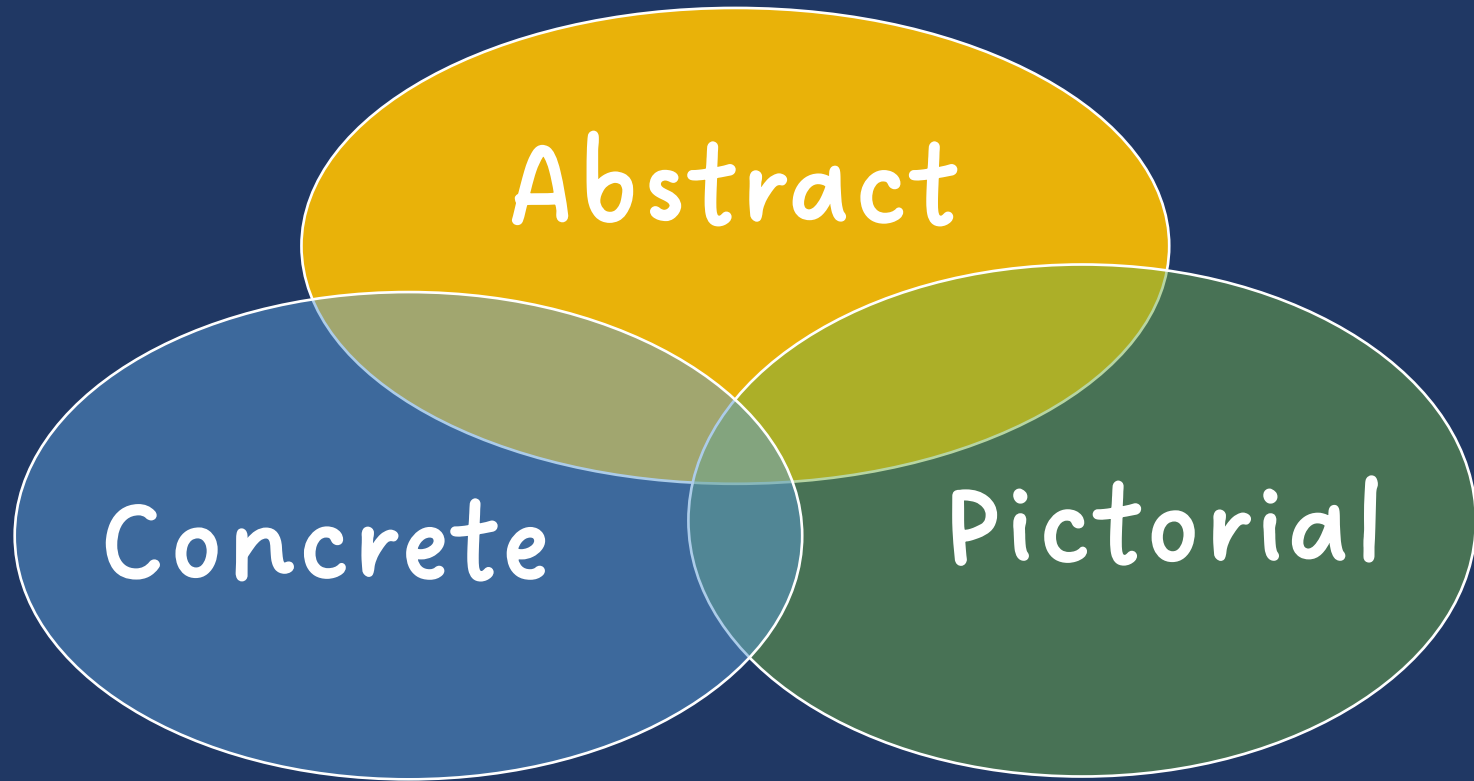
Virtual manipulatives contribute to increases in mathematics performance.

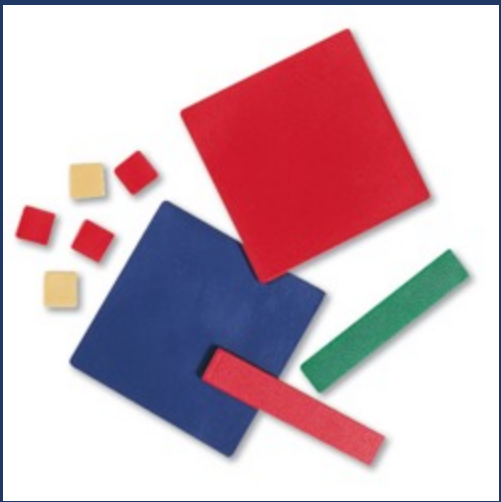
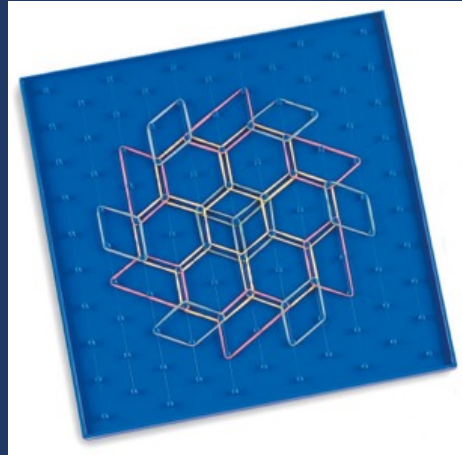
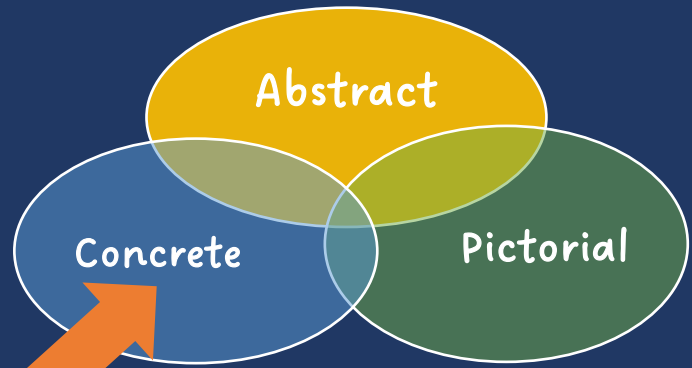
(Bouck et al., 2020; Satsangi et al., 2016)

