

Welcome to Project STAIR 2.0

Professional Development - Day 1



Principal Investigators



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Anne Marie Light



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UT Austin Research Team



TEXAS
The University of Texas at Austin



Sarah King



Katie Mason



Jessica Mao



Lauren McKenzie

Today's Materials

Teacher folder:

- Presentation handouts
 - Slides
 - Guided notes
- Teacher consent form
- Teacher W-9
- Copies of Parent consent
 - English
 - Spanish



Let Us Get to Know You



1. Name
2. How long have you been teaching?
3. What brought you to the project?
4. What do you hope to get from participating?

Agenda

Introduction

Project Overview and Goals

Defining Data-Based Individualization
(DBI)

STAIR 2.0 DBI Framework

Key Features of STAIR 2.0

- Algebra Readiness
- Instructional Program
- Assessment Data

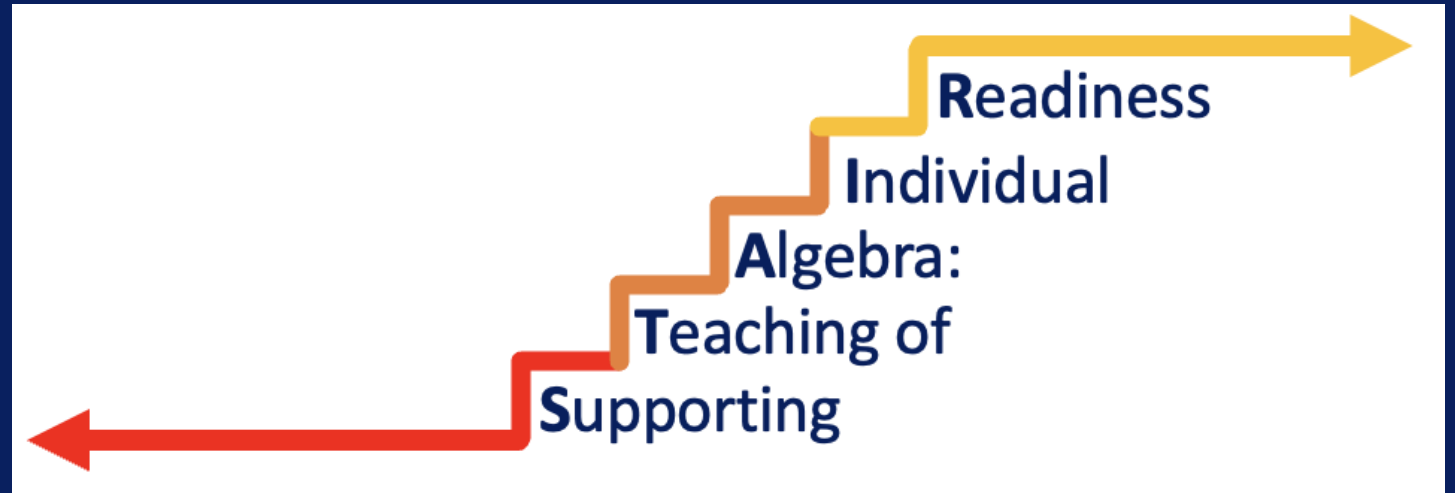
Implementation and Logistics

Next Steps & Wrap Up

Project Overview and Goals

What is Project STAIR 2.0?

Initial Study



- Funded by the Office of Special Education Programs (OSEP) of the U.S. Department of Education
- Funding period: 2018-2022
- Researchers from **Missouri**, **SMU**, and **UT Austin**
- Goal: to prepare students for **algebra**

Initial Study → Findings

What we learned...




Teacher
Knowledge



Student
Math Outcomes

Contents lists available at [ScienceDirect](#)

 **ELSEVIER**

Studies in Educational Evaluation

journal homepage: www.elsevier.com/locate/stueduc

Data-based individualization in mathematics to support middle school teachers and their students with mathematics learning difficulty

Sarah R. Powell^a, Erica S. Lembke^{b,*}, Leanne R. Ketterlin-Geller^c, Yaacov Petscher^d, Jiyung Hwang^b, Samantha E. Bos^a, Taylor Cox^c, Stacy Hirt^b, Erica N. Mason^b, Tiffini Pruitt-Britton^c, Elizabeth Thomas^b, Stephanie Hopkins^b

^a *The University of Texas at Austin, United States*
^b *University of Missouri, United States*
^c *Southern Methodist University, United States*
^d *Florida State University, United States*

What We Learned

- Teachers and students both benefitted from STAIR
 - **Teachers** demonstrated increased scores on understanding, confidence using, and frequency of DBI
 - **Students** grew significantly from pre- to posttest on 2 of 3 pre-algebraic outcome measures
 - There was a significant mean difference on the standardized DOMA

Remaining Questions

- How do we continue to support teachers and students as we navigate ongoing academic and economic impacts of the COVID-19 pandemic?
 - How do we do this while also being mindful of:
 - School-based personnel and staffing shortages
 - Cost
 - Limited resources
 - Students' individual academic/behavioral needs

Our Path Forward

- Institute for Education Sciences Research to Accelerate Pandemic Recovery in Special Education
 - **Project STAIR 2.0**



Current Study



- Funded by the Institute for Education Sciences
- Funding period: 2023-2027
- Researchers from **Missouri**, **SMU**, and **UT Austin**
- Goal: to prepare students for **algebra**

Accelerate Pandemic Recovery



Struggling Mathematicians

The 2022 National Assessment of Educational Progress (NAEP) results revealed that **78% of students with disabilities (SWD's) fall below basic** targets in math at 8th grade, compared to 34% percent of students without disabilities (NCES, 2022).

Students experiencing math challenges prior to the pandemic are facing even greater difficulties as in-person learning resumed, and many **students who did not experience math difficulties pre-pandemic demonstrate challenges now** (Texas Education Agency, 2021).

On-Going Partnership

- **2-year partnership**
- Our goal is to build teacher capacity to implement evidence-based strategies and intervention that can be sustained in classrooms
- Project timeline
 - Implementation Fall 2023 – Spring 2024
 - Sustainability checks 2025

STAIR 2.0 Roadmap



Recruit Students & Professional Development

Teachers will recruit qualifying students while working through 12 PD modules with research team.

Coaching Year 1

Teachers and coaches will work together on a weekly or bi-weekly basis. Teachers will progress monitor students and implement instructional changes.

Data Returned

Data will be returned to teachers so teachers can utilize the data findings while still providing instruction.



Initial Data Collection

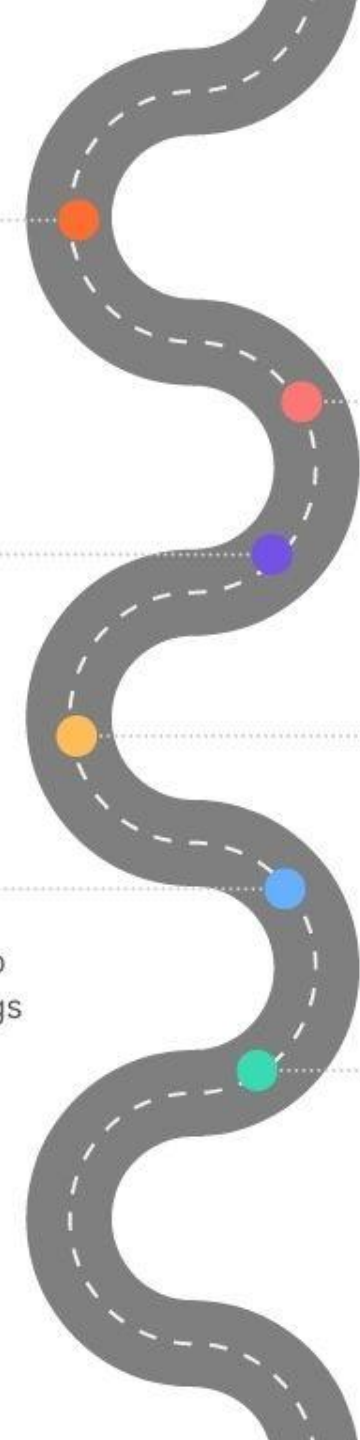
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Post Data Collection

The research team and teachers will work together to collect teacher and student post-assessment data.

Data Collection & Coaching Year 2

Teachers and students will continue in year 2. Teachers will engage in an individualized coaching cycle during year 2.



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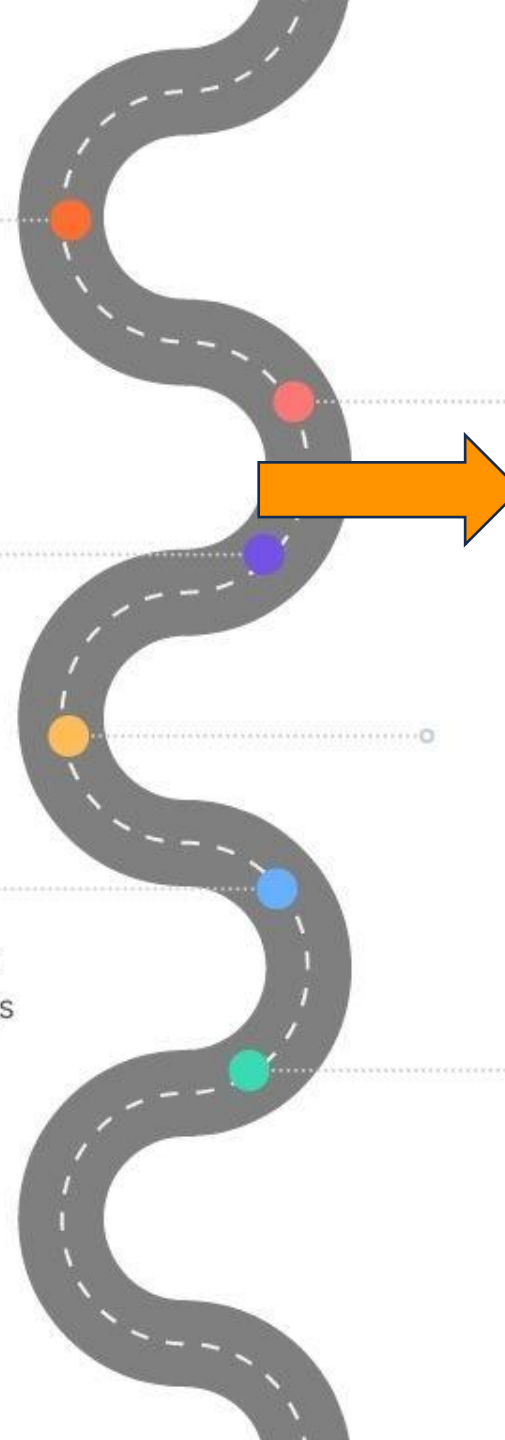
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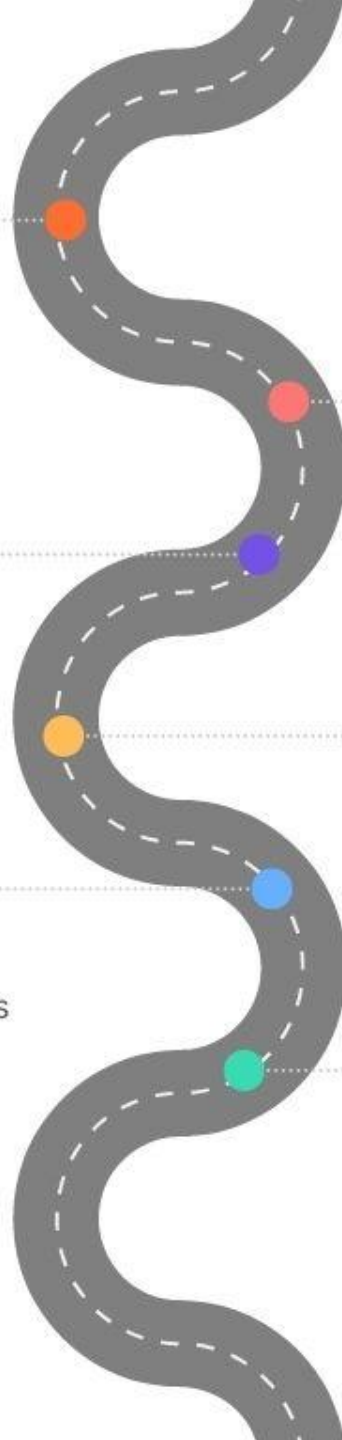
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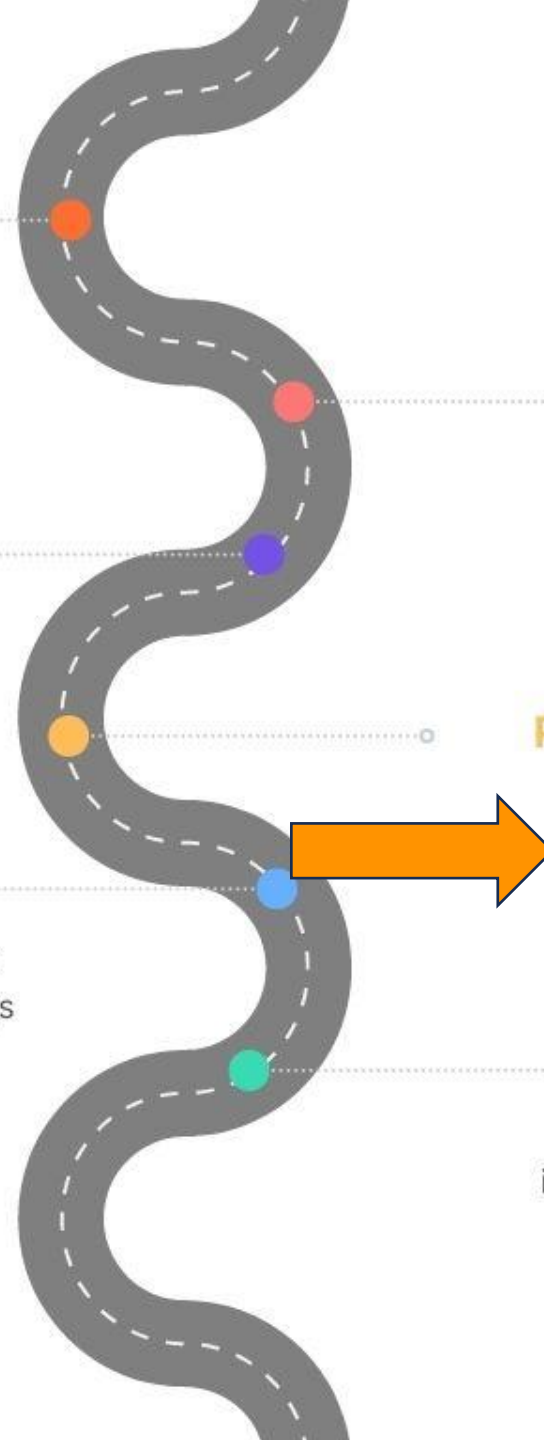
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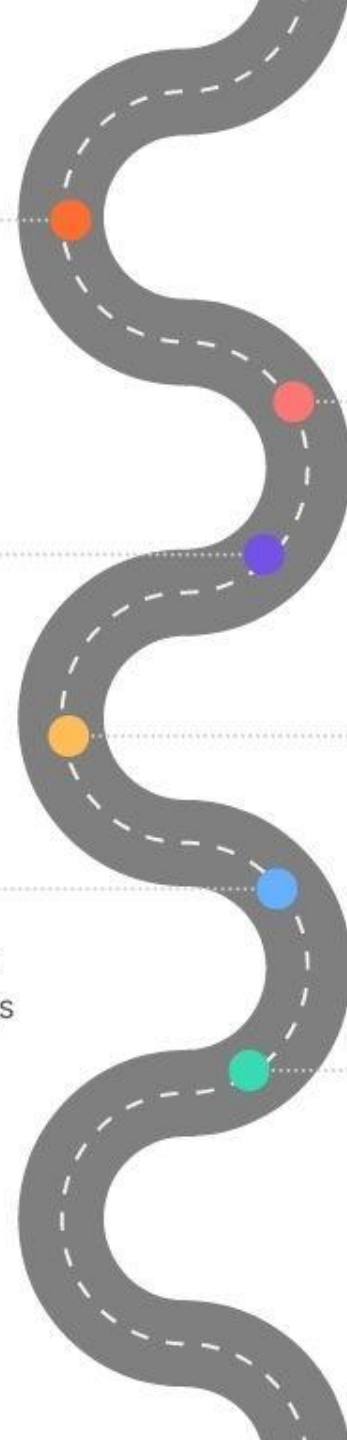
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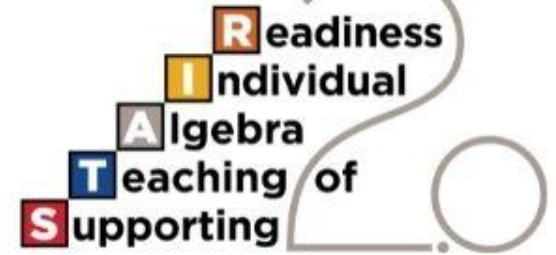
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Defining Data-Based Individualization

