

Teacher-Centric Design Process for a Dashboard to Support Formative Assessment

Robert P. Dolan, Emma L. Starr, Cara Wojcik, Kim Ducharme, and Jose Blackorby

CAST, Inc.

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Innovations in Science Map,
Assessment & Report Technologies

Agenda

- Project Background
- Brief Introduction to Universal Design for Learning
- Teacher Dashboard Co-Design Methodology
- Design Findings
- Next Steps

But first ... a (loaded) question

If a “formative” assessment is administered but its results aren’t used to inform subsequent instruction, is it formative?

Project Background

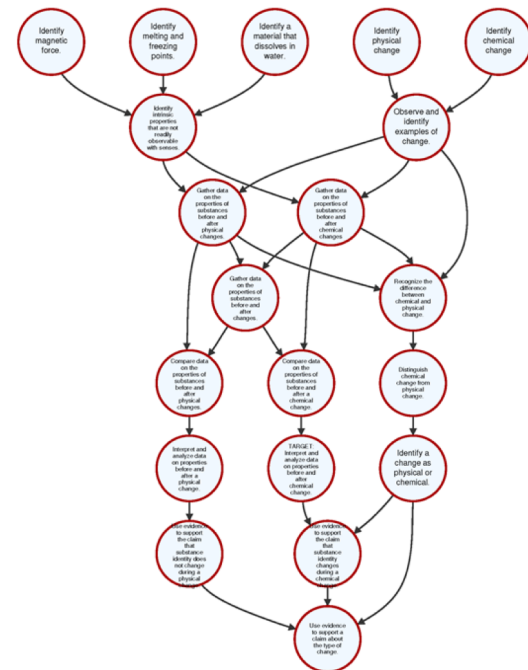
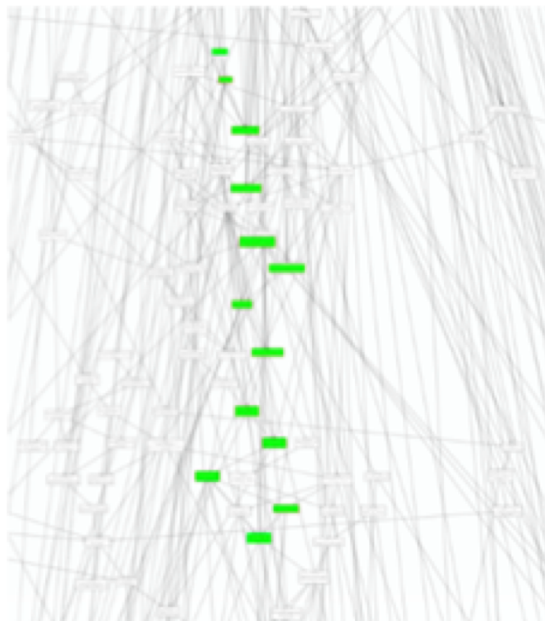
I-SMART Enhanced Assessment Grant

