

Data-Based Decision Making in Math

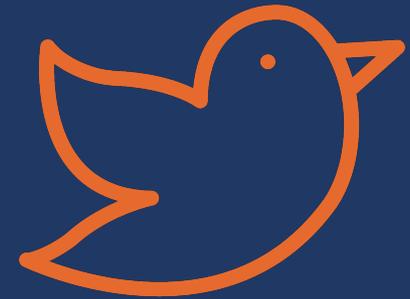


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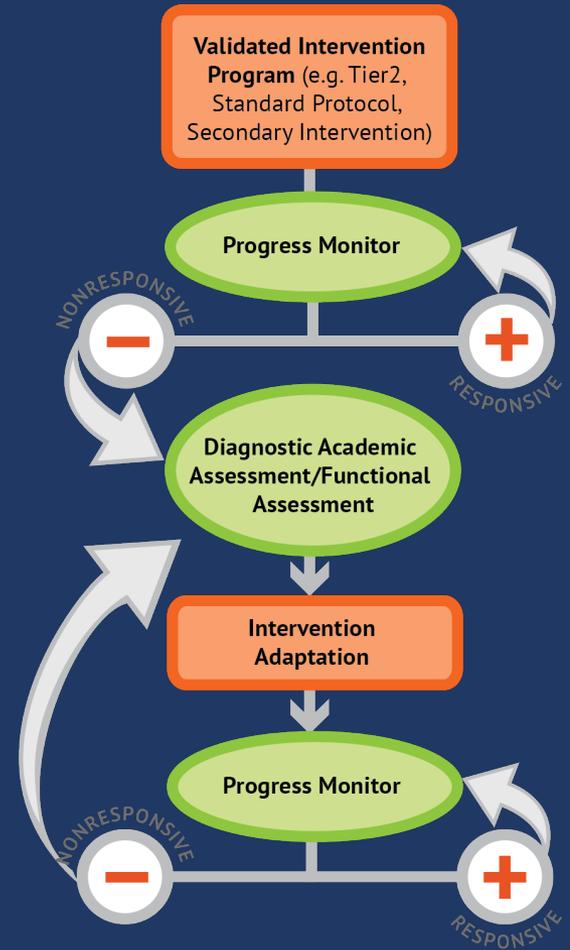
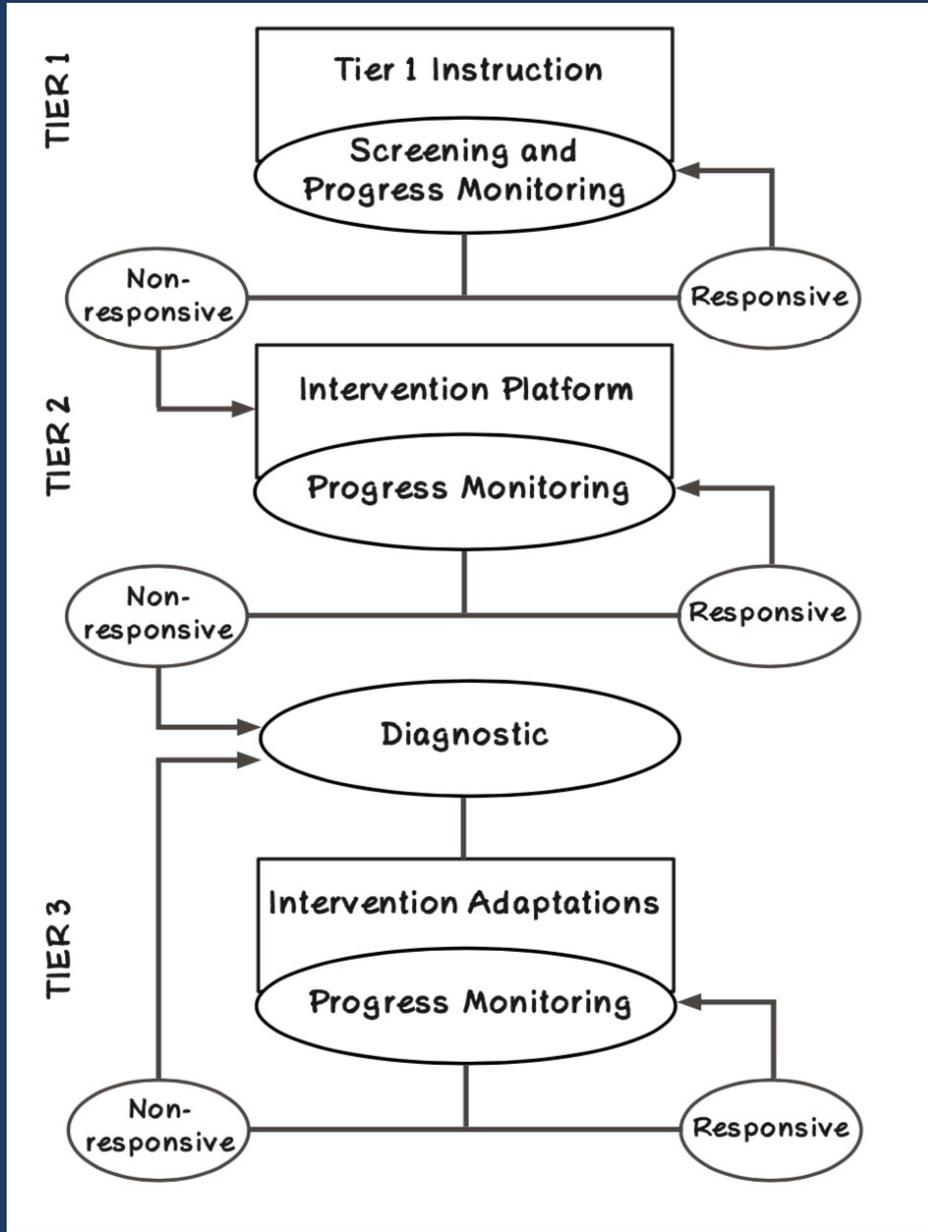
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Introduce yourself and
your role as an educator.

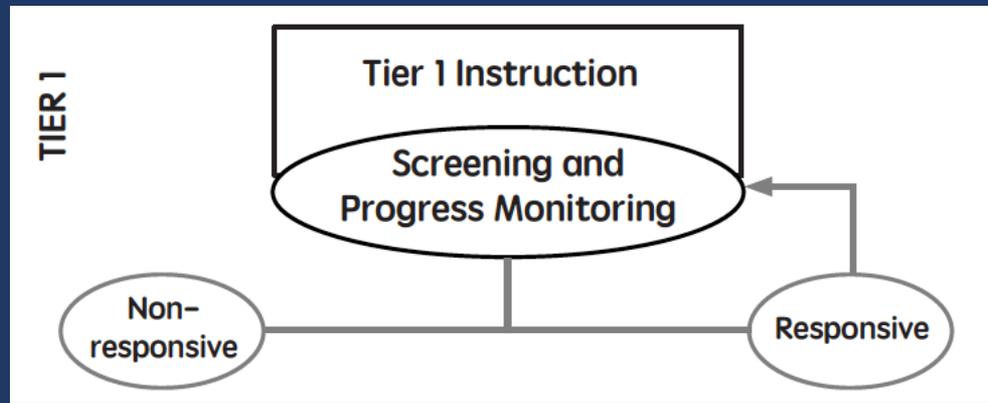
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Tier 1 Instruction:





- Core instruction utilizes **evidence-based practices**
- All students **screened** (universal screener)
- Students scoring below a cut-score are suspected **at risk** for math difficulties
- Suspected **at-risk students** monitored for 6 to 10 weeks during primary prevention using **progress monitoring**

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



evidence-based practice



evidence-based intervention

evidence-based strategy

promising practice

A method or strategy that has shown a positive result



evidence-based practice



evidence-based intervention

evidence-based strategy

promising practice

~~no or negative
evidence~~





Websites

ies.ed.gov/ncee/wwc/

IES WWC What Works Clearinghouse MENU Search Go

Select topics to **Find What Works** based on the evidence

- Literacy
- Mathematics
- Science
- Behavior
- Children and Youth with Disabilities
- English Learners
- Teacher Excellence
- Dropout Prevention
- Early Childhood (Pre-K)
- K-12 Kindergarten to 12th Grade
- Path to Graduation
- Postsecondary

WELCOME TO THE WHAT WORKS CLEARINGHOUSE

The What Works Clearinghouse (WWC) reviews the existing research on different *programs, products, practices, and policies* in education. *Our goal* is to provide educators with the information they need to make evidence-based decisions. We focus on the results from *high-quality research* to answer the question "What works in education?" Find more information **about the WWC.**

HIGHLIGHTS

WEBINAR Finding Evidence: New Resources for Education Researchers from the What Works Clearinghouse

QUICK LINKS

- INTERVENTION REPORTS
- PRACTICE GUIDES
- REVIEWS OF INDIVIDUAL STUDIES





Websites

www.evidenceforessa.org

EVIDENCE for ESSA

MATH PROGRAMS READING PROGRAMS

Search by Program Name

About Who We Are FAQs Contact Us

Proven Programs Successful Students

Your new standard for the most up-to-date and reliable information on programs that meet ESSA evidence standards.

LEARN MORE ABOUT ESSA >

Find Evidence Based Programs

Selecting a program is part of a larger [integrated process](#) as recommended by the U.S. Department of Education.

Reading Programs

- > Elementary
- > Middle/High School

Math Programs

- > Elementary
- > Middle/High School





Websites

www.edreports.org



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SEARCH



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We provide reports that help you evaluate educational materials because high quality content matters to teachers, to kids, and to our collective future.

EXPLORE REPORTS

UP NEXT





Websites

www.intensiveintervention.org

National Center on INTENSIVE INTERVENTION

at American Institutes for Research

Coaches' Corner

Search

Advanced Search

Resources

Tools Charts

Implementation Support

Instructional Support

About Us

Interactive DBI Process

Intensive intervention helps students with severe and persistent learning or behavioral needs. The Center's approach to intensive intervention is **data-based individualization (DBI)**.

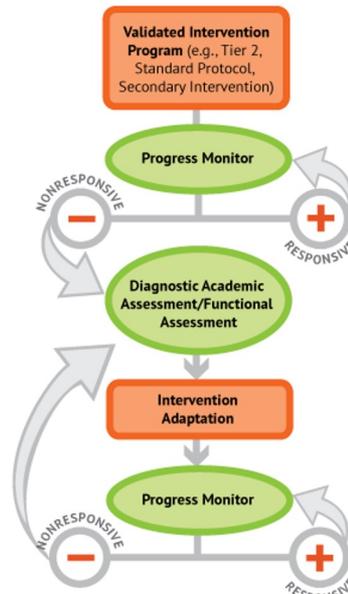
What is DBI?

DBI is a research-based process for individualizing and intensifying interventions through the systematic use of assessment data, validated interventions, and research-based adaptation strategies.

Click on the components in the graphic to learn more about the steps in the DBI process and find relevant resources.

[Read more about DBI](#) and [view this video to learn why intensive intervention is critical](#).

[View the NCII web tour to learn about navigating the site](#).



The NCII Newsletter

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15 New Math Videos on Place Value Computation



Do you have students struggling with place value computation? This series of videos focus on multiple strategies to help students struggling with addition, subtraction, multiplication and division.

[Watch the videos.](#)

New Reading Lessons & Activities

Looking for lessons to support decoding, vocabulary instruction, comprehension and more? Check out our new sample lessons that include modeling, error correction, practice, and fluency building.