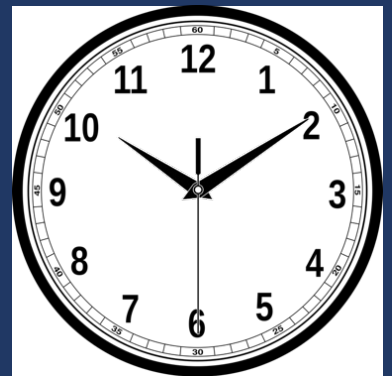
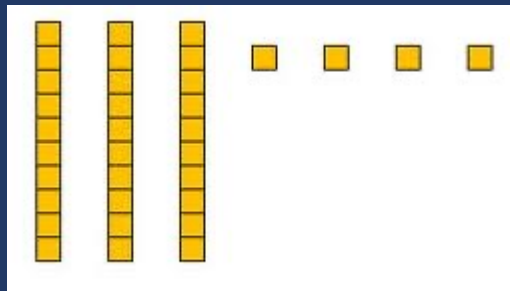
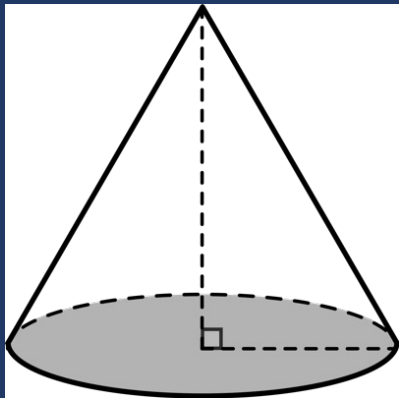
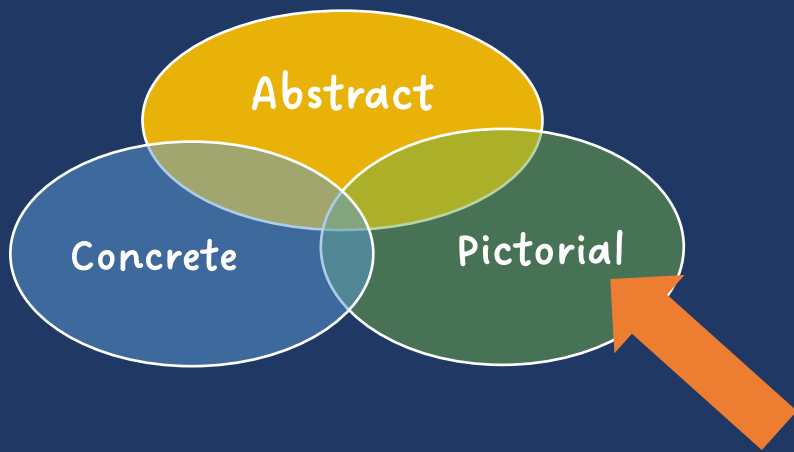
Other visuals (e.g., graphic organizers) contribute to increases in mathematics performance.