What is DBI and how does it fit into the STAIR 2.0 Framework?

DBI Glossary

Term	Definition
Data-Based Individualization	A research-based process for individualizing and intensifying interventions through the systematic use of assessment data, validated interventions, and research-based adaptation strategies.
Instructional Platform	The instruction you are currently providing to students that serves as a the “jumping off point” for the DBI framework.
Intervention	The combination of effective instructional practices and on-going assessment data collection and evaluation that is individualized to meet, and respond to, the unique needs of students.

Defining DBI

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

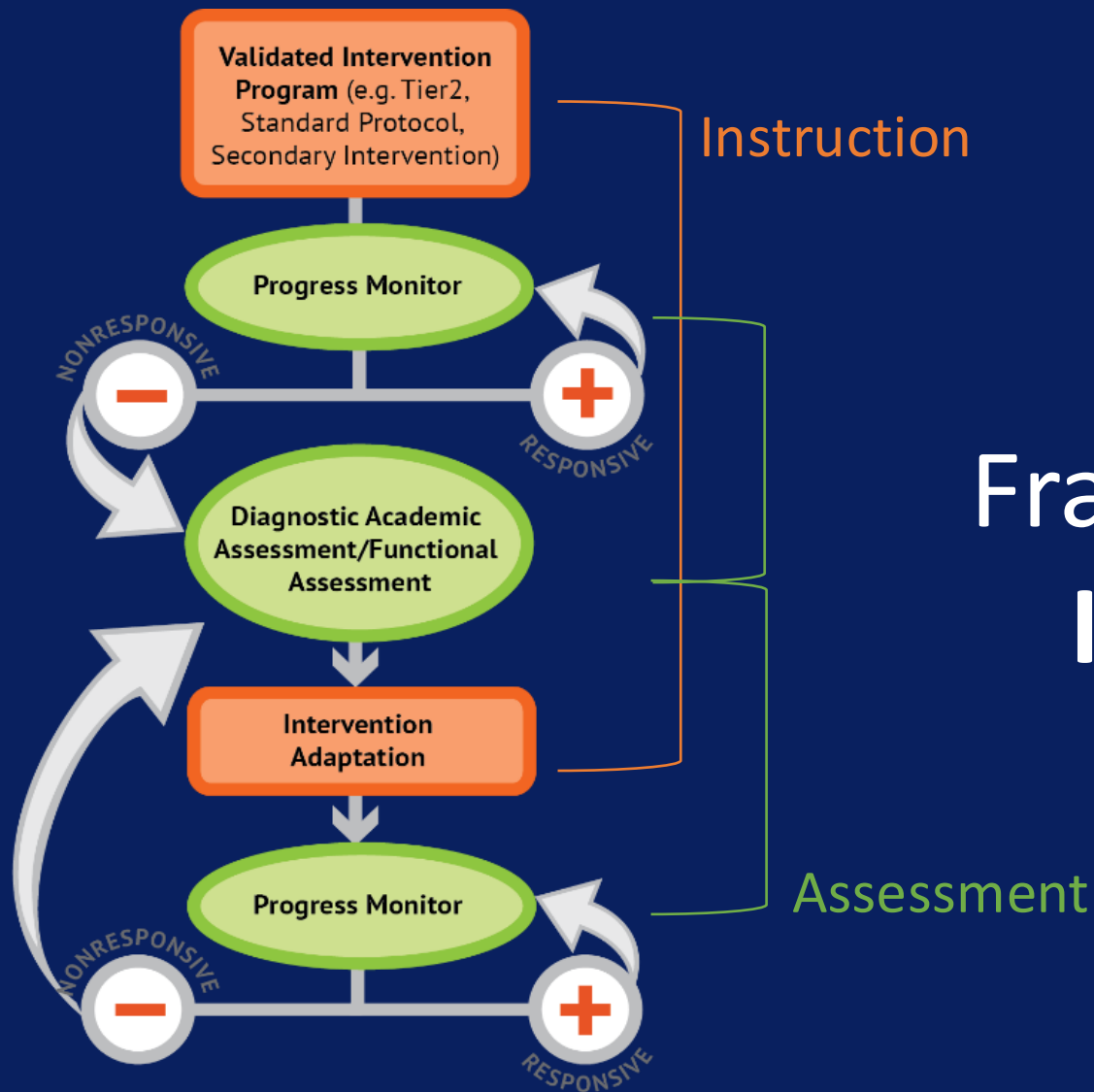
Data-Based Individualization

Is...

- A *framework* for making instructional decisions
- A *dynamic process* of ongoing assessment and intervention

Is not...

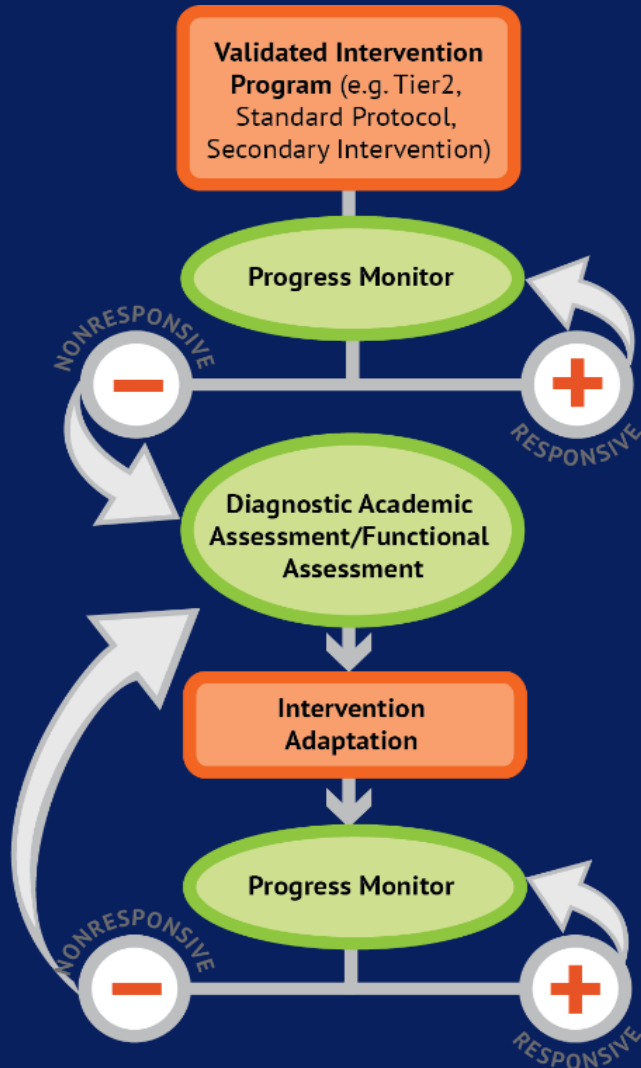
- A curriculum
- An assessment
- A single intervention



National Center on Intensive Intervention Framework for Data-Based Individualization (DBI)

Understanding The DBI Framework

Establish that there is a Tier 2 validated intervention/instructional platform in place

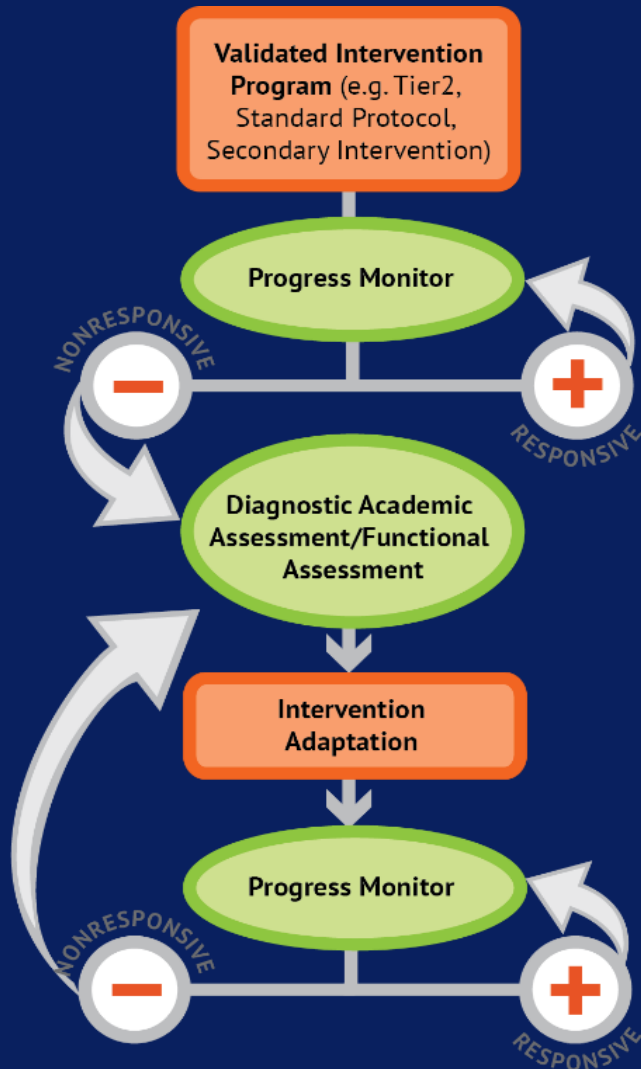


Understanding The DBI Framework

Establish that there is a Tier 2 validated instructional platform in place

Progress monitor:

- Establish a present level of performance
- Set an ambitious long-term goal
- Collect frequent assessment data
- Use decision rules