[View the reading lessons.](#)



evidence-based practice



evidence-based intervention

evidence-based strategy

promising practice

Assessment data to show results

Improvement from before intervention

Improvement compared to no treatment students

Replication

Multiple researchers

Multiple students

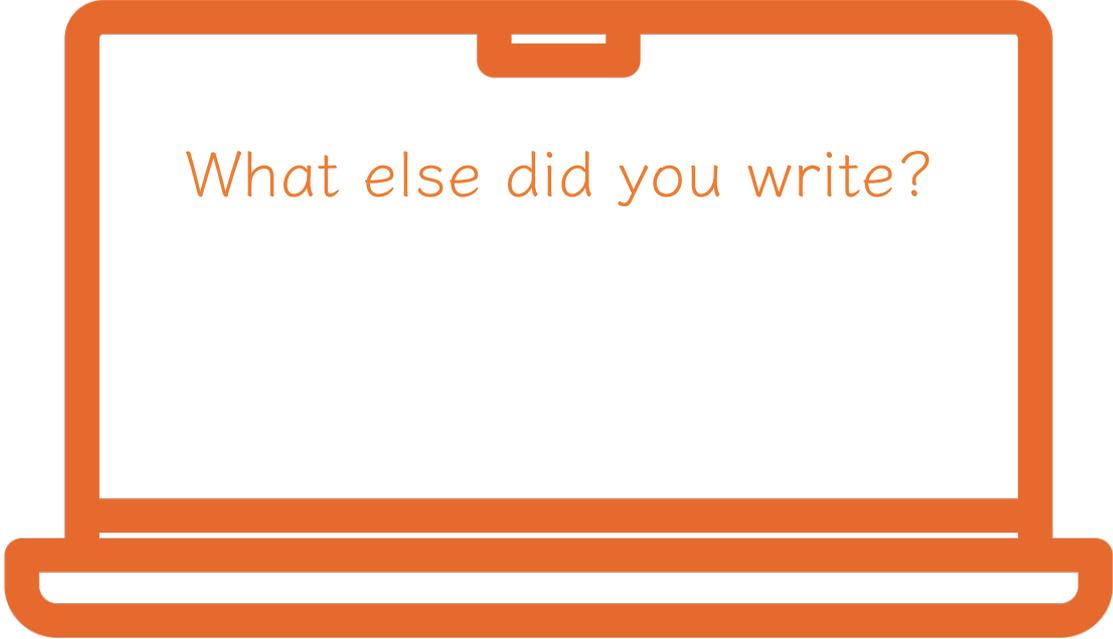
Multiple times

Setting and students similar to your own



Tier 1 Instruction:

- Evidence-based practices



What else did you write?

Screening and Progress Monitoring:

- Reliable measures with normative data
- Usually administered fall, winter, spring

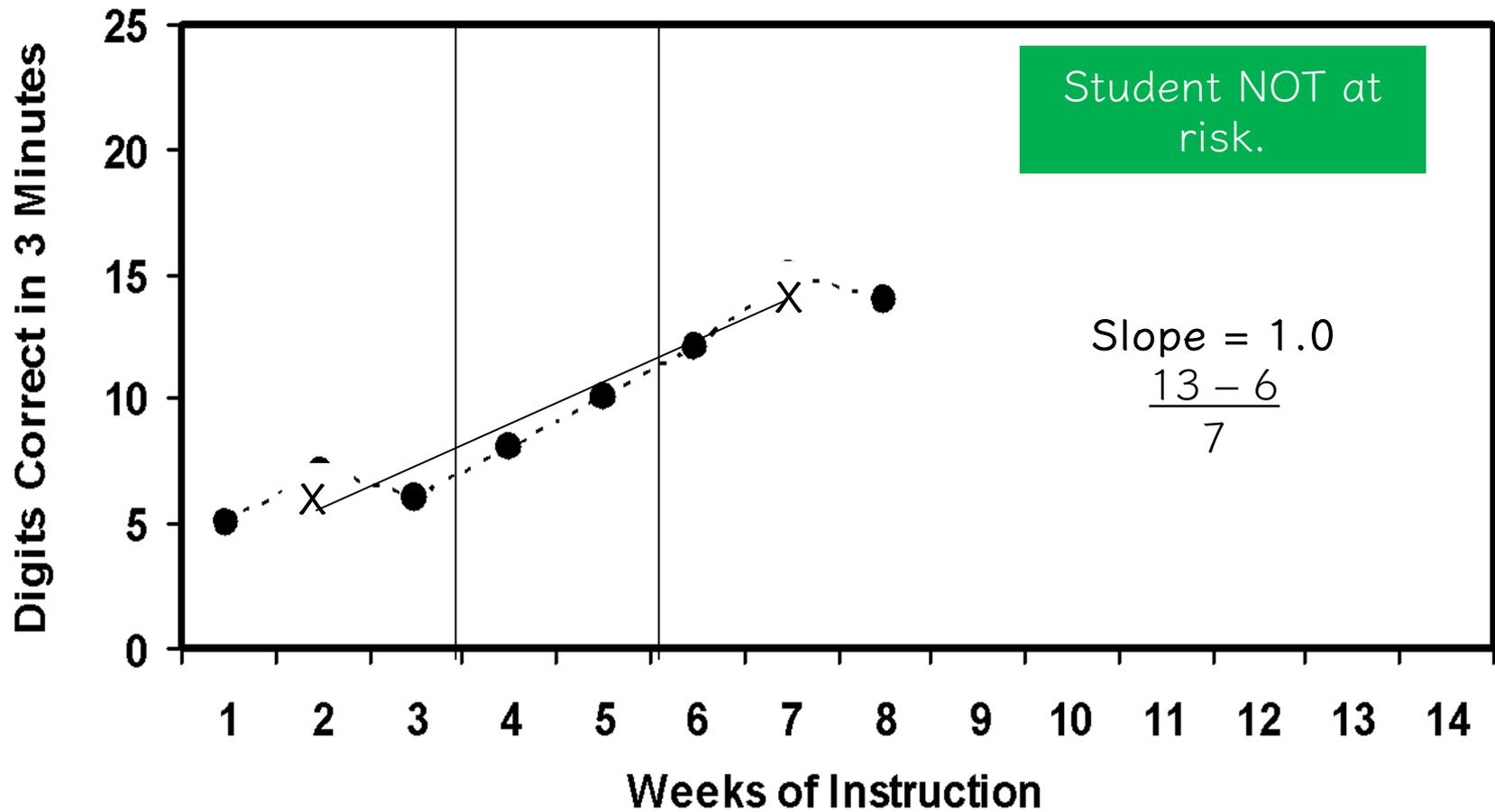
- Reliable measures, administered regularly

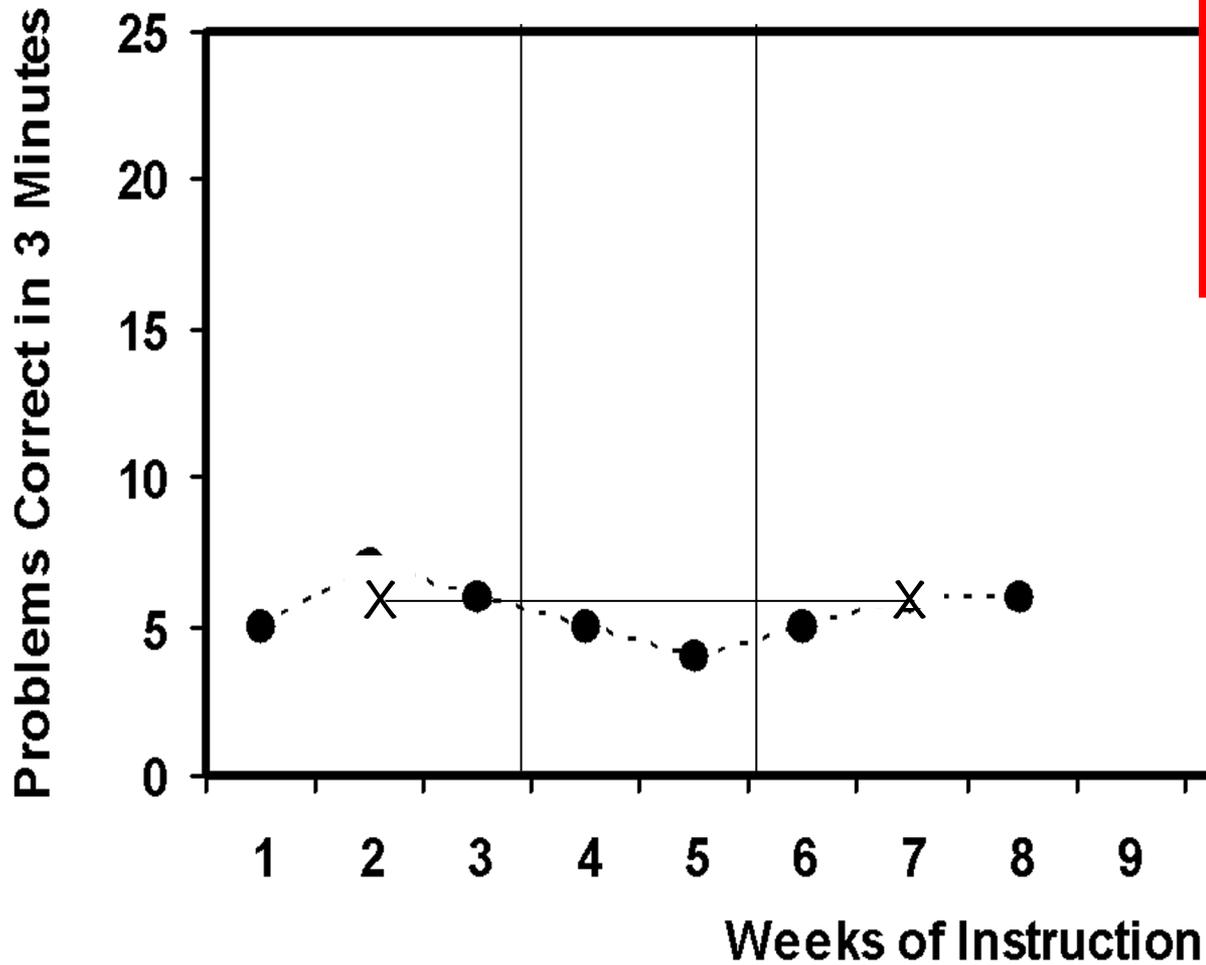


Decision Making:

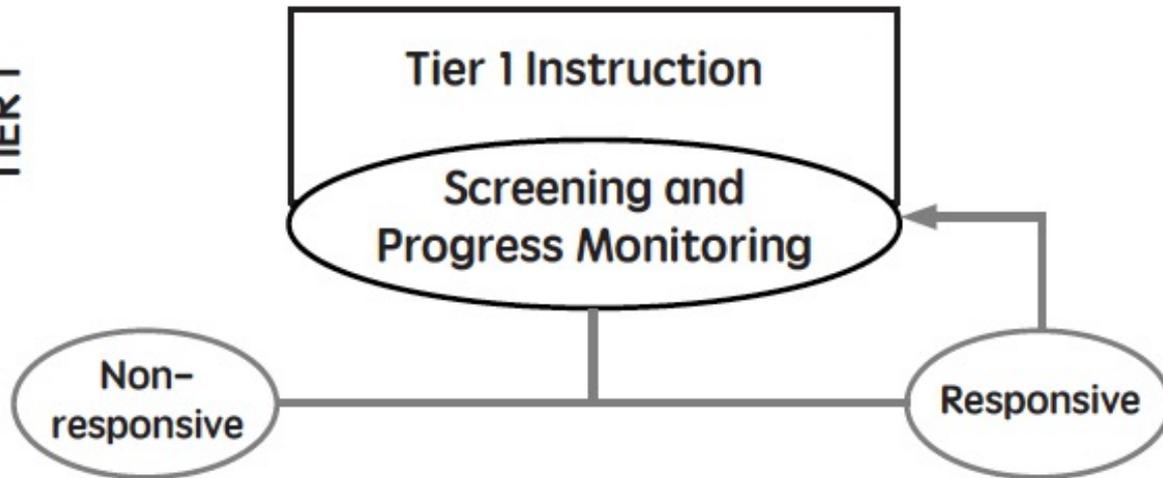
- After 6-10 weeks, student risk status is confirmed or disconfirmed







TIER 1



What are your school's
Tier 1 strengths and
weaknesses?



