NCSA 2025

June 23-25, 2025

Denver, Colorado

Maximizing Impact: Leveraging Assessment and Accountability to Drive Student Learning

National Conference on Student Assessment

Council of Chief State School Officers

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National Conference on Student Assessment

PIE Proof of Concept

Wednesday, June 25, 2025 | 12:15–1:00 p.m.

SPEAKERS

Jake Thompson & Brooke Nash • Accessible Teaching, Learning, and Assessment Systems (ATLAS)
Shaun Bates • Missouri Department of Elementary and Secondary Education

Pathways for Instructionally Embedded Assessment (PIE)

SESSION OBJECTIVES

- Describe the benefits and utility of summative achievement results based on instructionally embedded assessments.
- Define potential roles and associated design considerations for an end-of-year component in an instructionally embedded assessment system.
- List the inferences supported by different summative scoring models for an instructionally embedded assessment.

BACKGROUND

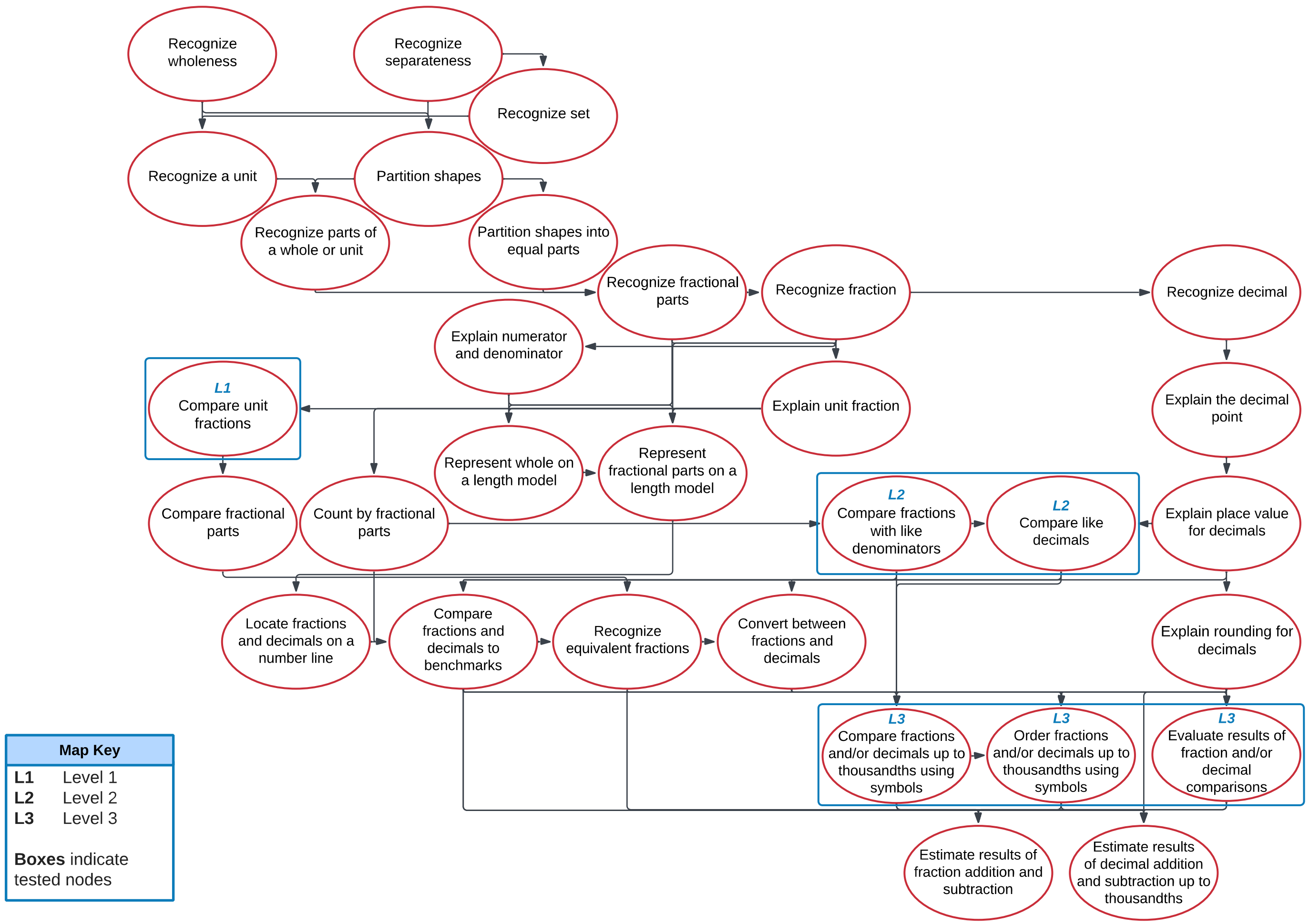
- The Pathways for Instructionally Embedded Assessment (PIE) is a CGSA funded project aimed at developing a proof-of-concept innovative assessment, piloted in classrooms during the 2024-2025 school year.
- The overarching goal of the pilot study was to evaluate PIE assessment results for multiple potential purposes. The *focus of this presentation is on how results from the instructionally embedded assessments can be used for summative purposes.*