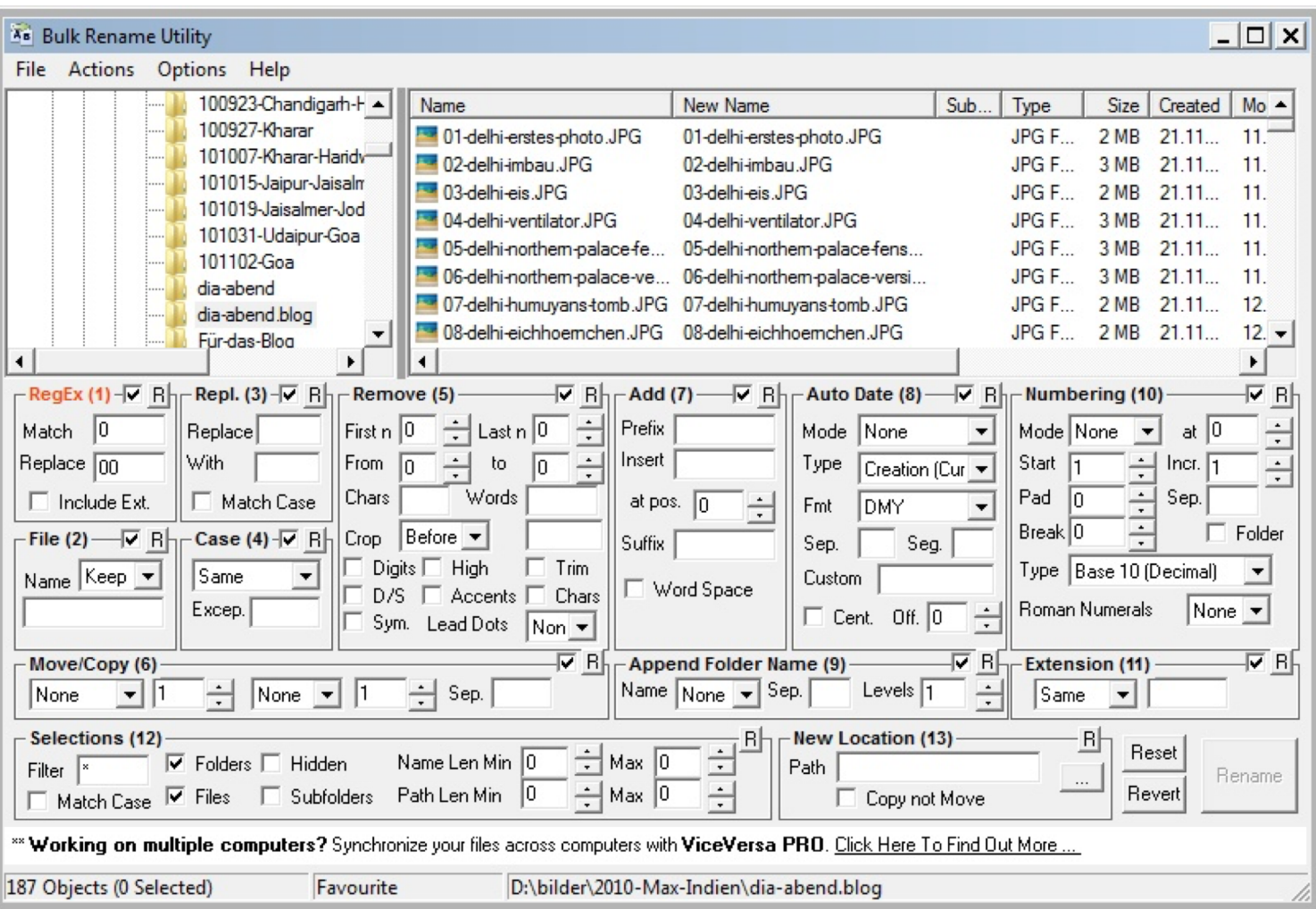
- Four year project 2017-2020
- MD (lead), MO, NJ, NY OK
- KU ATLAS + CAST + BYC
- Builds from previous dynamic learning map (DLM) efforts in ELA, math & science

I-SMART Key Factors

- Deeply integrates the **UDL guidelines** into the instructionally embedded test design and development process
- Supports students with significant cognitive disabilities **and students with and without disabilities** who are struggling to meet grade-level expectations in **science**
- Designed for **summative and formative** use
- Provides a new, actionable **dashboard** to support teacher use of test results to inform instructional decision making, co-designed with teachers through a UDL lens

Learning Map Models





The problem

Teachers are swimming (drowning) in student data, too often presented in unusable & non-actionable ways.

How can we make data displays—and the way they are used—more empowering and effective for teachers?

The approach

Apply UDL to co-design with teachers an interface that supports their leveraging of learning map models in using student test results for instructional decision-making

Brief Introduction to Universal Design for Learning

Universal Design for Learning (UDL)

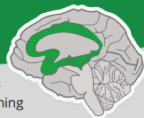
A **framework** for embedding options and supports into curricula and learning experiences to expand learning opportunities for *all* learners



Access Build Internalize

Provide multiple means of Engagement

Affective Networks
The "WHY" of Learning



Provide multiple means of Representation

Recognition Networks
The "WHAT" of Learning



Provide multiple means of Action & Expression

Strategic Networks
The "HOW" of Learning



Access

Provide options for Recruiting Interest ⁽⁷⁾

- Optimize individual choice and autonomy (7.1)
- Optimize relevance, value, and authenticity (7.2)
- Minimize threats and distractions (7.3)

Provide options for Perception ⁽¹⁾

- Offer ways of customizing the display of information (1.1)
- Offer alternatives for auditory information (1.2)
- Offer alternatives for visual information (1.3)

Provide options for Physical Action ⁽⁴⁾

- Vary the methods for response and navigation (4.1)
- Optimize access to tools and assistive technologies (4.2)

Build

Provide options for Sustaining Effort & Persistence ⁽⁸⁾

- Heighten salience of goals and objectives (8.1)
- Vary demands and resources to optimize challenge (8.2)
- Foster collaboration and community (8.3)
- Increase mastery-oriented feedback (8.4)

Provide options for Language & Symbols ⁽²⁾

- Clarify vocabulary and symbols (2.1)
- Clarify syntax and structure (2.2)
- Support decoding of text, mathematical notation, and symbols (2.3)
- Promote understanding across languages (2.4)
- Illustrate through multiple media (2.5)

Provide options for Expression & Communication ⁽⁵⁾

- Use multiple media for communication (5.1)
- Use multiple tools for construction and composition (5.2)
- Build fluencies with graduated levels of support for practice and performance (5.3)

Internalize

Provide options for Self Regulation ⁽⁹⁾

- Promote expectations and beliefs that optimize motivation (9.1)
- Facilitate personal coping skills and strategies (9.2)
- Develop self-assessment and reflection (9.3)

Provide options for Comprehension ⁽³⁾

- Activate or supply background knowledge (3.1)
- Highlight patterns, critical features, big ideas, and relationships (3.2)
- Guide information processing and visualization (3.3)
- Maximize transfer and generalization (3.4)

Provide options for Executive Functions ⁽⁶⁾

- Guide appropriate goal-setting (6.1)
- Support planning and strategy development (6.2)
- Facilitate managing information and resources (6.3)
- Enhance capacity for monitoring progress (6.4)

Goal

Expert learners who are...