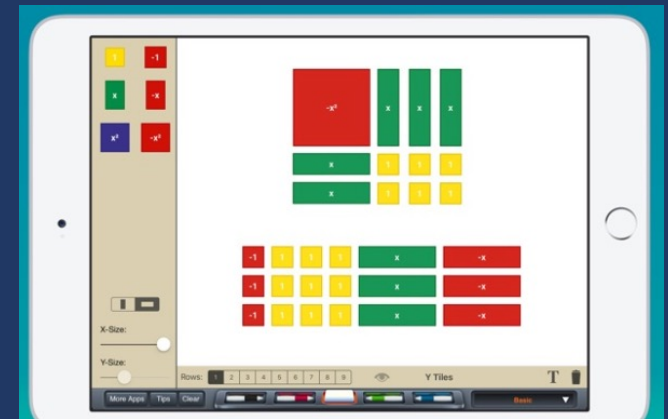
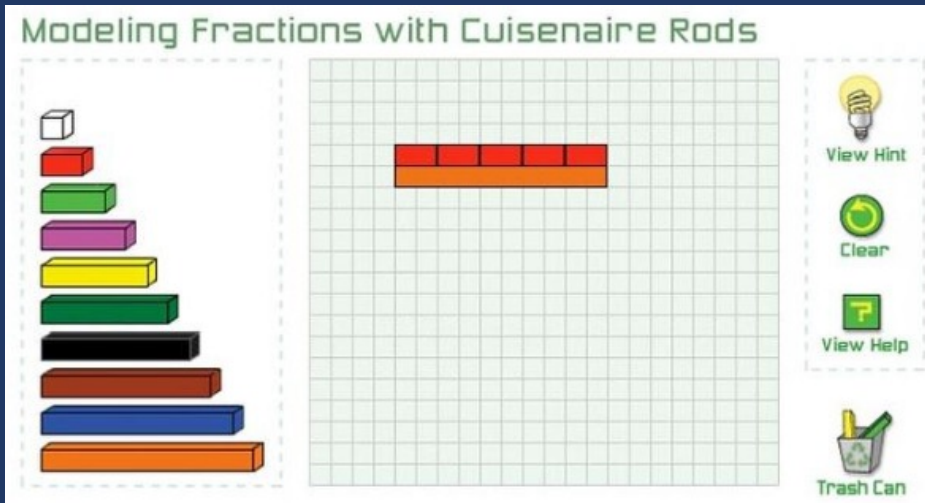
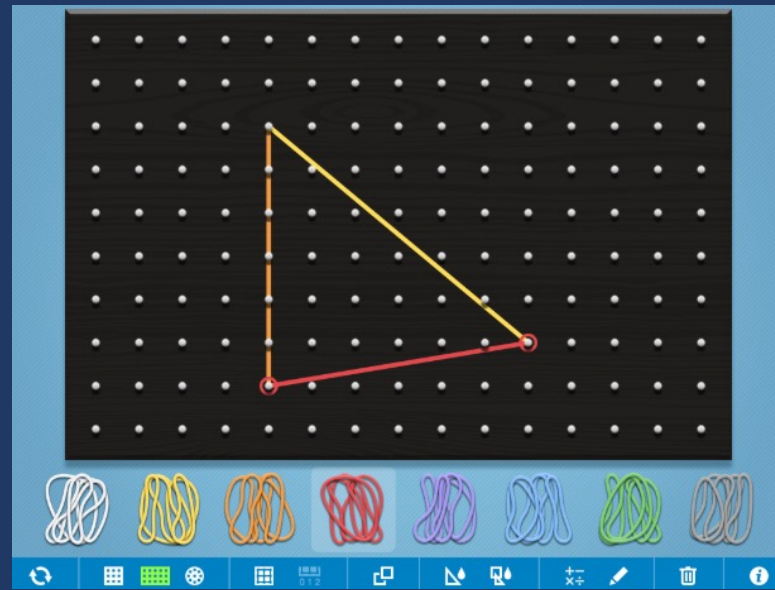
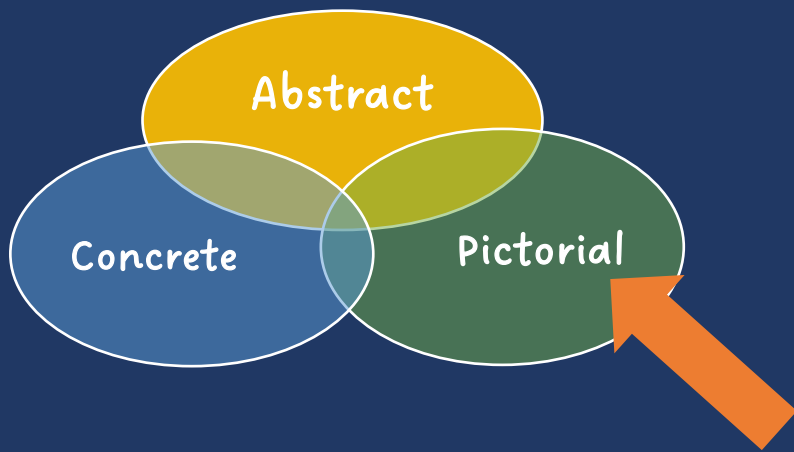
(Jitendra et al., 2009; Sharp & Dennis, 2017; van Garderen, 2007; Xin, 2008)

