

Evaluating Usability and Utility of a Teacher Dashboard to Support Instructional Decision-Making

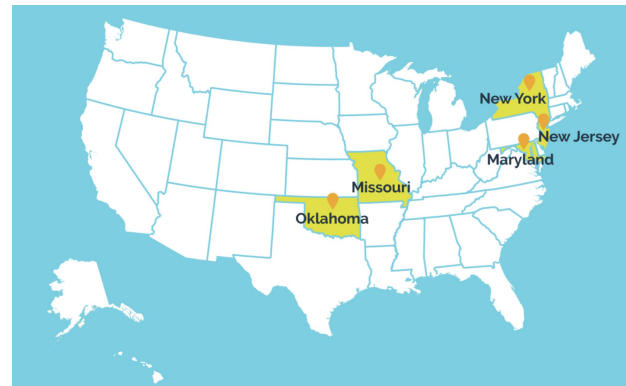
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CAST

NCME
June 11, 2021

I-SMART

Competitive Grants for State Assessments

- Four year project 2017-2020
- MD (lead), MO, NJ, NY OK
- KU ATLAS + CAST + BYC
- Builds from previous dynamic learning map (DLM) efforts in ELA, math & science



I-SMART Research Goals

1. Expand existing science learning map models
2. Connect expanded science maps to existing learning map models in ELA, math, and foundational academic skills
3. Develop and pilot short science assessments (“testlets”) for use throughout the school year
4. **Develop and evaluate an actionable reporting dashboard to support instructional decision-making**

June 26, 2017

Learning Map Model Neighborhood EE.MS.LS2-2: Use models of food chains/webs to identify producers and consumers in aquatic and terrestrial ecosystems.

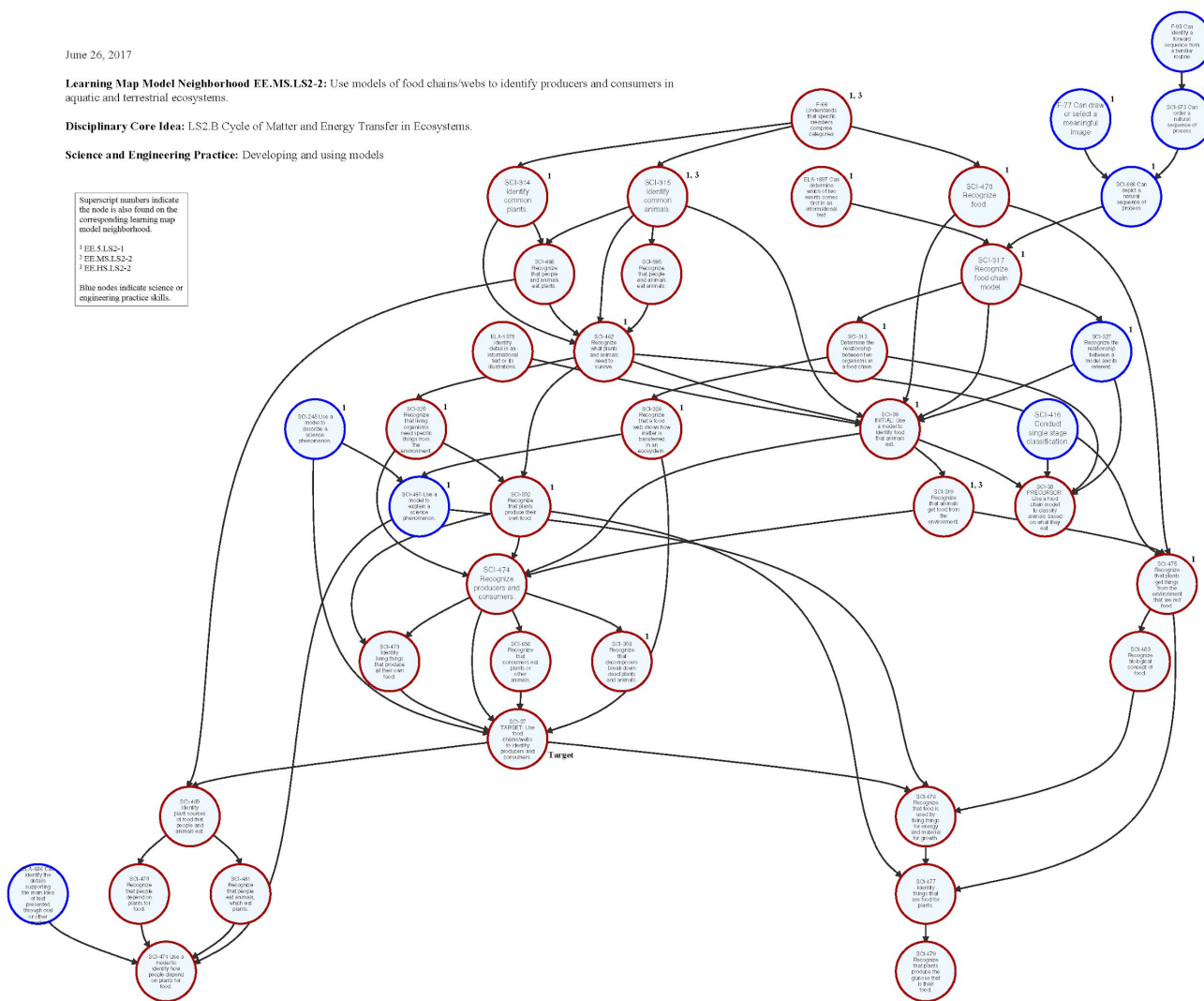
Disciplinary Core Idea: LS2.B Cycle of Matter and Energy Transfer in Ecosystems.