Purposeful & Motivated

Resourceful & Knowledgeable

Strategic & Goal-Directed

Dashboard Development

Teacher Co-Design Cadres

Main Cadre:

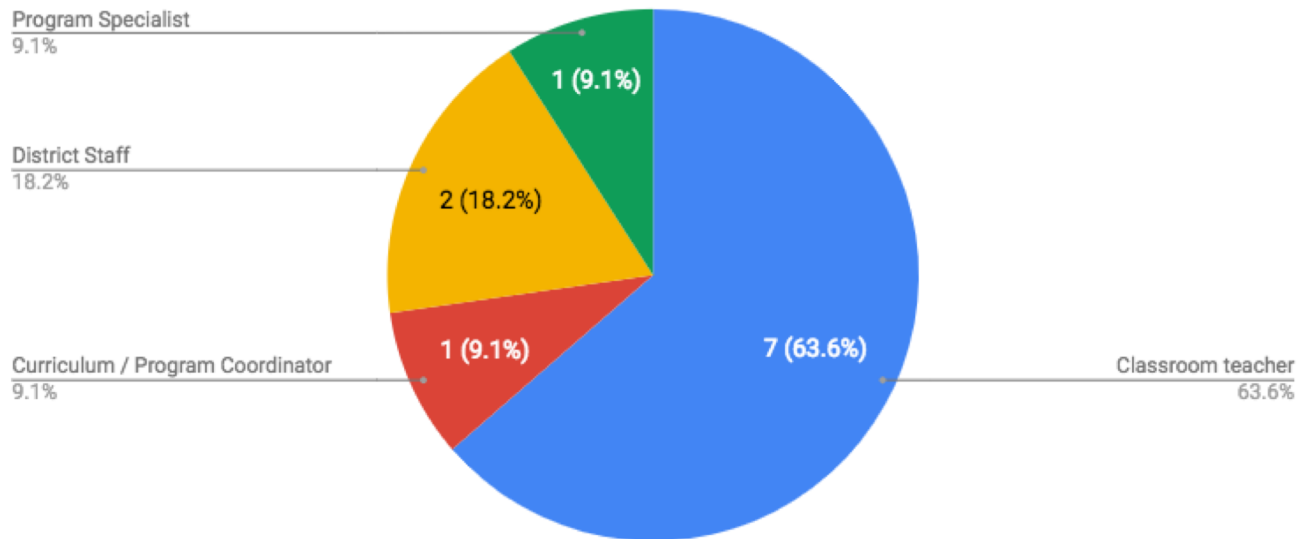
- 11 educators from four DLM partner states
- 4 sets of meetings
- Meetings of 1-5 cadre members, 2-4 I-SMART team members
- 90 minutes
- Video conferencing

Gen Ed Focus Group:

- 1 meeting
- Same format as above
- 2 gen ed science teachers (grades 6 & 8) from a MA school

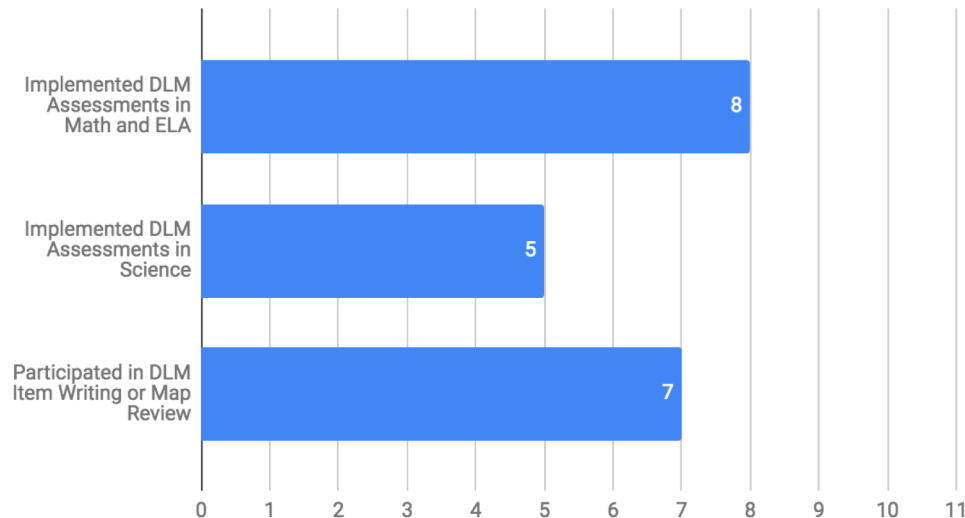
Cadre Participants

Cadre Members Current Primary Role



Cadre Participants

Previous DLM Experience



Iterative Discovery / Design Process:

Cadre Meetings 1-3

- Recap of the previous design's principal elements and features
- Walk-through of newly introduced screens and functions spotlighting design solutions resulting from teacher-generated feedback
- Facilitated discussion of prototype focusing on areas of clarity/confusion, features to change/add, most/least useful functions, and “Five Ws”

Cadre Meeting 4

- “Scavenger Hunt” usability testing session - teachers completed usability tasks to uncover any areas needing further refinement
- Cadre process reflection

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.

