

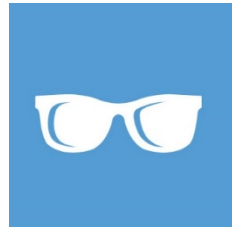


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Innovations
in Testing

San Diego, CA

2020



*Out With the Old, In With the New:
Rethinking How to Design, Administer, and
Score Large-Scale Assessment to Improve
Teaching and Learning*

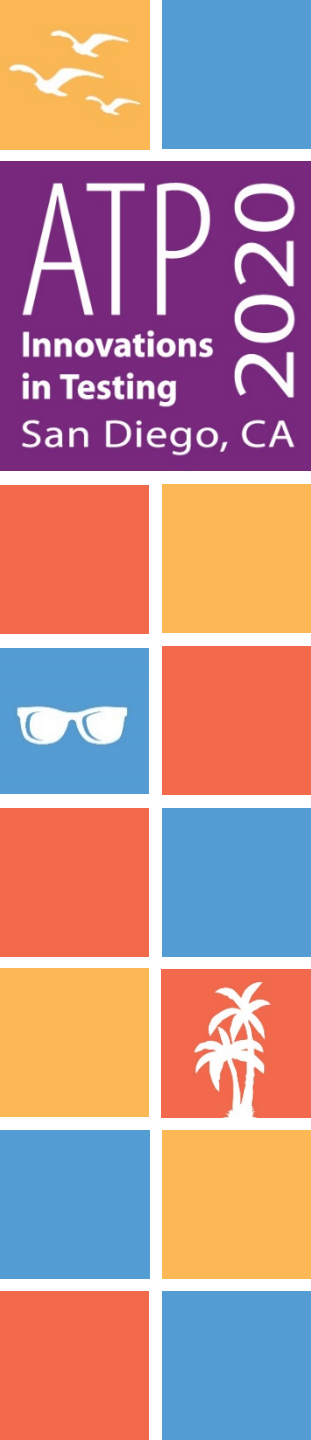
Brooke Nash & Russell Swinburne Romine

University of Kansas

Tammy Mayer

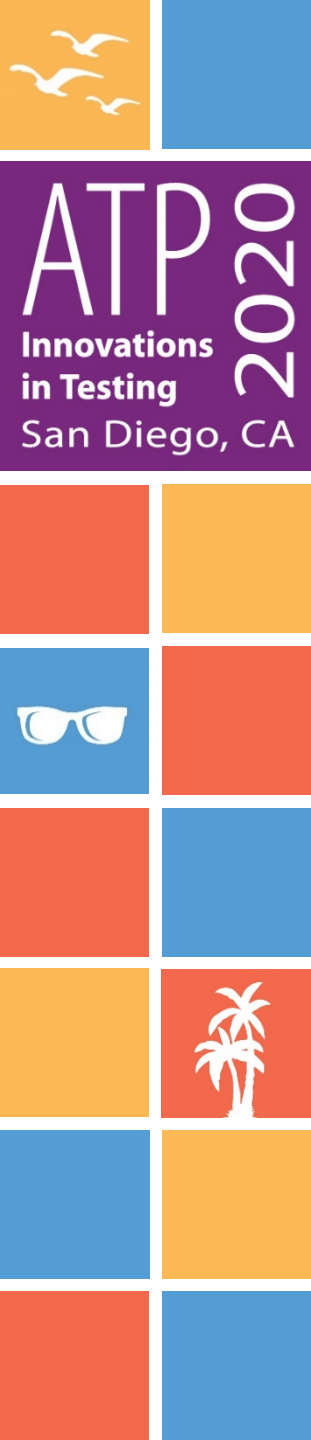
North Dakota Department of Public Instruction





Purpose of Session

- The purpose of this session is to describe an innovative approach to large-scale K-12 alternate assessments, currently employed by the Dynamic Learning Maps® assessment system, which uses:
 - interconnected learning map models as the basis for identifying assessment targets;
 - task templates based on principles of evidence-centered design to develop items aligned to the maps;
 - an embedded assessment administration design to more closely connect instruction to assessment; and
 - diagnostic classification modeling to provide information about students' mastery of skills within the maps.



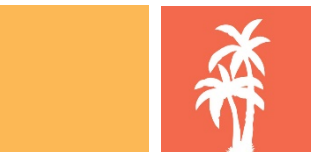
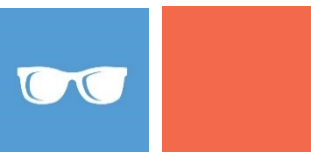
Objectives

To describe:

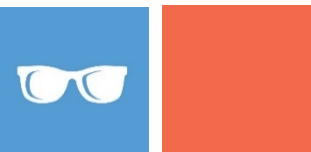
1. from a test developer's perspective, an approach to test development that uses learning map models and evidence-centered design as its foundation;
2. from a psychometrician's perspective, the scoring model used to provide profiles of student mastery; and
3. from a state education agency's perspective, implementation evidence of how the system is used and its impact on teachers and students.



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Assessment Design and Development



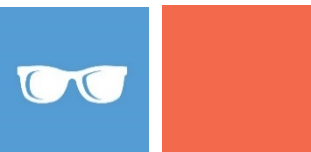
Developing a Map-Based Assessment System

■ Learning Maps as Architecture for Assessment Design

- Incorporating research synthesis with Academic Standards
- Providing multiple access points for assessments
- Supporting student learning by incorporating elements of Universal Design

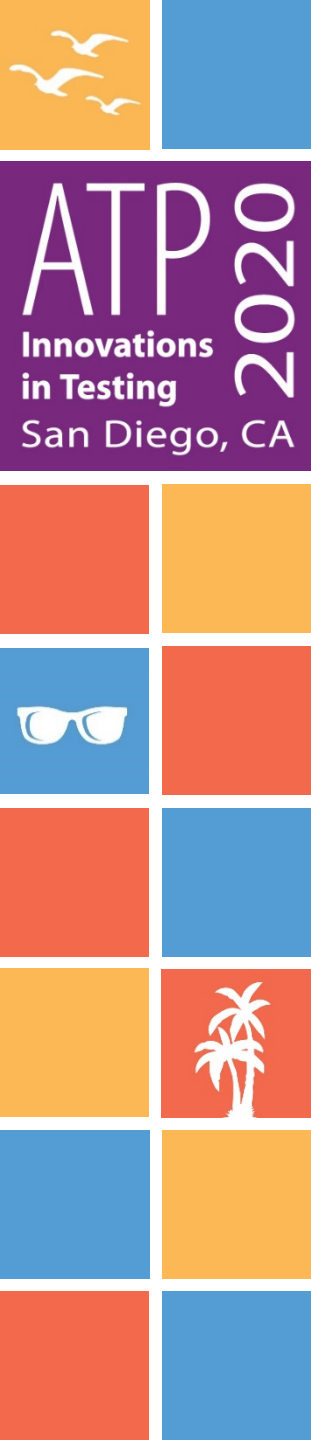
■ The Essential Element Concept Map

- Making the maps meaningful for test developers
- A streamlined approach to task templates and item specifications



Learning Map Design Principles

1. People learn.
2. People learn differently.
3. Multiple “pathways” of learning can be represented in large-scale maps.
4. Maps can help avoid getting “stuck.”
5. Maps can be used for multiple purposes.



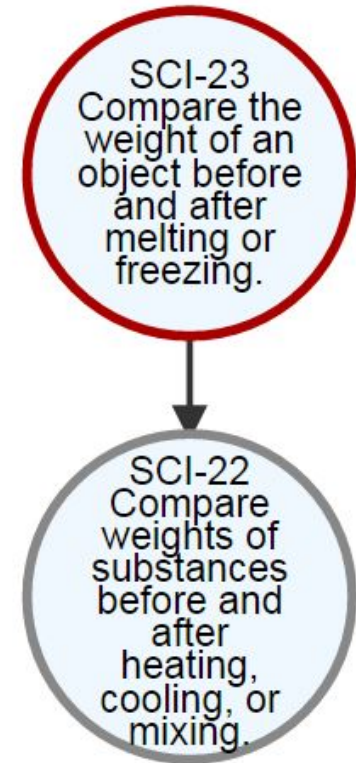
Charting A Course

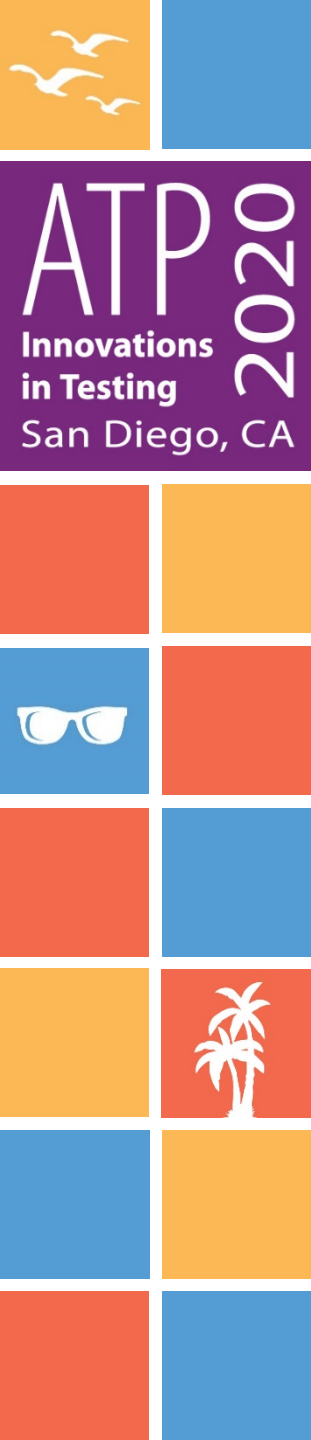
- Learning maps are similar to learning progressions, but developed on a larger scale.
- Learning maps represent the acquisition of knowledge, skills, and conceptual understanding.
- Multiple routes to reaching individual academic targets are represented.