Science and Engineering Practice: Developing and using models

Superscript numbers indicate the node is also found on the corresponding learning map model neighborhood.

¹ EE-5.LS2-1² EE.MS.LS2-2³ EE.HS.LS2-2

Blue nodes indicate science or engineering practice skills.



Dashboard Design & Evaluation Process

1. Needs evaluation with teachers
2. UDL-based co-design with teacher cadre
3. Prototype implementation
4. Usability and utility evaluation

DYNAMIC LEARNING MAPS: Tracker

[EE Resources](#)
[Glossary](#)
[Help](#)

Class Overview

B1: Science, Grade 7

Choose a student

Chemical Changes

Map

Notes

EE L4

15

Introduction	Initial	Precurator	Target
✓	✓	✓	✓
✓	✓	✓	✓
→	✓	✗	
→	✓	✓	✗
→	✓	✗	
→	✓	✓	✓
→	✓	✓	✗
✓	✓	✓	✓
✓	✓	✓	✓

Food Webs

Map

Notes

EE L4

15

Introduction	Initial	Precurator	Target
✓	✓	✓	✓
✓	✓	✓	✓
✓	✓	✓	
✓	✓	✓	✗
✓	✓	✗	
✓	✓	✓	✓
✓	✓	✓	✗
✓	✓	✓	✓
✓	✓	✓	✓

Trakt Inheritance

Map

Notes

EE

Introduction	Initial	Precurator
→		
→		
→		
→		
→		
→		
→		
→		
→		

Key:

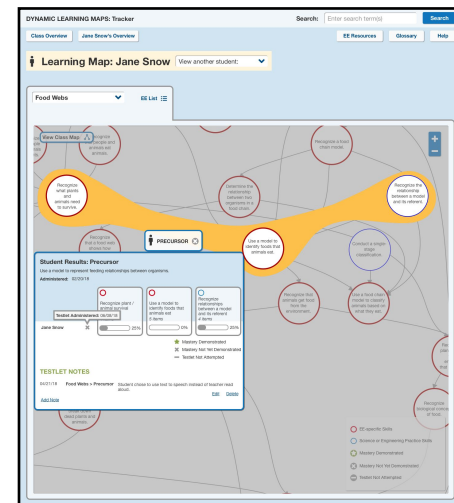
☒ Instruction Not Done

☒ Instruction In Progress

☒ Instruction Complete

☒ Missing Demonstration

☒ Missing Not Yet Demonstrated



Roster Overview

STATE	DISTRICT	SCHOOL
DLM QC State	Madison District (ISM)	Dover Middle School
SELECT ROSTER		
8th Grade Science		

Student Name ↑	ISM.EE.MS.LS2-2 Class Notes	Map EE List	ISM.EE.MS.PS1-2 Class Notes	Map EE List
Instruction	Initial	Precursor	Target	
Beaux, Chloe	➡	✖	✖	✖
Clough, Siobhan	➡	✖	✖	✖
Doe, Johnny	➡	✖	✖	✖
Elton, Katharine	—	—	—	—
Fulton, Reynold	—	✖	✖	✖
Gideon, Leann	—	✖	✖	✖
Liberty, Neal	✓	—	—	—
Oh, Karen	➡	✖	✖	✖
Pho, Hubert	➡	✖	✖	✖
Rowe, Asawan	➡	✖	✖	✖
Silvia, Timothy	—	✖	✖	✖
Tara, Alysia	—	✖	✖	✖
Victoria, Georgina	—	—	✖	✖
Weston, Krystal	—	✖	✖	✖
Zimmerman, Alex	—	✖	✖	✖