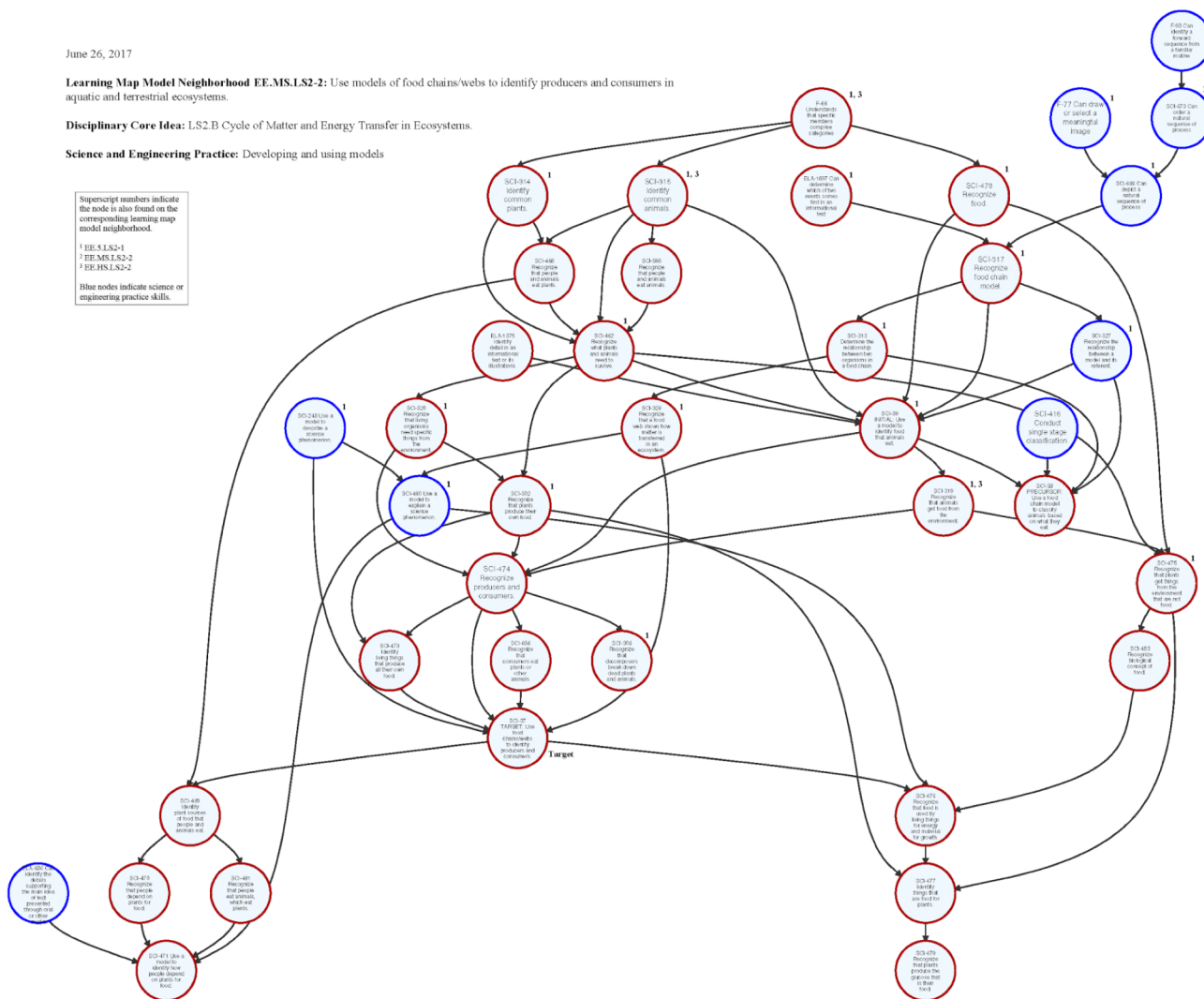
Disciplinary Core Idea: LS2.B Cycle of Matter and Energy Transfer in Ecosystems.