Elements of a Learning Map Model



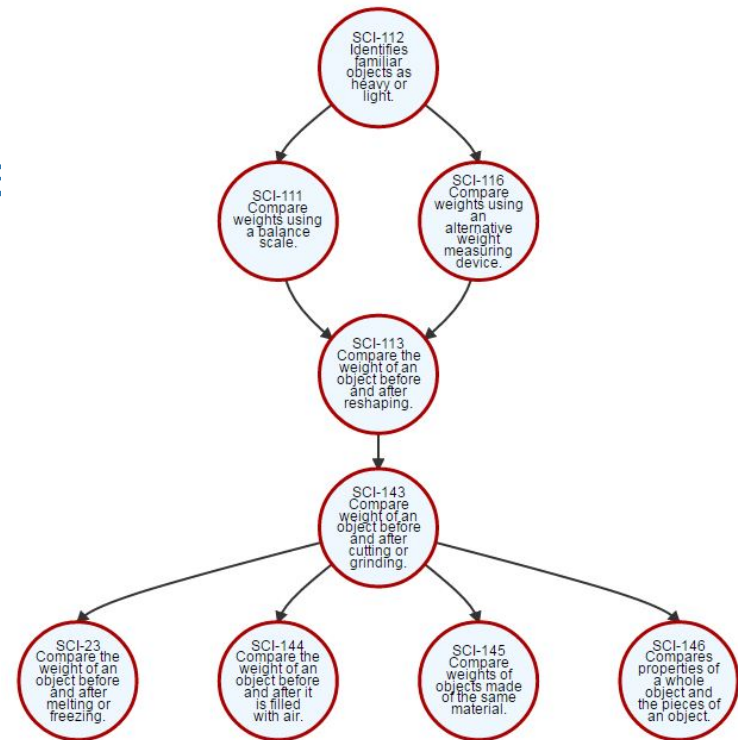
- Nodes represent unique, measurable knowledge, skills, or understandings.
 - Circle
- Connections indicate order of acquisition.
 - Arrows between the circles

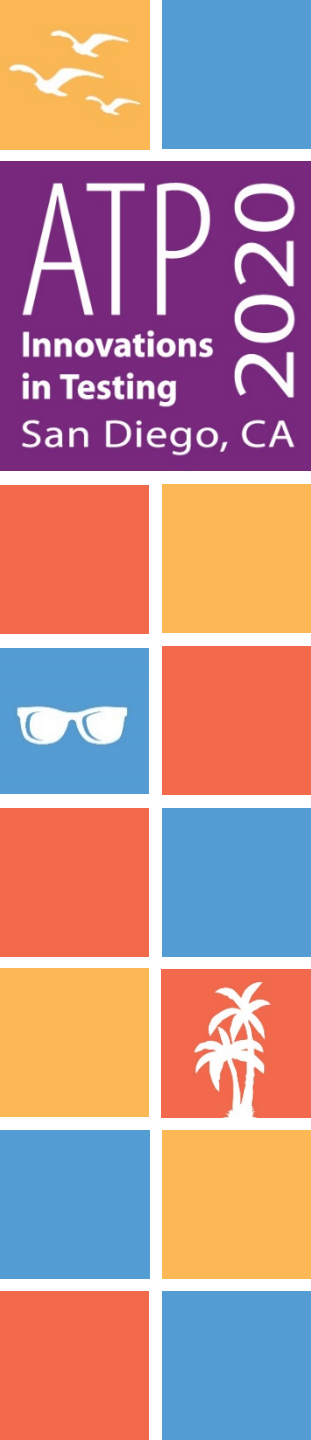




Interpreting a Map

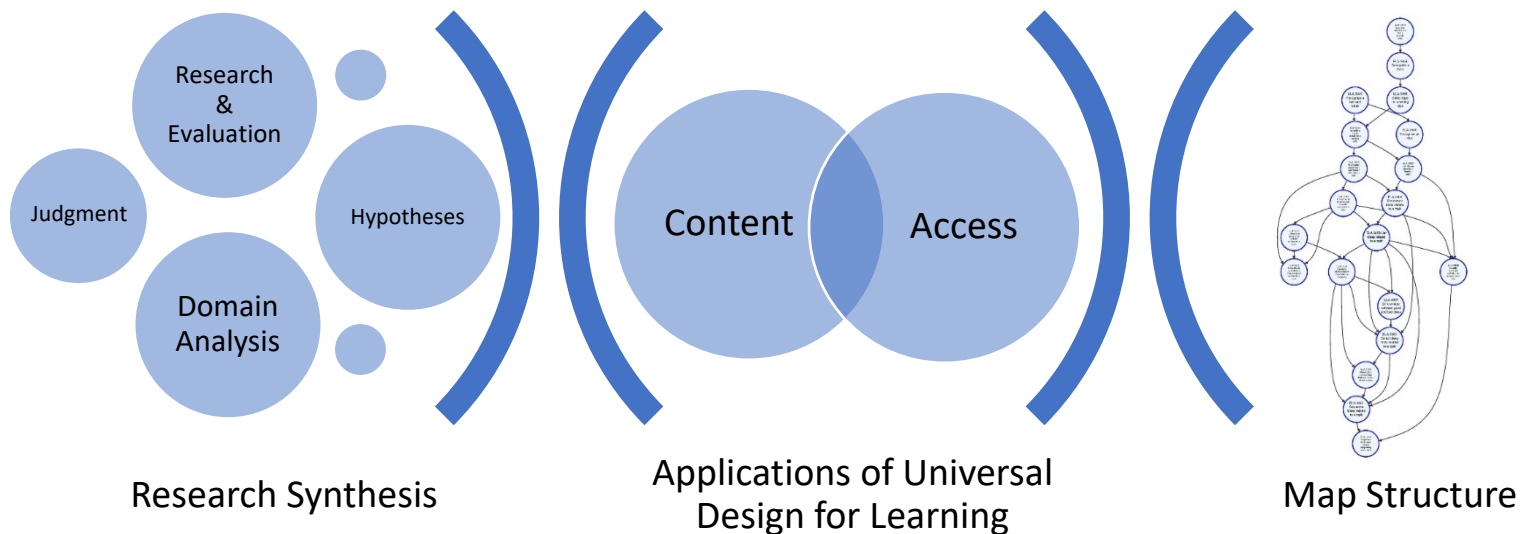
- Nodes increase in complexity as you move from top to bottom in the figure.
- Arrows are unidirectional
- Mastery of more complex skills supports inferences about mastery of preceding, less complex skills