Pathways for Instructionally Embedded Assessment

OVERVIEW OF THE PIE ASSESSMENT MODEL

1. Learning Pathways
2. Instructionally Embedded Assessment Delivery
3. Actionable Results

PIE.5.NF.A.3 Learning Pathway Map View



PIE.5.NF.A.3

Mathematics

Number Sense and Operations in Fractions (NF)

Grade 5

This document provides (a) the target grade-level content standard; (b) three levels of a learning pathway aligned with the learning target; (c) the knowledge, skills, and understandings associated with each level; and (d) a map view of the full learning pathway.

Learning Target

5.NF.A. Understand the relationship between fractions and decimals (denominators that are factors of 100).

3. Compare and order fractions and/or decimals to the thousandths place using the symbols >, = or <, and justify the solution.

Learning Pathway in Three Levels

The learning pathway presents three vertical levels that consist of knowledge, skills, and understandings that build toward and meet the learning target. **Level 1** represents emerging concepts and skills related to the learning target. **Level 2** represents concepts and skills approaching the learning target. **Level 3** represents the learning target and aligns with the grade-level content standard.

Level 1
Compare unit fractions.

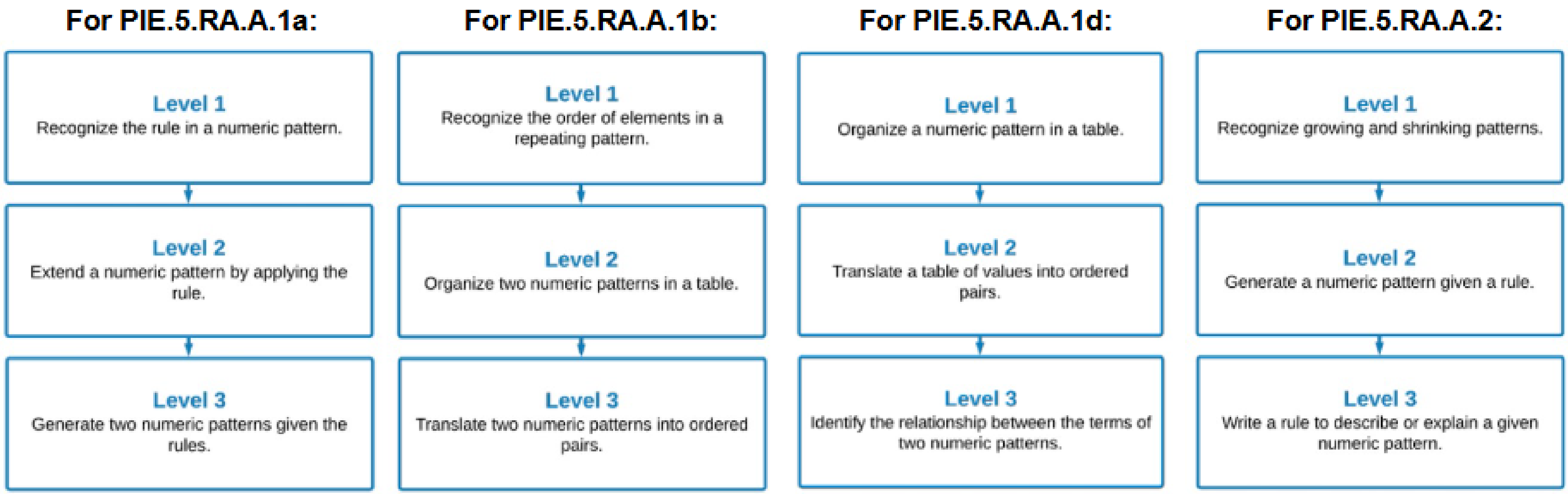
↓

Level 2
Compare fractions with like denominators and like decimals.