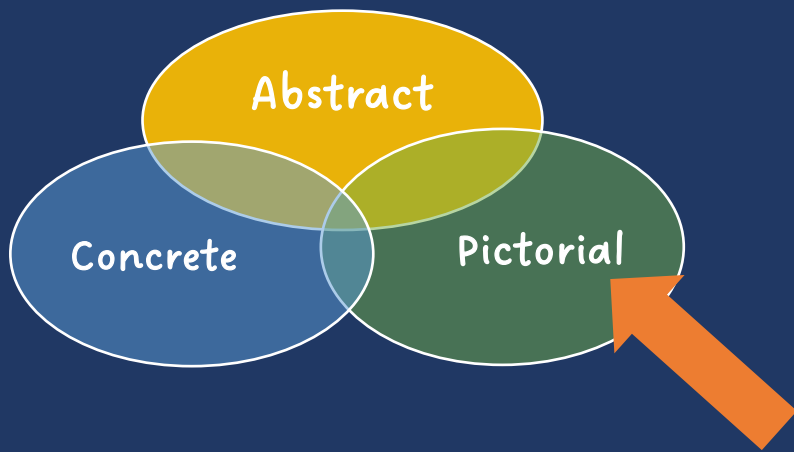










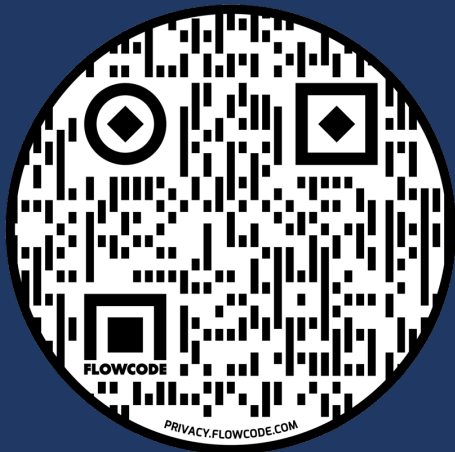


Virtual Manipulatives

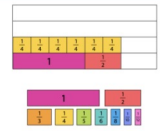

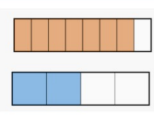
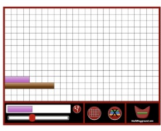
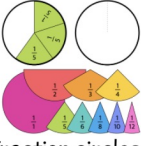
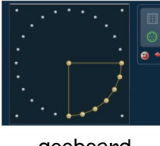
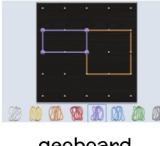


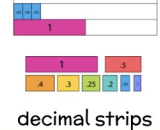

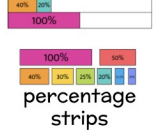
Help students see and learn math using different tools!

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

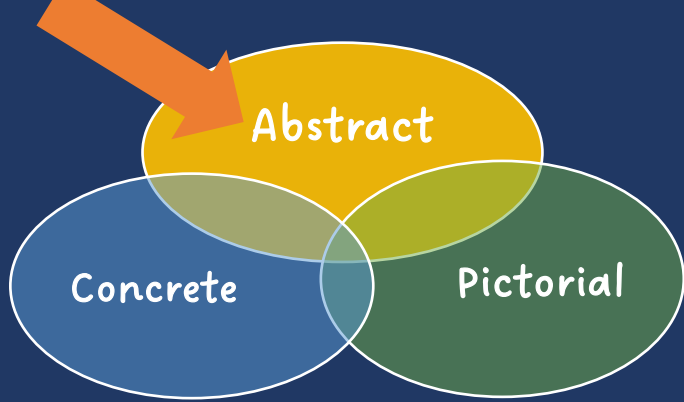
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<https://bit.ly/srpowell>

Fractions & Decimals	 fraction strips	 fraction strips	 fraction strips	 Cuisenaire rods
	 fraction circles	 geoboard	 geoboard	 geoboard
	 two-color counters	 decimal strips	 place value disks	 percentage strips





$$2 + 8 = 10$$

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

$$x - 6 = 8$$

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



Why are multiple representations helpful to use with students?

What materials might you need?

Fluency



What is the role of fluency in maths?

How important is basic facts learning to support strategy learning?

What intervention do you suggest for a child who have difficulty recognising and recalling numerals?

What do we do with children who are unable to memorise their times tables?

Maths fluency - how does it impact students learning?

What is the best way teach multiplication?

Instructional Platform

INSTRUCTIONAL DELIVERY

Explicit

Language

Multiple
representations

INSTRUCTIONAL STRATEGIES

Fluency





Mathematics fluency, particularly fluency with facts and computation, is related to overall mathematics performance.

(Bailey et al., 2012; Cirino et al., 2019; Koponen et al., 2007, 2017; Vukovic et al., 2014)

Fact fluency practice improves mathematics fact performance.

(Burns et al., 2010; Coddling et al., 2011; McCallum et al., 2004; Nelson et al., 2013; Poncy et al., 2010; Schutte et al., 2015; Stocker & Kubina, 2017)

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

Knowing multiples

Identifying shapes

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



What is an important fluency topic in math?

What are ways students can build fluency with that topic?

Problem Solving



How can I best support my son who has dyslexia and suspected dyscalculia?

Can you suggest some strategies to assist students with working memory difficulties to manage better with word problems?

How can you take slow processing speed into account in children that struggle with maths, particularly worded maths problems?

What are interventions or approaches to support those with Maths procedural fluency and worded problems difficulties?

Instructional Platform

INSTRUCTIONAL DELIVERY

Explicit

Language

Multiple
representations

INSTRUCTIONAL STRATEGIES

Fluency

Problem solving





Key words tied to operations is an ineffective word-problem strategy.