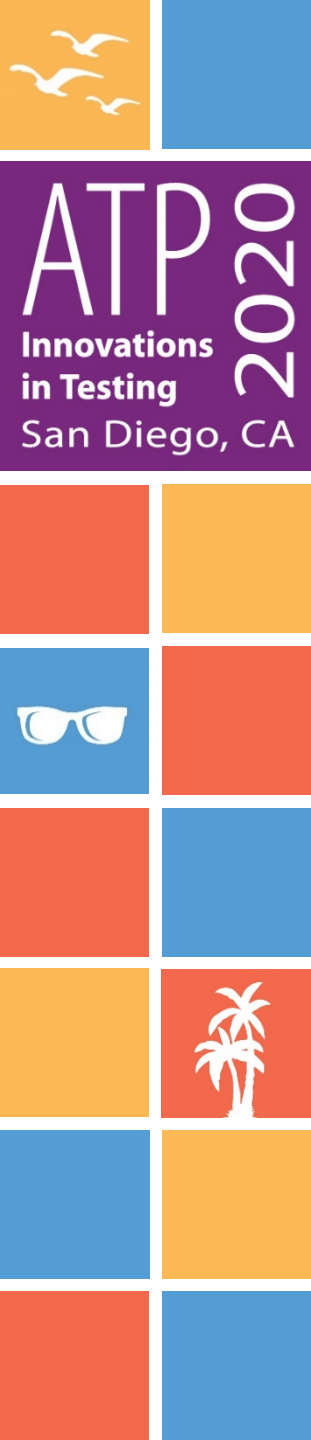




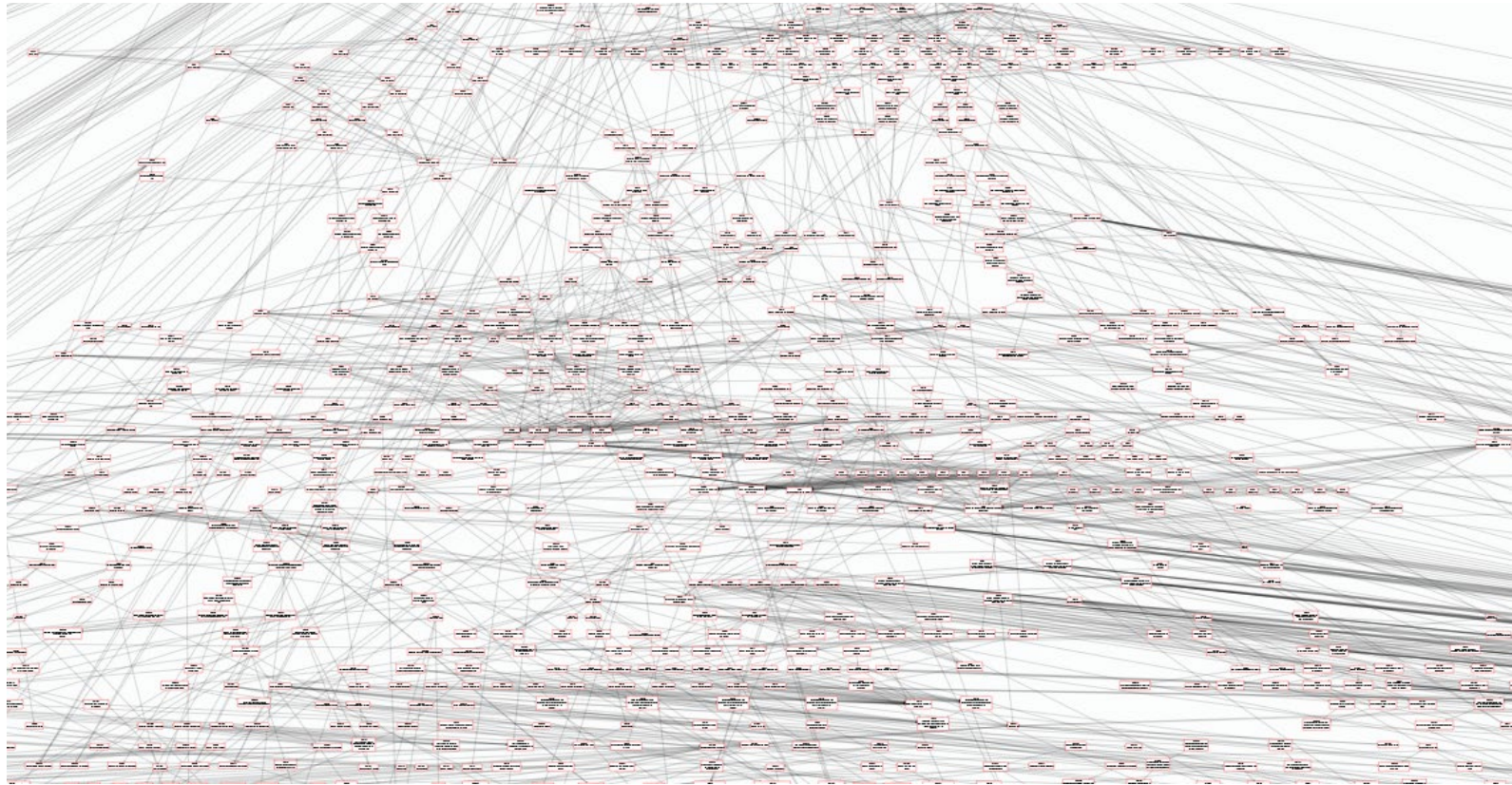
Developing Map Structures

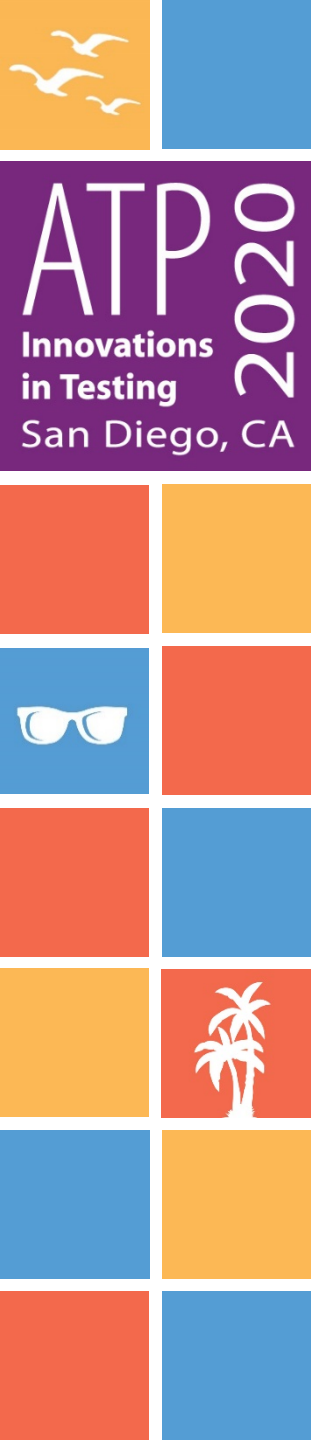
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They Get Pretty Big

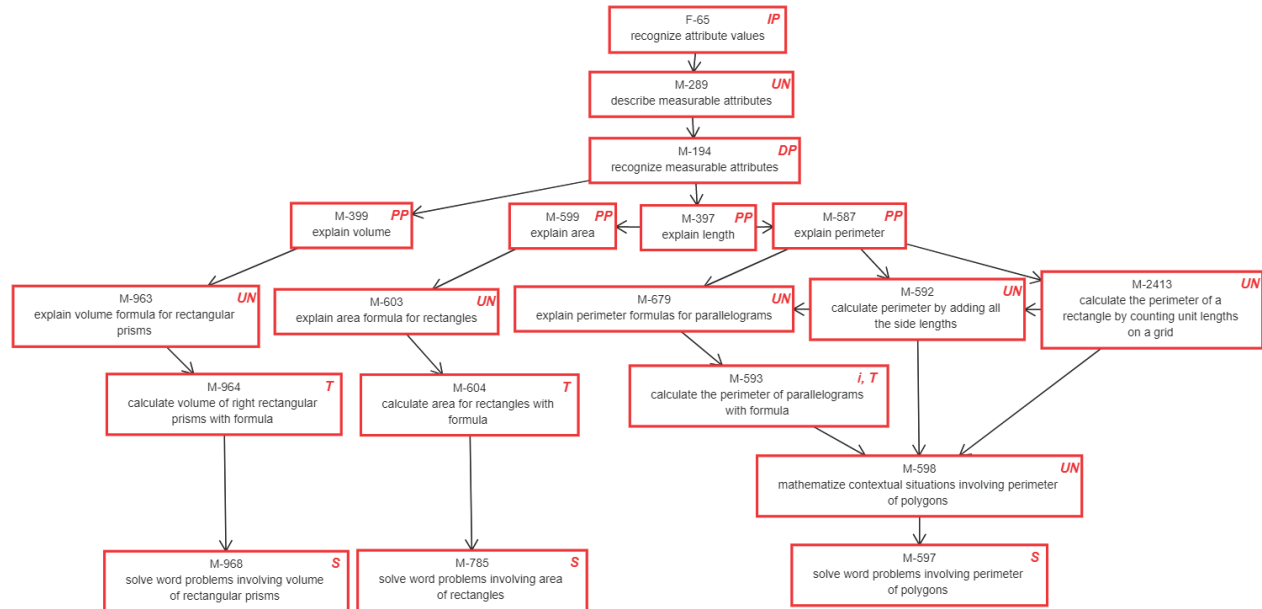


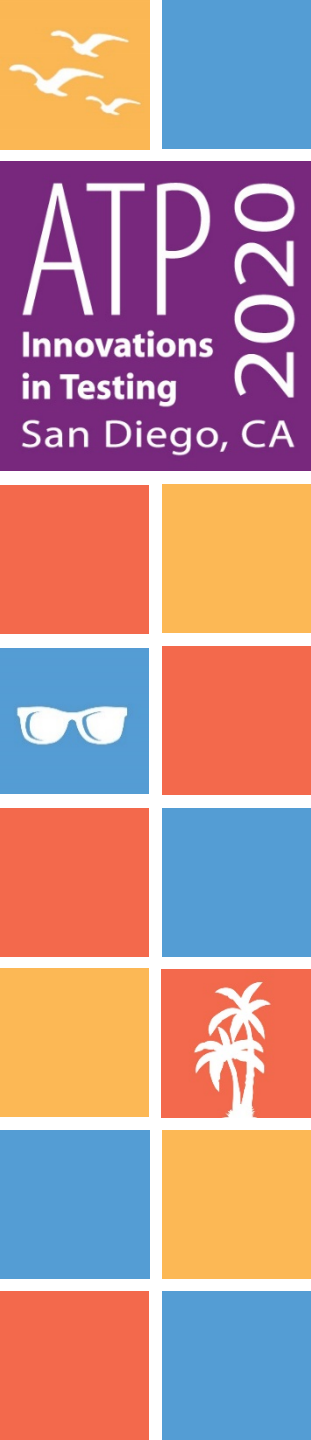


Locating Assessment Targets Within the Maps

- Each academic standard on the DLM test blueprint has an associated *Minimap*
- Minimaps show
 - the targeted knowledge, skills, and understandings described by the standard
 - precursor nodes representing skills that precede, but are on a pathway to the target
 - successor nodes, representing achievement beyond the expectations described by the standard

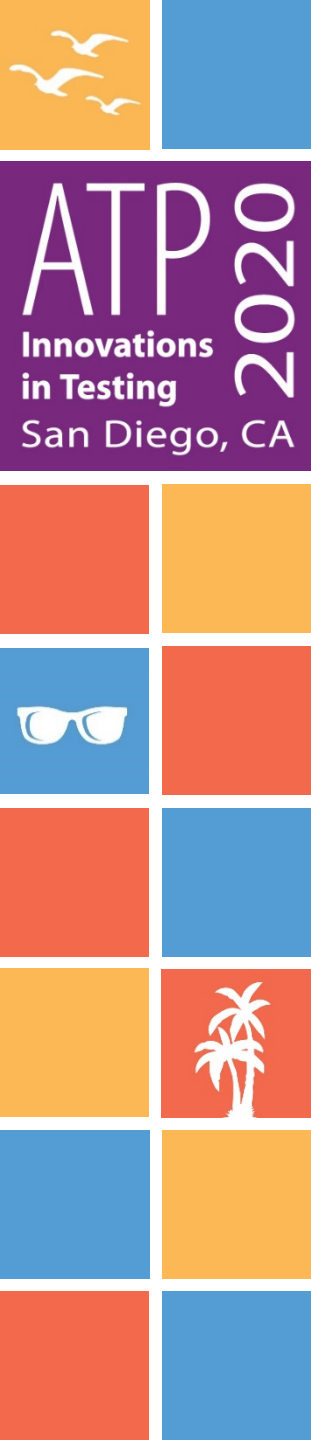
Example Math Mini-Map





Testlets

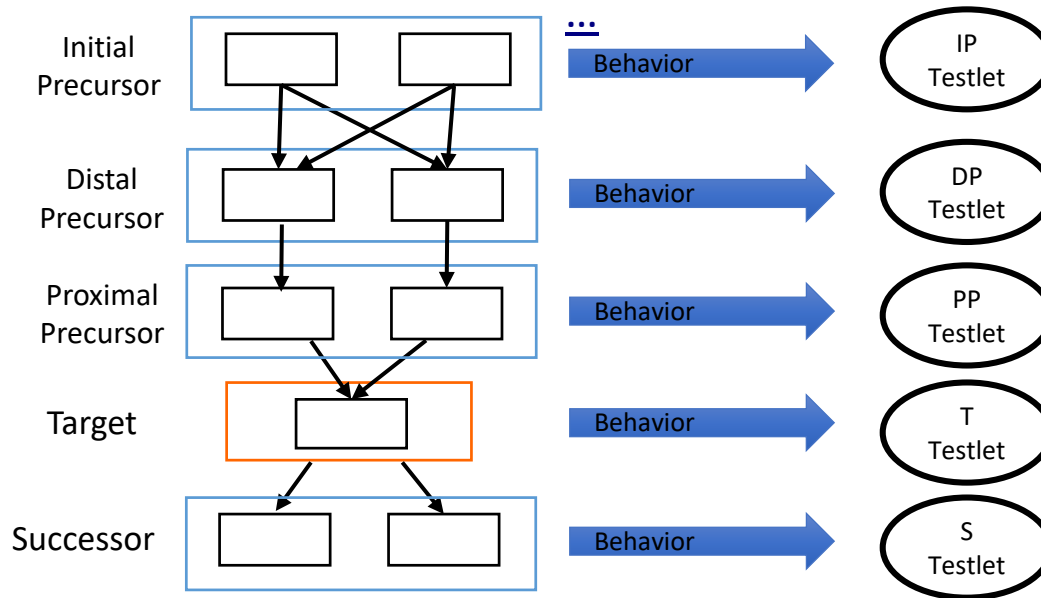
- Items are administered in short testlets
- Testlets are collections of 3-9 items centered around an engagement activity
- Item measures a single standard (known as an Essential Element)



The Essential Elements Concept Map (EECM)


Connects the learning map

...to the items delivered.