Key: — Instruction Not Begun ✖ Mastery Demonstrated
 ➡ Instruction In Progress ✖ Mastery Not Yet Demonstrated
 ✓ Instruction Complete

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Student Essential Element List View

Student EE List

SELECT ORGANIZATION

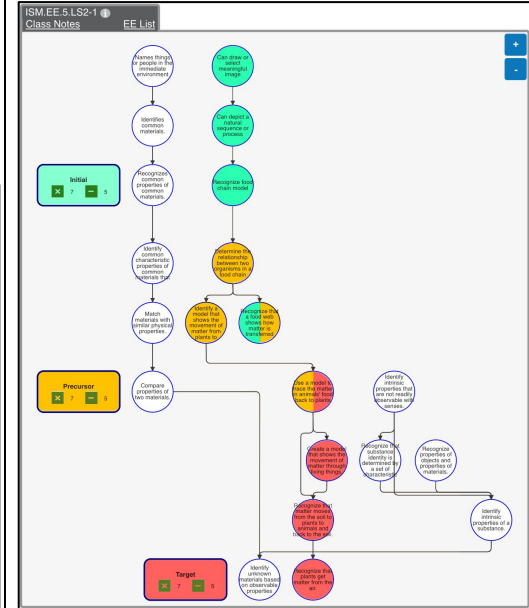
STATE: DLM QC State DISTRICT: Madison District (ISM) SCHOOL: Dover Middle School

SELECT ROSTER: 8th Grade Science SELECT STUDENT: Pho, Hubert

☒ Show Nodes ☐ Show Node Observations

ISM.EE.MS.LS2-2	Map
<p>Initial</p> <p>✖ Place objects in categories, identify common animals and plants, and determine the relationship between organisms in a food chain.</p> <p>Nodes</p> <p>Understands that specific members comprise categories. Not Attempted</p> <p>Determine the relationship between two organisms in a food chain. 75.00%</p> <p>Identify common plants. Not Attempted</p> <p>Identify common animals. Not Attempted</p> <p>TESTLET NOTES</p> <p>7/14/2020 TESTLET NOT ADMINISTERED. Please disregard any data in this linkage level.</p> <p>Edit Delete Add Note</p>	<p>Precursor</p> <p>✖ Use food chains and webs to identify roles of organisms (e.g., producer, consumer) and relationships between organisms.</p> <p>Nodes</p> <p>Use food chains/webs to identify producers and consumers. 85.71%</p> <p>Determine the relationship between two organisms in a food chain. 75.00%</p> <p>Use a model to describe a feeding relationship between two living things. 85.71%</p> <p>Recognize that a food web shows how matter is transferred. 75.00%</p> <p>Identify producers. 75.00%</p> <p>Recognize producers and consumers. 87.50%</p> <p>Recognize that consumers eat plants or other animals. 75.00%</p> <p>TESTLET NOTES</p> <p>7/14/2020 Hubert identified responses verbally today rather than pointing to them.</p> <p>Edit Delete Add Note</p>
<p>Target</p> <p>✖ Use food chains and webs to identify roles of organisms (e.g., producer, consumer) and relationships between organisms.</p> <p>Nodes</p> <p>Identify producers. 75.00%</p> <p>Recognize that people eat animals, which eat plants. 83.33%</p> <p>Recognize predation. 66.67%</p> <p>Recognize that consumers eat plants or other animals. 75.00%</p> <p>TESTLET NOTES</p> <p>7/12/2020 Student wanted to read testlet themselves today rather than use their read-aloud accommodations.</p> <p>Edit Delete Add Note</p>	

Learning Map Model View



Methods: Subjects

- 17 elementary, middle, and high school special education teachers from partner states
- Experience administering DLM-based alternate assessments
- Teaching science to students with significant cognitive disabilities
- Half also have taught science in inclusive, general education settings

Methods: Study Components

1. Pre-study survey
2. Training video
3. Dashboard usability session
4. Self-guided exploration
5. Dashboard utility session (cognitive lab)
6. Post-study survey

Methods: Analysis

- Usability data analyzed quantitatively to calculate critical error, error-free, and scaffolding rates
- Utility data analyzed using set of codes based on our research questions
- Grounded theory approach used to uncover additional emergent themes throughout the analysis process