Science and Engineering Practice: Developing and using models

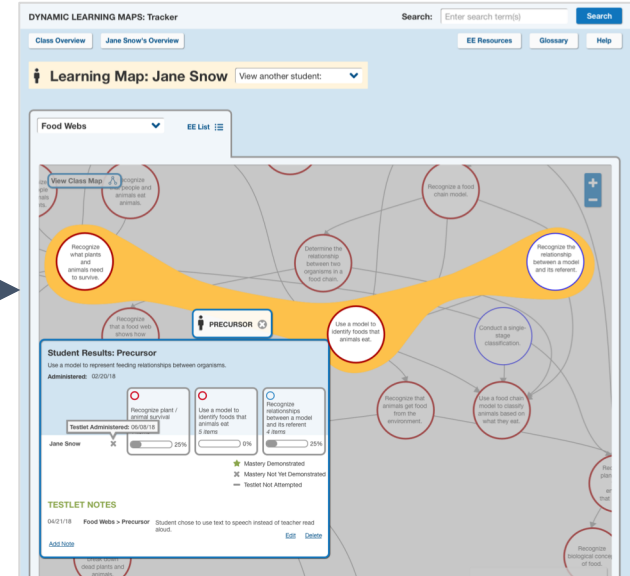
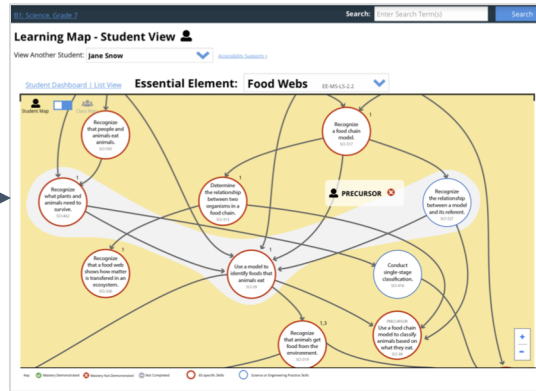
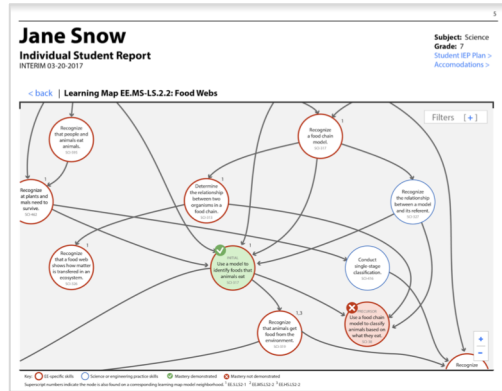
Superscript numbers indicate the node is also found on the corresponding learning map model neighborhood.

¹ EE.S.LS2-1
² EE.MS.LS2-2
³ EE.HS.LS2-2

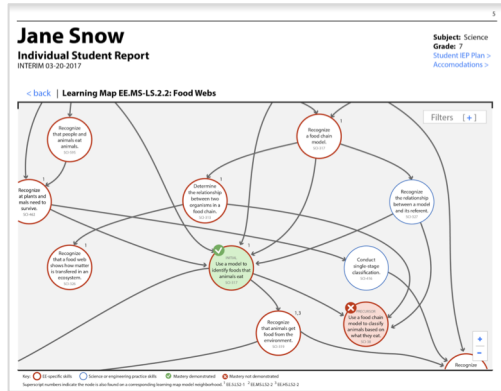
Blue nodes indicate science or engineering practice skills.