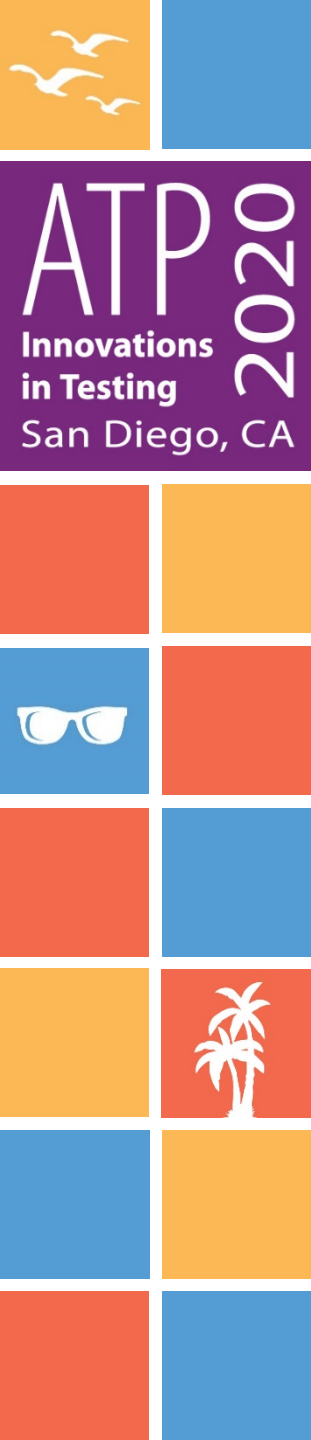


EECM

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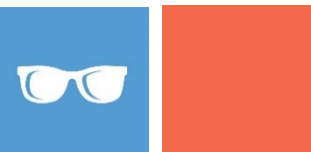
Claim: Conceptual Area: General Education Content Standard: Essential Element:					
Essential Questions					
Vocabulary	(a) Initial Precursor	(b) Distal Precursor	(c) Proximal Precursor	(d) Target	(e) Successor
Concepts					
Words					
(a) Initial Precursor Nodes	Node Descriptions		Node Observations		# Items
					<input type="checkbox"/> TA
(a) Questions to Ask			(a) Misconceptions		

- Full template includes repeated rows for the other linkage level nodes.
- Each EECM contains a minimap view.
- Includes information traditional used in task templates and construct definition materials in an easy to use format.



EECM

- Links the content domain (map) to test development (testlets)
- Places student access to content at the forefront of test development
- EECM specified for each standard
- For each standard, five access points called linkage levels
 - Map nodes measured at each linkage level along with description and observation
 - Vocabulary and key concepts by level
- Describes common misconceptions, common questions to ask
- Ensures consistency across the test development process.

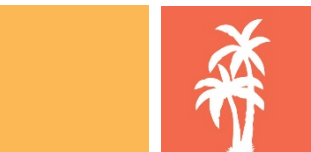
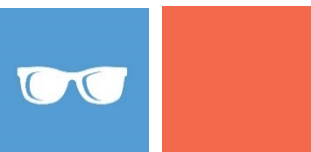


Evaluating the Map-Based, EECM Development Approach

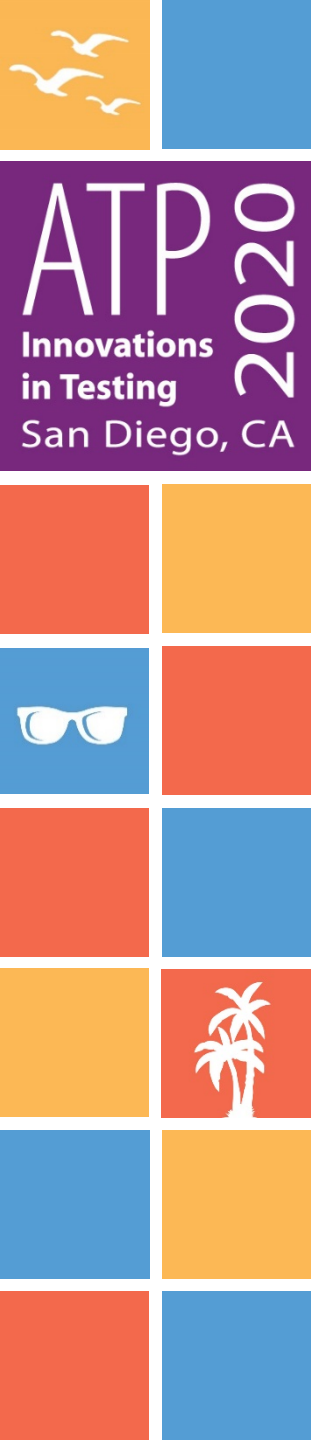
- **Strong Evidence of Alignment of relationships in the assessment system**
 - Internal Review Panels
 - External Review Panels
 - External, Independent Alignment Study
- **Strong Evidence for Response Processes as Intended**
 - Test administration observations
 - Cognitive Labs
 - Teacher Survey
- **For additional information see**
 - Bechard, et al., (2019). Evidence Centered Design for Learning Maps-Based Assessment, *International Journal of Testing*, 19:2, 188-2015.



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Assessment Administration



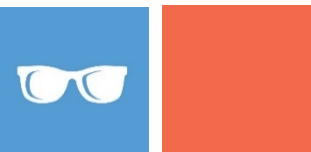
Traditional K-12 Large-Scale Assessment

- End of a year, summative evaluation of fixed set of content standards
- Results used to meet federal accountability requirements
- Results are delivered too late in the year and at a level of reporting that lacks utility for instruction (Marion, 2018; Wilson, 2018)
- Associated with negative impacts on disadvantaged students, narrowing of the curriculum, increased testing anxiety, and decreased teacher morale (Blazer, 2012)

Blazer, C. (2012). Social networking in schools: Benefits and risks; review of the research; policy considerations; and current practices. *Information Capsule*, 1109, 1-23.

Marion, S. F. (2018). The opportunities and challenges of a systems approach to assessment. *Educational Measurement: Issues and Practice*, 37(1), 45-48.

Wilson, M. (2018). Making measurement important for education: The crucial role of classroom assessment. *Educational Measurement: Issues and Practice*, 37(1), 5-20.



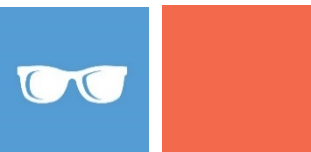
Instructionally Embedded Assessment

■ Purpose

- Provide an integrated assessment solution for students with significant cognitive disabilities that meets federal accountability requirements, AND is instructionally useful.

■ Advantages

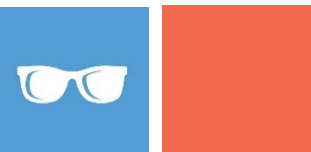
- Potential for efficiency in assessment development, testing time, and instruction
- Results are timely to support teachers' classroom instruction



Instructionally Embedded Assessment (cont.)

■ Features

- Short assessments available throughout the year, administered at instructionally relevant time points
- Based on flexible blueprints to support teacher choice of content based on individual students' instructional goals
- Based on learning map models to show progression of skills
- Provides timely and fine-grained results as instruction occurs



Instructionally Embedded Administration

- Teachers develop online instructional and assessment plans at the beginning of the academic year
 - Choose which Essential Elements to test and when (can also select level of cognitive complexity to test within each Essential Element)
- Engage in instructional and assessment cycles throughout the year
- Educator interface provides status of instructional and assessment plans and results of student progress

Choose at least three EEs in C1.1, including at least one RL and one RI.



Complete

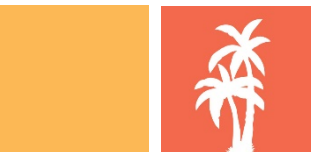
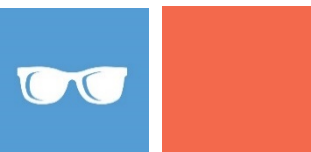
Claim: ELA.C1 Students can comprehend text in increasingly complex ways.

Conceptual Area: ELA.C1.1 Determine critical elements of text

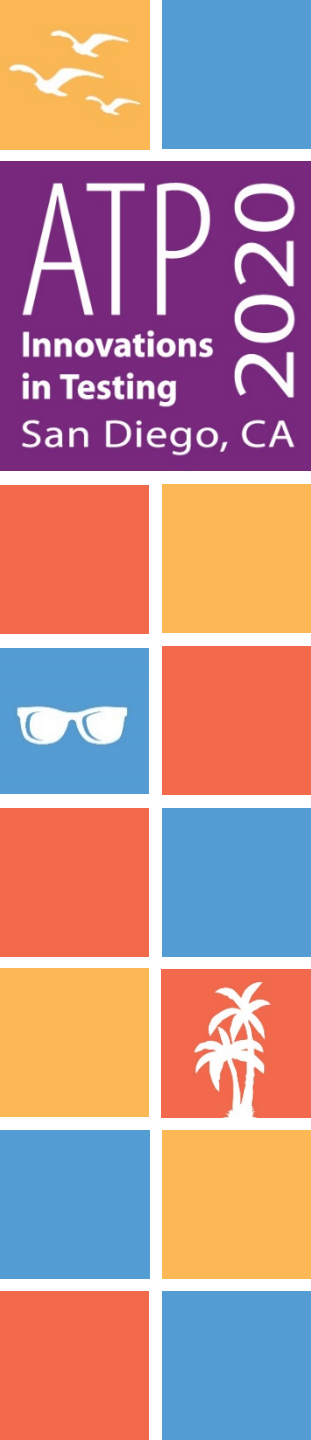
Essential Element	Initial Precursor	Distal Precursor	Proximal Precursor	Target	Successor
ELA.EE.RI.4.1 Identify explicit details in an informational text.	understand object names [empty space]	name or identify objects in pictures [empty space]	identify concrete detail in informational text [empty space]	identify explicit text details and words [empty space]	identify explicit text details and words [empty space]
ELA.EE.RI.4.2 Identify the main idea of a text when it is explicitly stated.	understand object names Testlet Assigned 06/25 [empty space]	name or identify objects in pictures [empty space]	identify concrete details in informational texts [empty space]	identify text topic and related details [empty space]	identify topic-related words in informational text [empty space]
ELA.EE.RI.4.3 Identify an explicit detail that is related to an individual, event or idea in a historical, scientific, or technical text.	understand object names [empty space]	use category knowledge to draw conclusions Testlet Assigned 06/25 [empty space]	identify concrete details in an informational text [empty space]	understand concrete details (person, place, idea) [empty space]	understand key details [empty space]
ELA.EE.RI.4.5 Identify elements that are characteristic of informational texts.	determine similar or different Testlet Complete 06/17 [empty space]	name or identify objects in pictures [empty space]	understands purpose of pictures [empty space]	recognize informational text characteristics [empty space]	understand structural purpose of text [empty space]