Understanding The DBI Framework

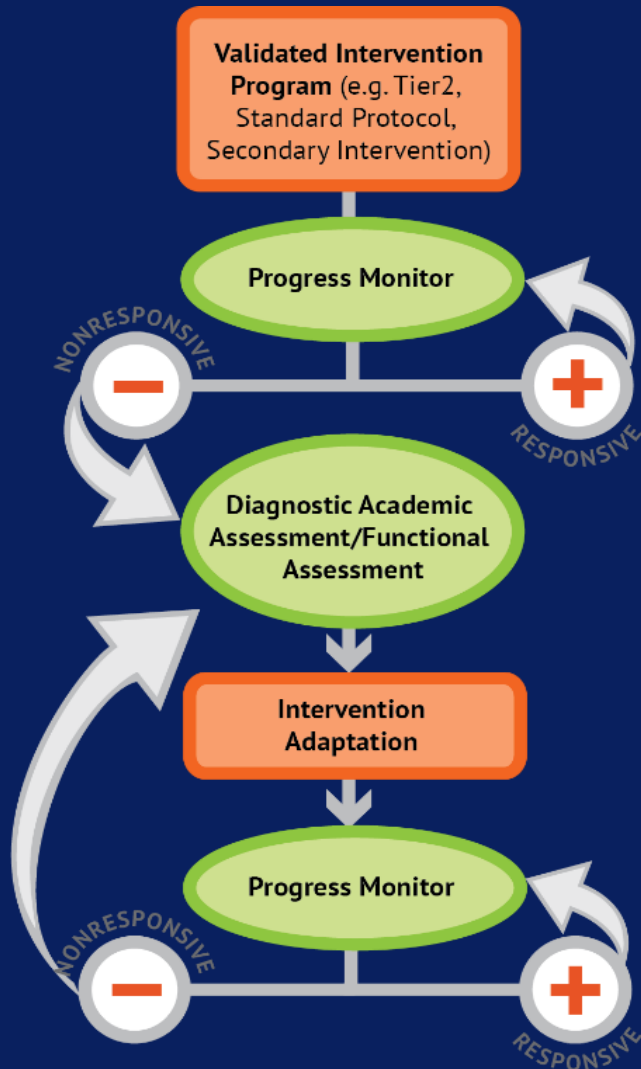
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Based on student response:

- Continue the Tier 2 program with progress monitoring OR
- Collect diagnostic data



Understanding The DBI Framework

Establish that there is a Tier 2 validated instructional platform in place

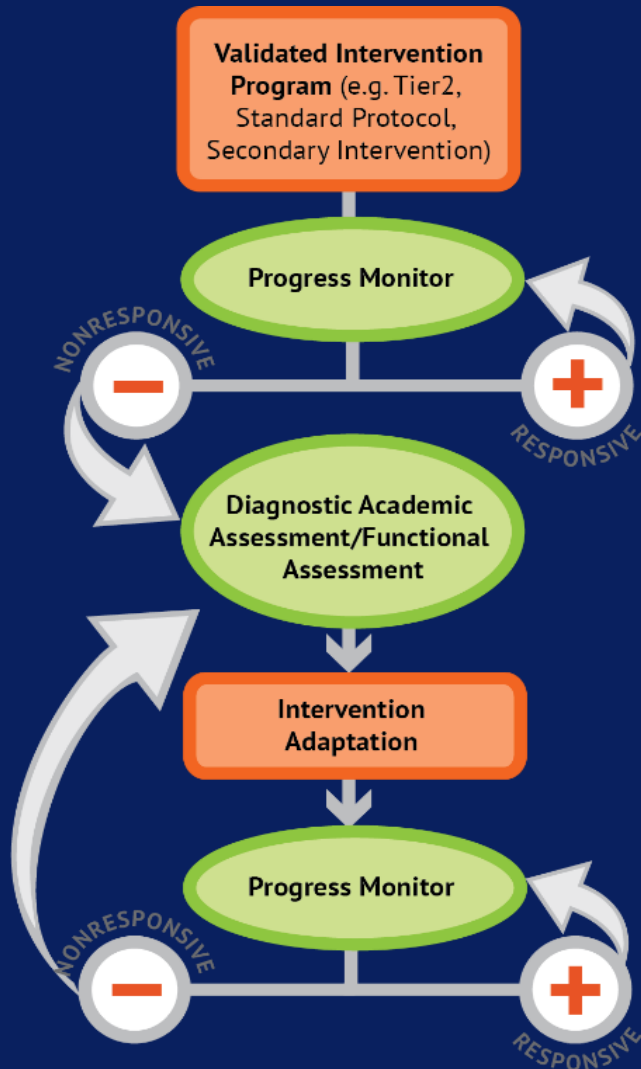
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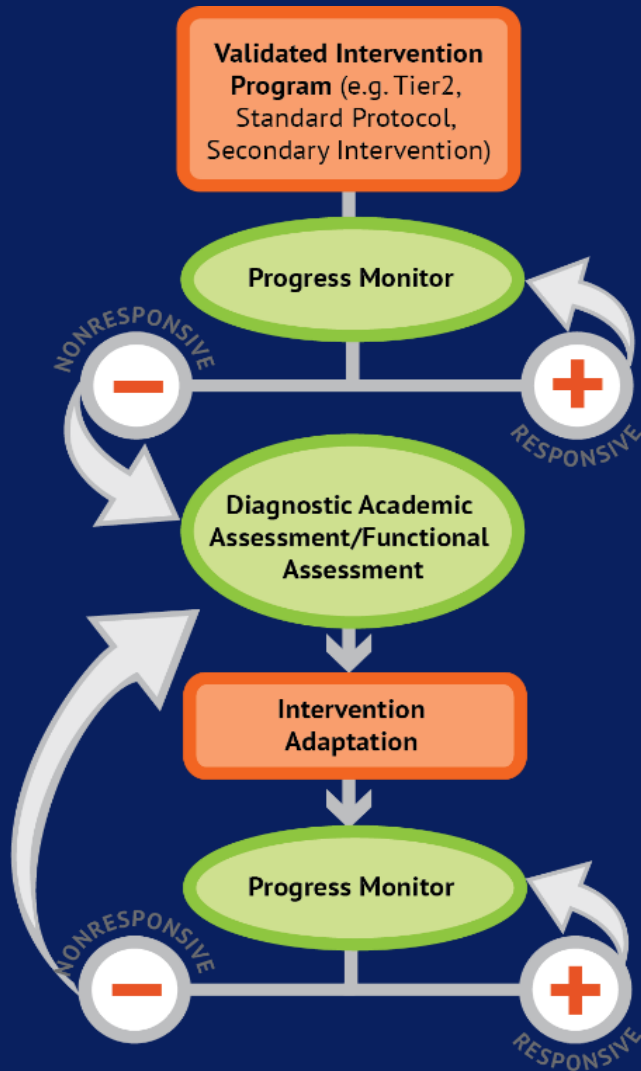
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Make instructional adaptations based on a hypothesis



Understanding The DBI Framework



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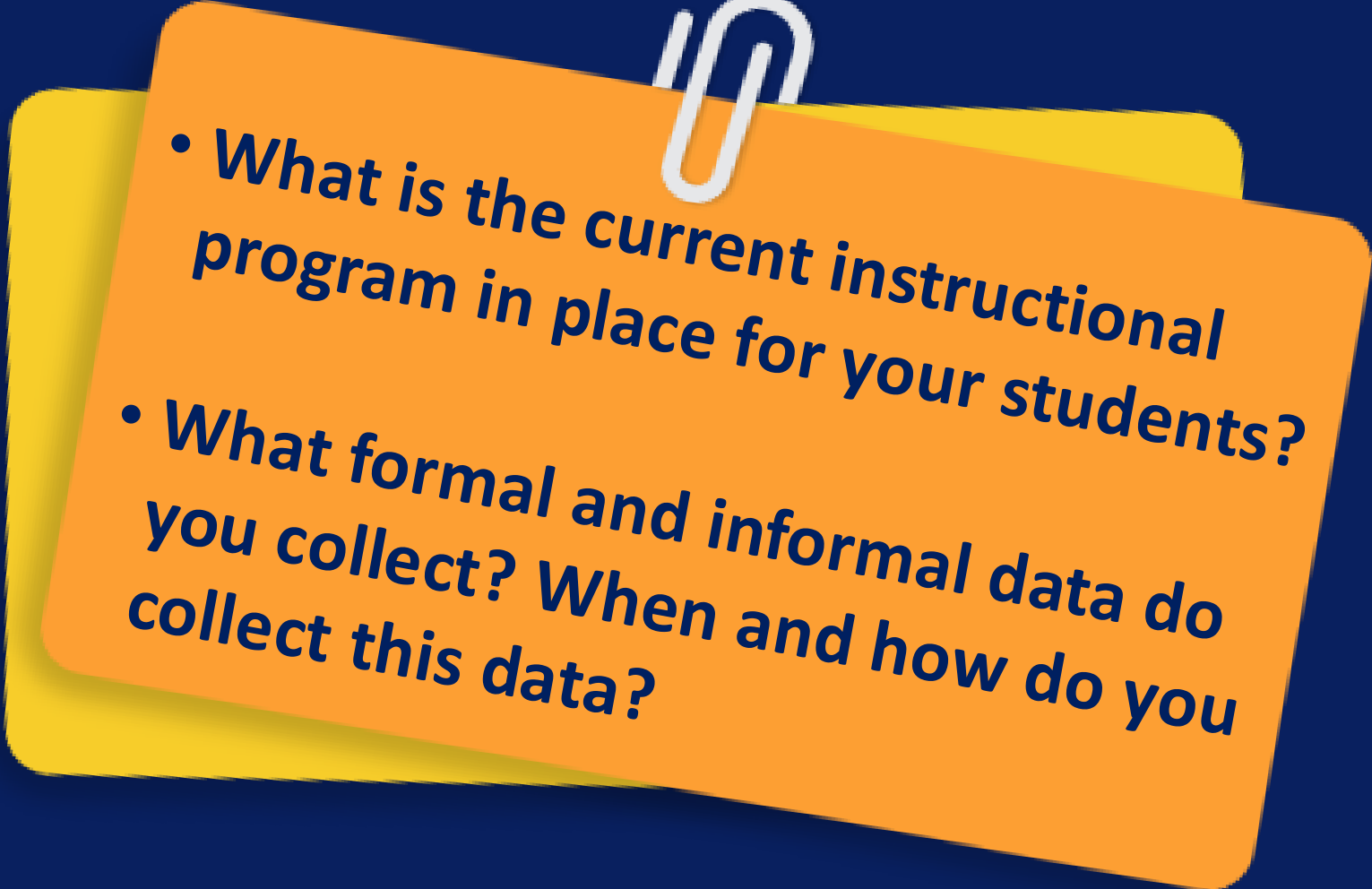
Based on student response:

- Continue the Tier 2 program with progress monitoring OR
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Make instructional adaptations based on a hypothesis

Continue to monitor progress to determine if student is responding adequately

Think-Pair-Share

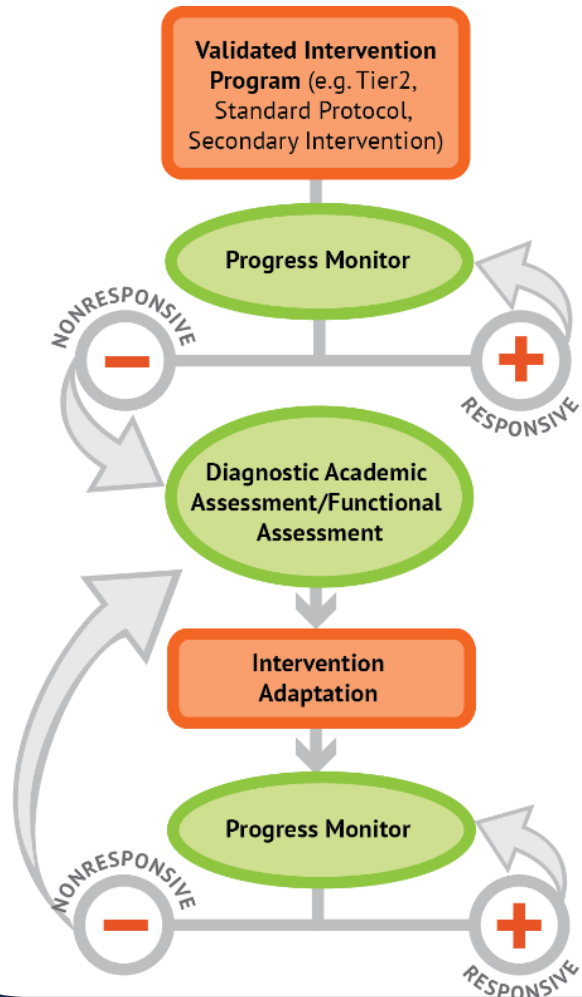
- 
- What is the current instructional program in place for your students?
 - What formal and informal data do you collect? When and how do you collect this data?