Data-based Individualization

DBI is a process and NOT
a single program or strategy

DBI is an ongoing process in which
intervention and assessment are linked; it's
NOT a one time fix

DBI is often domain-specific but can be
implemented in multiple domains

DBI will likely need to occur over
a sustained period of time

Intervention: Occurs frequently and with intensity

Validated Intervention Program (e.g. Tier2, Standard Protocol, Secondary Intervention)

Progress Monitor

NONRESPONSIVE

RESPONSIVE

Diagnostic Academic Assessment/Functional Assessment

Intervention Adaptation

Progress Monitor

NONRESPONSIVE

RESPONSIVE

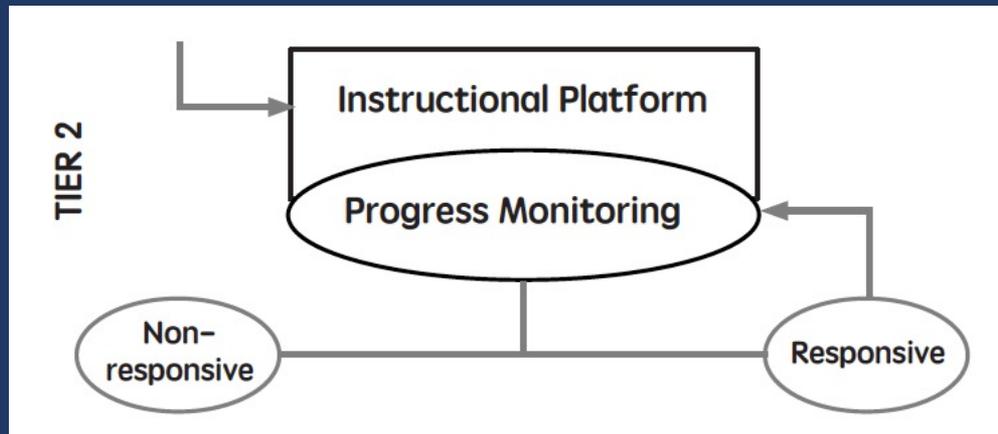
Assessment: Formative

Assessment: Diagnostic

Assessment: Formative

Intervention adaptation: Content, dosage, explicit instruction, attention to transfer





- Students are tutored in small groups using **evidence-based practices**
- Tutoring takes place three or four times a week
- Each tutoring session lasts 30 to 60 minutes
- Tutoring lasts 10 to 20 weeks
- Progress monitoring continues weekly

Instructional Platform:



Instructional Platform

INSTRUCTIONAL DELIVERY

Explicit
instruction

Precise
language

Multiple
representations

INSTRUCTIONAL STRATEGIES

Fluency building

Problem solving
instruction



Explicit
instruction

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



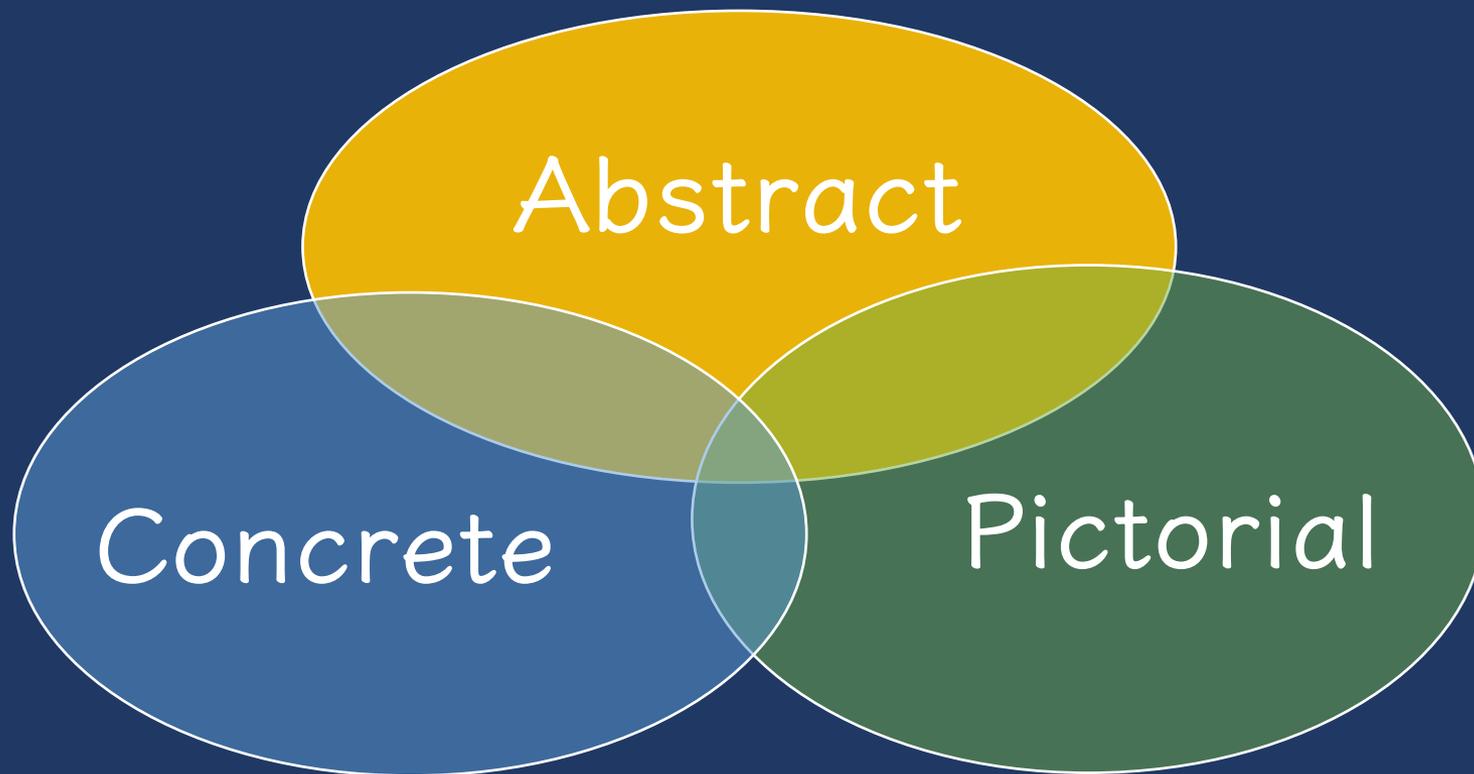
Precise
language

Use formal math language

Use terms precisely



Multiple
representations



Fluency building

Addition

Subtraction

Multiplication

Division



Problem solving
instruction

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 (spowell@gaosim.utexas.edu)

Total

Difference

Change

Equal Groups

Comparison

Ratios/Proportions



Instructional Platform:

INSTRUCTIONAL DELIVERY

Explicit instruction

Precise language

Multiple
representations

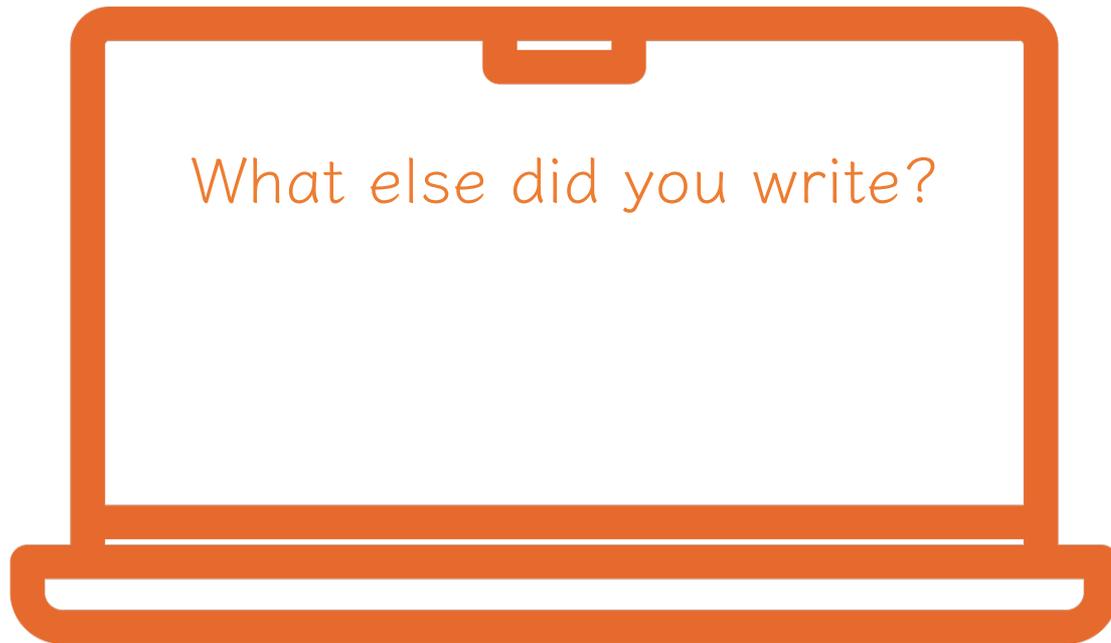
INSTRUCTIONAL STRATEGIES

Fluency building

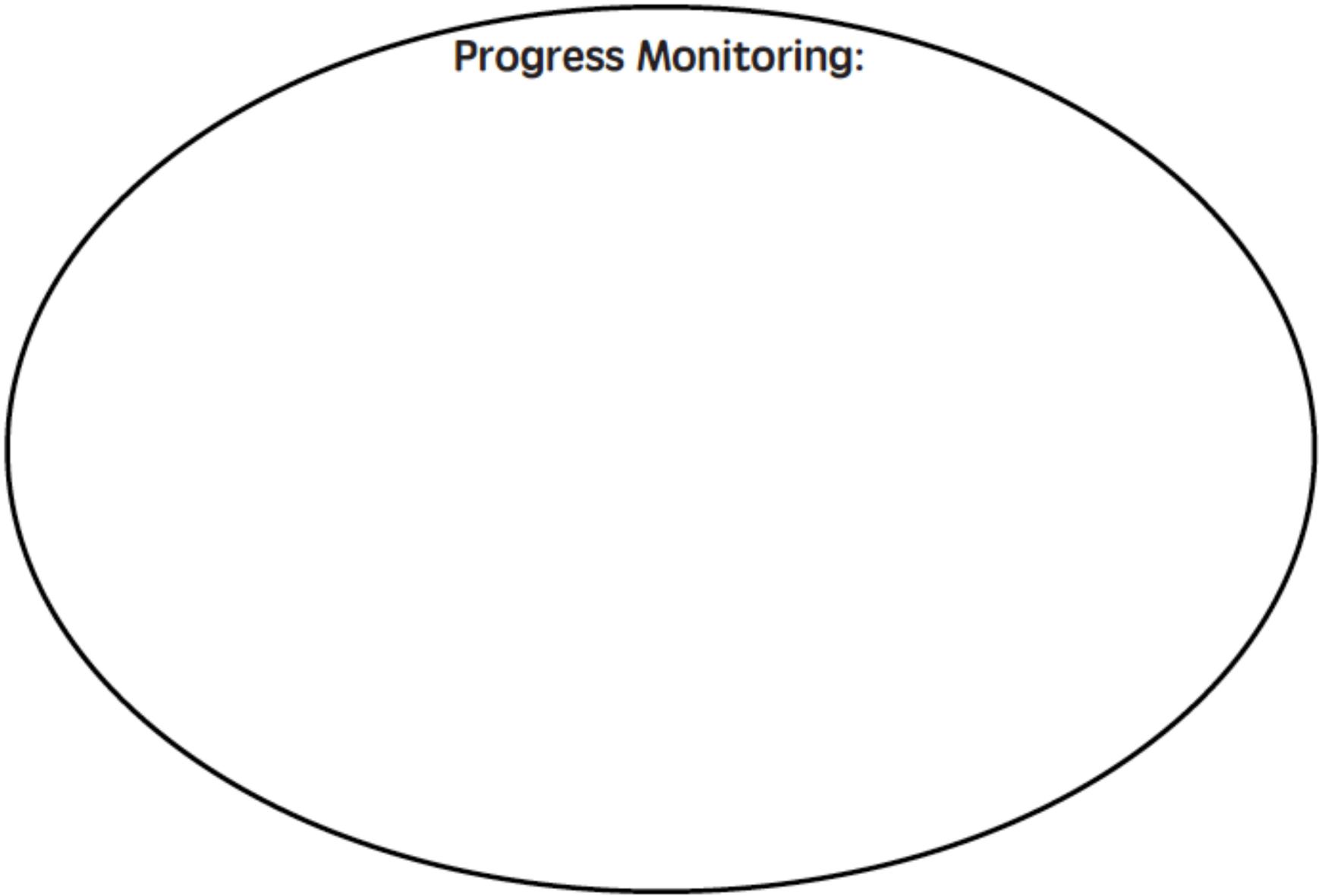
Problem solving
instruction



Instructional Platform:



Progress Monitoring:



Number Identification

6 16 23 10 17

38 97 20 15 24

14 33 11 79 8

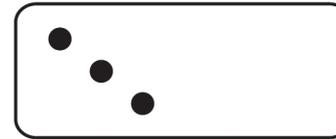
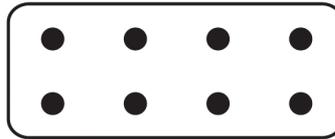
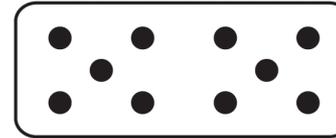
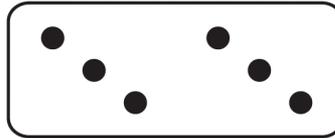
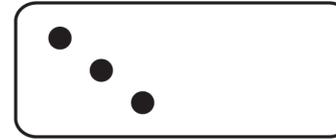
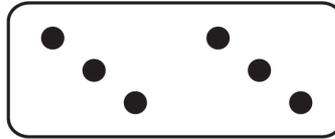
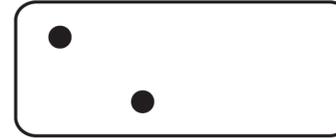
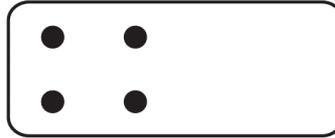
21 19 93 3 49

4 30 12 9 1

28 7 27 2 13



Quantity Discrimination



Missing Number

13 ___ 15 16

50 60 ___ 80

40 45 ___ 55

50 51 ___ 53

23 ___ 25 26

15 20 ___ 30

27 28 ___ 30

38 48 ___ 68

75 ___ 85 90

83 ___ 85 86

Acadience® Math / Computation Grade 4
Benchmark 1 / Form A

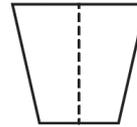
Total: _____

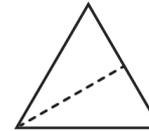
1. $\begin{array}{r} 527 \\ +320 \\ \hline \end{array}$	2. $\begin{array}{r} 4778 \\ +2242 \\ \hline \end{array}$	3. $8\frac{4}{5} - 6\frac{2}{5} =$	4. $\begin{array}{r} 9 \\ \times 8 \\ \hline \end{array}$	5. $4\overline{)573}$
6. $\begin{array}{r} 197 \\ - 74 \\ \hline \end{array}$	7. $\frac{5}{8} + \frac{2}{8} =$	8. $\begin{array}{r} 7273 \\ - 387 \\ \hline \end{array}$	9. $\begin{array}{r} 19 \\ \times 11 \\ \hline \end{array}$	10. $9\frac{7}{12} - 1\frac{4}{12} =$
11. $8\overline{)642}$	12. $7\overline{)49}$	13. $\begin{array}{r} 99 \\ \times 72 \\ \hline \end{array}$	14. $\frac{1}{4} + \frac{2}{4} =$	15. $\begin{array}{r} 526 \\ \times 6 \\ \hline \end{array}$
16. $8\frac{9}{10} - 1\frac{5}{10} =$	17. $\frac{1}{3} + \frac{1}{3} =$	18. $\frac{9}{12} - \frac{2}{12} =$	19. $\begin{array}{r} 829 \\ \times 7 \\ \hline \end{array}$	20. $6\overline{)939}$
21. $3\overline{)397}$	22. $\begin{array}{r} 65 \\ \times 23 \\ \hline \end{array}$	23. $\begin{array}{r} 2414 \\ - 668 \\ \hline \end{array}$	24. $\begin{array}{r} 7568 \\ +1638 \\ \hline \end{array}$	25. $\begin{array}{r} 34 \\ \times 12 \\ \hline \end{array}$

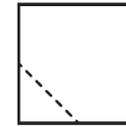
Computation

Total: _____

1. Is the dotted line a line of symmetry for each shape? Write "yes" or "no" in the space provided below each shape.







2. Compare the number in Box 1 with the number in Box 2. Fill in the blank with > (greater than), = (equal to), or < (less than):

Box 1	>, =, <	Box 2
835		751
333		613
131		168

3. List three numbers that are multiples of 4:

4. Jake read 17 books over the summer that were nonfiction and 43 books that were fiction. His friend Ross read 38 books total. How many more books did Jake read than Ross? _____ books.

5. Compare the decimal in Box 1 with the decimal in Box 2. Fill in the blank with > (greater than), = (equal to), or < (less than):

Box 1	>, =, <	Box 2
0.47		0.25
0.39		0.68
0.89		0.91

6. We rented a movie that was 2 hours and 15 minutes long. How many minutes total was the movie? _____ minutes.

Concepts and Applications



Progress Monitoring Considerations

- Skills to be measured—age and grade appropriate
- Cost and training requirements
- Administration and scoring time
- Data management
- Technical rigor (consider population)
 - Reliability
 - Validity
 - Evidence of being sensitive to change
 - Alternate/parallel forms



Progress Monitoring:

- Reliable measures, administered regularly
- Efficient and easy to administer
- Skills assessed serve as indicators of general knowledge

What else did you write?



Decision Making:



Setting Goals

Benchmark

Slope (ROI)

Intra-
individual



Determining Response

Four most recent, consecutive scores



Trendline



Decision Making:

- Teachers set goals

Benchmark

Slope (ROI)

Intra-individual

Trendline

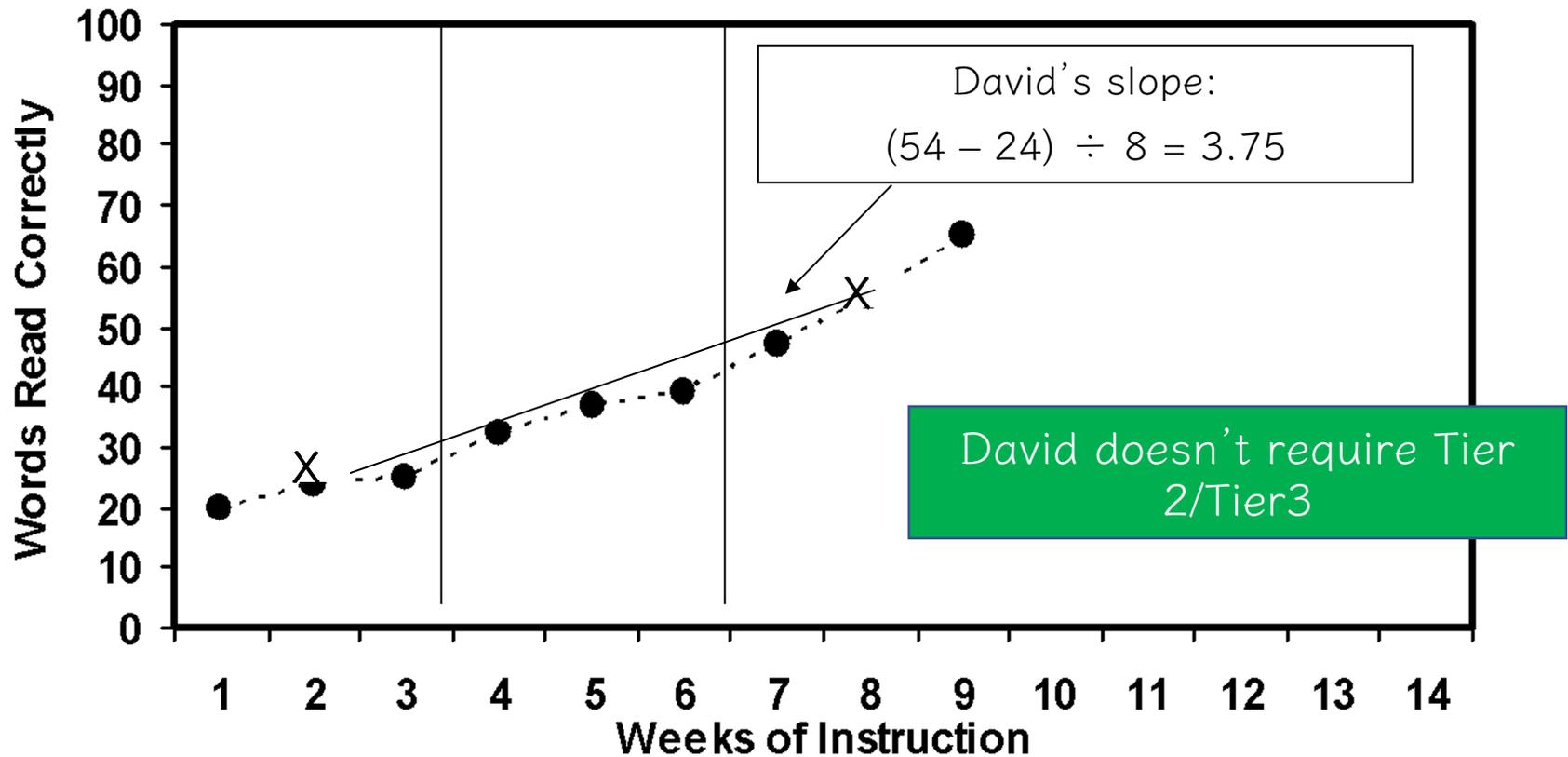


- After 10-20, student progress is determined
 - Adaptations to instructional platform
 - Intensify support (Tier 3)

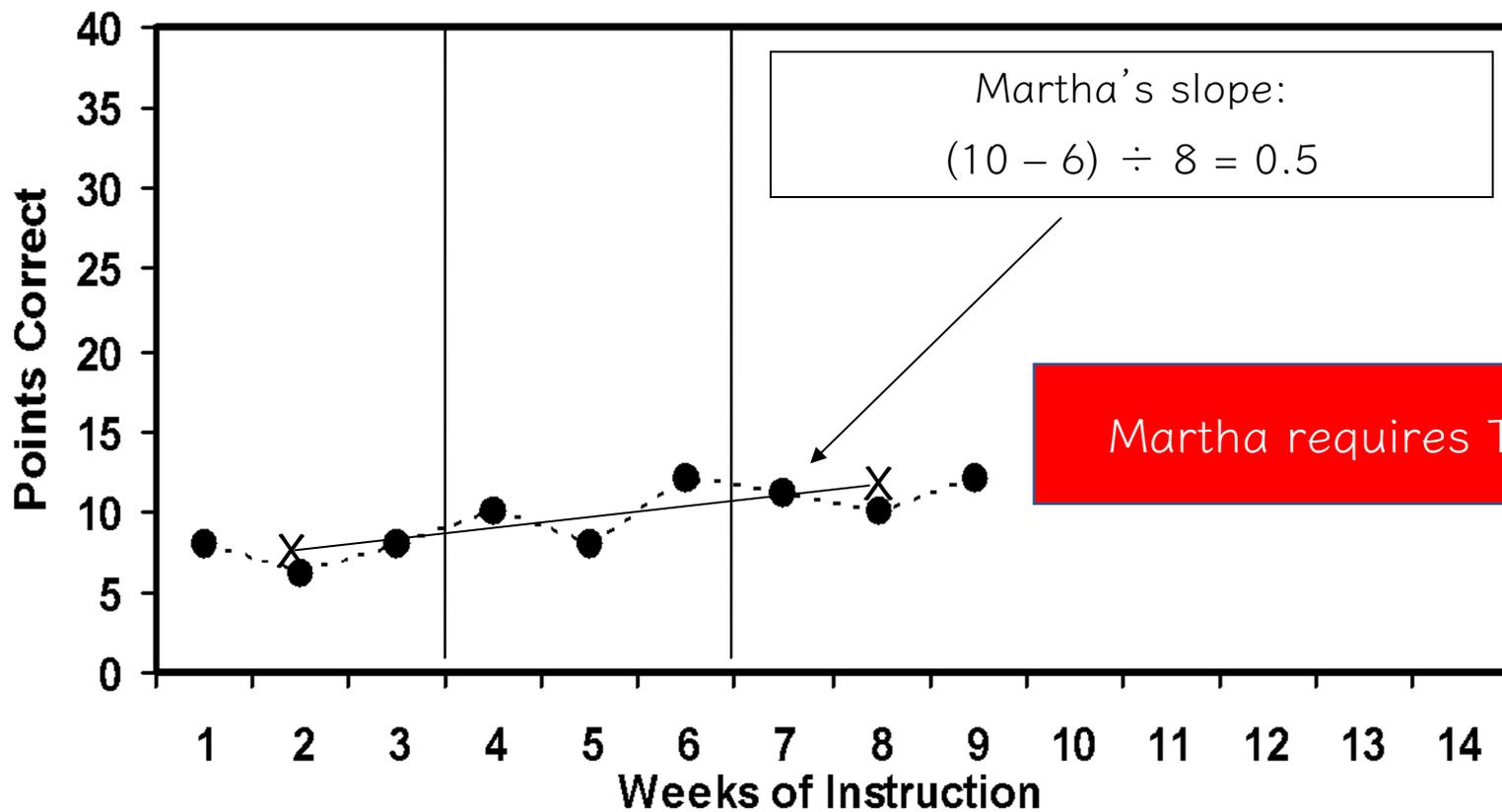
Decision Making:

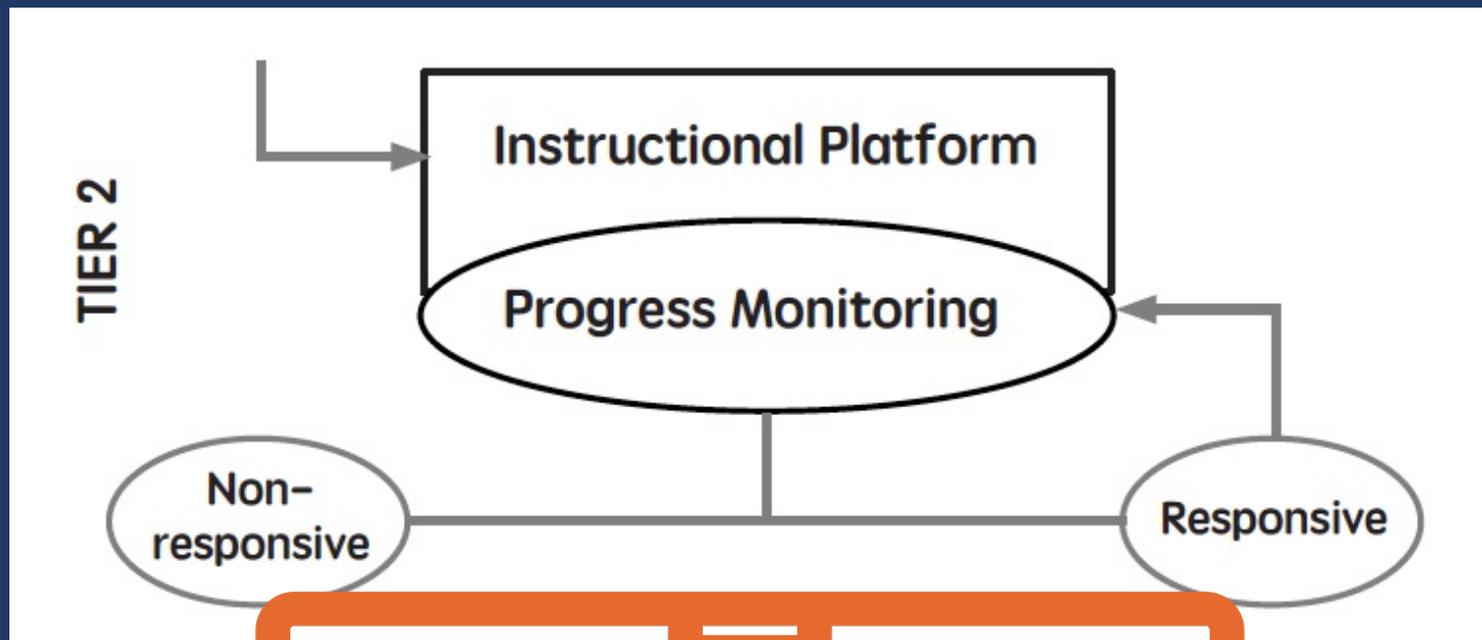
What else did you write?

David

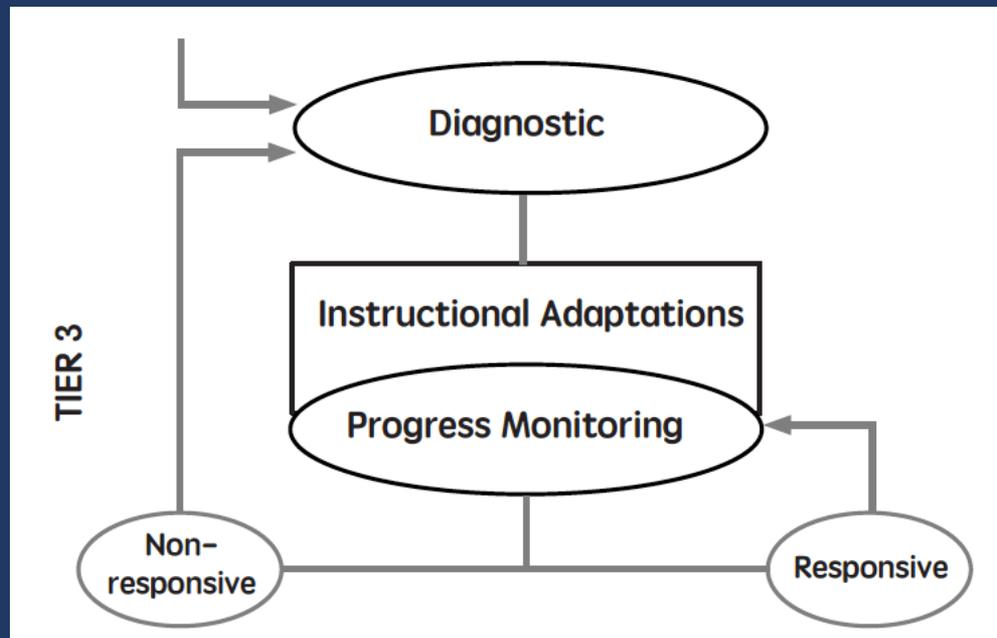


Martha



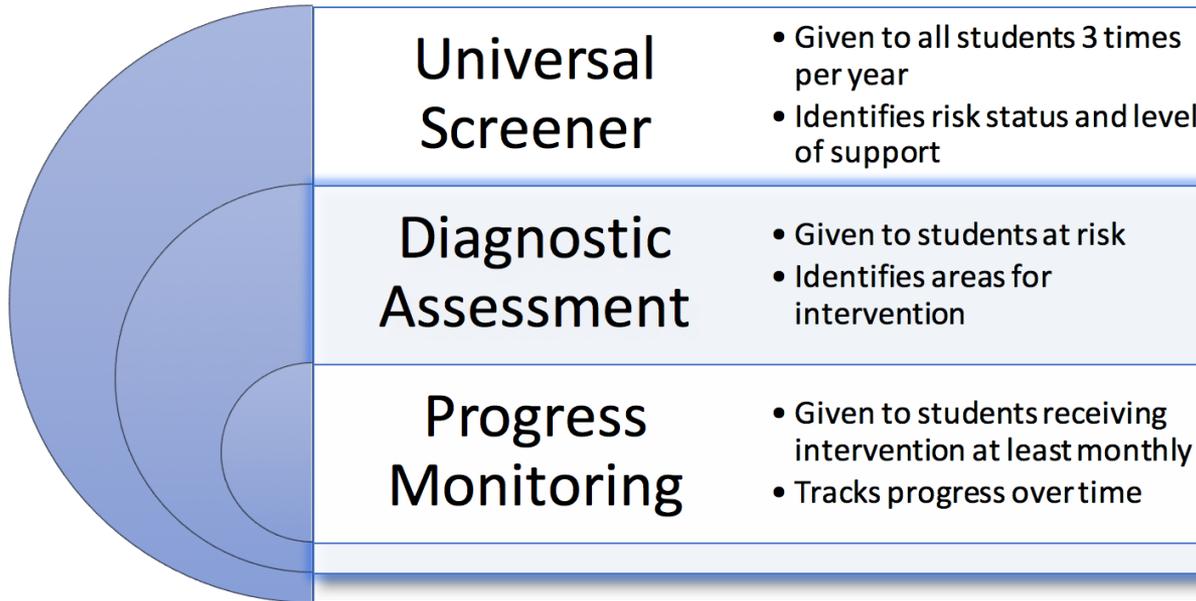


What are your school's
Tier 2 strengths and
weaknesses?



- Diagnostics are conducted
- Adaptations are made to the student's intervention
- Student progress is monitored weekly
 - With adequate slopes or end levels, students return to Tier 1 or 2

Diagnostic:



Instructional Adaptations:



Implement with greater fidelity

Ensure that you are implementing the intervention or strategy with fidelity

Cover, Copy, and Compare:

1. Create a sheet for the student. This sheet should contain 10 problems and cover material the student needs to practice. All problems should be answered.
2. Ask the student to look at each problem and read it aloud.
3. Ask the student to cover the problem with an index card.
4. Ask student to copy the entire problem to the right of the covered problem.
5. Ask student to lift up index card and compare his or her copy to the original.
6. Repeat for all problems.
7. Conduct three times per week.



Implement with greater fidelity

Ensure that you are implementing the intervention or strategy with fidelity

Math Fact Flash Cards

- __ Tutor greets student.
- __ Tutor starts timer.
- __ Tutor begins flash card activity immediately.
- __ Tutor reminds student of flash card procedures; answers questions if necessary.
- __ Tutor sets timer for 1 minute.
- __ Tutor allows student to respond to cards.
- __ Tutor prompts student to Count Up if incorrect.
- __ Tutor stops presenting cards when timer goes off.
- __ Tutor prompts student to count correct cards.
- __ Tutor encourages student to “beat the score.”
- __ Tutor sets timer for 1 minute.
- __ Tutor allows student to respond to cards.
- __ Tutor prompts student to Count Up if incorrect.
- __ Tutor stops presenting cards when timer goes off.
- __ Tutor prompts student to count correct cards.
- __ Tutor prompts student to graph the higher number.
- __ Tutor records flash card score in attendance log.
- __ Tutor rewards student with gold coin.

Word Problem Warm-Up

- __ Tutor presents word problem from previous session's Pirate Problems.
- __ Tutor encourages student to talk through solution steps.
- __ Tutor assists with explanation, as needed.
- __ Tutor rewards student with gold coin.

Tutoring Lesson

- __ Tutor begins tutoring lesson immediately.
- __ Tutor prompts student to describe Counting Up strategy.
- __ Tutor quizzes student on 4 math facts, reminding student to Count Up as necessary.
- __ Tutor presents story problem #1.
- __ Tutor allows time for student to respond.
- __ Tutor praises/corrects student's responses.
- __ Tutor rewards student with gold coin.

- __ Tutor presents story problem #2.
- __ Tutor allows time for student to respond.
- __ Tutor praises/corrects student's responses.
- __ Tutor rewards student with gold coin.

- __ Tutor presents story problem #3.
- __ Tutor allows time for student to respond.
- __ Tutor praises/corrects student's responses.
- __ Tutor rewards student with gold coin.

Sorting Activity

- __ Tutor begins sorting activity immediately.
- __ Tutor reminds student of sorting procedures and answers questions as necessary.
- __ Tutor sets timer for 2 minutes.
- __ Tutor reads cards out loud for student.
- __ Tutor allows student to place cards on sorting mat without interrupting.
- __ Tutor prompts student to stop when timer goes off.
- __ Tutor goes through correction procedure with up to 3 cards from “incorrect” pile.
- __ Tutor goes through cards with student, counting the number of correct cards.
- __ Tutor rewards student with gold coin.
- __ Tutor records sorting cards score on Attendance Log.