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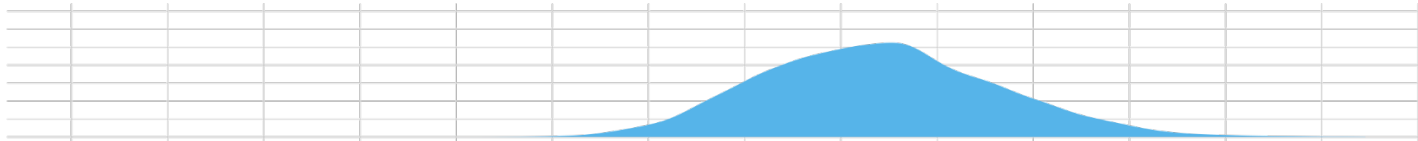


Scoring Model

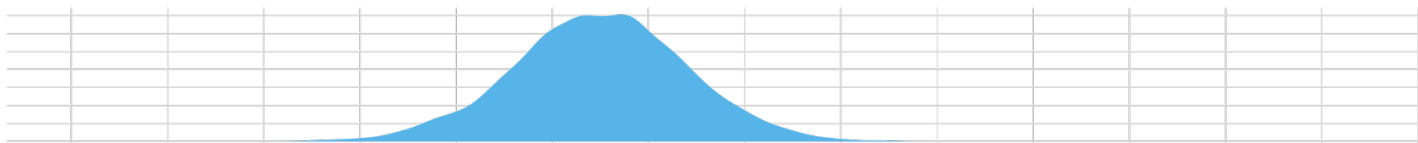


Traditional (IRT) Scoring

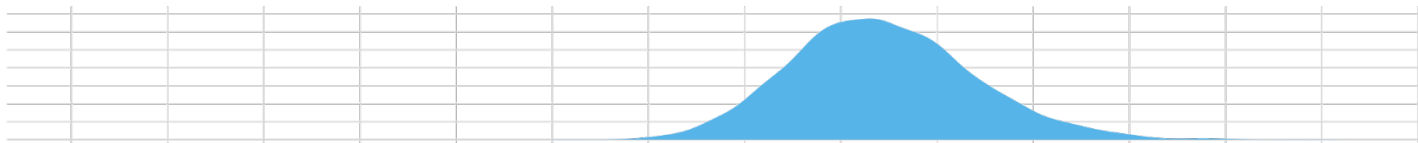
English Language Arts



Mathematics



Science



-3

-2

-1

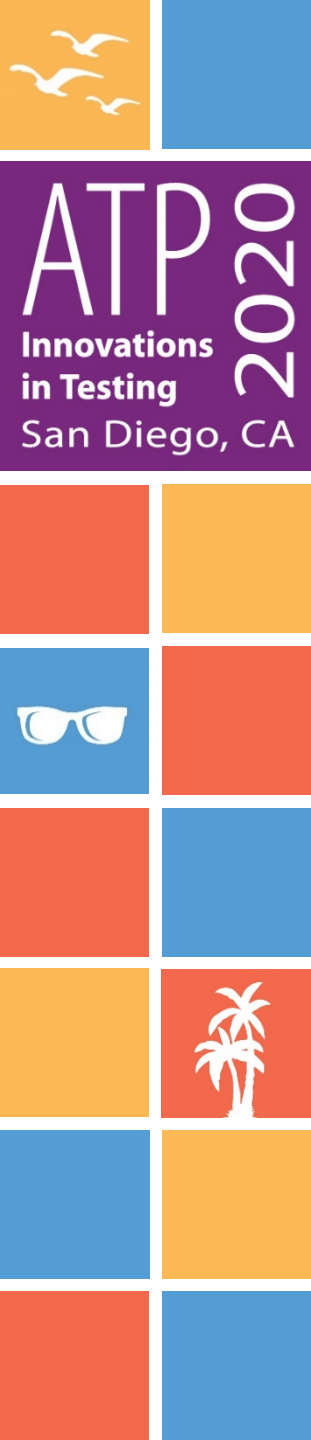
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Diagnostic Classification Modeling as an Alternative

- Because of the desire to provide more fine-grained information beyond a single score value, DLM assessments are not scored using classical or item response theory
 - No raw or scale score
- Instead, a *profile of mastered* skills is created to summarize student performance



Moving to a More Fine-Grained Model

SCI.5.LS.1.1: Provide evidence that plants need air and water to grow.

Linkage Level = Initial

Distinguish things that grow from things that don't grow.

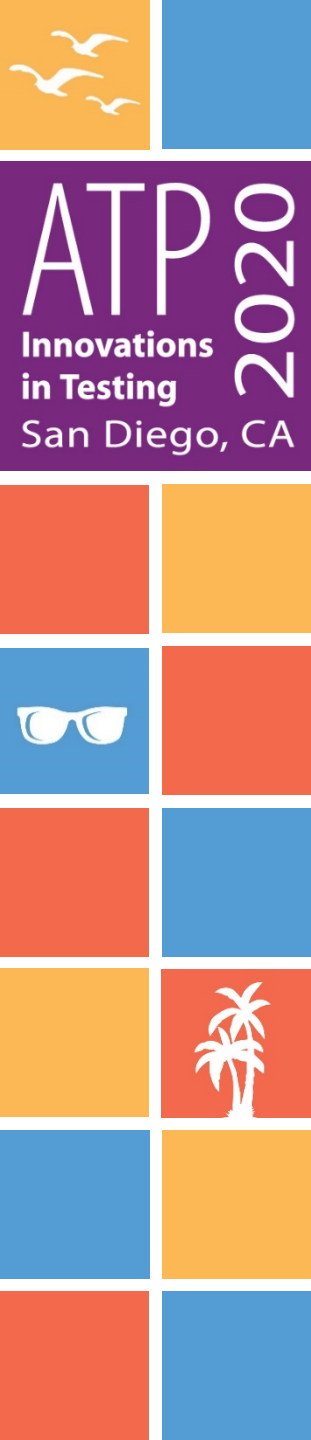
Linkage Level = Precursor

Provide evidence that plants grow.

Linkage Level = Target

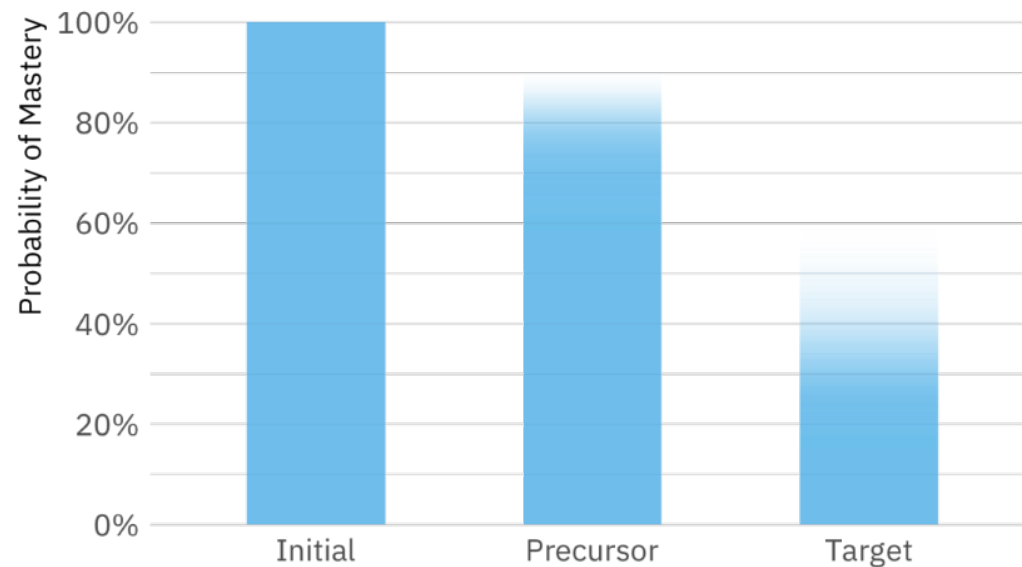
Provide evidence that plants need air and water to grow.

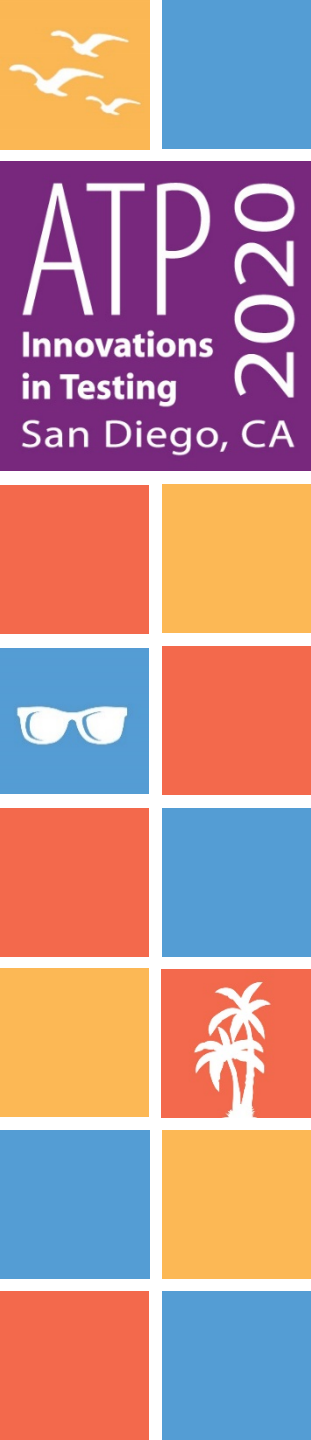




Diagnostic Classification Modeling

- Diagnostic classification modeling (DCM) is a statistical method that provides diagnostic feedback about students' mastery of discrete skills.