STAIR 2.0 DBI Framework

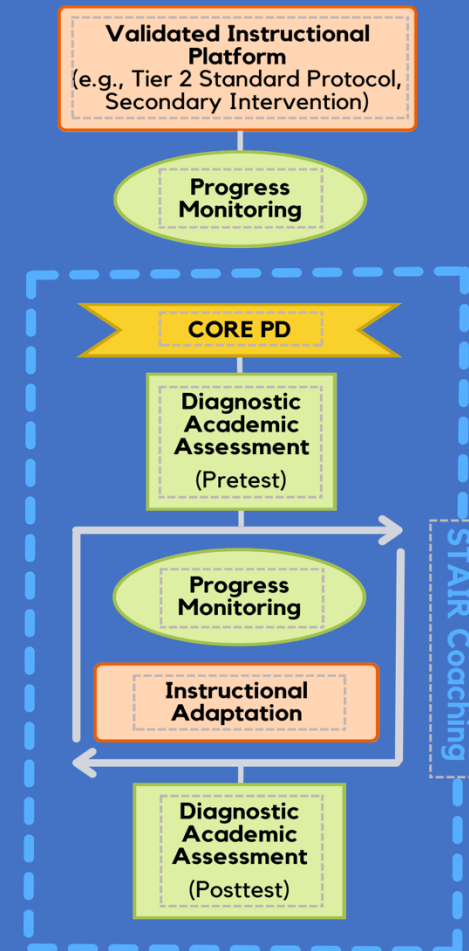
How does the DBI framework operate within STAIR 2.0?

DBI Framework Within STAIR 2.0

NCII DBI Framework



STAIR 2.0 DBI Framework



STAIR 2.0 DBI Framework: Assumptions

Data-Based Individualization: Assumptions

We can only hypothesize that a given instructional approach will work for an individual student; thus, we must test whether it is effective for that student.



Why STAIR 2.0?

Research-based interventions are not one size fits all; some students may not respond

DBI provides a framework to individualize instruction

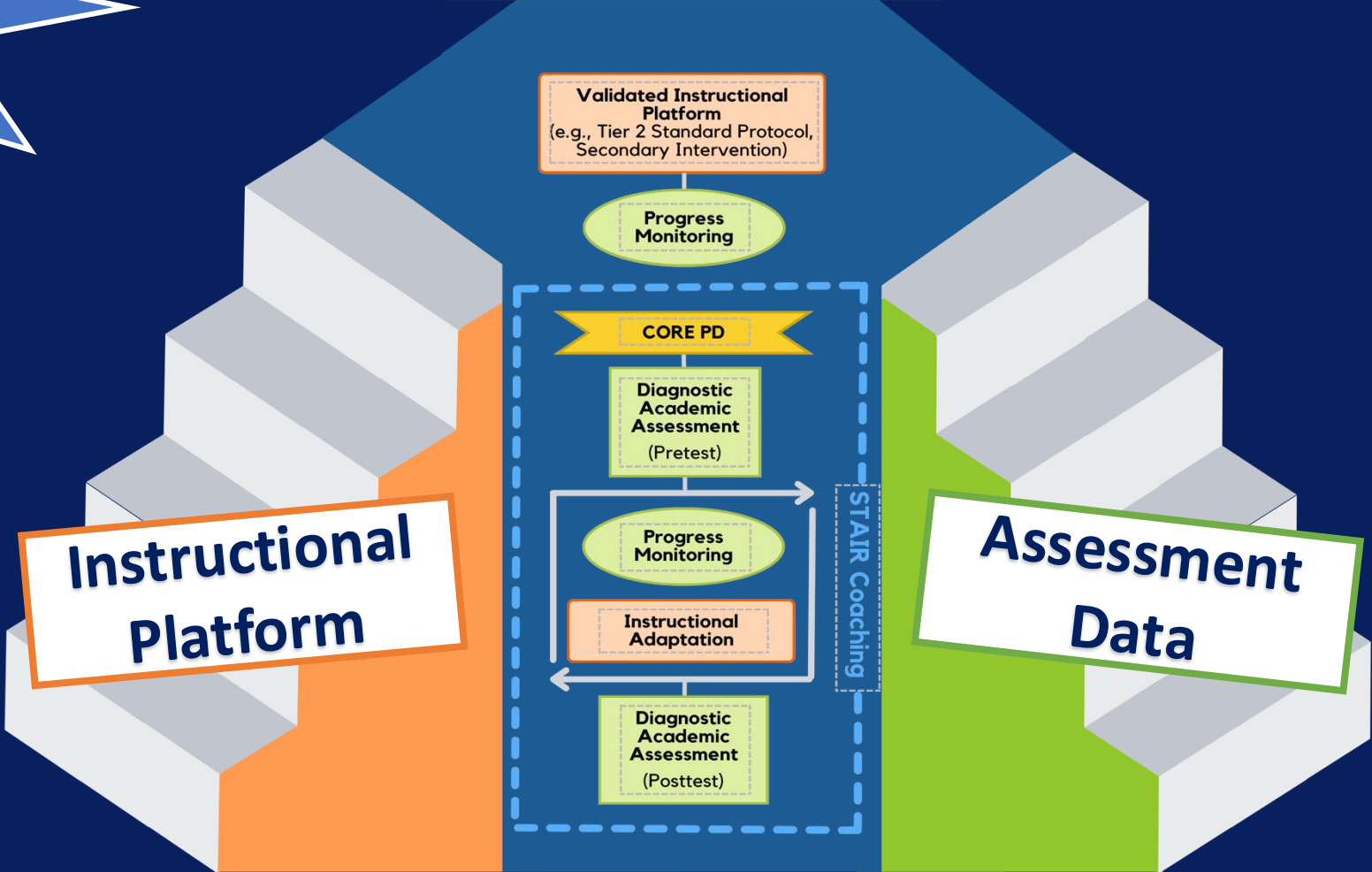
When teachers use DBI correctly, student achievement can improve

Key Features of STAIR 2.0

What are the key features of Project STAIR implementation?

OUR GOAL!

Algebra Readiness



Algebra Readiness

Validated Instructional Platform
(e.g., Tier 2 Standard Protocol, Secondary Intervention)

Progress Monitoring

CORE PD

Diagnostic Academic Assessment
(Pretest)

Progress Monitoring

Instructional Adaptation

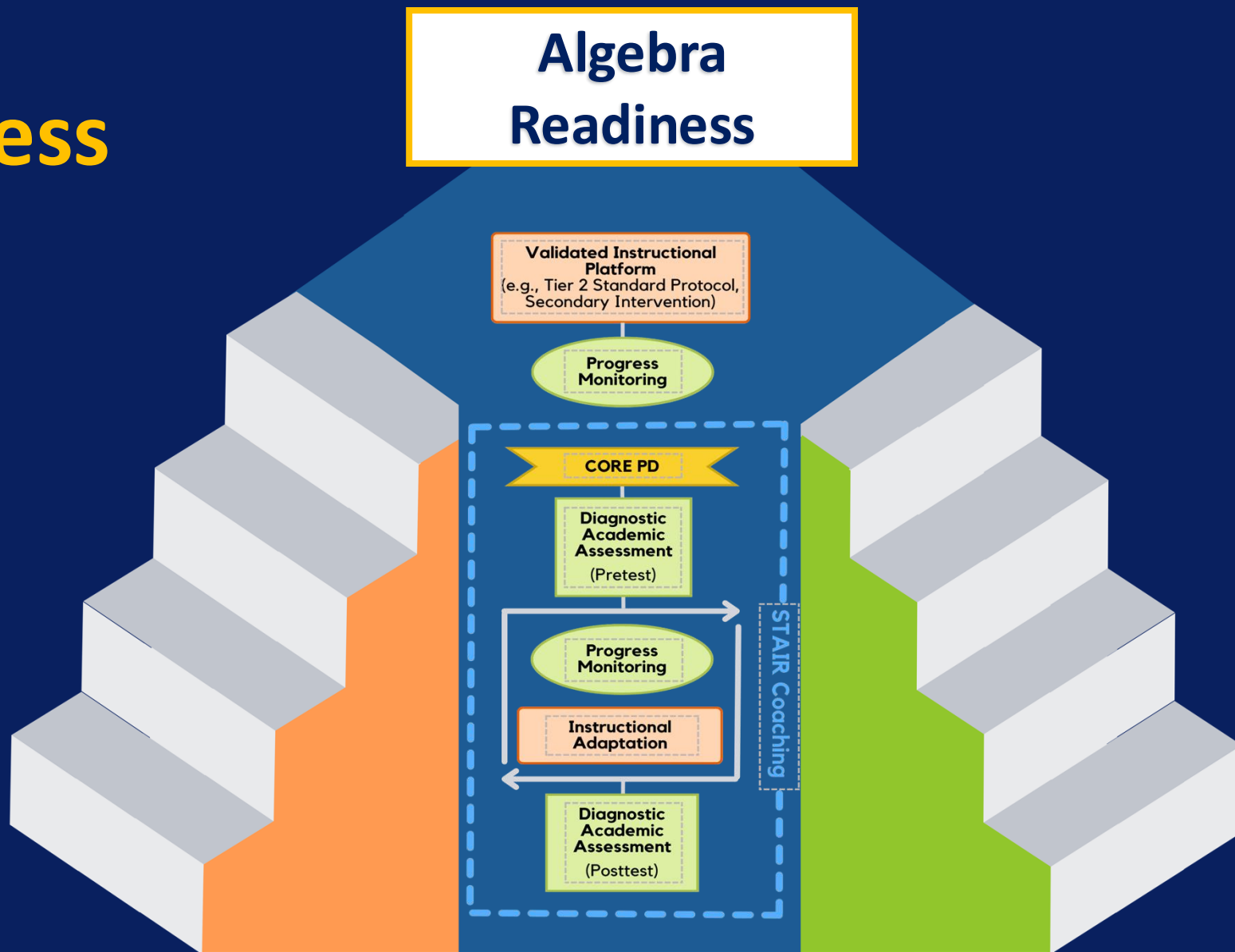
Diagnostic Academic Assessment
(Posttest)

STAIR Coaching

Instructional Platform

Assessment Data

Feature #1: Algebra Readiness



Algebra Readiness

- Algebra is viewed as the “gatekeeper” to future success
- Improving students’ algebraic reasoning is a critical area of need for students experiencing mathematics difficulty

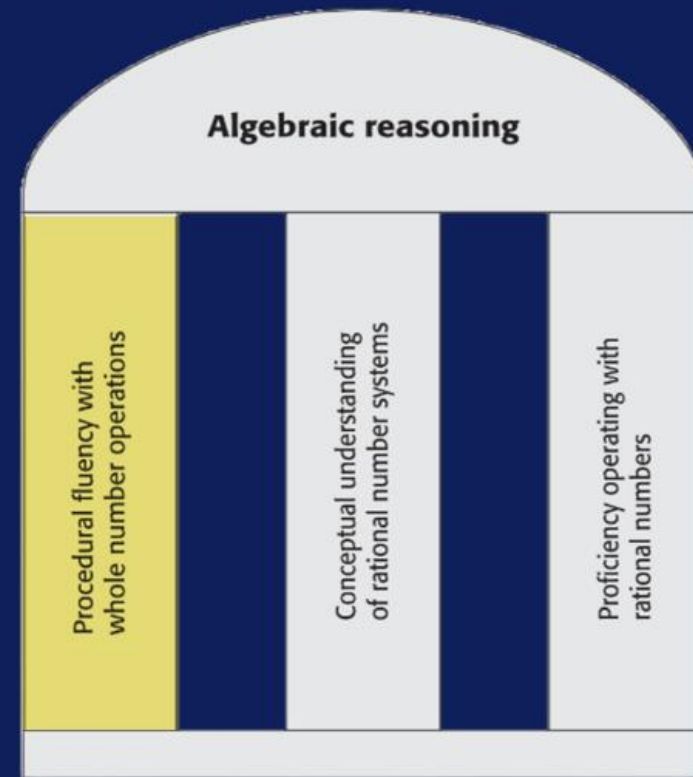


Three Pillars of Algebra Reasoning

1. Procedural fluency with whole number computation

2. Conceptual understanding of rational number systems

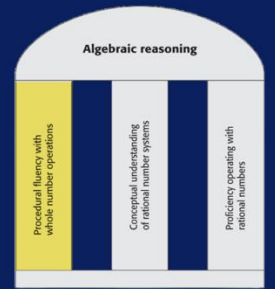
3. Proficiency operating with rational numbers



Procedural Fluency

Fluency is more than adding, subtracting, multiplying and dividing with ease.