Results: Usability

Ability to Complete Tasks	Roster Views			Student Views		
	Overview	Map	EE List	Overview	Map	EE List
<i>n tasks</i>	7	4	3	3	4	4
Yes, independently and readily	63%	70%	88%	94%	44%	61%
Yes, independently with some effort	14%	12%	6%	0%	22%	20%
Yes, with minimal prompting	14%	10%	0%	6%	28%	2%
Yes, with extensive prompting	4%	6%	6%	0%	3%	15%
No, required intervention	6%	2%	0%	0%	3%	2%

Utility: Research Question 1

Can learning map models can effectively support instructional decision-making?

		Post-Study				
		SD	D	A	SA	T
Pre-Study	Strongly Disagree					
	Disagree			2	1	3
	Agree			6	5	11
	Strongly Agree				2	2
	Total			8	8	16

Research Question 1

- Visual aid for effectively guiding goal setting, communication, and/or choice of appropriate instructional pathways with built in “detour” or “re-route” options
- “Conceptually and visually unfamiliar”
- “Assessment-industry jargon”

Utility: Research Question 2

Does the dashboard provide an effective means for understanding the learning map models?

Research Question 2

- Ten teachers (59%) reported that the dashboard interface improved their ability to understand learning map models
- Five teachers (29%) indicated that the learning map models remained complex, jargon-filled, and unfamiliar, despite use of the dashboard
- Challenges with user interface as developed in prototype (zooming, panning)

Utility: Research Question 3

Does the dashboard convey student data in a means conducive to informing instructional decision-making?

Research Question 3

- All teachers reported the dashboard to convey student test performance data better than traditional score reports for informing instructional decision-making
- Graphical vs. tabular presentation of data
 - Seven teachers (41%) preferred graphical
 - Four teachers (24%) preferred tabular
 - Six teachers (35%) preferred combination

Utility: Research Question 4

Would the dashboard improve teachers' ability to make instructional decisions?

(What kinds? How?)

Research Question 4

In general, results from instructionally embedded assessments can effectively inform instructional decision-making

		Post-Study				
		SD	D	A	SA	T
Pre-Study	Strongly Disagree					
	Disagree			1		1
	Agree			4	6	10
	Strongly Agree				5	5
	Total			5	11	16

DLM assessment results can effectively inform instructional decision-making” on the pre- and post-study surveys

		Post-Study				
		SD	D	A	SA	T
Pre-Study	Strongly Disagree					
	Disagree			2		2
	Agree			7	5	12
	Strongly Agree				2	2
	Total			9	7	16

Research Question 4

- All teachers indicated dashboard would improve their instructional decision-making
 - Content and lesson planning
 - Goal setting
 - Instructional grouping
 - Testlet administration
- "[It's] all in one picture... [the learning map model] shows the different steps, so I could create my lessons in certain sequences to get to the target."

Research Question 4

Dashboard Compared with Existing DLM Score Reports	Much worse	Some-what worse	About the same	Some-what better	Much better
Ease of use in interpreting individual student results			1 6%		16 94%
Ease of use in comparing across multiple students				2 12%	15 88%
Effectiveness for informing instructional decision-making for individual students			1 6%	1 6%	15 88%
Effectiveness for informing instructional decision-making for multiple students				3 18%	14 82%

Utility: Research Question 5

Can teachers be trained to use dashboard effectively to support instructional decision-making? (What types of training)

Research Question 5

- All teachers believed that teachers can be trained to make effective use of the dashboard in informing instructional decision-making
- Training should be flexible, consistently accessible, active, and network driven
 - Eight teachers (47%) suggested “hands on” simulations or case-studies
 - Three teachers (18%) suggested training videos
 - Four teachers (24%) suggested mentorship-style training opportunities for new teachers

Additional Findings

- Communication support
 - Students: “I like to have the kids talk about where they are goal-wise—if they see the colors, they can see they are working at that”
 - Parents/guardians: “Visual representation of what their kids know”
 - Other educators: “Figure out weaknesses in our curriculum and plan better”
- General education
 - All teachers believed dashboard would be useful in general education and co-teaching environments

Take Home Points

- No one-size-fits-all solutions
 - Importance of applying UDL principles to provide flexibility and design scaffolds
- Learning map models *can* support instructional decision-making for many teachers
- Dashboard extremely useful for supporting communication with students, parents/guardians, and other educators