Pirate Problems Daily Review

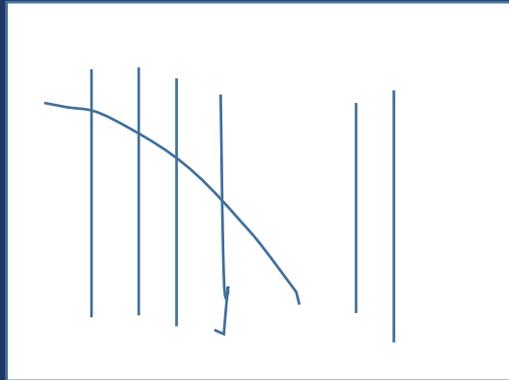
- __ Tutor begins Pirate Problems Daily Review immediately.
- __ Tutor reminds student of Pirate Problems procedures; answers questions as necessary.
- __ Tutor sets timer for 2 minutes.
- __ Tutor allows student to work independently for 2 minutes.
- __ Tutor prompts student to stop when timer goes off.
- __ Tutor sets timer for 2 more minutes (for word problem on back).
- __ Tutor allows student to work independently for 2 more minutes.
- __ Tutor prompts student to stop when timer goes off.
- __ Tutor corrects the problems while student watches.
- __ Tutor models Counting Up strategy for incorrectly answered items.
- __ Tutor writes score on corner of sheet.
- __ Tutor records Pirate Problems score in attendance log.
- __ Tutor rewards student with gold coin.
- __ Tutor prompts student to count coins and mark on map.
- __ Tutor dismisses student to return to class.
- __ Tutor stops timer.
- __ Tutor records time of session in attendance log.
- __ Tutor records date in attendance log.



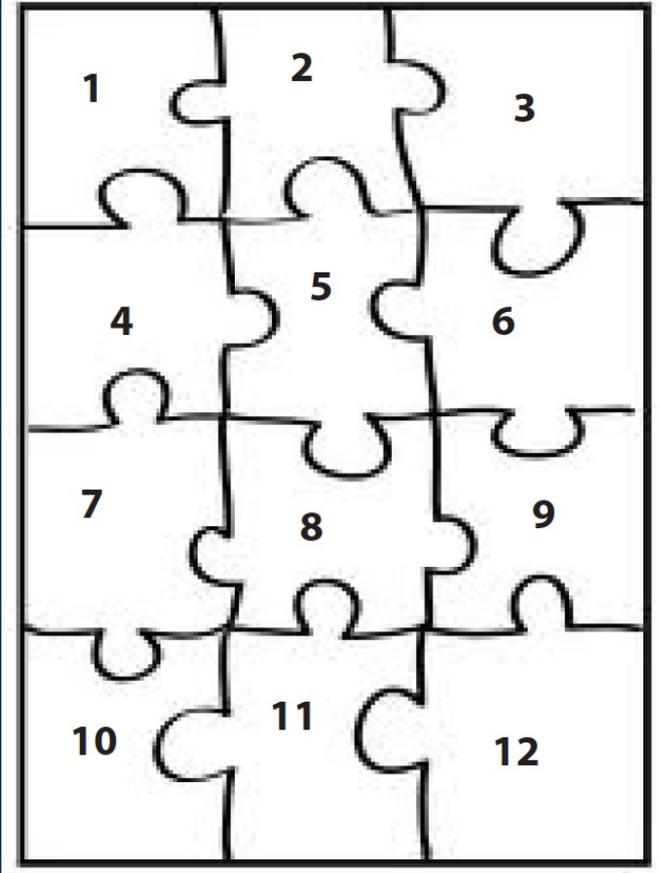
Implement with greater fidelity

Embed behavioral supports

May want to incorporate strategies to improve self-regulation and minimize nonproductive behavior



PUZZLE



Implement with greater fidelity

Embed behavioral supports

May want to incorporate strategies to improve self-regulation and minimize nonproductive behavior

UPSCheck
Understand
Plan
Solve
Check



Implement with greater fidelity

Embed behavioral supports

Increase dosage

Conduct longer sessions, more sessions per week, or more weeks within DBI



Implement with greater fidelity

Embed behavioral supports

Increase dosage

Conduct longer sessions, more sessions per week, or more weeks within DBI

September

October 2015
S M T W T F S
1 2 3
4 5 6 7 8 9 10
11 12 13 14 15 16 17
18 19 20 21 22 23 24
25 26 27 28 29 30 31

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
30	31	1	2	3	4	5
6	7 Labor Day	8 ★	9 ★	10 ★	11 ★	12
13	14	15 ★	16 ★	17 ★	18 ★	19
20	21	22 ★	23 ★	24 ★	25 ★	26
27	28	29 ★	30 ★	1 ★	2 ★	3



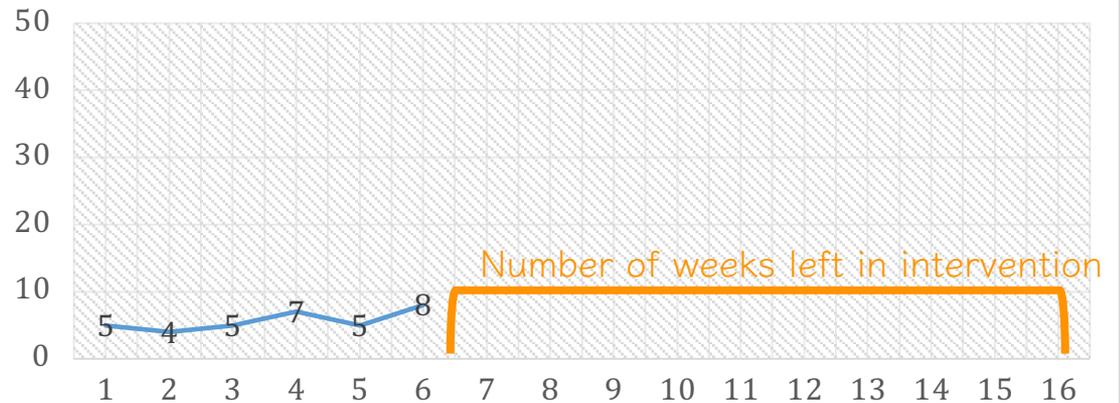
Implement with greater fidelity

Embed behavioral supports

Increase dosage

Conduct longer sessions, more sessions per week, or more weeks within DBI

Maria's Progress



Implement with greater fidelity

Embed behavioral supports

Increase dosage

Adapt mathematics content



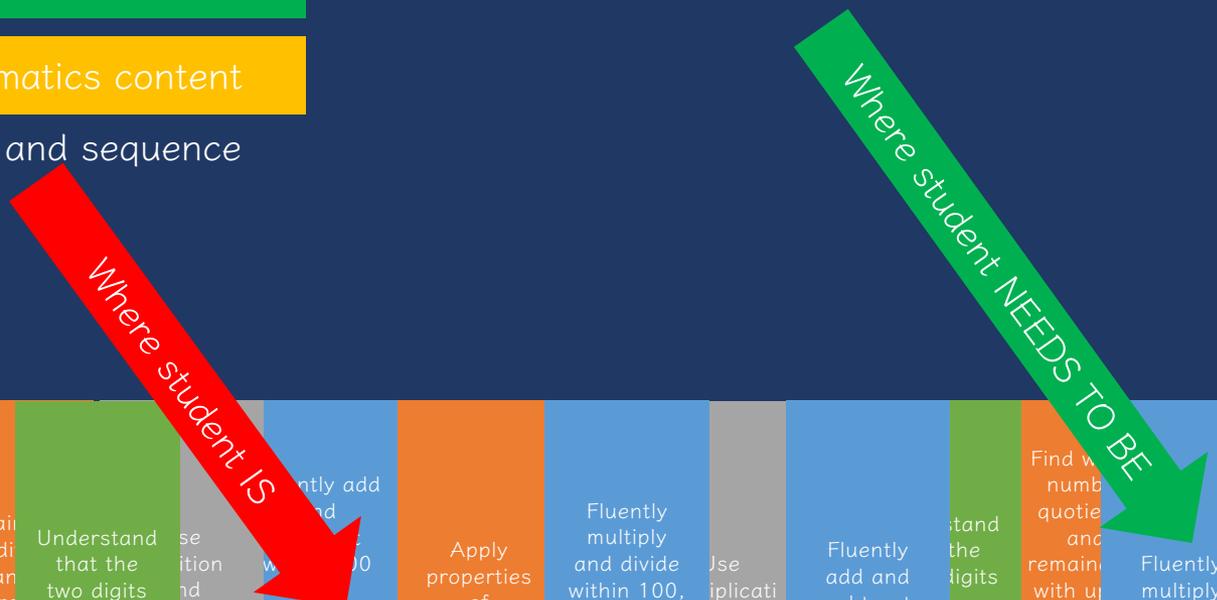
Implement with greater fidelity

Embed behavioral supports

Increase dosage

Adapt mathematics content

Alter the scope and sequence



Explain addition and subtraction strategies using place value and properties of operations.	Understand that the two digits of a two-digit number represent amounts of tens and ones.	Use addition and subtraction within 100 to solve problems and explain the steps.	Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.	Apply properties of operations as strategies to multiply and divide.	Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division.	Use multiplication and division within 100 to solve word problems.	Fluently add and subtract multi-digit whole numbers using the standard algorithm.	Understand the digits in a three-digit number represent hundreds, tens, and ones.	Find whole number quotients and remainders with up to four-digit dividends and one-digit divisors using strategies based on place value.	Fluently multiply multi-digit whole numbers using the standard algorithm.	Solve multi-step word problems with whole numbers involving multiplication, division, and operations with whole numbers.
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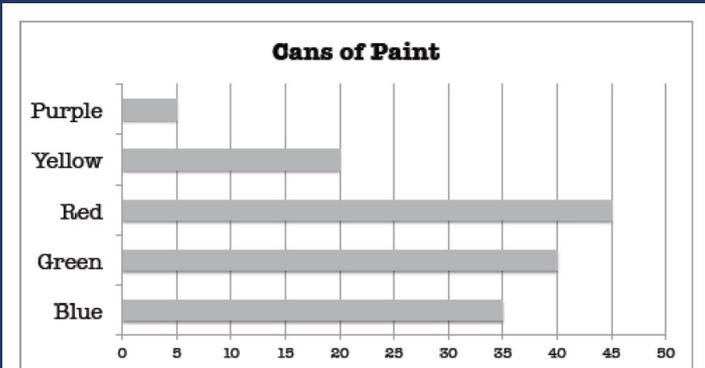
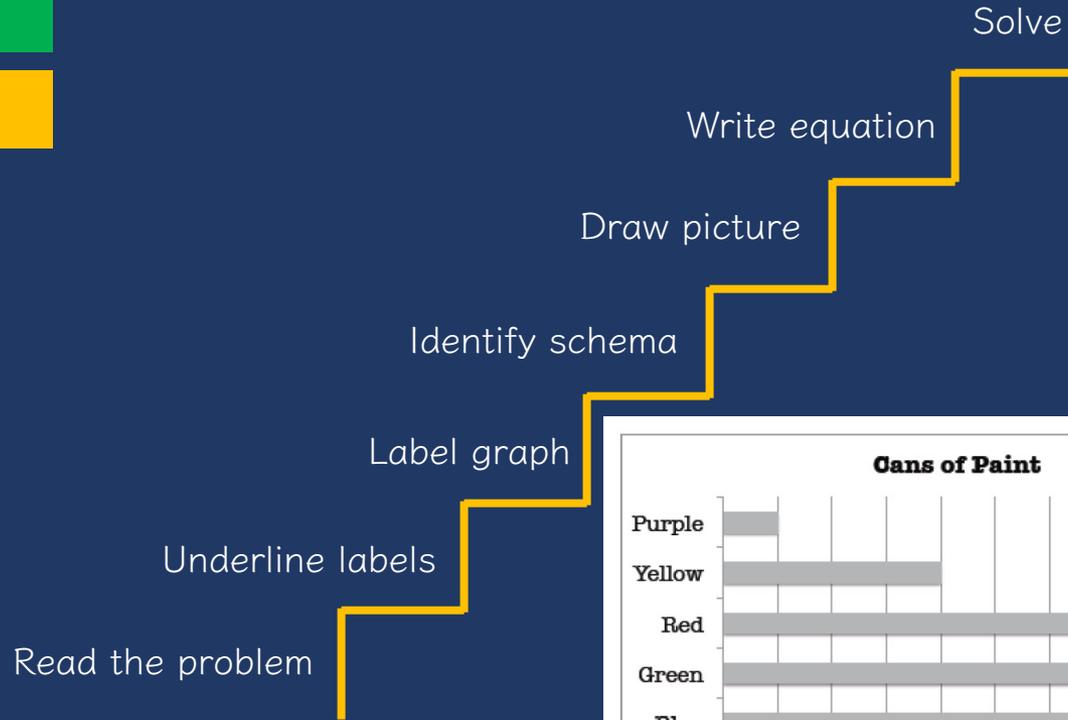
Implement with greater fidelity

Embed behavioral supports

Increase dosage

Adapt mathematics content

Break down problems into smaller steps



A. If the hardware store sells all of the purple, yellow, and blue cans of paint, how many cans of paint will the store sell?