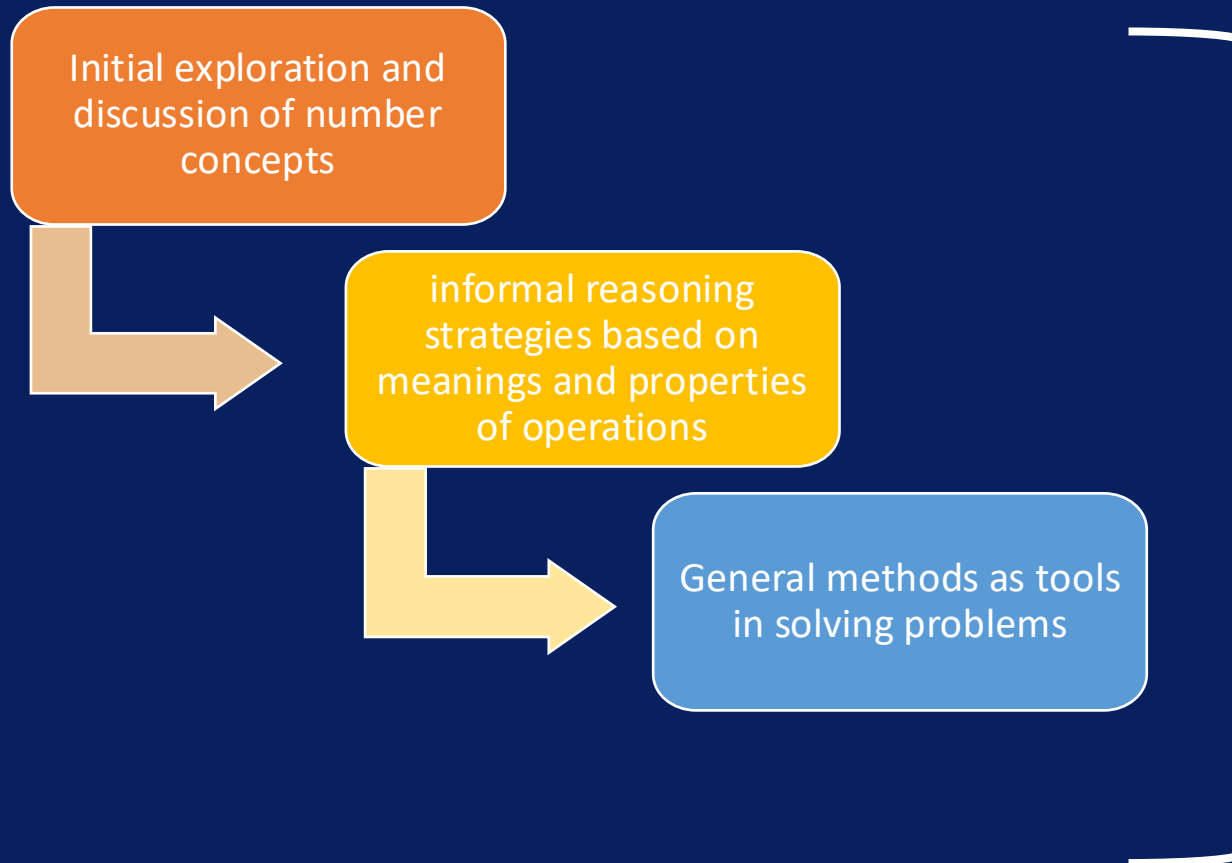
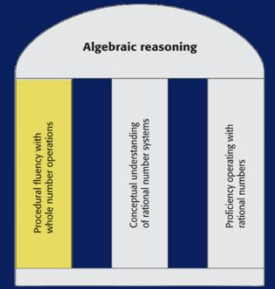
The National Research Council (2001) defines procedural fluency as the “knowledge of procedures, knowledge of when and how to use them appropriately, and skill in performing them **flexibly, accurately and efficiently.**”



Property	Example
Distributive	$4(2+3) = (4 \times 2) + (4 \times 3)$
Commutative	Addition: $5 + 7 = 7 + 5$ Multiplication: $6 \times 4 = 4 \times 6$
Associative	Addition: $(1 + 3) + 2 = 1 + (3 + 2)$ Multiplication: $(4 \times 5) \times 2 = 4 \times (5 \times 2)$
Identity	Addition: $7 + 0 = 0 + 7$ Multiplication: $7 \times 1 = 1 \times 7$
Inverse	Addition: $5 + (-5) = 0$ Multiplication: $6 \times \frac{1}{6} = 1$

Procedural Fluency

How do students build fluency?



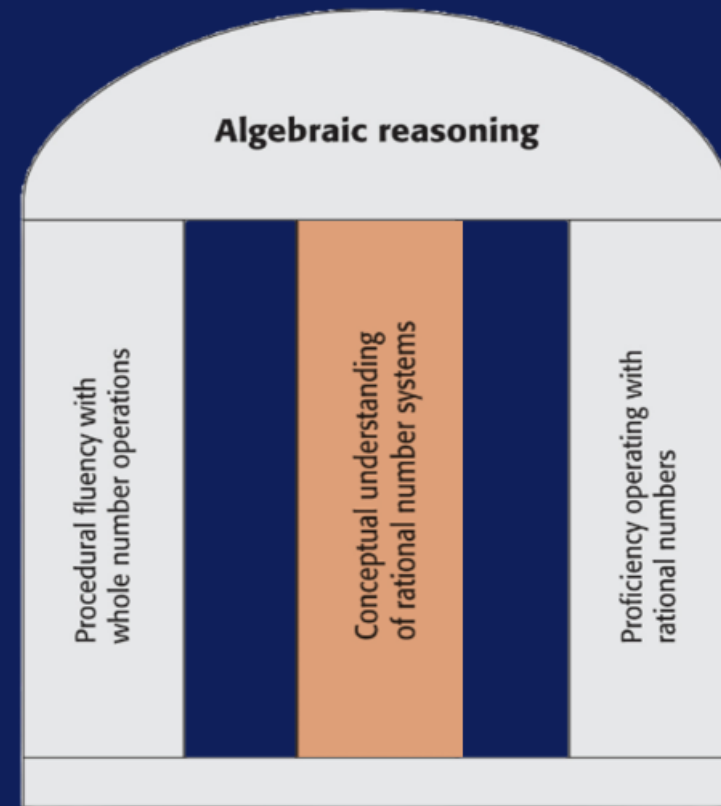
- Whole number computation
- Fraction operations
- Proportional relationships
- Measurement
- Algebraic procedures

Three Pillars of Algebraic Reasoning

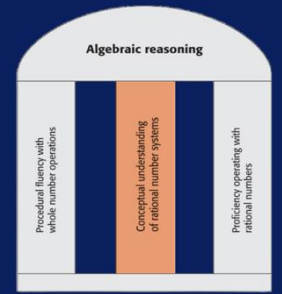
1. Procedural fluency with whole number computation

2. Conceptual understanding of rational number systems

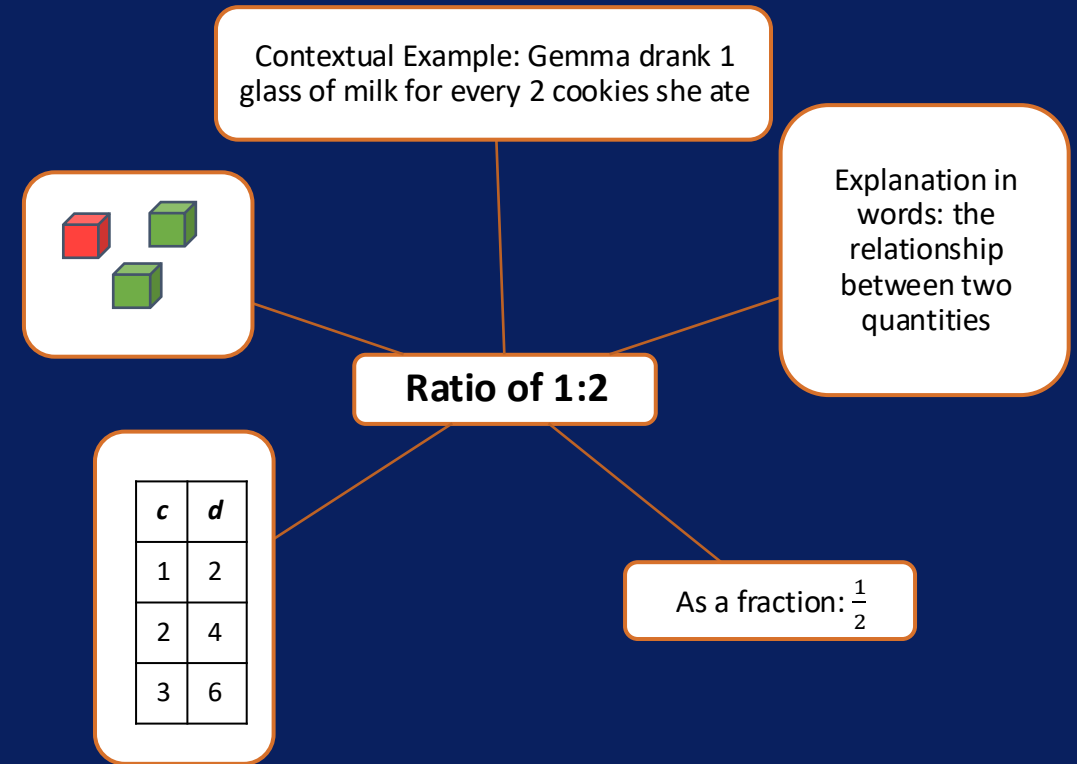
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Conceptual Understanding

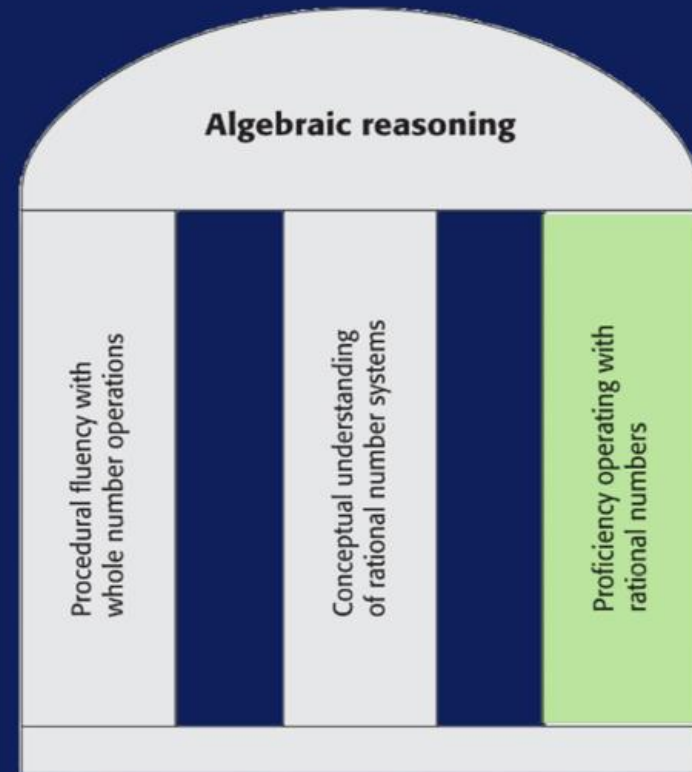


Conceptual understanding in math is the foundation of a framework representing the intertwined relationships between mathematical concepts, patterns, and practices.

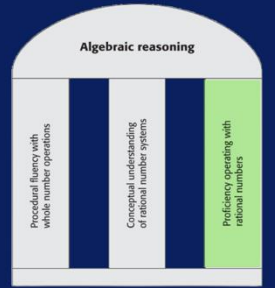


Three Pillars of Algebraic Reasoning

1. Procedural fluency with whole number computation
2. Conceptual understanding of rational number systems
3. Proficiency operating with rational numbers



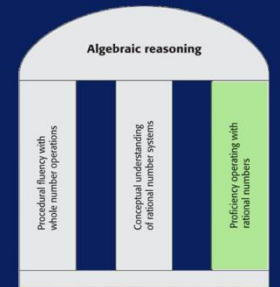
Proficiency With Rational Numbers



Rational numbers comprise the set of all numbers that can be represented as a fraction or a ratio of an integer to an integer

- By 6th grade: students should be able to recognize a rational number as a single point on a number line
- In 7th grade: Students should develop a unified understanding of a number (i.e., understand fractions, decimals, and percents as representations of rational numbers)

Proficiency With Rational Numbers



Conceptual understanding of fractions is an important link to algebra!