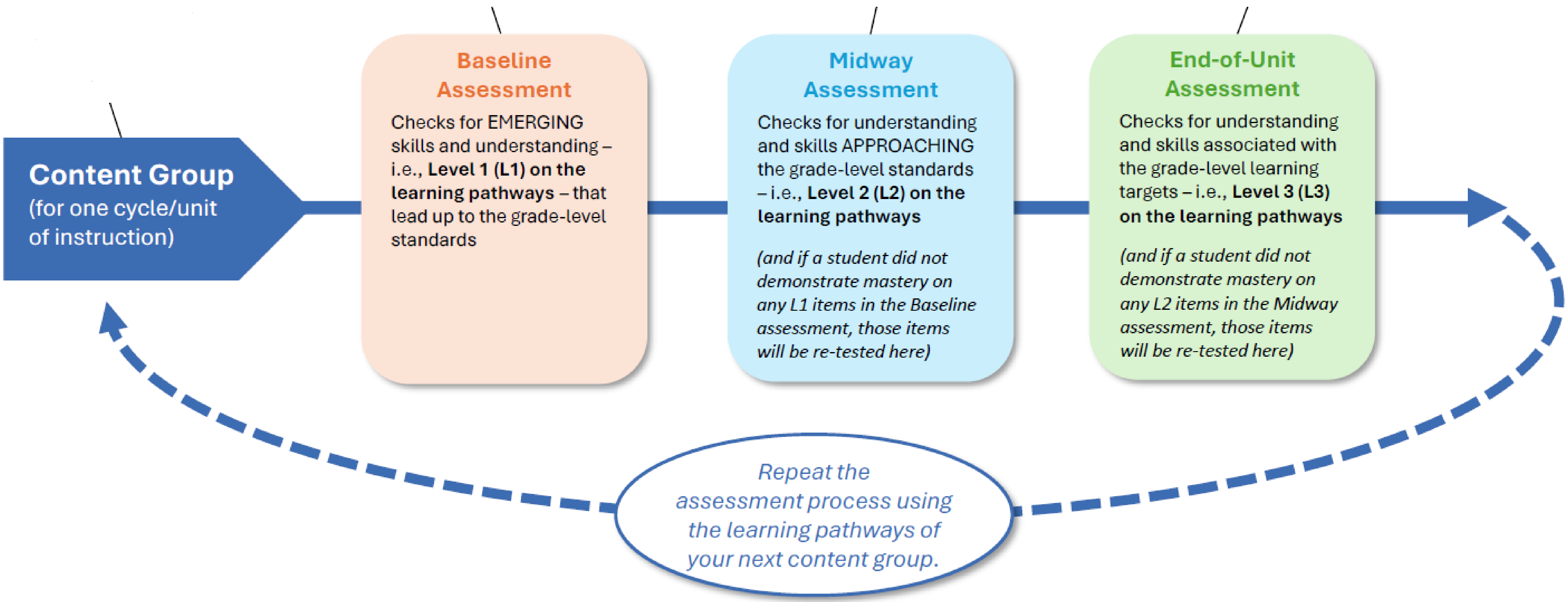
↓

Level 3
Compare and order fractions and/or decimals up to the thousandths place using symbols (<, >, =) and justify the solution.

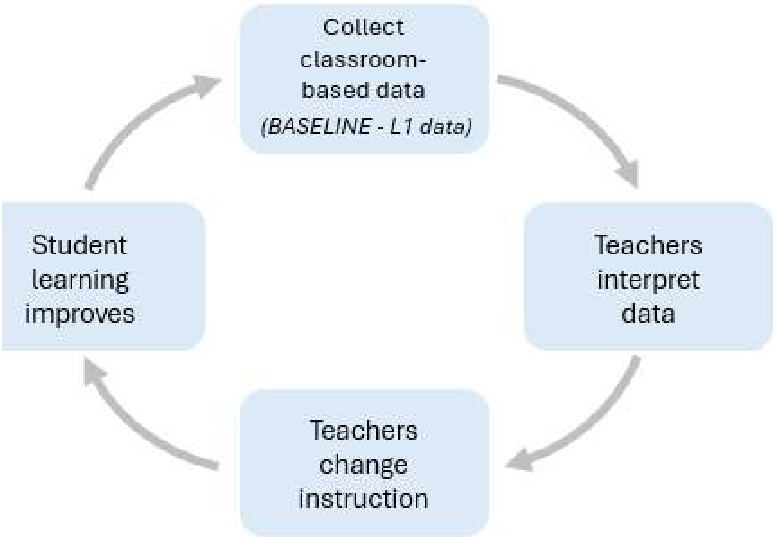
EXAMPLE CONTENT GROUP WITH PATHWAY LEVELS



Four learning pathways in Ginnie's "*Number Patterns*" content group


Content Group
(for one cycle/unit of instruction)
Baseline Assessment
Checks for EMERGING skills and understanding – i.e., **Level 1 (L1) on the learning pathways** – that lead up to the grade-level standards
Midway Assessment
Checks for understanding and skills APPROACHING the grade-level standards – i.e., **Level 2 (L2) on the learning pathways**
(and if a student did not demonstrate mastery on any L1 items in the Baseline assessment, those items will be re-tested here)
End-of-Unit Assessment
Checks for understanding and skills associated with the grade-level learning targets – i.e., **Level 3 (L3) on the learning pathways**
(and if a student did not demonstrate mastery on any L2 items in the Midway assessment, those items will be re-tested here)
Repeat the assessment process using the learning pathways of your next content group.