Iterative co-design cycles



Iterative co-design cycles



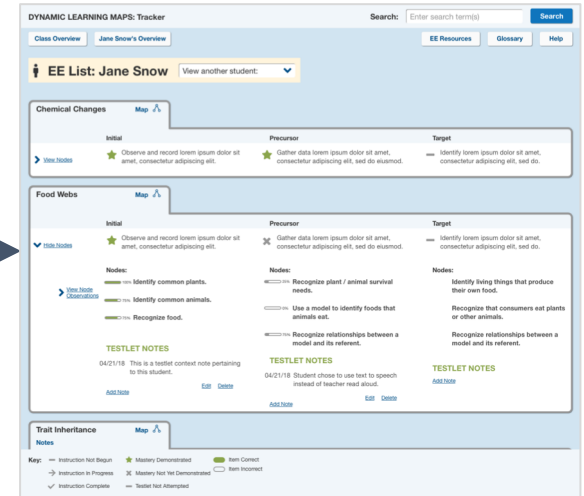
Search: Enter search term(s) Search

View Another Student: Jane Snow

Essential Elements List - Student View

Essential Element	Instruction	Testlets	Precursor	Target
Origin Structure SC.12-12.1.2 [View Node]	✓	Initial ✓ Observe and identify examples of form ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor.	Gather data on ut enim ad minim veniam, quis nostrud exercitation ullamco laboris.	Interpret and analyze data aute irure dolor in reprehenderit in voluptate velit esse cillum dolore.
Organism Habitats SC.12-12.1.3 [View Node]	✓	✓ Identify exception sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim.	Investigate and identify hac habitasse platea dictumst quisque sagittis purus.	Investigate and predict amet mauris commodo quis imperdiet massa tincidunt.
Food Webs SC.12-12.2 [View Node]	✓	✓ Recognize and identify organisms and what they eat. Nodes tested: ● ● ● Identify common plants, SC.12-12.1.1 ● ● ● Identify common animals, SC.12-12.1.2 Testlet content notes: ● ● ● Student chose to use text to speech instead of teacher read aloud. [Add Note]	✗ Use a model to represent feeding relationships between organisms. Nodes tested: ● ● ● Recognize plant/animal survival needs, SC.12-12.1.1 ● ● ● Use a model to identify foods that animals eat, SC.12-12.1.2 ● ● ● Recognize relationships between a model and its referent, SC.12-12.1.3 Add notes	✗ Use a model to represent relationships among producers and consumers in an ecosystem. Nodes: ● ● ● Identify common plants, SC.12-12.1.1 ● ● ● Identify common animals, SC.12-12.1.2 Recognize food, SC.12-12.2 Add notes
Trait Inheritance SC.12-12.3 [View Node]	✓	✓ Use a model to recognize that sound waves are transmitted by vibrations.	✗ Investigate changes in vibrations and sources of sound in everyday life.	Use a model to show how light waves or sound waves are reflected, absorbed, or transmitted through various materials.

Key: ✓ History demonstrated ✗ History not demonstrated
Instruction: ● Instruction Not Begun ● Instruction In Progress ● Instruction Complete
Testlets: ● Testlet Not Attempted



Iterative co-design cycles

Download report distribution template (Showing lower view of an essential element)

Jan Snow
Individual Student Report
INTERIM 03-20-2017

Subject: Science
Grade: 7
Report: SP Plan
Accommodations

Learning Profile

Essential Element: 1-1
Linkage Level: 1-1-1

ES.MS.PS1-2 Chemical Changes ✓
ES.MS.PS1-3 Motion of Objects ✓
ES.MS.PS1-4 Thermal Energy Transfer ✗✗
ES.MS.PS1-5 Sound Waves ✓
ES.MS.SS1-1 Organ Structures ✓
ES.MS.SS1-2 Food Webs ✓
ES.MS.SS1-3 Nutrient Cycles ✓
ES.MS.SS1-4 Earth-Sun-Moon ✓
ES.MS.SS1-5 Rock Formation ✓
ES.MS.SS1-6 Ecosystem Processes ✓

Search by: ES code
Sort by: ES code
Chronologically
Instructionally
Level of Difficulty

Interim 03/20/2018

Individual Student Report: **Jane Snow**

Subject: Science
Grade: 7
Report: SP Plan
Accommodations

Learning Profile

Essential Elements: 1-1-1
Linkage Level: 1-1-1-1

Chemical Changes ES.MS.PS1-2 ✓
Motion of Objects ES.MS.PS1-3 ✓
Energy ES.MS.PS1-4 ✗
Organ Structure ES.MS.PS1-5 ✓
Food Webs ES.MS.SS1-1 ✓
Earth Systems ES.MS.SS1-2 ✗
Human Impact ES.MS.SS1-3 ✗

Choose an Essential Element to investigate a learning map

Dashboard - Class View

View Another Class: B1: Science, Grade 7
View Student Dashboard: Choose student

B1: Science, Grade 7

Student Name	Chemical Changes ES.MS.PS1-2	Motion of Objects ES.MS.PS1-3	Food Webs ES.MS.SS1-1	Organ Structure ES.MS.SS1-2	Earth Systems ES.MS.SS1-3	Human Impact ES.MS.SS1-4
Chloe Brouse	✓	✓	✗	✓	✓	✓
Jeffrey Cough	✓	✓	✓	✓	✗	✗
Jeffrey Doe	✓	✗	✓	✓	✗	✗
Karen Oh	✓	✓	✗	✓	✓	✓
Robert Phe	✓	✓	✓	✓	✗	✗
Andrew Rowe	✓	✓	✓	✓	✓	✓
Jane Snow	✓	✗	✓	✓	✓	✗
Grace Tye	✓	✗	✓	✓	✓	✓
Janet Zuh	✓	✗	✓	✓	✓	✓

DYNAMIC LEARNING MAPS Tracker

Overview: **Jane Snow**

Chemical Changes ES.MS.PS1-2
Motion of Objects ES.MS.PS1-3
Food Webs ES.MS.SS1-1
Organ Structure ES.MS.SS1-2
Earth Systems ES.MS.SS1-3
Human Impact ES.MS.SS1-4

Essential Element ES.MS.SS1-1
Essential Element ES.MS.SS1-2
Essential Element ES.MS.SS1-3
Essential Element ES.MS.SS1-4

JANE SNOW'S NOTES

03/20/18: Jane Snow is in Science, Grade 7. Food Webs. The first learning map is 1-1-1-1. She is currently in the 1-1-1-1 learning map. She is currently in the 1-1-1-1 learning map. She is currently in the 1-1-1-1 learning map.