Instruction should be grounded in:

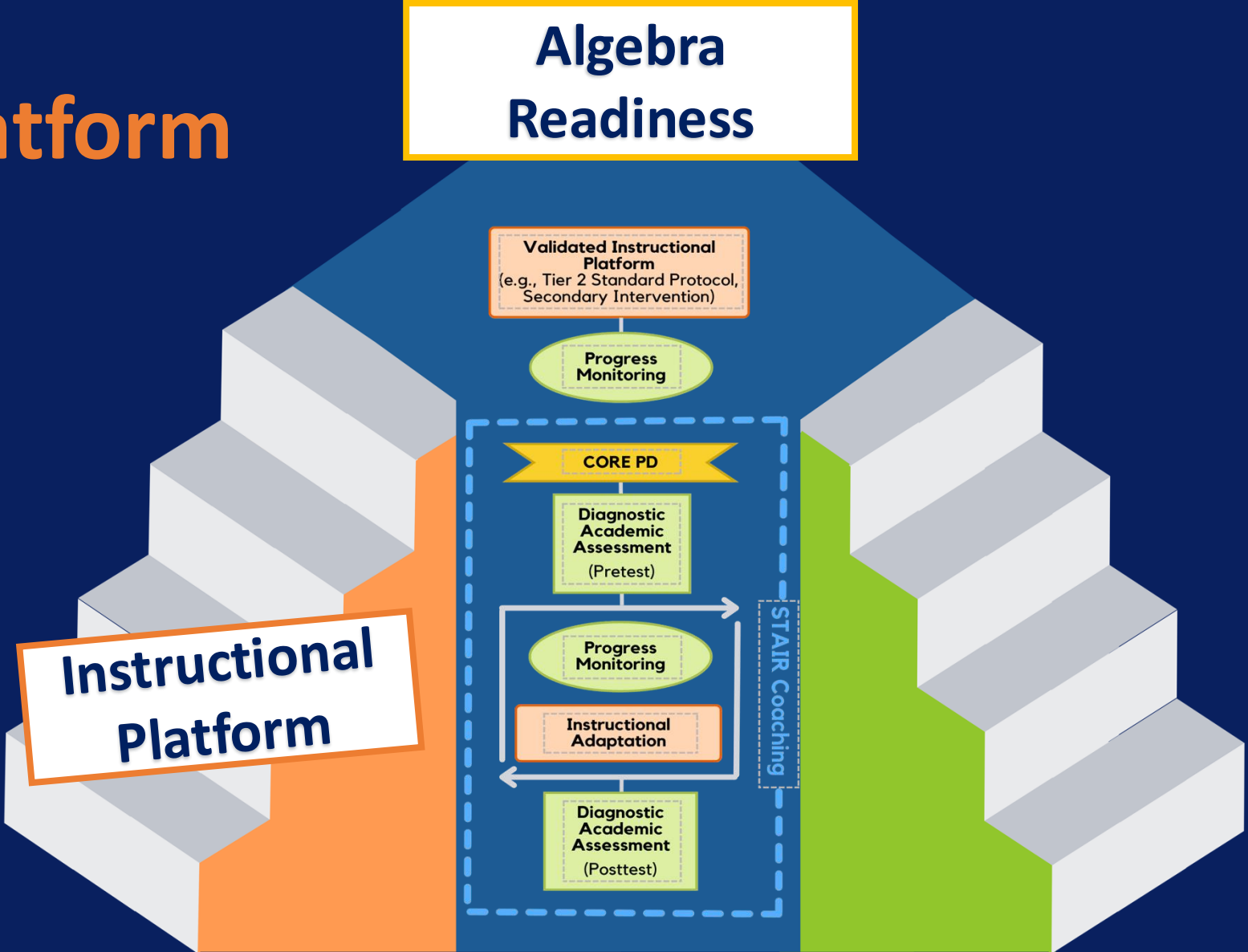
- Fraction concepts
- Underlying mathematical rationale

Table 2. Properties required to verify the algorithm for division of fractions.

Number properties	Numeric examples	Algebraic examples
Division is the inverse operation of multiplication	$25 \div 6 = x$ $25 = x \times 6$	$M \div N = X \ (N \neq 0) \Leftrightarrow$ $(M = X \times N \ (N \neq 0) \ (1))$
Given	$M = \frac{9}{13}$ $N = \frac{6}{7}$ $X = \frac{x}{y}$	Put $M = \frac{a}{b}$, $N = \frac{c}{d}$, and $X = \frac{x}{y} \ (b \neq 0, d \neq 0, y \neq 0)$
Substitution	$\frac{9}{13} \div \frac{6}{7} = \frac{x}{y}$	$\frac{a}{b} \div \frac{c}{d} = \frac{x}{y}$
Fundamental Theorem of Fractions	$\frac{9}{13} = \frac{x}{y} \times \frac{6}{7}$	$\xrightarrow{\text{by}(1)} \frac{a}{b} = \frac{x}{y} \times \frac{c}{d}$
Identity Property of Multiplication	$\frac{9}{13} \times \frac{7}{6} = \frac{x}{y} \times \frac{6}{7} \times \frac{7}{6}$	<u>multiply both sides by $\frac{d}{c}$</u> $\frac{a}{b} \times \frac{d}{c} = \frac{x}{y} \times \frac{c}{d} \times \frac{d}{c}$
Multiplicative Inverse	$\frac{6}{7} \times \frac{7}{6} = 1$ $\xrightarrow{\quad} \frac{9}{13} \times \frac{7}{6} = \frac{x}{y}$	$\frac{c \times d}{d \times c} = 1$ $\xrightarrow{\quad} \frac{a}{b} \times \frac{d}{c} = \frac{x}{y}$
If $a = b$ and $b = c$, then $a = c$	$\therefore \frac{9}{13} \div \frac{6}{7} = \frac{9}{13} \times \frac{7}{6}$	$\therefore \frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \times \frac{d}{c}$

TIME FOR A
BREAK.

Feature #2: Instructional Platform

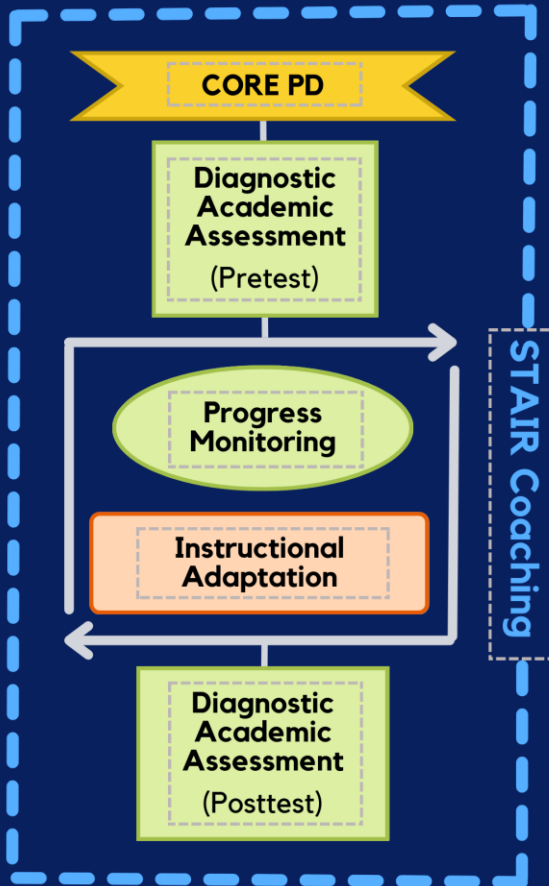


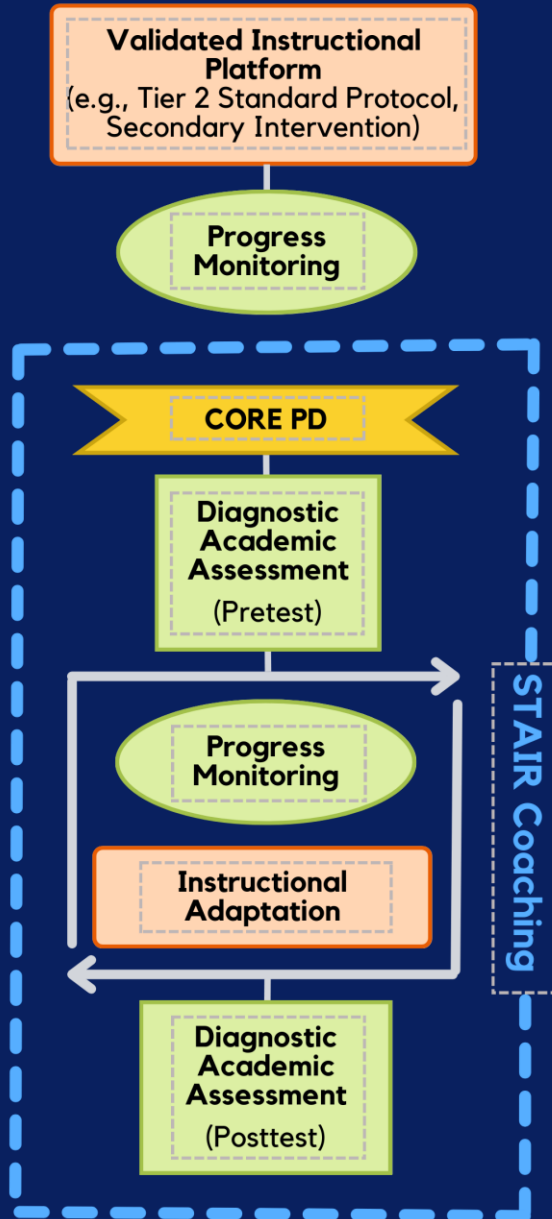
Validated Instructional Platform
(e.g., Tier 2 Standard Protocol, Secondary Intervention)



Let's focus on this instructional platform

Progress Monitoring



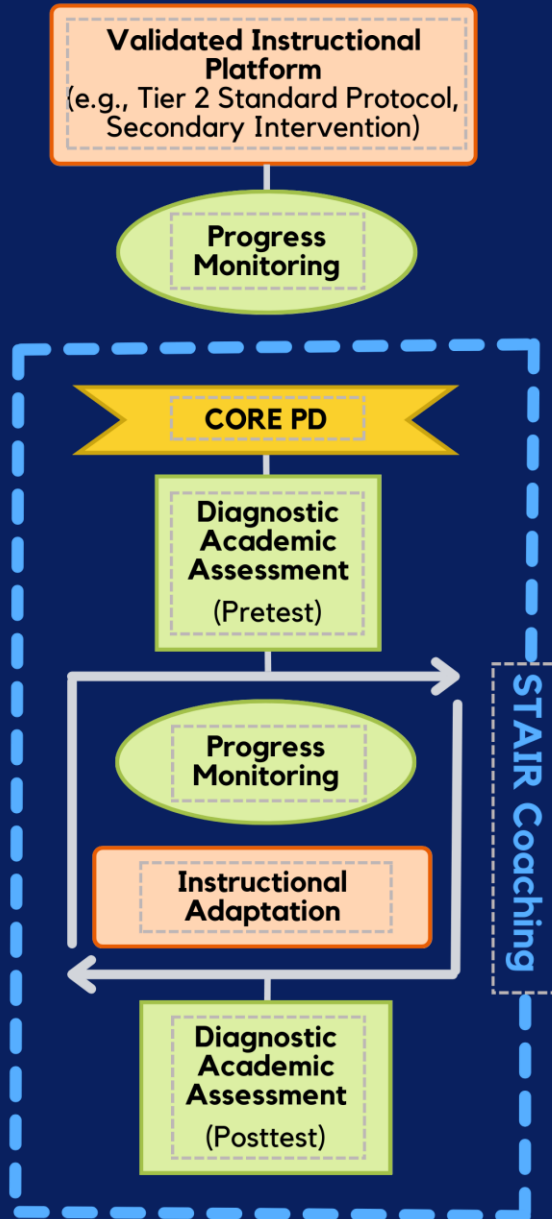


Let's focus on this instructional platform

What do we mean by instructional platform?

For this project, the instructional platform is the jumping off point for the DBI framework!





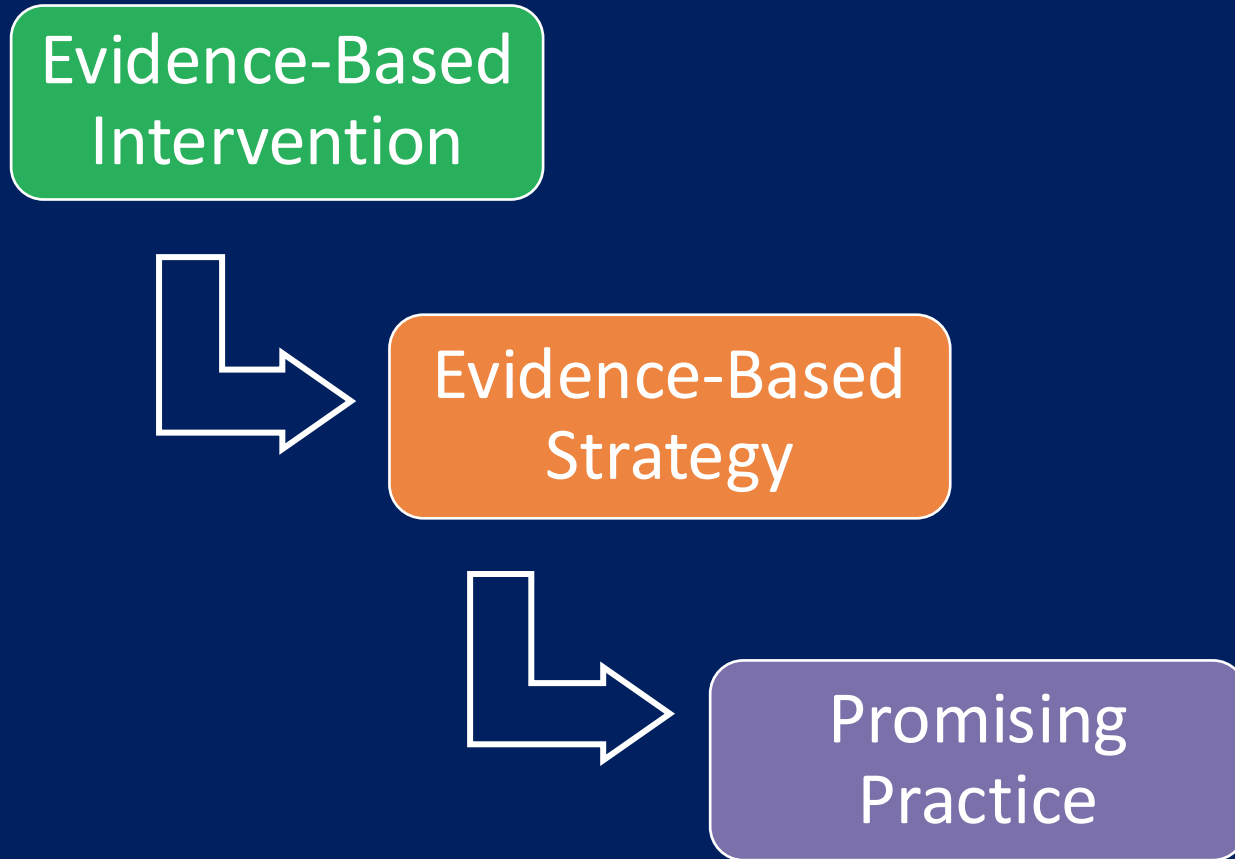
Let's focus on this instructional platform

What should be included as part of the instructional platform?