Ginnie administers the PIE Baseline assessment to see where her students are relative to the learning standards of her first content group, "*Number Patterns.*"



Legend

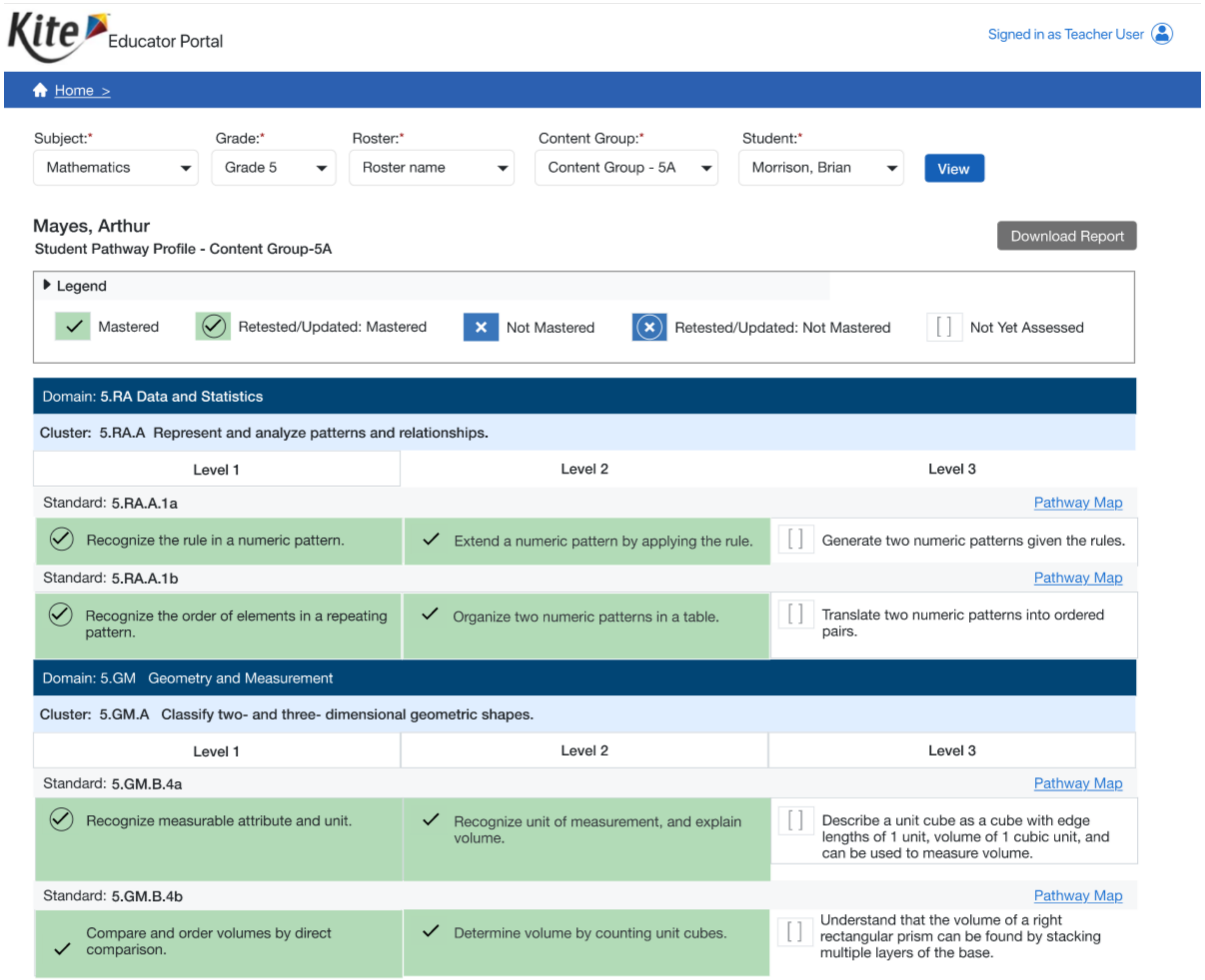
✓ Mastered | Retested/Updated: Mastered | X Not Mastered | Retested/Updated: Not Mastered | — Not Yet Assessed

	PIE.5.RA.A.1a			PIE.5.RA.A.1b			PIE.5.RA.A.1d			PIE.5.RA.A.2		
Student	L1	L2	L3	L1	L2	L3	L1	L2	L3	L1	L2	L3
1	✓			X			X			X		
2	✓			X			X			X		
3	X			✓			✓			✓		
4	X			X			X			X		
5	✓			X			X			✓		
6	X			✓			✓			X		
7	X			X			X			X		
8	X			✓			X			X		
9	✓			X			✓			✓		
10	X			✓			X			X		
11	✓			X			✓			✓		
12	X			✓			X			X		
13	X			✓			X			X		
14	X			X			✓			X		
15	✓			X			X			X		
16	X			X			X			X		
17	✓			✓			✓			✓		
18	X			✓			X			X		
19	✓			X			✓			X		
20	X			X			X			✓		
21	X			X			X			✓		
22	✓			X			X			X		
% Mastered	41%			36%			32%			32%		