DYNAMIC LEARNING MAPS Tracker

Class Overview: **B1: Science, Grade 7**

View Student Overview: Choose student

B1: Science, Grade 7

Student Name	Chemical Changes ES.MS.PS1-2	Motion of Objects ES.MS.PS1-3	Food Webs ES.MS.SS1-1	Organ Structure ES.MS.SS1-2	Earth Systems ES.MS.SS1-3	Human Impact ES.MS.SS1-4
Chloe Brouse	✓	✓	✗	✓	✓	✓
Jeffrey Cough	✓	✓	✓	✓	✗	✗
Jeffrey Doe	✓	✗	✓	✓	✗	✗
Karen Oh	✓	✓	✗	✓	✓	✓
Robert Phe	✓	✓	✓	✓	✗	✗
Andrew Rowe	✓	✓	✓	✓	✓	✓
Jane Snow	✓	✗	✓	✓	✓	✗
Grace Tye	✓	✗	✓	✓	✓	✓
Janet Zuh	✓	✗	✓	✓	✓	✓

Test results: class overview



Class Overview

B1: Science, Grade 7



View Student Overview

Choose a student



B1: Science, Grade 7

Chloe Beaux

Siobhan Clough

Johnny Doe

Karen Oh

Hubert Pho

Asawan Rowe

Jane Snow

Grace Tso

Jamal Zoh

Chemical Changes

Map

Notes

EE List

Instruction

Initial

Precursor

Target



Food Webs

Map

Notes

EE List

Instruction

Initial

Precursor

Target



Trait Inheritance

Map

Notes

EE List

Instruction

Initial

Precursor



Key: Instruction Not Begun Mastery Demonstrated
 Instruction In Progress Mastery Not Yet Demonstrated
 Instruction Complete

Test results: student overview

Class Overview

EE Resources

Glossary

Help



Overview: Jane Snow

View another student:



Chemical Changes

Map



[Preview Map](#)

EE List



Instruction Initial Precursor Target



Food Webs

Map



[Preview Map](#)

EE List



Instruction Initial Precursor Target



Trait Inheritance

Map



[Preview Map](#)