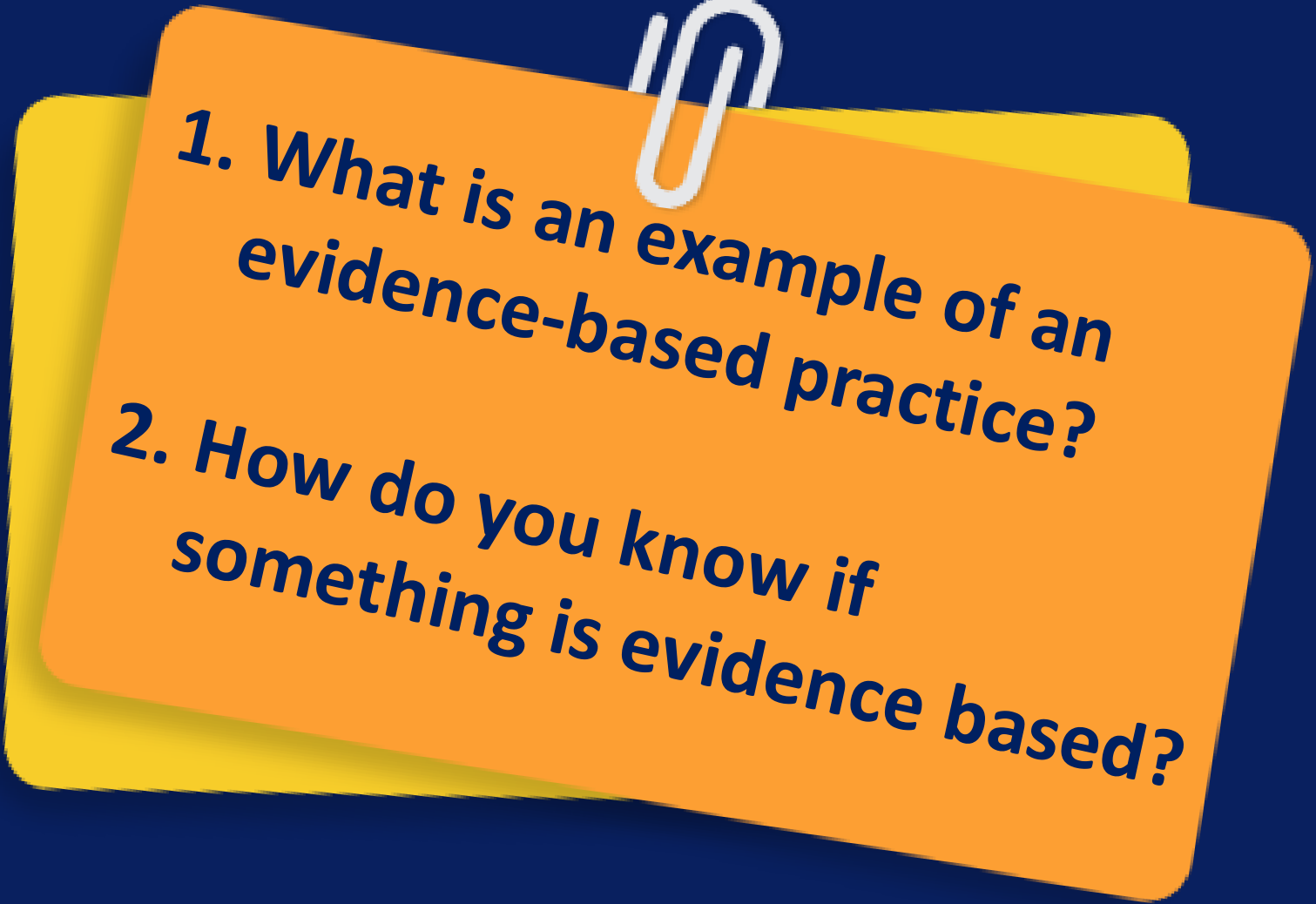
Instruction should incorporate the use of evidence-based practices.



Evidence-Based Practices



Stop & Jot

- 
1. What is an example of an evidence-based practice?
 2. How do you know if something is evidence based?

What Are Evidence-Based Practices?

Practices with research to support their efficacy

Assessment data

Improvement
pre- to post-
implementation

Treatment gains
vs. control
group

Replication

Conducted with
multiple researchers

Implemented with
multiple students

Evaluated multiple
times

Setting Alignment

Setting and students are
comparable to your
classroom

How do you
determine if there
is evidence?

Examples of Evidence-Based Practices in Mathematics

*More on this
coming up in
PD #2*

Explicit
Instruction

Multiple
Representations

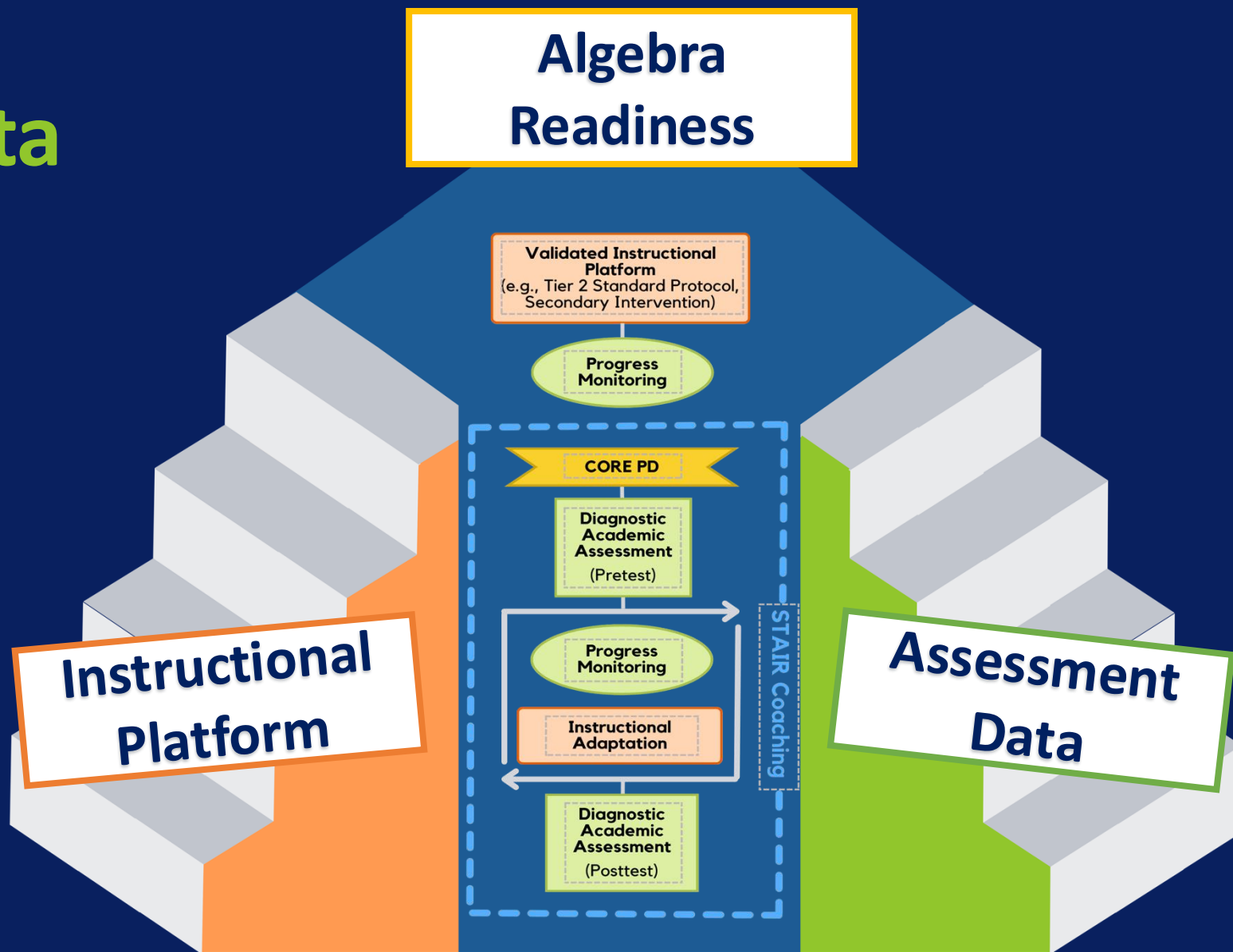
Mathematics
Language



Word Problem
Instruction

Fluency Practice

Feature #3: Assessment Data



Why Should We Assess?

- Research supports using assessment systems to improve student achievement in mathematics (Gersten et al., 2009)
- Assessment results can be valuable in our decision making
- *“Data-based decision making”*

Turn and Talk



**What information can we get
from assessing students?**

Decision

Does a student need supplemental mathematics instruction?

Data

- Mathematics screener results
- Classroom work samples
- Classroom observations
- Classroom tests and quizzes

```
graph LR; A[Diagnostic Assessments] --> B[Progress monitoring]; B --> C((Goal));
```

Diagnostic
Assessments

Progress
monitoring

Goal

When Should We Assess?

- Each type of teaching decision you make may come at different points during the learning cycle

1. Decisions **Formative Assessments** learning process

1. Decision **Summative Assessments** learning process

Who Should We Assess for Project STAIR?

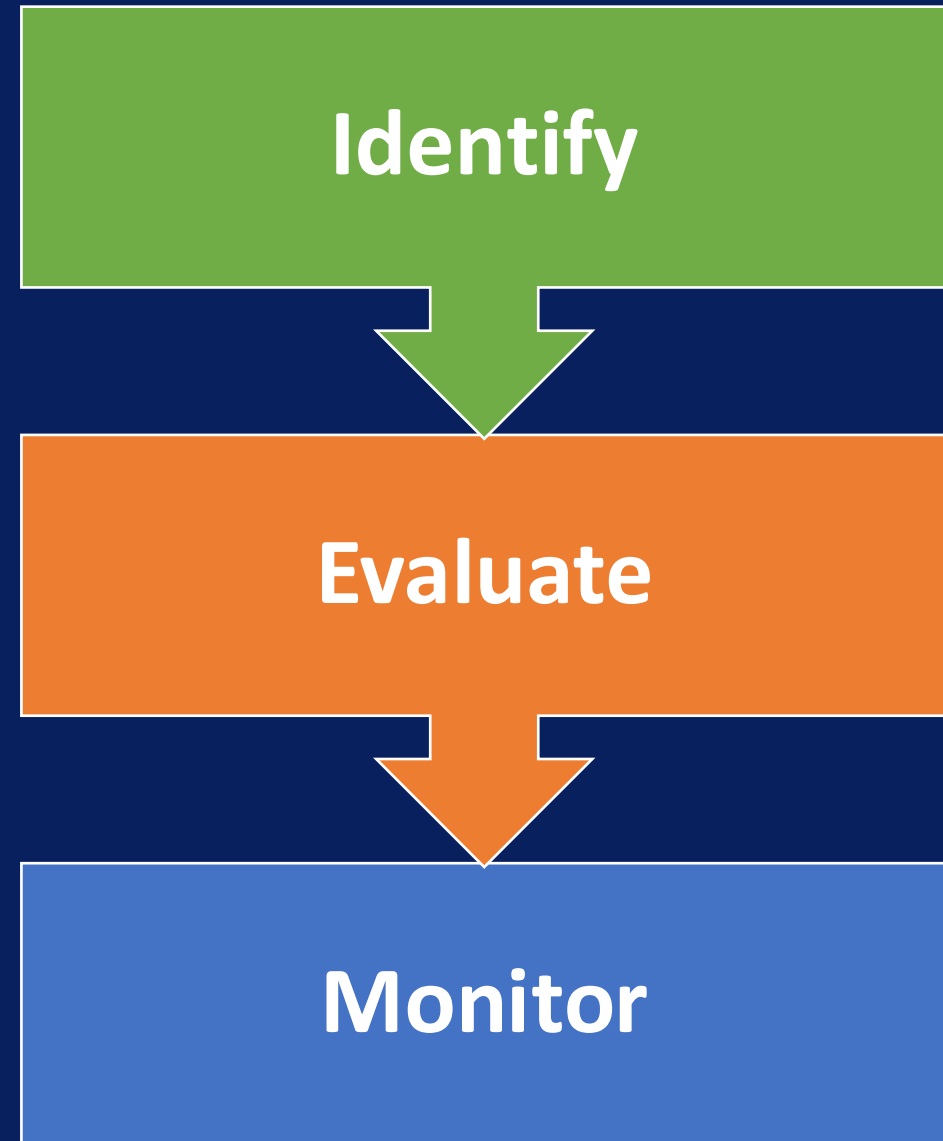
Students must have intensive learning need in math, as evidenced by an **IEP goal in math**, or shown **significant learning difficulty** in mathematics

Must take the **general** grade-level state standardized assessment

Currently in **middle school**

Note: Parental consent and student assent will be needed for all students

How Do We Assess?



Step 1: Identify



First, we must identify students who require intensive support!