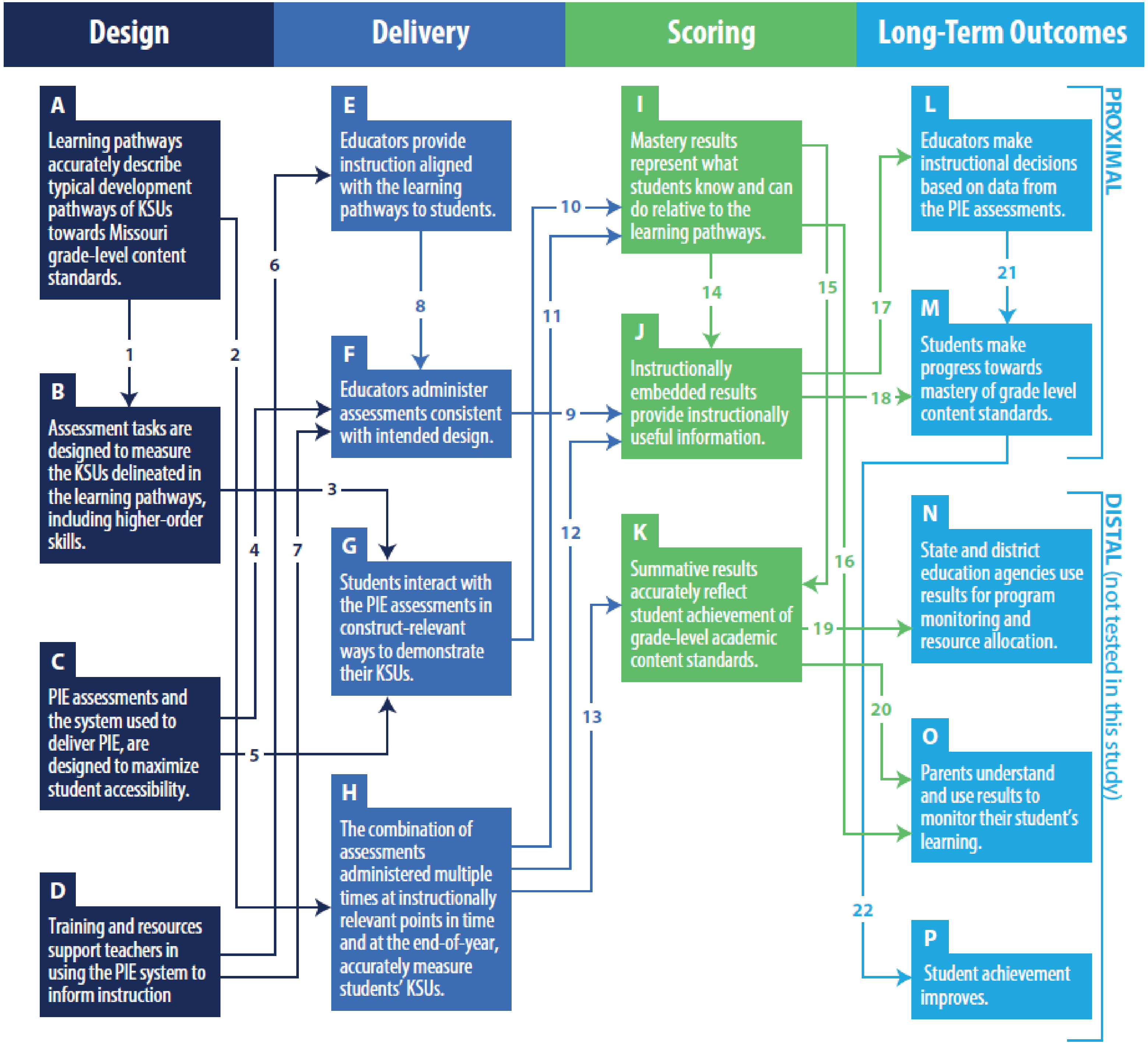
Pathways for Instructionally Embedded Assessment

REPORTING

- Results are reported as a mastery profile
- Summarizes KSUs mastered by the student during the instructionally embedded window



PIE THEORY OF ACTION



FROM EMBEDDED TO SUMMATIVE REPORTING

- Result uses should be consistent with the PIE Theory of Action
  - Mastery results provide instructionally useful information
  - Summative results reflect achievement of content standards
- Embed assessments into instruction to measure skill/competency acquisition as it occurs, and then summarize that information
- End-of-year assessments may be optionally included depending on specific claims of the assessment system