Implement with greater fidelity

Embed behavioral supports

Increase dosage

Adapt mathematics content

Focus on the language of
mathematics

precise

concise



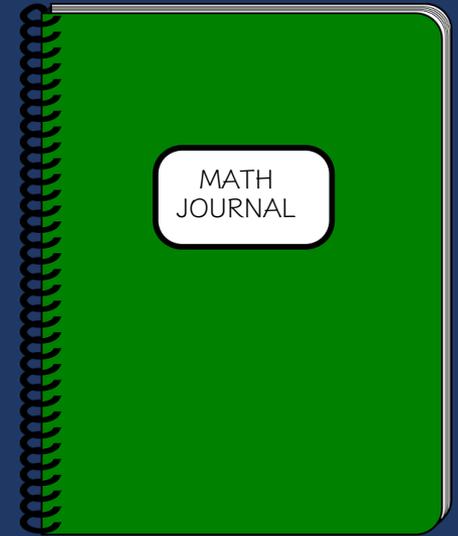
Implement with greater fidelity

Embed behavioral supports

Increase dosage

Adapt mathematics content

Focus on the language of mathematics



Define:	Characteristics:
<input type="text"/>	
Example:	Non-example:



Implement with greater fidelity

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Engage student in more
discourse

“Tell me how you solved this problem.”

“What were you thinking about when you regrouped?”

“How would you teach this problem to another student?”

“Describe the word problem in 10 words or less.”



Implement with greater fidelity

Embed behavioral supports

Increase dosage

Adapt mathematics content

Provide worked examples

“Talk through this problem with me.”

$$\begin{array}{r} 405 \\ + 16 \\ \hline 411 \end{array}$$

$$\begin{array}{r} 405 \\ + 16 \\ \hline 421 \end{array}$$



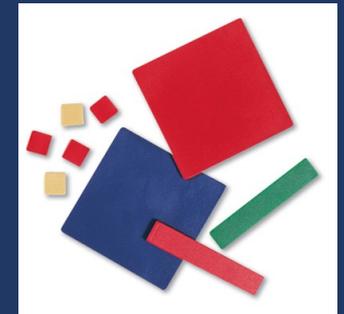
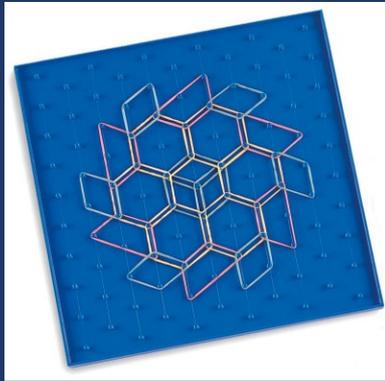
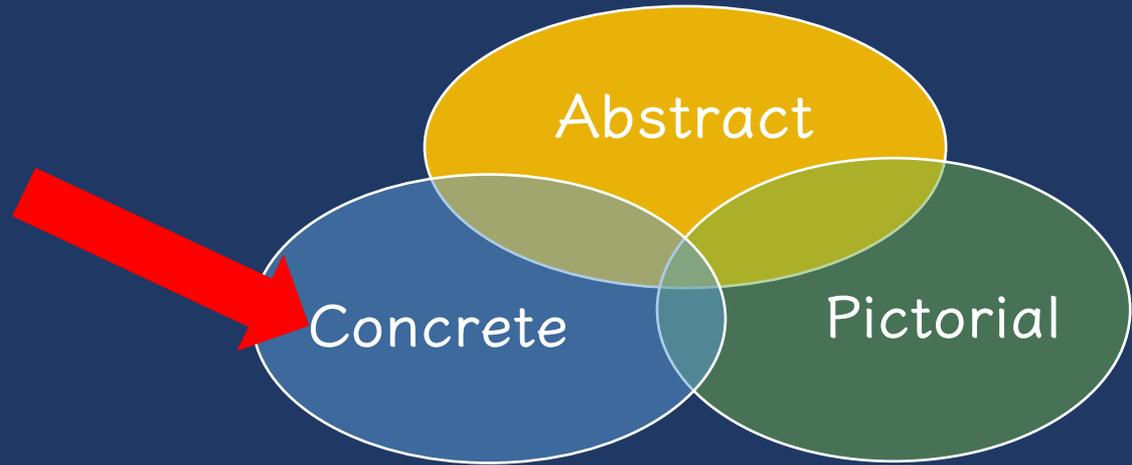
Implement with greater fidelity

Embed behavioral supports

Increase dosage

Adapt mathematics content

Utilize more three-dimensional representations



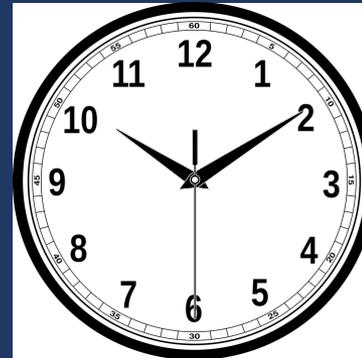
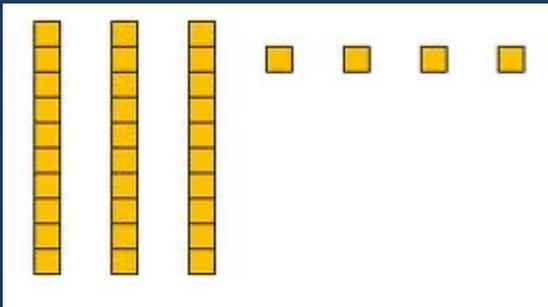
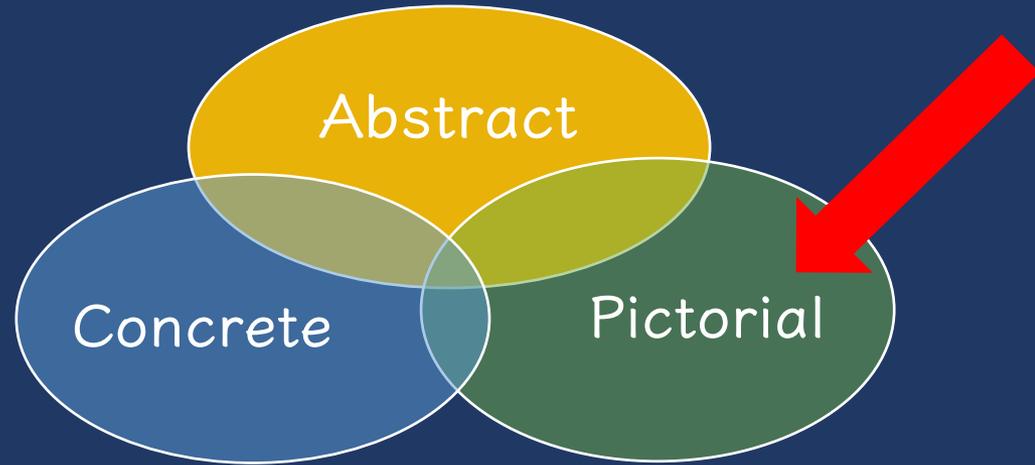
Implement with greater fidelity

Embed behavioral supports

Increase dosage

Adapt mathematics content

Utilize more two-dimensional representations



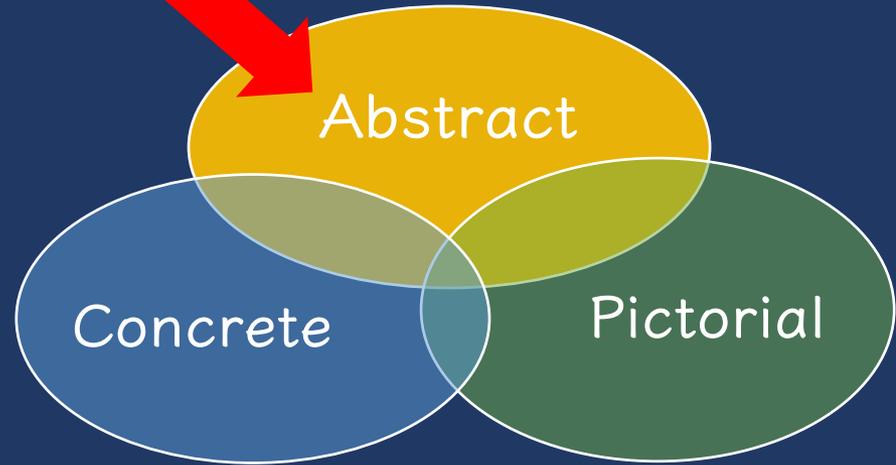
Implement with greater fidelity

Embed behavioral supports

Increase dosage

Adapt mathematics content

Ensure students understand the abstract



$$2 + 8 = 10$$

34 = 3 tens and 4 ones

$$x - 6 = 8$$

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



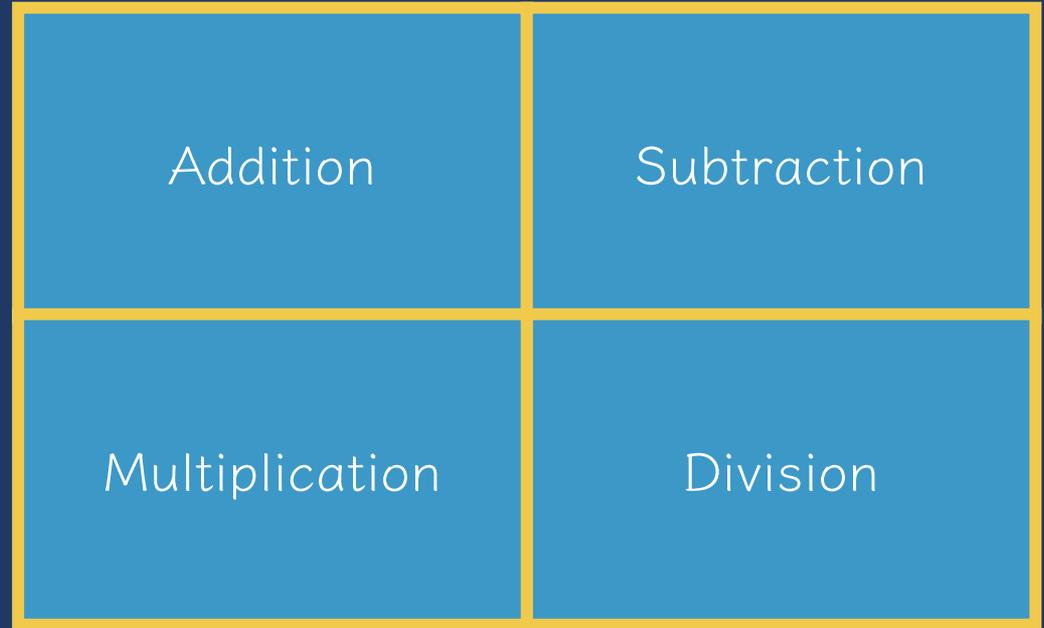
Implement with greater fidelity

Embed behavioral supports

Increase dosage

Adapt mathematics content

Focus on fact fluency



Implement with greater fidelity

Embed behavioral supports

Increase dosage

Adapt mathematics content



X	1	2	3	4	5

$$-3 + (-4) = \underline{\quad} \quad 5 - (-6) = \underline{\quad}$$



Implement with greater fidelity

Embed behavioral supports

Increase dosage

Adapt mathematics content

Teach alternate algorithms

Subtraction

Standard

$$\begin{array}{r} 315 \\ - 96 \\ \hline \end{array}$$

Partial
Differences

$$\begin{array}{r} 315 \\ - 96 \\ \hline \end{array}$$

Add Up

$$\begin{array}{r} 315 \\ - 96 \\ \hline \end{array}$$



Implement with greater fidelity

Embed behavioral supports

Increase dosage

Adapt mathematics content

Encourage alternate methods
and solutions

$$\begin{array}{r} 405 \\ + 16 \\ \hline 400 \\ 10 \\ + 11 \\ \hline 421 \end{array}$$

$$\begin{array}{r} 405 \\ + 16 \\ \hline 421 \end{array}$$



Implement with greater fidelity

Embed behavioral supports

Increase dosage

Adapt mathematics content

Explicitly teach problem solving



Don't tie key words
to operations



Have an attack
strategy



Teach word-
problem schemas



Implement with greater fidelity

Embed behavioral supports

Increase dosage

Adapt mathematics content

Utilize explicit instruction

Make sure you're doing it! And do it well!