Typically, a universal screener is used to identify students at-risk , but for the purposes of this project, we already know the students we are going to support!



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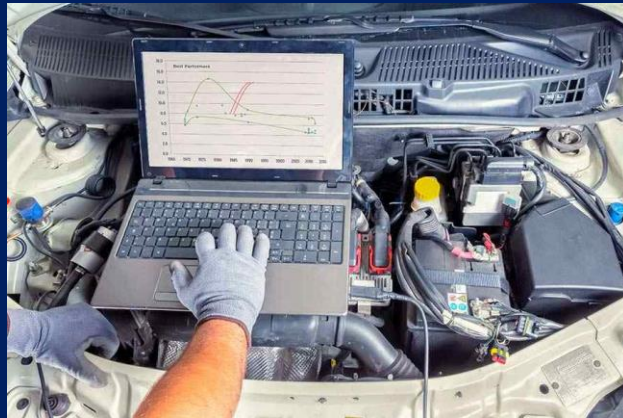
Currently in **middle school**

Step 2: Evaluate



Determine which specific skill areas they are needing targeted instruction in using **diagnostic assessment** data!

Examples of Diagnostic Assessments:



Car diagnostics



Medical diagnostic tests

Step 2: Evaluate



Questions to Consider:

1. Why is a student underperforming?
 - What are the student's correct conceptualizations or understandings of the content?
 - What are the student's persistent misconceptions and errors?
2. What content and/or instructional design features should be included in the intervention for this student?

Step 2: Evaluate

An example of results from a diagnostic assessment

Diagnostic Summary - (6 out of 11 constructs mastered)

Part I - Prescreening	75.1 % Correct	Results
Prescreening		
Part II - Algebra		
Eval. Adv. Exponents	●	Solv. & Grap. Sys. of Lin Equ.. ○
Solving Linear Equations.....	●	Polynomial Operations
Graph & Analyze Linear Equ..	●	Factoring Polynomials
Relations & Functions.	●	Radical Expressions & Equ.... ○
Solving & Graphing Inequal....	●	Quadratic Expressions
		Rational Expres. & Equ. ○

Test Question Legend

+	Tested Correctly
-	Tested Incorrectly
N/T	Not Tested
●	Mastery of Construct*
○	Partial Mastery of Construct*
○	Non-mastery of Construct*

* Mastery of a construct is determined by the student either correctly answering the corresponding pre-screening question or correctly answering 75% or more of the questions in the full construct set. Partial mastery is determined by full construct testing and a percent correct of greater than 50% but less than 75%.

● **Construct 1: Evaluating Advanced Exponents**

Mastery demonstrated by Pre-Screening

Test Question	Results
Zero exponent rule	nt
Applying a negative exponent	nt
Multiplying monomials	nt
Dividing monomials	nt
Applying negative exponents to variables	nt
Multiplying in scientific notation	nt
Dividing in scientific notation	nt

● **Construct 2: Solving Linear Equations**

Mastery demonstrated by Pre-Screening

Test Question	Results
Solving a multi-step equation	nt
Solving an equation with no solution set	nt
Solving an equation with an infinite solution set.....	nt
Isolating variables.....	nt
Solving a word problem involving percent.....	nt
Solving absolute value equations	nt

● **Construct 3: Graph and Analyze Linear Equations**

Mastery demonstrated by complete construct testing

Test Question	Results
Graphing an equation	+
Graphing an absolute value equation.....	+
Deriving an equation from a graph	+
Deriving an equation from the y-intercept and slope	+
Deriving an equation from two points	+
Writing an equation for a parallel line	+
Writing an equation for a perpendicular line	+
Verifying a point on a line	+
Determining perimeter of a polygon from coordinates	-

● **Construct 4: Relations and Functions**

Mastery demonstrated by complete construct testing

Test Question	Results
Identifying a function from a relation	+
Completing the input/output for a function.....	+
Identifying range/domain	+
Identifying a graph from a relation chart.....	-
Writing a function from data.....	+
Identifying a function from a graph	-
Using a stem and leaf table.....	+

● **Construct 5: Solving and Graphing Inequalities**

Mastery demonstrated by complete construct testing

Test Question	Results
Solving a linear inequality.....	+
Solving an absolute value inequality	+
Solving a compound inequality.....	+
Graphing a two-variable inequality	-
Graphing an inequality system	+

○ **Construct 6: Solving and Graphing Systems of Linear Equations**

Non-mastery demonstrated by construct testing

Test Question	Results
Solving systems using substitution.....	+
Solving systems using addition	+
Solving systems using subtraction	+
Solving systems using multiplication	-
Identifying parallel line solution sets.....	-
Identifying infinite solution sets.....	+
Graphing systems	-
Solving three-variable systems	-

Step 2: Evaluate



Student diagnostic data collected during STAIR 2.0:

- Diagnostic Online Math Assessment (DOMA)
- Wide Range Achievement Test (WRAT)
- Math Anxiety Rating Scale

Let's Take a Look!

Diagnostic Assessment (DOMA)

Summary of Scores (Score Ranges by grade)

K	1	2	3	4	5	6	7	Raw Score	Grade Level
Numbers and Operations									
1-4	5-13	14-22	23-41	42-61	62-83	84-91	92-105	43	5.15
Measurement									
1-2	3-4	5-12	13-18	19-26	27-31	NA	32-34		
Data Analysis									
1-1	2-4	5-9	10-12	13-16	17-21	22-27	28-36	12	5.5
Geometry									
1-4	5-7	8-10	11-19	20-30	31-36	37-44	45-53	4	3.5
Algebra									
1-1	2-4	5-6	7-13	14-20	21-25	26-31	32-43	1	1.25
TOTAL									
0-12	13-32	33-59	60-103	104-154	155-196	197-224	225-271	64	4.71

Sub-Test	Section Title	Instructional Goal	Section Score	Gr. Lv. Score	Tested Score
x	Multiplication of Whole Numbers (<3 to 5.9) NUM-06				
	Multiplication Readiness (Grouping and Repeated Addition)		1	3.2	NT
	Multiplication Facts (Factors of 0 and 1)		2	3.5	NT
	Multiplication Facts (Factors 2 to 10)		3	3.7	NT
	Multiplication (Powers of Ten)		4	3.9	NT
	Multiplication (Commutative, Associative, & Distributive Application)		5	4.3	NT
	Multiplication (2 digit number by 1 digit number)		6	4.6	NT
	Multiplication (3 digit number by 1 digit number)		7	4.9	NT
	Multiplication (2 and 3 digit number by a 2 digit number)		8	5.5	+
→	Multiplication (Commutative, Associative, & Distributive Terminology)	Bellerose correctly identify the commutative, associative, and distributive properties.	9	5.9	NT

Step 3: Monitor



Now that we have identified a skill(s) to target for the student, we can begin implementing an intervention and tracking their progress

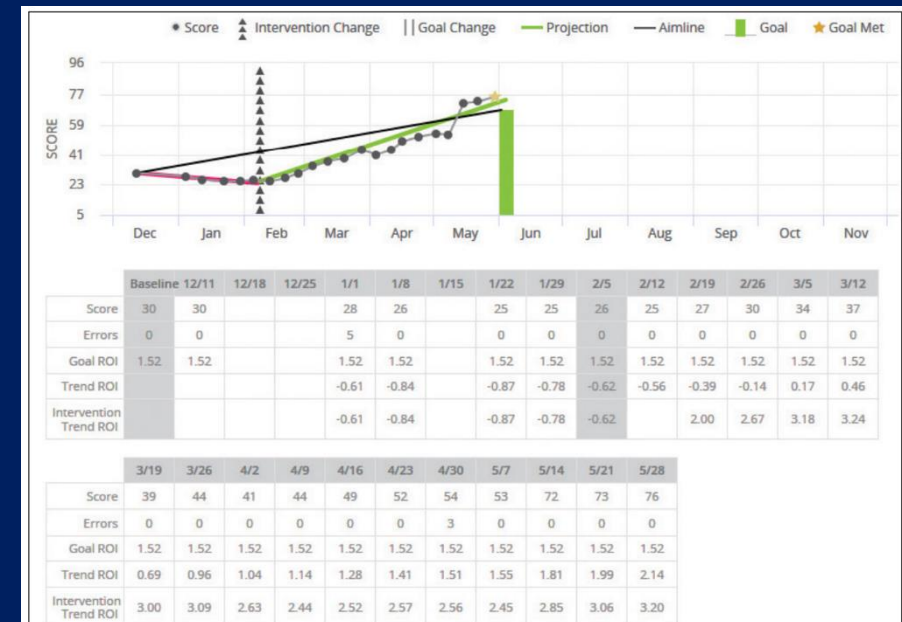
Progress monitoring is a form of assessment in which student learning is evaluated on an ongoing, regular basis (e.g., weekly)

The primary purpose is to determine which students are not responding adequately to instruction.

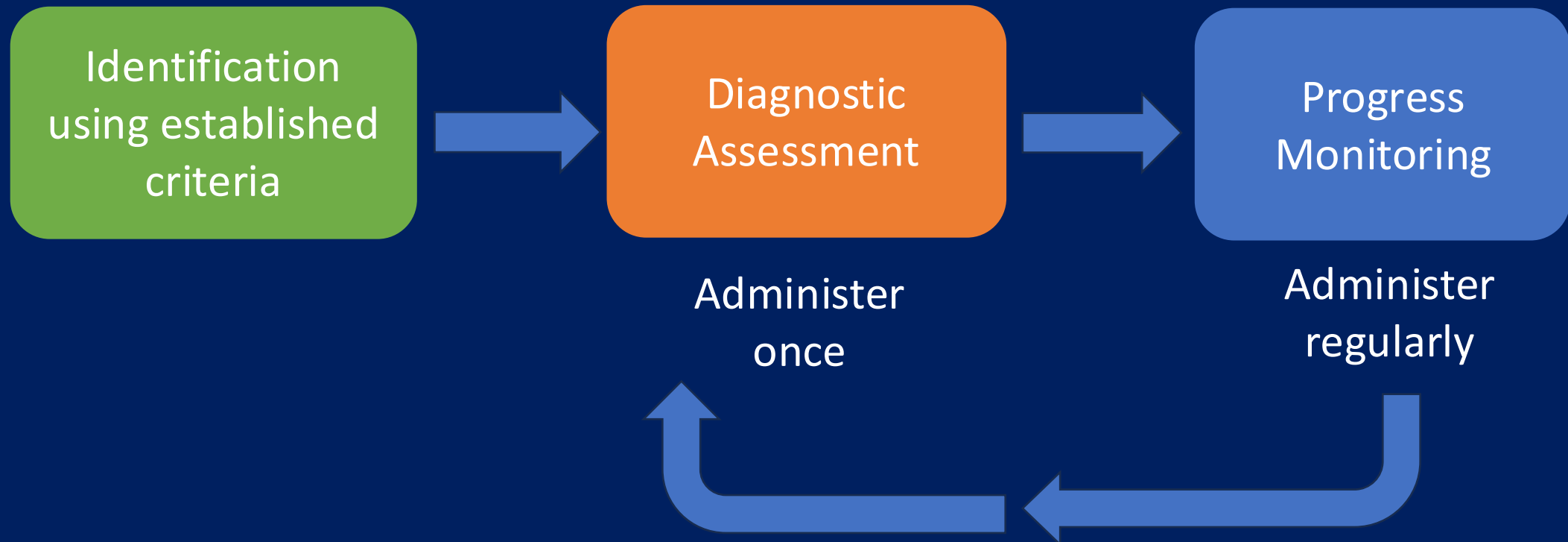
Step 3: Monitor

Progress Monitoring Assessment

- AIMSweb
 - AIMSweb is a reliable and valid tool for monitoring the progress of students in academic areas
 - Computer administered
 - Built in graphing features



In full, the assessment process should look like:



Implementation and Logistics

What does implementation look like for teacher participants?

Implementation Overview

Teachers will...

- Select 3-6 students to be the focus of project
- Receive ongoing coaching from paired an assigned instructional coach for the duration of the study
- Participate in CORE professional development over the course of the project
- Attend recurring coaching meetings
- Collect and analyze student data
- Be observed by your STAIR Coach (based upon *your* schedule) and receive tailored feedback
- Follow a specified coaching schedule based on group assignment

Teacher Participant Expectations

- Implement instructional platform with consistency
- Schedule 5 classroom observations and participate in coaching/feedback sessions to follow each observation
- Participate in weekly or bi-weekly (depending on group assignment) check-ins with coach that will occur via:
 - Email
 - Zoom / in-person
- Collect weekly progress monitoring data

What to Expect: Face-to-Face vs. Virtual Coaching

Classroom Observations

- Follow an agenda built around teaching observation and data-based decision making
- Coach observes classroom lesson and provides feedback
- Brainstorm potential solutions

Virtual Coaching Check-Ins

- Discuss fidelity of intervention
- Discussions of instruction and DBI
- Brainstorm potential solutions

Next Steps and Wrap Up

You want to participate....now what?

You Want to Participate...Now What?

- Sign teacher consent form**
- Choose students for participation
- Distribute parent consent (English/Spanish available)
- Obtain student assent (Coaches will assist with this!)
- Coach will communicate to schedule next meeting
- Complete W9 form**
- Complete teacher pre-assessments
- Complete student pre-assessments



Questions?

Thank you!