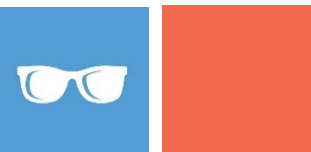
Linkage Level Mastery: Probability

Using all student responses to items for a given linkage level within an Essential Element, the statistical model is applied to determine the probability that a student is a master of that linkage level:



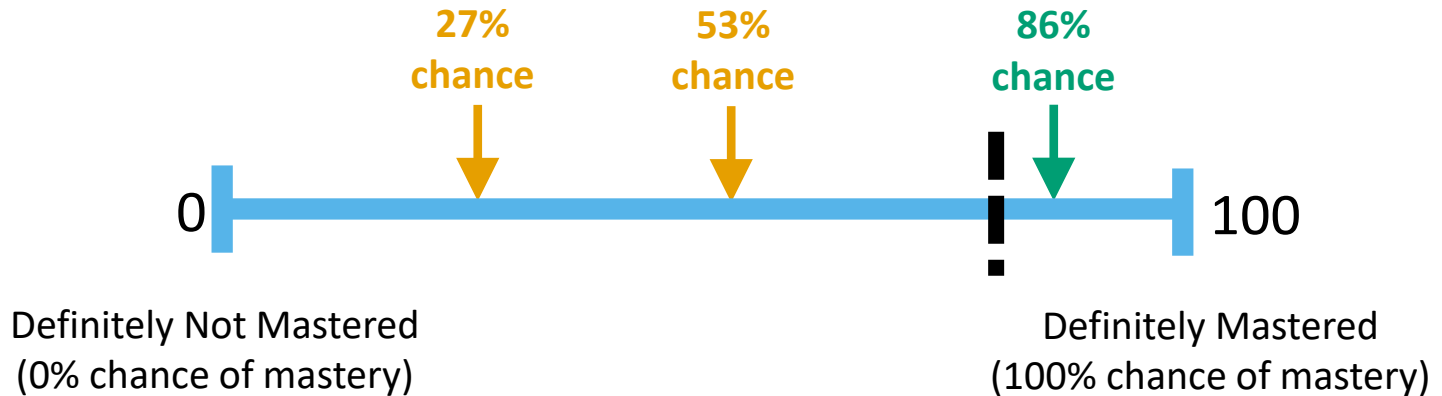
Definitely Not Mastered
(0% chance of mastery)

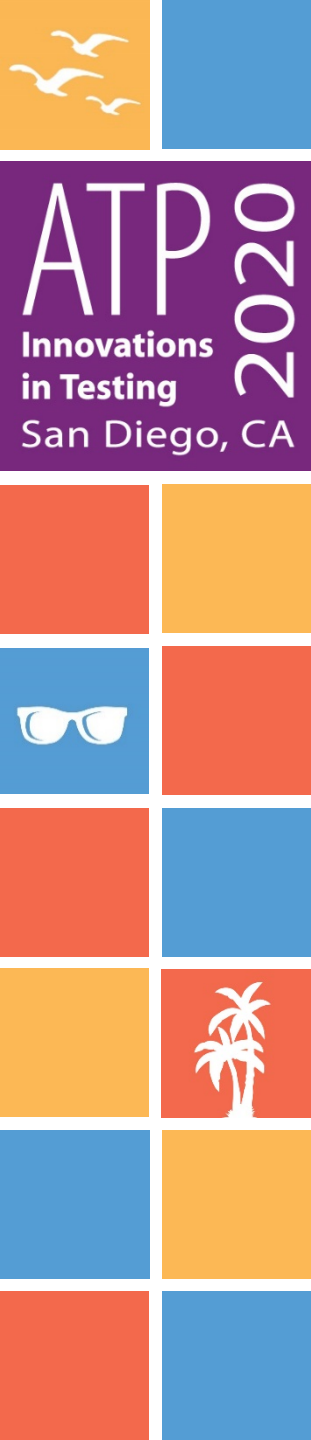
Definitely Mastered
(100% chance of mastery)



Linkage Level Mastery: Probability

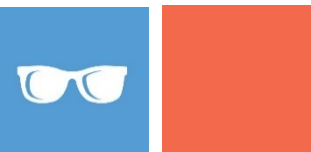
The statistical model tells us the probability that the student is a master. For DLM assessments, the student must have an 80% or greater chance of mastery to be considered a master.





Essential Element Mastery

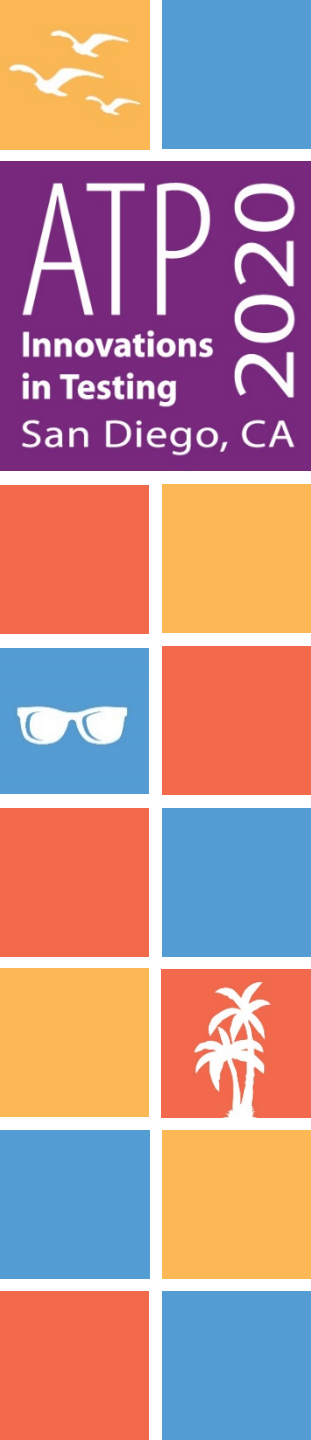
- Combine information about linkage levels within an Essential Element to get to **highest linkage level mastered** for each EE
 - No evidence of mastery = 0
 - Initial precursor level mastery = 1
 - Distal precursor level mastery = 2
 - Proximal precursor level mastery = 3
 - Target level mastery = 4
 - Successor level mastery = 5



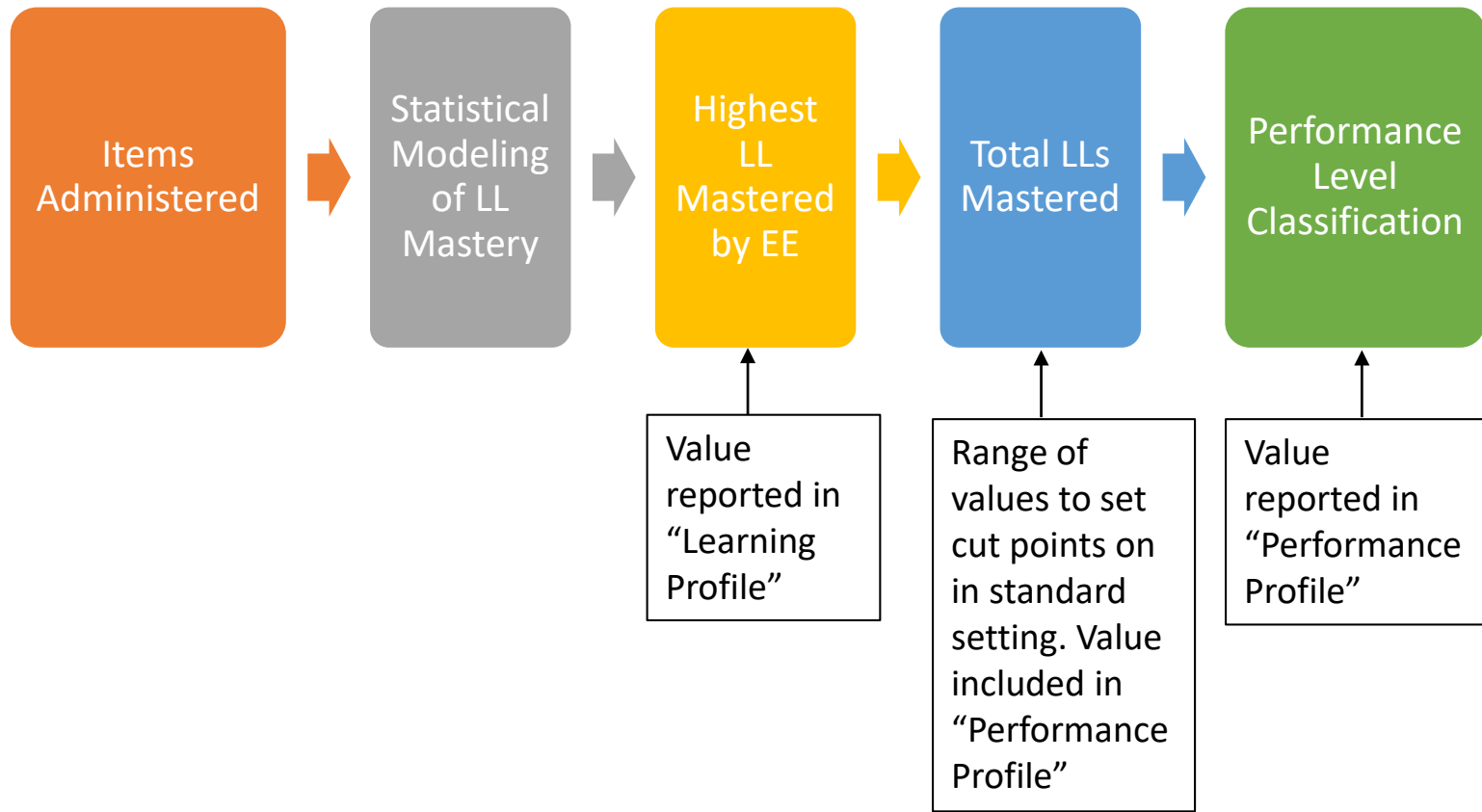
Total Mastery & Performance Levels

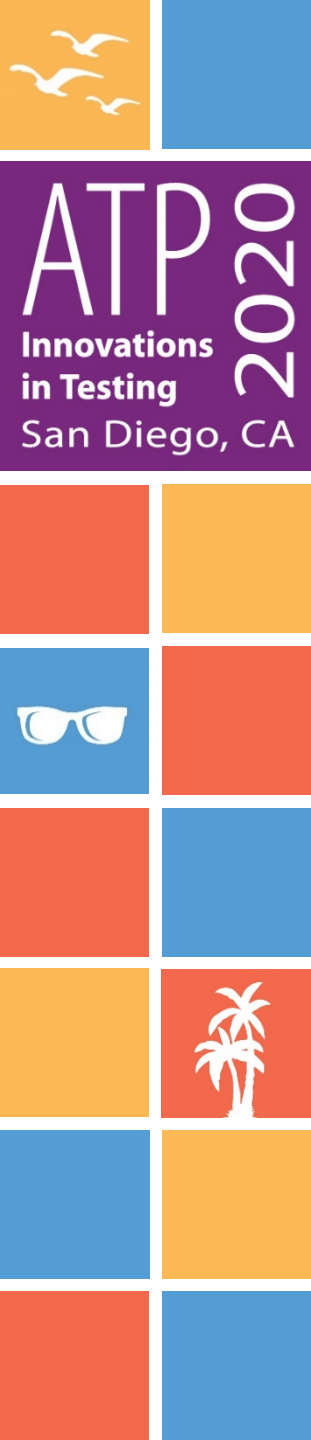
- Number of linkage levels mastered is combined across all EEs to get **total linkage levels mastered**
 - For example, if there are 10 EEs x 5 linkage levels = 50 possible linkage levels

Performance Level Descriptors	
Emerging (E)	The student demonstrates emerging understanding of and ability to apply content knowledge and skills represented by the EEs.
Approaching (AP)	Student's understanding of and ability to apply targeted content knowledge and skills represented by the EEs is approaching the target .
Target (T)	The student's understanding of and ability to apply content knowledge and skills represented by the EEs is at target .
Advanced (AD)	The student demonstrates advanced understanding of and ability to apply content knowledge and skills represented by the EEs.