(Karp et al., 2019; Powell et al., 2022)

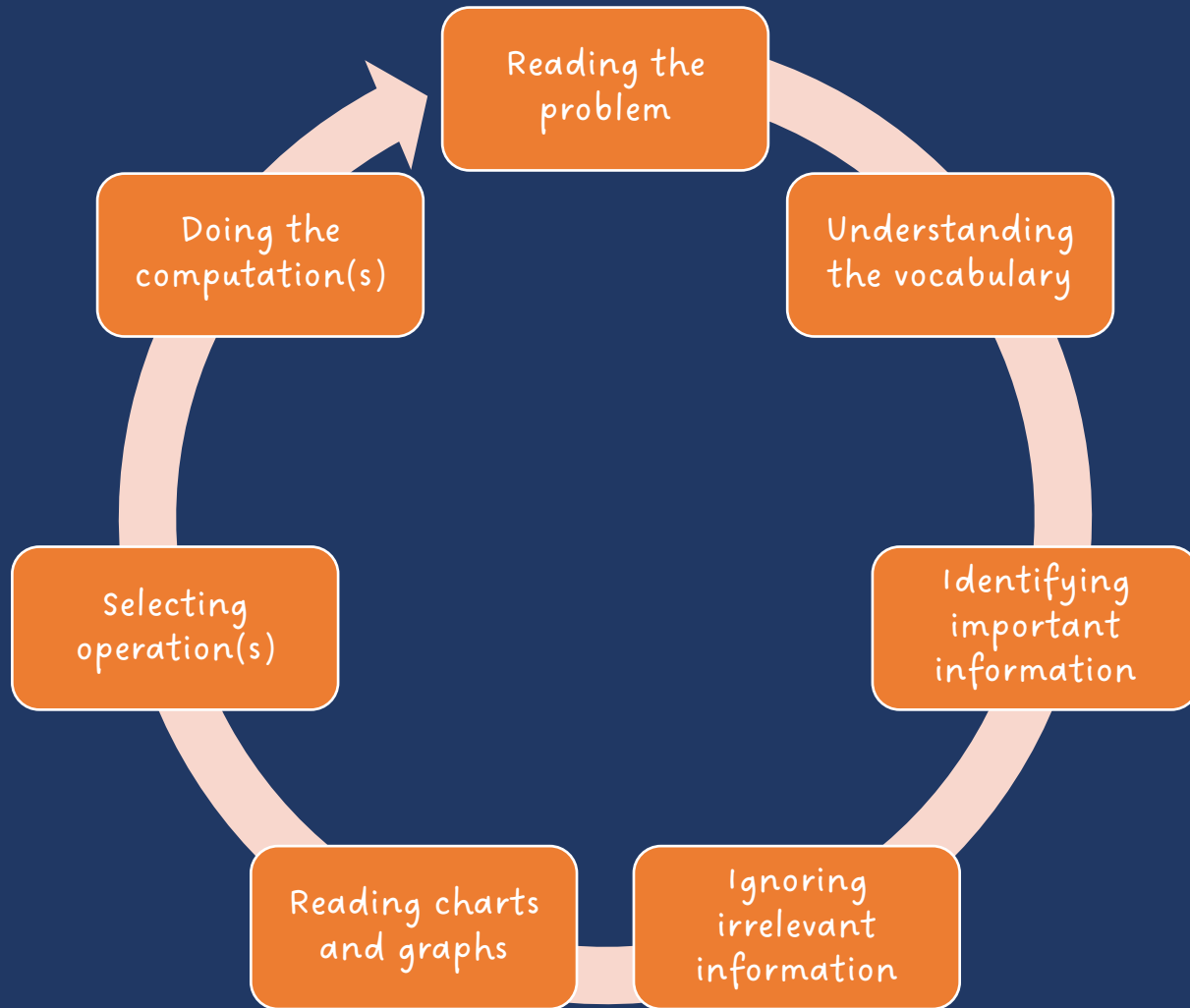
Using a meta-cognitive strategy improves word-problem performance.

(Freeman-Green et al., 2015; Krawec et al., 2012; Montague et al., 2011; Swanson et al., 2014)

A focus on schemas improves word-problem performance.

(Alghamdi et al., 2020; Cook et al., 2020; Flores et al., 2016; Fuchs et al., 2021; Griffin et al., 2019; Jitendra et al., 2013; Lein et al., 2020; Peltier et al., 2020; Powell et al., 2022; Xin & Xhang, 2009; Zheng et al., 2013)







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"> add all together or altogether and both combined how many in all how much in all increased by plus sum together total 	<ul style="list-style-type: none"> change decreased by difference fewer or fewer than how many are left (or have left) how many did not have how many how much taller, heavier, less or less lost minus need to reduce remain subtract take away
<ul style="list-style-type: none"> Multiplication Words x by (dimension) double each group every factor of increased by multiplied by x of product times triple 	<ul style="list-style-type: none"> Division Words as much cut up each group equal share half (or other parts) how many parts per percent quotient ratio of separated share some

OPERATION cue words

ADDITION and total join more than in all altogether sum increased	SUBTRACTION less than decreased remaining left fewer take away difference minus
MULTIPLICATION product times as many as by equal groups	DIVISION quotient each broken into distribute evenly parts

Math POSTER

ADDITION -sum -total -more than -plus -both -combined -increased by -perimeter -plus	MULTIPLICATION -product -double -area -times -per -every -each -by -When total is unknown
SUBTRACTION -difference -remain -left -less than -minus -how many more -fewer than -decrease -give away -reduce -discount	DIVISION -quotient -divide by -into -split -out of -shared -per -every -each -evenly -equal groups -half -When total is known

Division

Taking a total and sharing it

Addition

Putting two or more things/amounts together.