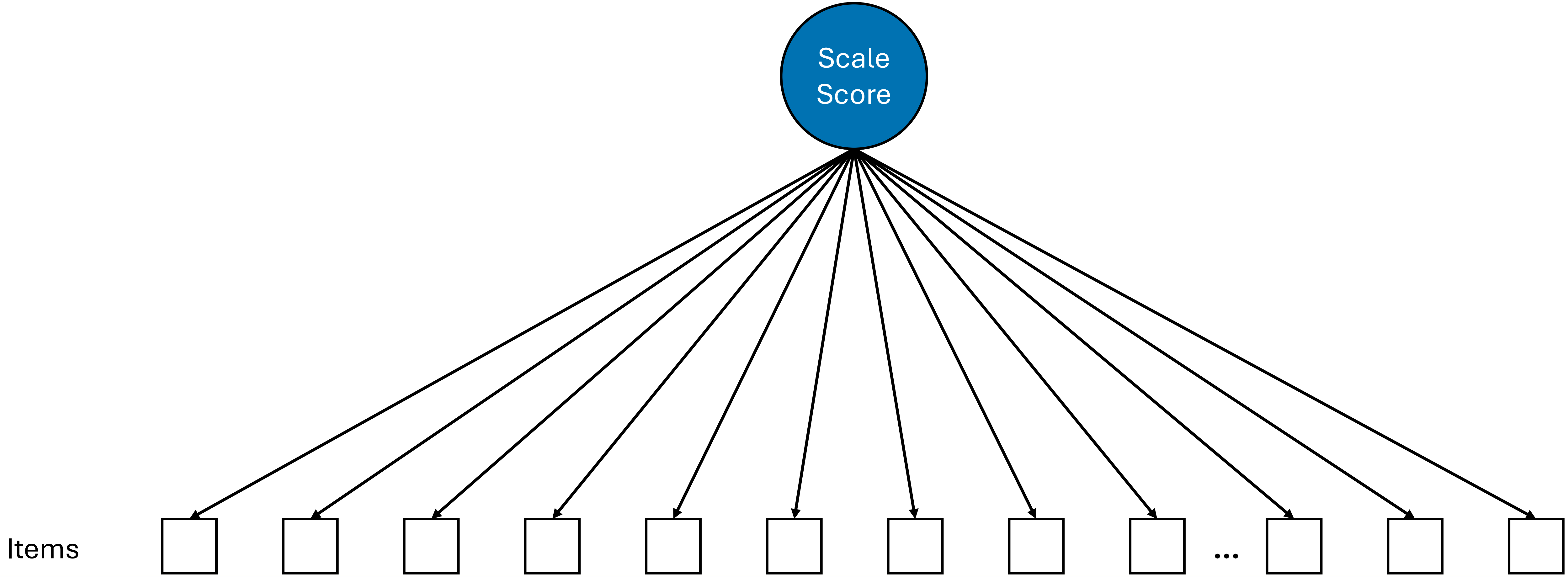
Summative Results From Embedded Assessments

Pathways for Instructionally Embedded Assessment

MODELS UNDER CONSIDERATION

- Traditional scale score model
- Diagnostic model