Summary of Stages of Scoring





DLM Reports

■ Learning Profile

- Linkage level mastery
- A version is available as a progress report throughout the year to help guide instructional plans

■ Performance Profile

- Overall performance level and percent of linkage levels mastered by domain
- Summarizes student performance data collected from across the year

Individual Student End-of-Year Report Learning Profile 2019-20




NAME: Student DLM
DISTRICT: DLM District
SCHOOL: DLM School

DISTRICT ID: 12345
STATE: DLM State
STATE ID: 868154

Student's performance in 10th grade English language arts Essential Elements is summarized below. This information is based on all of the DLM tests Student took during the 2019-20 school year. Grade 10 had 19 Essential Elements in 4 Conceptual Areas available for instruction during the 2019-20 school year. The minimum required number of Essential Elements for testing in 10th grade was 10. Student was tested on 12 Essential Elements in 4 of the 4 Conceptual Areas.

Demonstrating mastery of a Level during the assessment assumes mastery of all prior Levels in the Essential Element. This table describes what skills your child demonstrated in the assessment and how those skills compare to grade level expectations.

Area	Essential Element	Level Mastery				
		1	2	3	4 (Target) 	5
ELA.C1.2	ELA.EE.L.9-10.4.a	Identify familiar objects through property word descriptors	Identify definition of words	Identify missing words using sentence context	Use semantic clues to identify word meaning	Use semantic clues to identify phrase meaning
ELA.C1.2	ELA.EE.L.9-10.5.b	Draw conclusions from category knowledge	Identify the multiple meanings of a word	Identify word meaning of multiple meaning words using context clues	Identify the intended meaning of multiple meaning words	Understand how multiple meaning words can result in humor
ELA.C1.2	ELA.EE.RI.9-10.1	Identify concrete details in a familiar informational text	Identify concrete details in an informational text	Cite textual evidence for inferred information	Discriminate between citations for explicit and inferred information	Cite evidence for a text's specific meaning
ELA.C1.2	ELA.EE.RI.9-10.2	Identify concrete details in an informational text	Identify details relevant to the topic of text	Summarize a familiar informative text	Identify key details supporting the central idea	Support implicit and explicit meaning with details

REPORT DATE: 12-13-2019
SUBJECT: English language arts
GRADE: 10

Individual Student End-of-Year Report Performance Profile 2019-20



NAME: Student DLM
DISTRICT: DLM District
SCHOOL: DLM School

DISTRICT ID: 12345
STATE: DLM State
STATE ID: 868154

Overall Results

Students in Grade 10 English language arts are expected to be administered assessments covering 50 skills for 10 Essential Elements. Student mastered 40 skills during the year.

Overall, Student's mastery of English language arts fell into the third of four performance categories: **at target**. The specific skills Student has and has not mastered can be found in Student's Learning Profile.



EMERGING:	The student demonstrates emerging understanding of and ability to apply content knowledge and skills represented by the Essential Elements.
APPROACHING THE TARGET:	The student's understanding of and ability to apply targeted content knowledge and skills represented by the Essential Elements is approaching the target .
AT TARGET:	The student's understanding of and ability to apply content knowledge and skills represented by the Essential Elements is at target .
ADVANCED:	The student demonstrates advanced understanding of and ability to apply targeted content knowledge and skills represented by the Essential Elements.

REPORT DATE: 12-13-2019
SUBJECT: English language arts
GRADE: 10

Individual Student End-of-Year Report
Performance Profile 2019-20



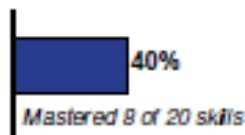
DYNAMIC[®]
LEARNING MAPS

NAME: Student DLM
DISTRICT: DLM District
SCHOOL: DLM School

DISTRICT ID: 12345
STATE: DLM State
STATE ID: 868154

Performance Profile, continued

Use writing to
communicate

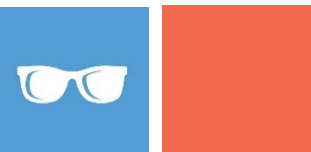


Integrate ideas and
information in writing

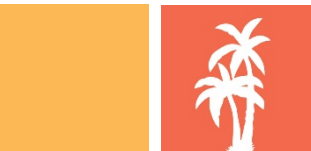
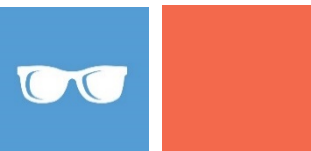




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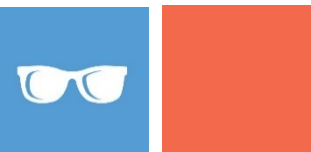


State Implementation



Implementation: North Dakota's Instructionally Embedded Window

- **Instructionally Embedded Assessments** – computer-based assessments that are intended to be integrated with classroom instruction
 - Provide teachers with flexibility in the selection and delivery of testlets for a student (customization)
 - Generate results that teachers can use to inform plans for further instruction
 - For both ELA and Mathematics

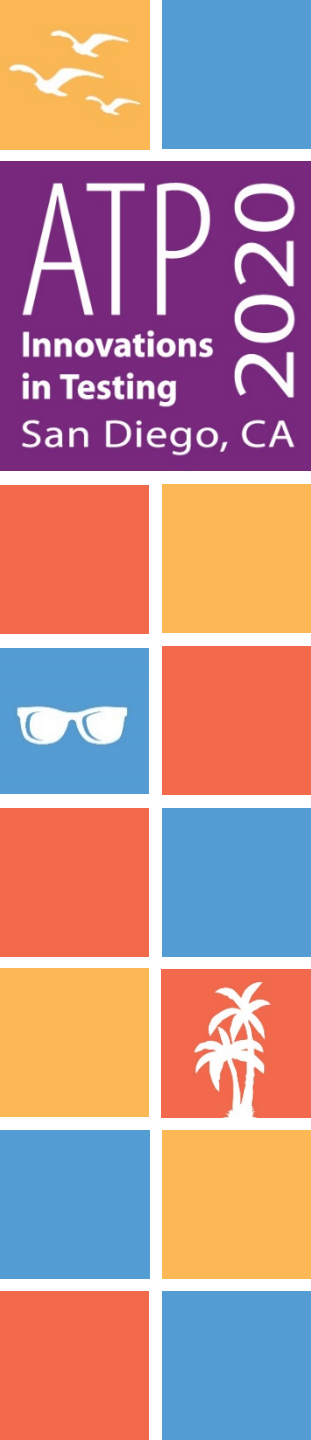


North Dakota 2019-20

Participation

- Test sessions: 9,075
- Students: 520
- Teachers: 221
- Schools: 167
- Districts: 66

*With at least one testlet complete between 9/9/2019 and 2/26/2020



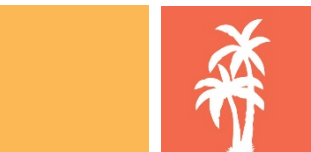
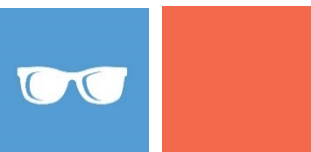
North Dakota Students Taking 2019-20 Testlets by Grade

Grade	Students
Grade 3	67
Grade 4	76
Grade 5	81
Grade 6	67
Grade 7	81
Grade 8	72
Grade 9	0
Grade 10	54
Grade 11	22
Grade 12	0

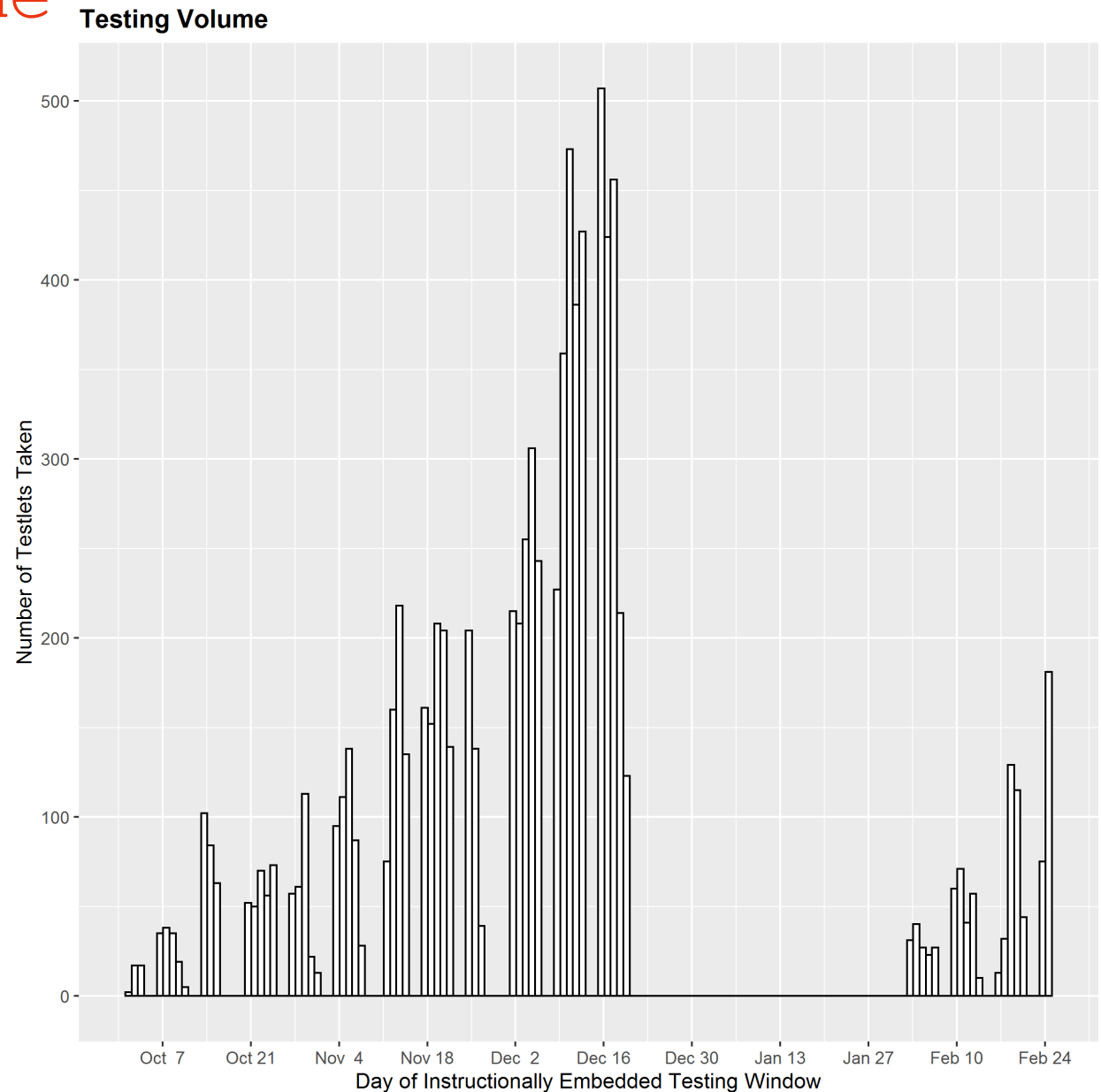
*With at least one testlet complete between 9/9/2019 and 2/26/2020