Keywords: Total, Altogether, In all, Sum, more than, added to, plus, join

Problem Solving Key Words

Addition	Subtraction
add together sum both	are not decrease difference fewer, larger, shorter left less than minus remain take away

key words

addition sum both	in all together perimeter	total plus add
-------------------------	---------------------------------	----------------------

more than

combined

triple
factor
product

multiply
each
per
in all
multiple
area
double

average

division
equal groups
half

split
shared
equally

quotient
divide
each

distribute

Math Operation - Key Words

Addition	Subtraction
♦ add ♦ altogether ♦ and ♦ both ♦ in all ♦ sum ♦ total ♦ increase	♦ difference ♦ fewer than ♦ gave/take away ♦ decreased by ♦ how many more ♦ show much longer/smaller/shorter ♦ minus ♦ remaining
Multiplication	Division
♦ area ♦ product ♦ Each ♦ by - of - per ♦ Times ♦ double, twice, triple ♦ total ♦ increase	♦ quotient ♦ divide ♦ into ♦ equal parts/share ♦ equally ♦ per ♦ amount of each

Math Key Words

Addition	Subtraction	Multiplication	Division
+	-	×	÷
plus	subtract	times	quotient
sum	minus	product	split
add	difference	factor	share
total	left	double	divide
all together	left over	groups	separate
increase	decrease	each	each
more	take away	area	average
combine	fewer	rows	equal groups





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

Schema	Occurrence of schema		Any keyword		Schema-specific keywords ^a		Multiple keywords ^a		Keyword(s) led to correct solution ^a	
	<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

^aWhen a problem featured a keyword.





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

Schema	Occurrence of schema ^a		Any keyword		Keyword(s) led to correct solution ^b	
	n	%	n	%	n	%
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

^aSum across schemas does not equal 100 because each word problem featured more than one schema.

^bWhen a problem featured a keyword.





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 much more scrap paper does he need?

Teach an attack strategy

Teach about schemas

RIDE

Read the problem.

Identify the relevant information.

Determine the operation and unit for the answer.

Enter 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

Stop and read the problem carefully.

Think about your plan and the strategy you will use.

Act. Follow your plan and solve the problem.

Review your answer.

RICE

Read and record the problem.

Illustrate your thinking.

Compute.

Explain 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

Study the problem.

Organize the facts.

Line up the plan.

Verify the plan with computation.

Examine 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?

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

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

Total

Part

Part



Total

B.

In March and April, it rained a total of 11.4 inches. If it rained 3.9 inches in March, how many inches did it rain in April?

U✓

$$P1 + P2 = T$$

P✓

$$3.9 + ? = 11.4$$

S✓

✓✓

$$? = 7.5 \text{ inches}$$

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



Difference

Jana has 107 wooden beads and 68 glass beads. How many more wooden beads than glass beads does Jana have?

Enter your answer in the response box.

←	→	↶	↷	✖
1	2	3		
4	5	6		
7	8	9		
0	.	$\frac{\square}{\square}$		

$$\begin{array}{r} U \\ P \\ S \\ \checkmark \end{array} \quad \begin{array}{l} G - L = D \\ 107 - 68 = ? \\ ? = 39 \text{ more} \\ \text{wooden beads} \end{array}$$



Change

Join

An amount that increases or decreases

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

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

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

End amount

Change amount

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?

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

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

End amount

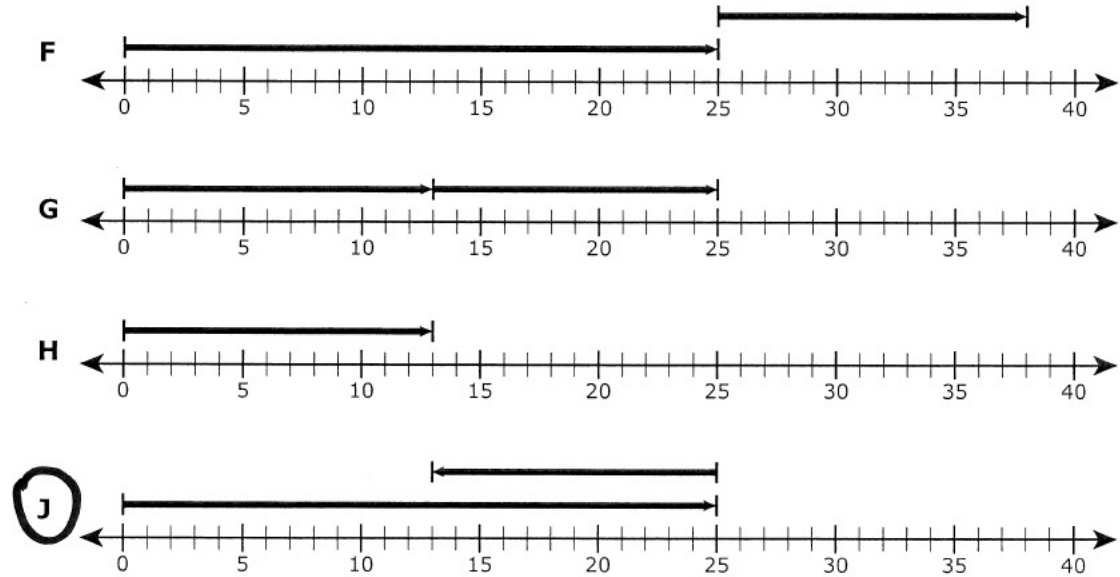
Change amount

Start amount



Change

28 There were 25 people in a library. Some people left the library and went home. Then there were 13 people remaining in the library. Which number line represents one way to determine the number of people who left the library?