- Hybrid model combining diagnostic and scale score features

TRADITIONAL SCALE SCORE MODEL



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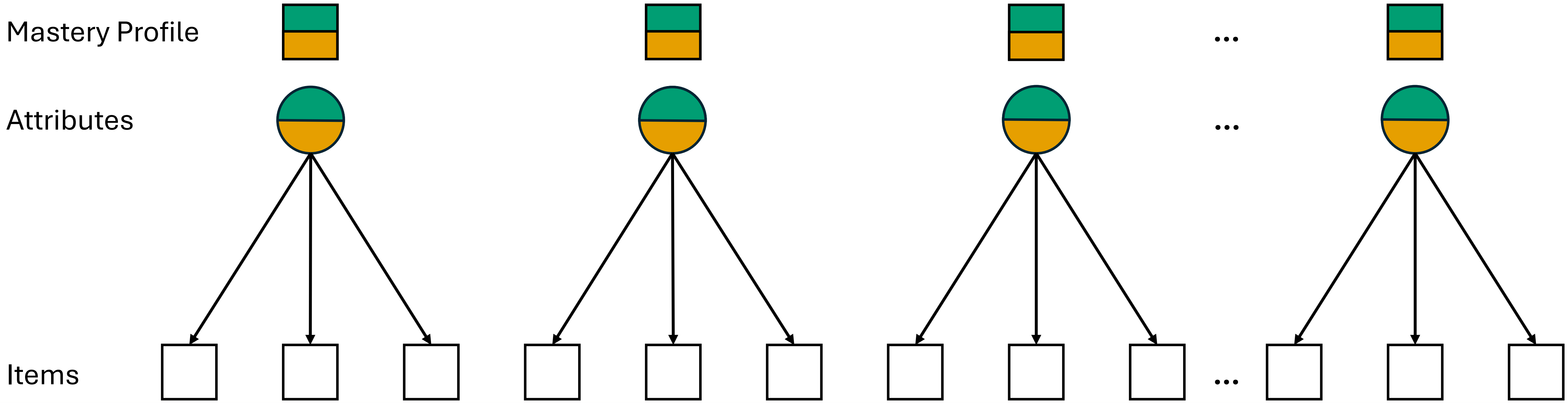
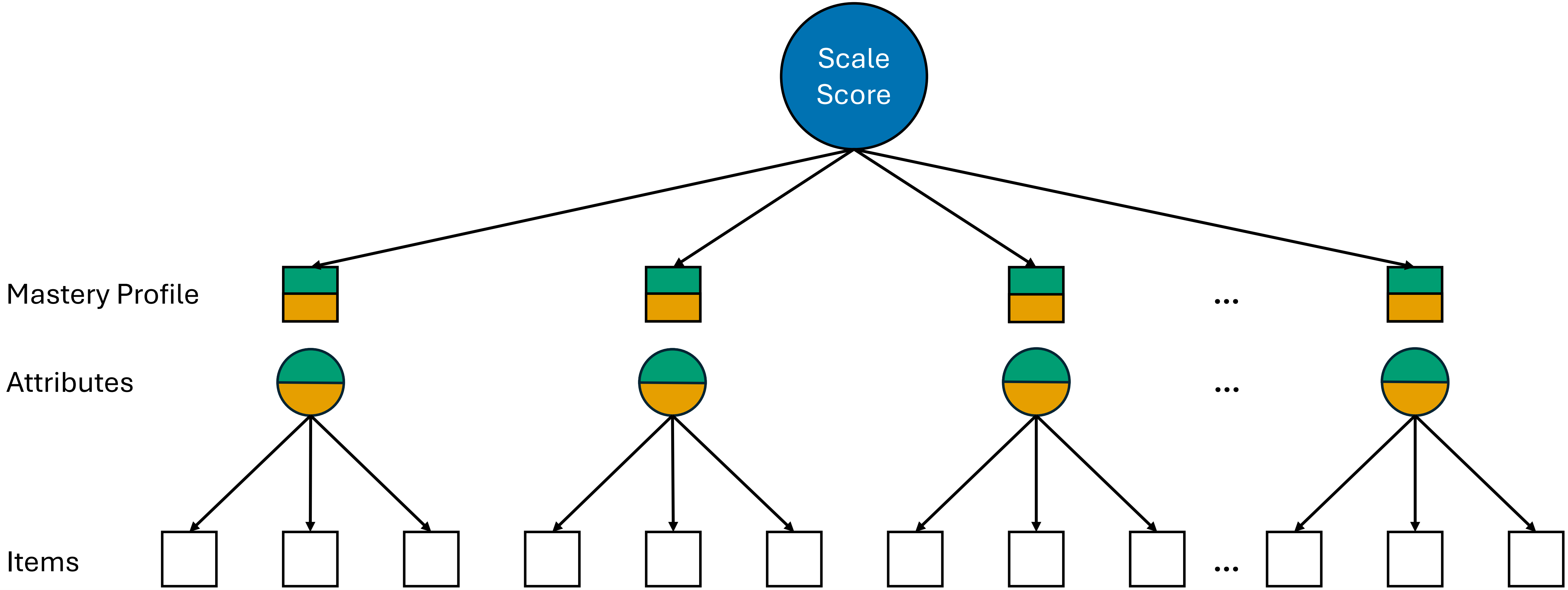
DIAGNOSTIC MODEL