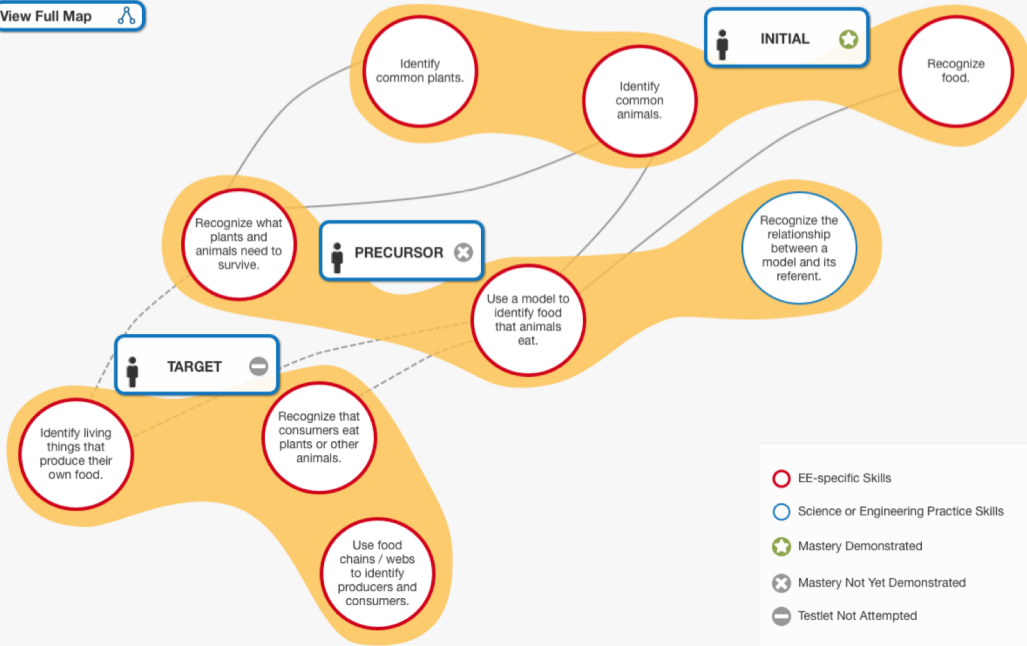
EE List



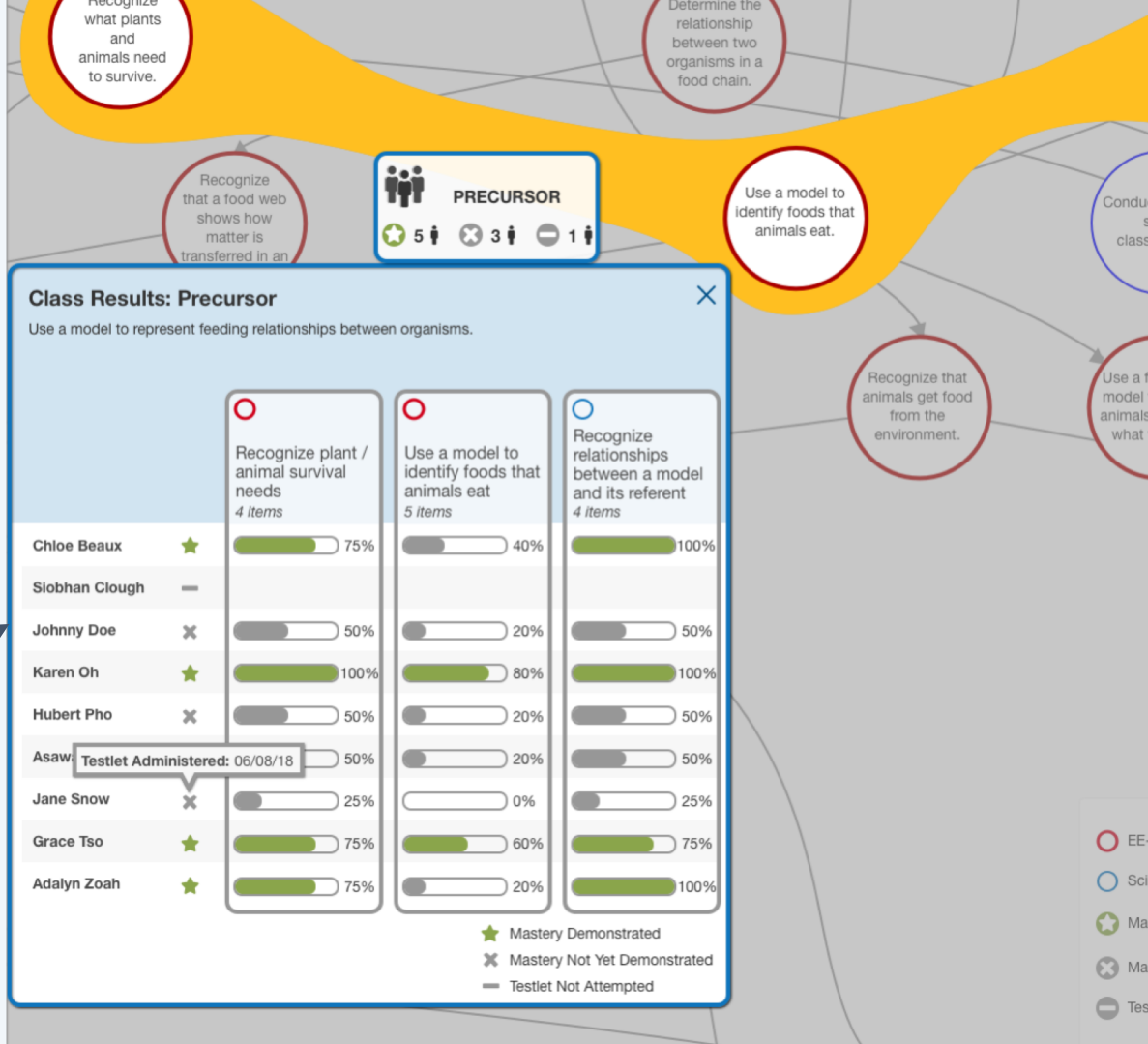
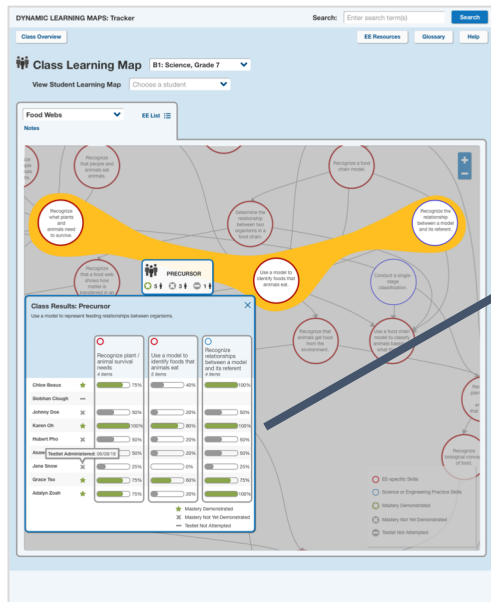
Instruction Initial Precursor Target



View Full Map



Test results: detail view by class



Summary of Design Findings

- Teachers found the learning maps valuable for understanding student progress and supporting instructional decisions
- However, scaffolding teacher's use of the map is necessary; there is a learning curve that can be supported through multiple representations of the same data
- Necessary to include aggregate view of class data to meet teachers' instructional needs

Final Cadre Findings

- In final usability/interpretability testing, cadre members were able to complete tasks effectively
- Feedback from cadre about final design was positive
- In final reflection, cadre members reported that they felt positive about the process, including that their ideas were used and that they developed professionally through participating

Next Steps

Upcoming Research Study

- Pilot study of science assessment system in 2020
 - Including evaluation of teacher dashboard through ...
 - Interpretability and usability studies
 - Teacher interviews and focus groups

Thank you

For more information:

bdolan@cast.org