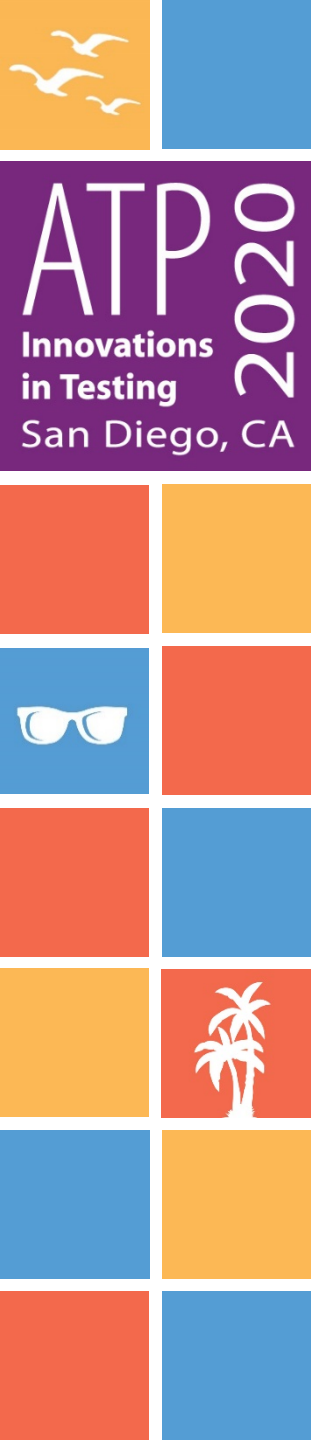


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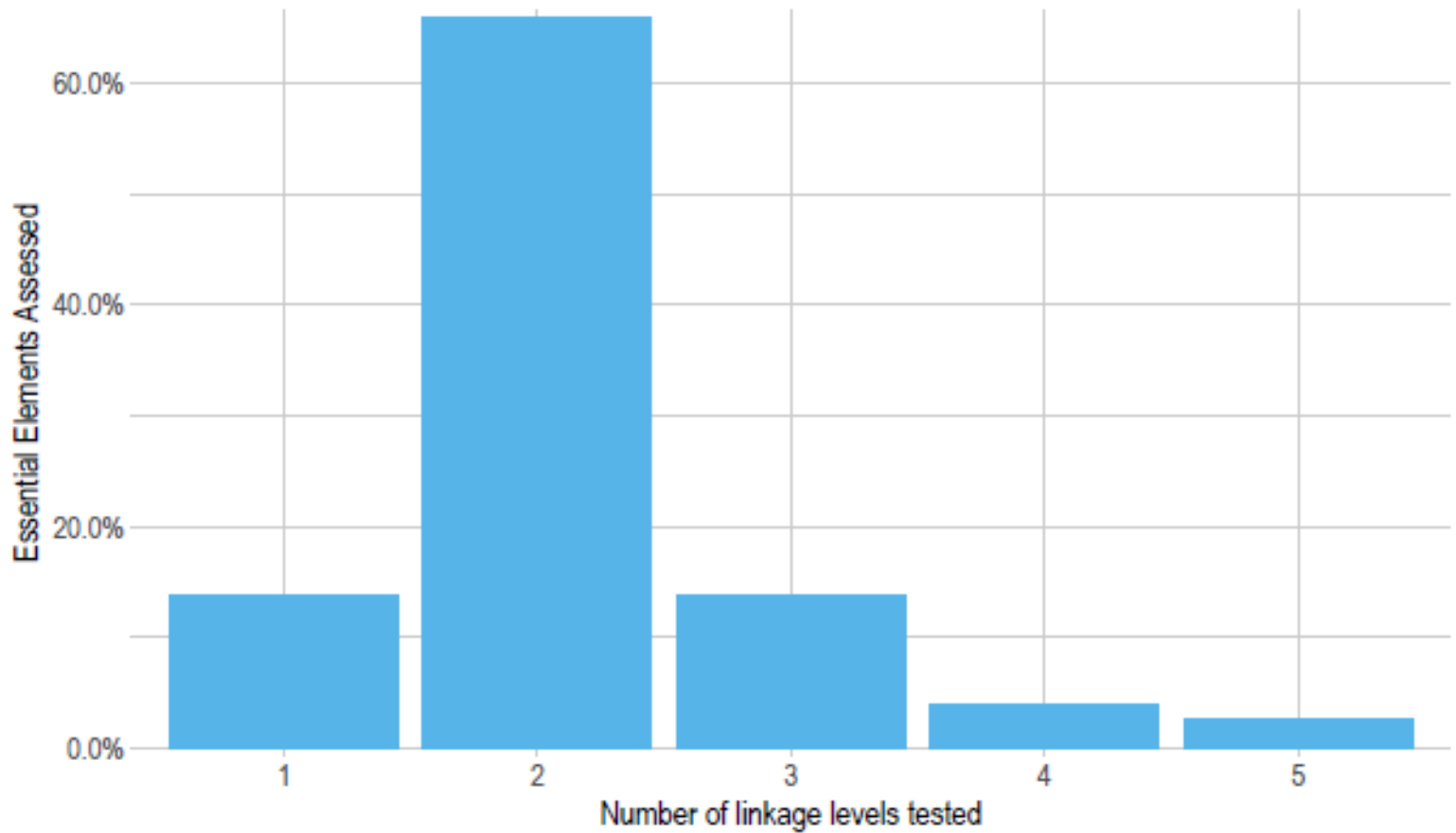


North Dakota 2019-20 Testing Volume





Number of Linkage Levels Assessed on Essential Elements



Progress Reports

Individual Student Progress Report



Name: First59845 Last59845
Subject: English Language Arts
Report Date: October 05, 2015

School: Blue River Elementary
District: Blue Valley SomethingLongName For Testing
State: Kansas

Year: 2015
Grade: Grade 5
ID: 59845

First59845's current performance in Grade 5 English Language Arts Essential Elements is summarized below. This information is based on all of the Dynamic Learning Maps tests taken between the beginning of the school year and October 05, 2015. The target level is the grade level expectation for students to have proficient understanding of and ability to apply the Essential Element.

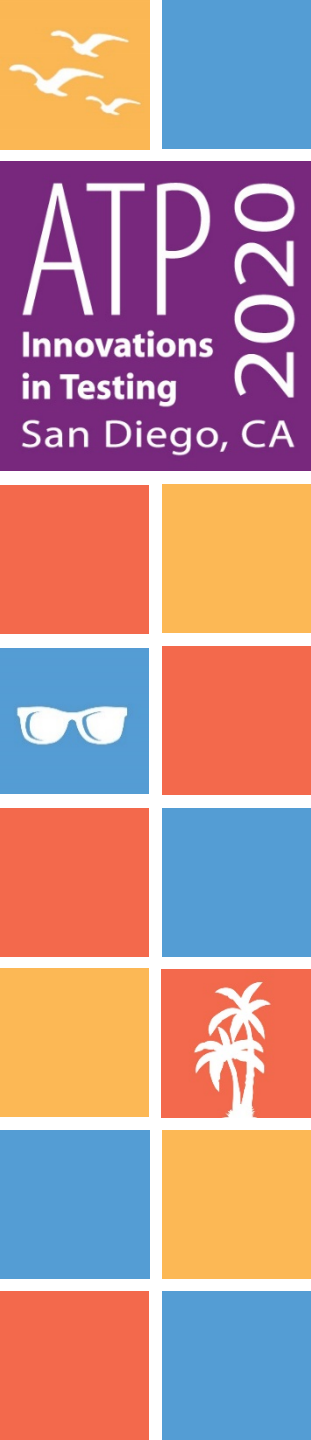
This report does not show progress on all of First59845's instructional goals. First59845 may be taught other academic concepts that have not yet been tested. This report does not show progress on IEP goals.

Claim: ELA.C2		Conceptual Area: ELA.C2.1 - Use writing to communicate			
Grade Level Expectation	Level 1	Level 2	Level 3	Level 4	Level 5
ELA.EE.CW.5.T Conventional Writing				introduces topic and writes related information Assessed: 02/26	

Claim: ELA.C1		Conceptual Area: ELA.C1.2 - Construct understandings of text			
Grade Level Expectation	Level 1	Level 2	Level 3	Level 4	Level 5
ELA.EE.L.5.5.c Demonstrate understanding of words that have similar meanings.	identify familiar people, objects, places, events	identify descriptive words	identify words with opposite meanings	understand similar word meanings Planned	identification of similar meaning words
ELA.EE.RI.5.2 Identify the main idea of a text when it is not explicitly stated.	identify familiar people, objects, places, events	identify illustrations for familiar text	identify concrete detail in informational text	identify implicit main idea and supporting details Mastered: 02/25	identify implicit main idea and supporting details
ELA.EE.RL.5.2 Identify the central idea or theme of a story, drama or poem.	identify familiar people, objects, places, events	identify character actions	identify character's actions and the consequences	identify specific theme of a story and apt details Mastered: 02/25	identify specific theme of a story and apt details

Claim: ELA.C1		Conceptual Area: ELA.C1.1 - Determine critical elements of text			
Grade Level Expectation	Level 1	Level 2	Level 3	Level 4	Level 5
ELA.EE.RI.5.1 Identify words in the text to answer a question about explicit information.	can respond to yes/no questions	recognize simple details of familiar text	identify/answer questions about concrete details Attempted: 12/12	identify words related to explicit information Planned	use details to identify explicit information

= Target	= Mastered	= Attempted	= Assessed, no results available	= Planned
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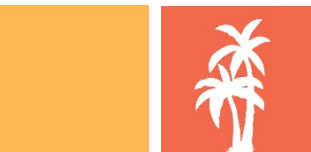
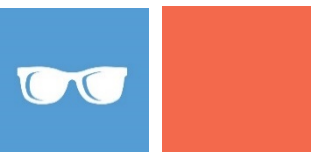


Learning Profiles Help

- Set instructional goals
- Connect previous grade's EEs to current grade
- Identify strengths and weaknesses
- Guide goal development for a standards-based IEP



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Thank You!