U
P
S
✓

$$\boxed{25} - ? \rightarrow \boxed{13}$$

? = 12 people left

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?

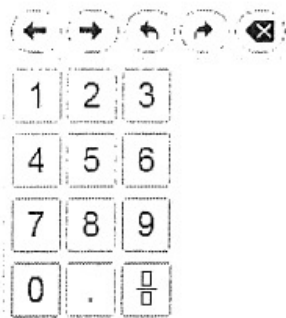
Groups



Equal Groups

Jack has 24 fish. He puts them into 4 bowls. Each bowl has an equal number of fish.

How many fish are in each bowl?



U
P
S
V

$$\boxed{4} \times \textcircled{?} = \triangle 24$$

$$\begin{array}{r} 4 \\ \times ? \\ \hline 24 \end{array}$$

$$4 \overline{)24}$$

$$? = 6 \text{ fish}$$

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



Comparison

Susan has 3 times as many books as Mary. Mary has 18 books. Which equation can be solved to figure out how many books Susan has?

(A) $\square - 3 = 18$

(B) $3 + 18 = \square$

(C) $18 \div \square = 3$

(D) $3 \times 18 = \square$

U

P

S

✓

$$\boxed{18} \times \textcircled{3} = \triangle ?$$

$$? = 54 \text{ books}$$

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





What are student challenges with word-problem solving?

What are teacher challenges with word-problem solving?



Instructional Platform

INSTRUCTIONAL DELIVERY

Explicit

Language

Multiple
representations

INSTRUCTIONAL STRATEGIES

Fluency

Problem solving



Do you have recommendations for screening and programs?

If undertaking targeted, small group intervention, what time frame what you stick to?

What are the evidence-based practices in mathematics?

Does productive struggle have a place in evidence based instruction?

What resources/approaches are available for me to read/peruse?

What evidenced based programs are available for students who have difficulties in mathematics?

How do you use student diagnostic information in intervention?

Tools for identifying a learning difficulty in maths?

What resources would you recommend?





Myths That Undermine Maths Teaching

Sarah R. Powell, Elizabeth M. Hughes, and Corey Peltier



Analysis Paper 36
August 2022



Susan
McKinnon
Foundation

CIS Education
Program

Centre for Independent Studies



Assisting Students Struggling with Mathematics: Intervention in the Elementary Grades

Educator's Practice Guide

WWC 2021006
U.S. DEPARTMENT OF EDUCATION

A publication of the National Center for Education Evaluation and Regional Assistance (NCEE) at IES





Pirate Math Equation Quest

About

Research

Individual

Small Group

STAAR

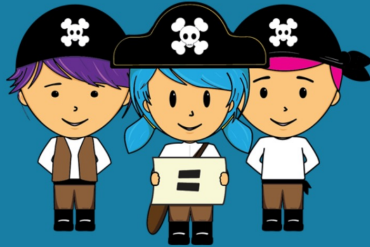
Videos

Welcome to Pirate Math Equation Quest!

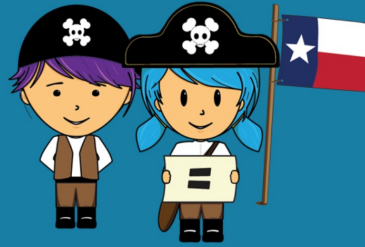
Individual Word-Problem
Intervention



Small-Group Word-Problem
Intervention



Small-Group Word-Problem
Intervention for STAAR



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Intensive Intervention in Mathematics Course Content

NCII, through a collaboration with the University of Connecticut, developed a set of course content focused on developing educators' skills in designing and delivering intensive mathematics instruction. This content is designed to support faculty and professional development providers with instructing pre-service and in-service educators who are developing and/or refining their implementation of intensive mathematics intervention.

Intensive instruction was recently identified as a [high-leverage practice in special education](#), and DBI is a research based approach to delivering intensive instruction across content areas (NCII, 2013). This course provides learners with an opportunity to extend their understanding of intensive instruction through in-depth exposure to DBI in mathematics, complete with exemplars from actual classroom teachers.

NCII, through a collaboration with the University of Connecticut and the [National Center on Leadership in Intensive Intervention](#) and with support from the [CEEDAR Center](#), developed course content focused on enhancing educators' skills in intensive mathematics intervention. The course includes eight modules that can support faculty and professional development providers with instructing pre-service and in-service educators who are learning to implement intensive mathematics intervention through data-based individualization (DBI). The content in this course complements concepts covered in the [Features of Explicit Instruction Course](#) and so we suggest that users complete both courses.