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



Implement with greater fidelity

Embed behavioral supports

Increase dosage

Adapt mathematics content

Utilize explicit instruction

Explicitly teach transfer

Explicitly teach how current learning relates to other learning

$$\begin{array}{r} 405 \\ + 16 \\ \hline \end{array} \quad \begin{array}{r} 4305 \\ + 216 \\ \hline \end{array}$$

Marney baked 89 cookies and sold 40 cookies at the bake sale. How many cookies does Marney have left?

Marney had \$89 and spent \$40 on shoes. How much money does Marney have left?

Marney had \$89 and spent \$40 on shoes. How much money will Marney have after buying the shoes?



Instructional Adaptations:

Implement with greater fidelity

Embed behavioral supports

Increase dosage

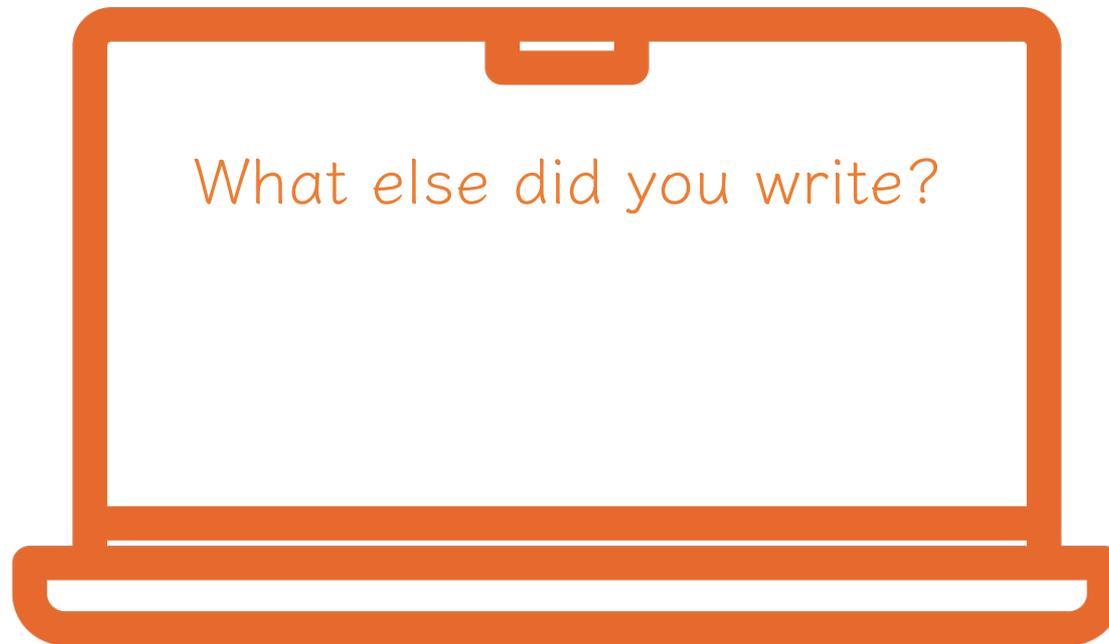
Adapt mathematics content

Utilize explicit instruction

Explicitly teach transfer



Instructional Adaptations:



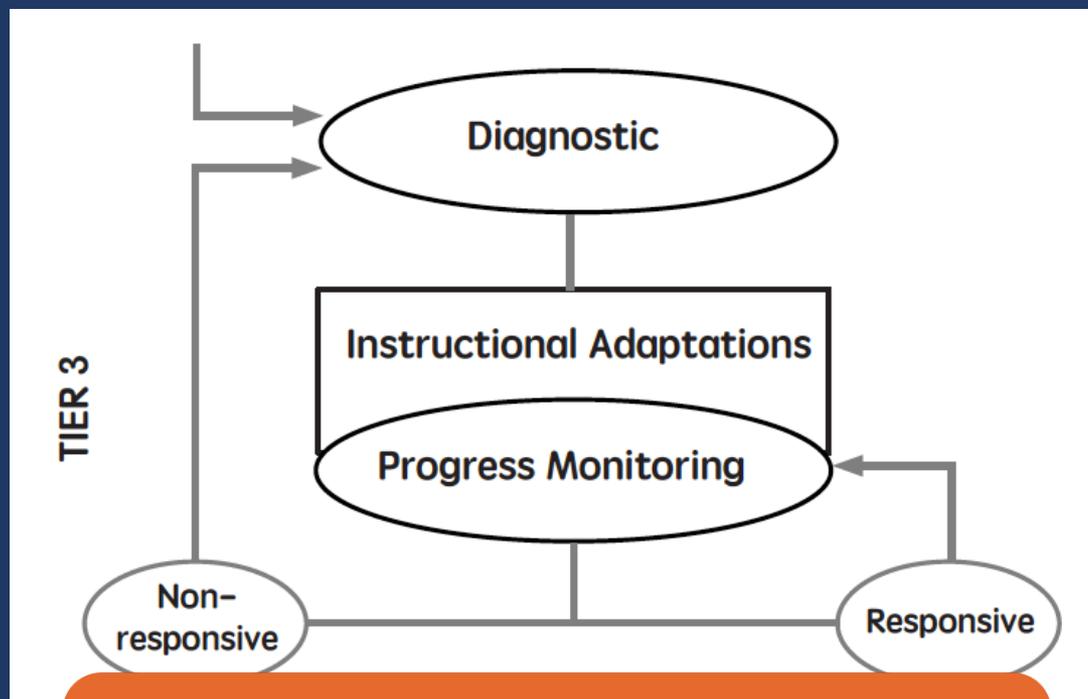
Progress Monitoring:

- Reliable measures, administered regularly
- Efficient and easy to administer
- Skills assessed serve as indicators of general knowledge

Decision Making:

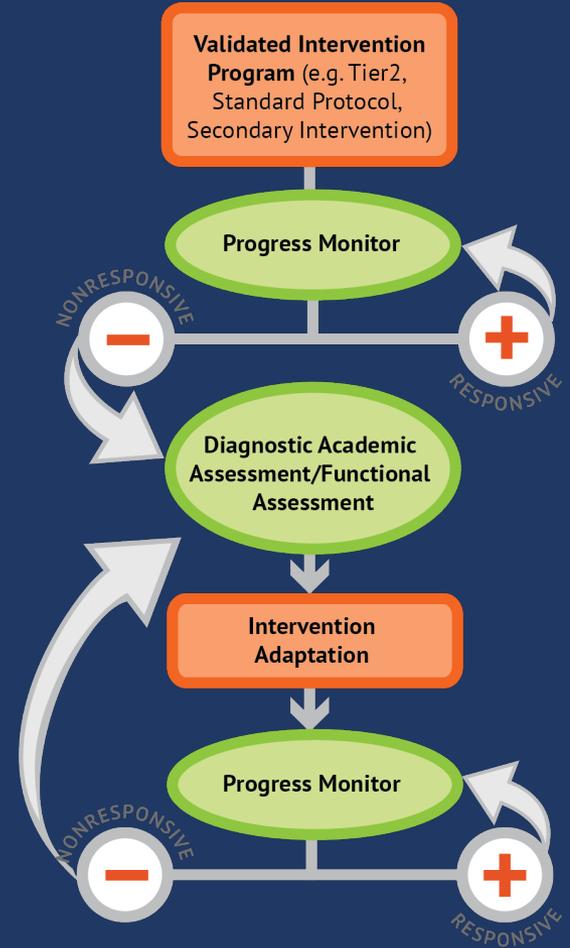
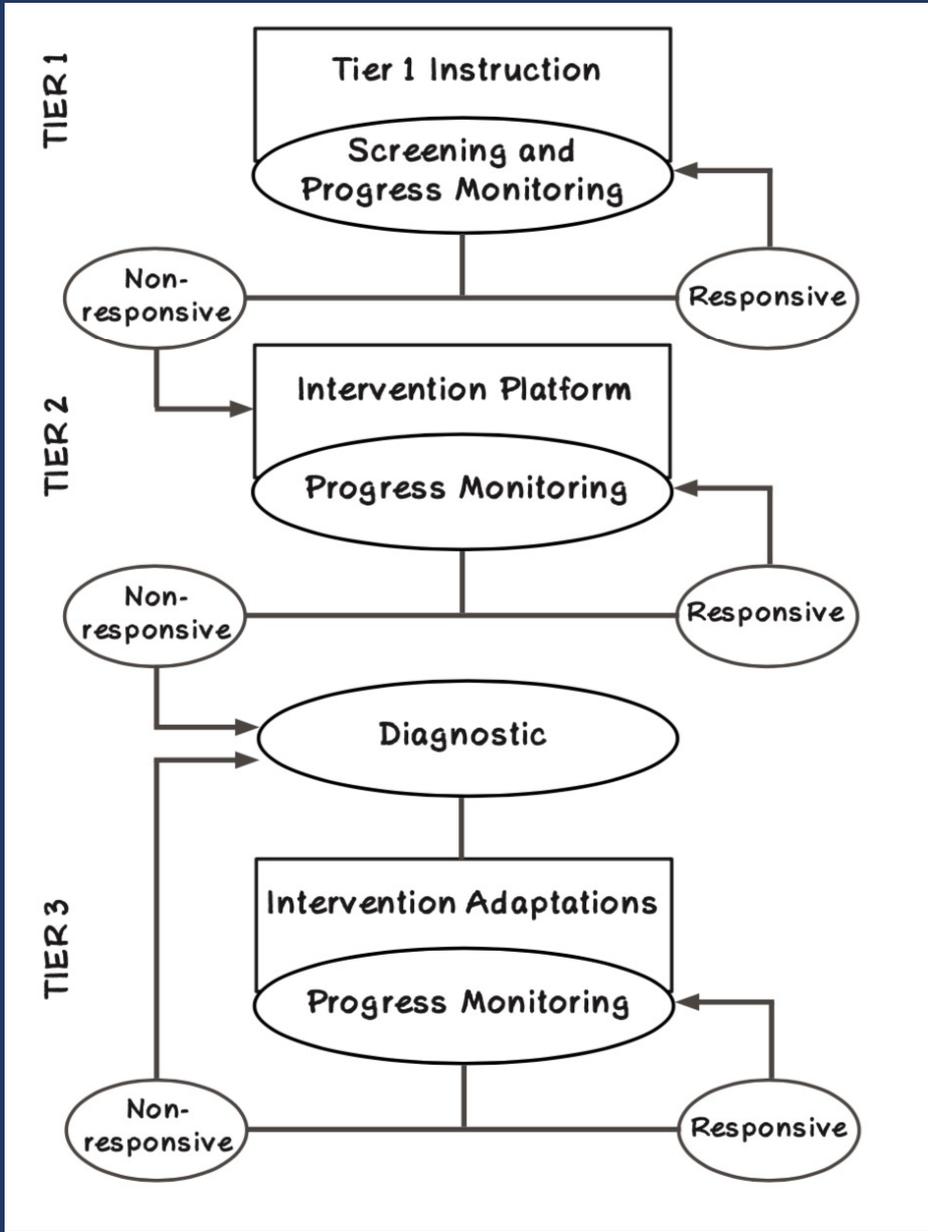
- After 10-20 weeks, student progress is determined





What are your school's Tier 3 strengths and weaknesses?



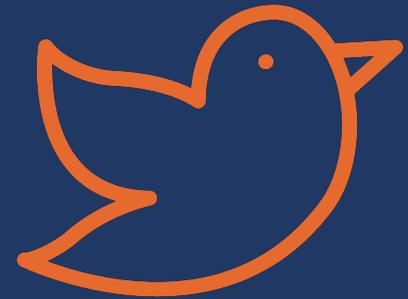


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