HYBRID MODEL



MODELING OVERVIEW

	Scale Score Model	Diagnostic Model	Hybrid Model
Advantages	• Widely used • Well tested • Familiar to stakeholders	• Well tested • Instructionally-relevant grain-size • Consistent with embedded results	• Supports both instructionally-relevant and overall results • Scale score can be incorporated into existing accountability systems
Disadvantages	• Inconsistent with embedded results across profiles • Not well-suited to instructional decisions • Unreliable subscores	• Not easy to synthesize a whole profile (e.g., “is my student on track?”) • Unfamiliar to many stakeholders	• Untested; requires research to understand and support intended uses

MODEL EVALUATION

- Model fit for each model assessed using posterior predictive model checks
  - Methodological details described in Thompson (2024)
- Reliability of scale score or mastery classifications

Thompson (2024)

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DATA

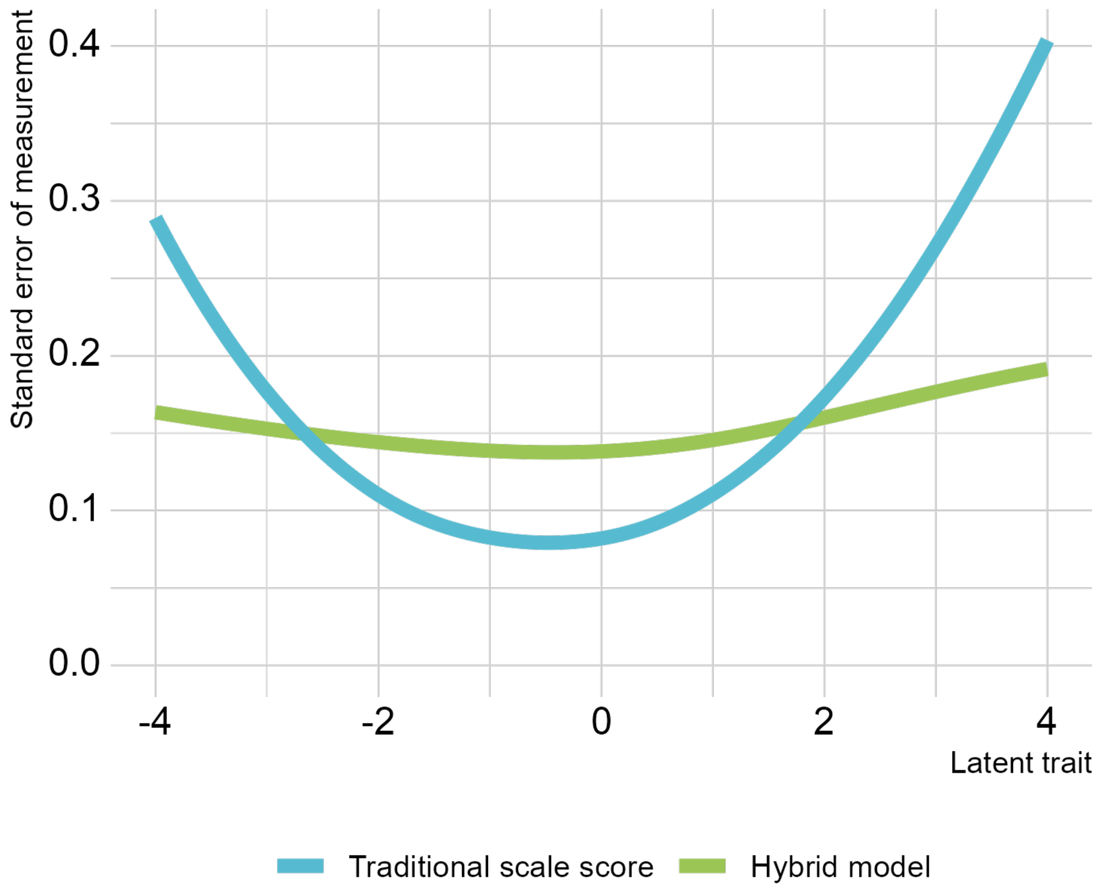
- Inclusion criteria:
  - Student must have completed at least one content standard in the instructionally embedded window
- 1,572 5th grade students in Missouri
  - 55 teachers from 28 districts and 32 schools
  - Students completed an average of 12 standards

RESULTS: ABSOLUTE FIT

- All three models showed adequate model fit (i.e., *ppp* > .05)
- Traditional scale score model (2PL/GRM) and hybrid model (Beta IRT) showed good recovery of the student raw score distribution
- Diagnostic model show adequate model fit for the majority of models
  - 25 estimated diagnostic models (1 per content standard)
  - 21 demonstrated adequate model fit

RESULTS: RELIABILITY

- Both traditional scale score and hybrid model showed good reliability with low standard errors of measurement
    - Hybrid model more consistent over the range of the latent trait
- All diagnostic models showed high levels of classification accuracy and consistency



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CONCLUSIONS

- Based on these results all three models met evaluation standards for technical adequacy
  - Sufficient levels of both model fit and reliability
- Implementation should be driven by consistency with theory of action and stakeholder needs

RECOMMENDATIONS FOR FUTURE IMPLEMENTATION

Support for relevant claims in the Theory of Action provided by each scoring model:

Claim	Scale Score Model	Diagnostic Model	Hybrid Model
I: Mastery results represent what students know and can do relative to the learning pathways.	**Not supported**	**Results reported directly as the set of mastery KSUs**	**Mastery results directly inform summative scale score**
K: Summative results accurately reflect student achievement of grade-level academic content standards.	**Supported with a single scale score**	**Supported with a profile of mastered KSUs**	**Supported with both scale score and diagnostic profile**
L: Educators make instructional decisions based on data from the PIE assessments.	**Not well suited to instructional decision-making**	**Instructional decision-making based on mastery profile**	**Instructional decision-making based on mastery profile**
M: Students make progress towards mastery of grade-level content standards.	**Supported with existing growth models**	**Additional research needed to evaluate profile-based growth**	**Supported with existing growth models**

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ADDITIONAL CONSIDERATIONS

- Findings indicate that instructionally embedded results can "stand alone" to better meet stakeholder needs
  - Reduce end of year testing burden
  - Timely and instructionally relevant results
  - Summative results that align to existing accountability systems
- Optional end-of-year testing could be administered as needed
  - May or may not be included in scoring model to inform results
  - Opportunity for students to test on missed content (e.g., moved schools)
  - Use matrix sampling to gauge where buildings or schools are *at the end of the year*

Discussion

- Define potential roles and associated design considerations for an end-of-year component in an instructionally embedded assessment system
  - Missouri will continue to need a growth measure; with this model can we measure year-to-year growth and within-year growth of students.
  - Our design needed to be focused on the primary users of the system. DESE and LEAs want to support teachers, parents and the students through their learning.
- Design considerations
  - How do we attempt to mitigate behavioral changes when a system becomes part of accountability?
  - How do we support our teachers and instructional pedagogies?
  - How do we support our transient population?

Missouri DEPARTMENT OF ELEMENTARY & SECONDARY EDUCATION

PIE Pathways for Instructionally Embedded Assessment

- Missouri is pursuing an IADA
- Our focus is supporting a competency-based model and traditional scope-and-sequence-based instruction
  - Scalability
  - Learning maps development
  - Funding

GET IN TOUCH!

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