MODULE 5: INTENSIVE MATHEMATICS INTERVENTION: INSTRUCTIONAL STRATEGIES



The cover features a central illustration of a blue calculator displaying '195', several colorful plus signs, a blue grid notepad with a yellow pencil, and a red pair of scissors. In the top right corner, there is a logo for 'INCLUSION IN TEXAS' with a green icon of three people. The title 'Instructional Routines for Mathematics Intervention' is written in large white font on a blue background. Below the title, a paragraph explains the purpose of the materials. At the bottom right, the 'TEA Texas Education Agency' logo is visible.

**INCLUSION
IN TEXAS**

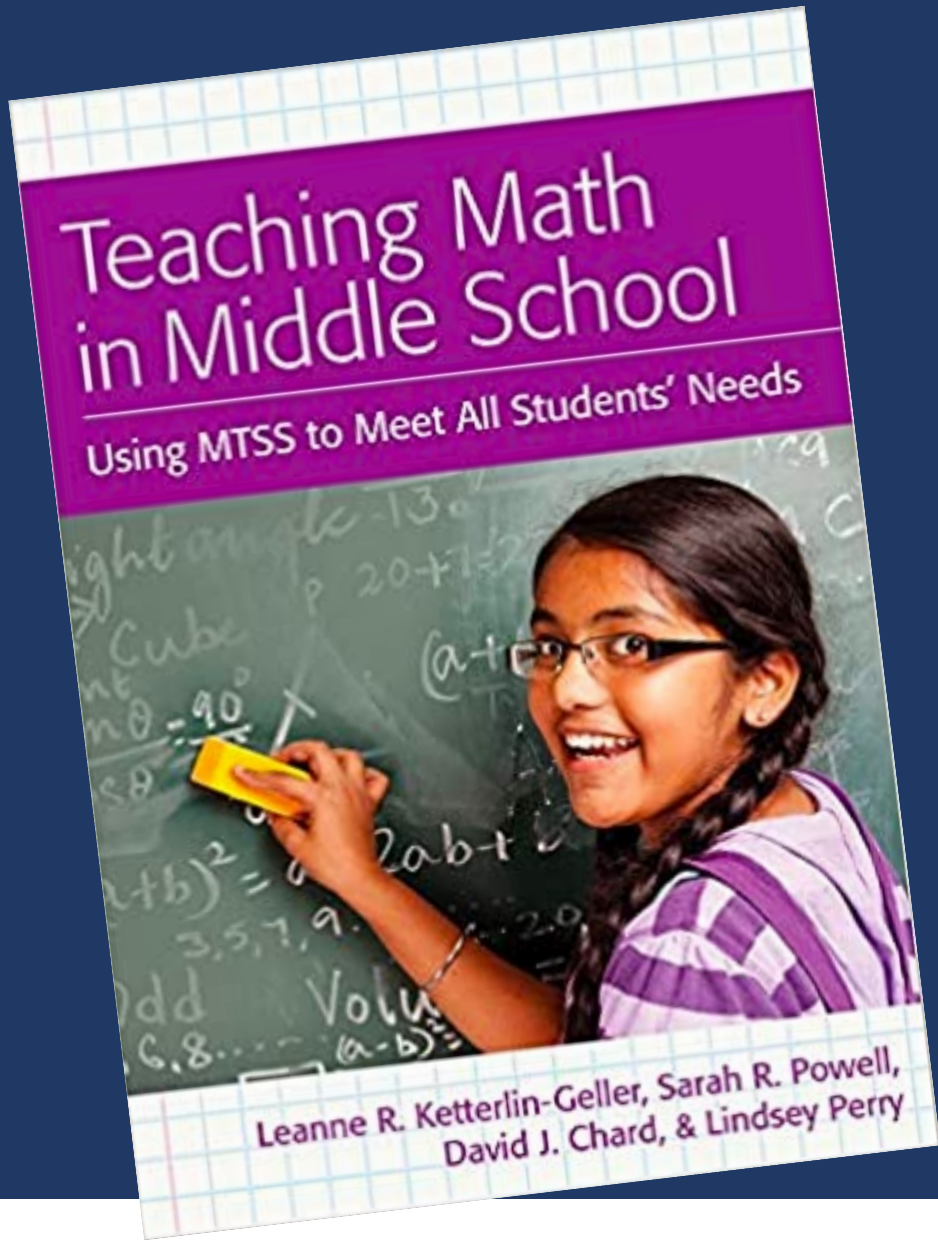
Instructional Routines for Mathematics Intervention

The purpose of these mathematics instructional routines is to provide educators with materials to use when providing intervention to students who experience difficulty with mathematics. The routines address content included in the grades 2-8 Texas Essential Knowledge and Skills (TEKS). There are 23 modules that include routines and examples – each focused on different mathematical content. Each of the 23 modules include vocabulary cards and problem sets to use during instruction. These materials are intended to be implemented explicitly with the aim of improving mathematics outcomes for students.

TEA
Texas Education Agency

https://www.inclusionintexas.org/apps/pages/index.jsp?uREC_ID=2155039&type=d&pREC_ID=2169859





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