

Supporting Diverse Students and Teachers in Effective Classroom Assessment Through UDL

UDL-IRN Summit #UDLIRN

June 2, 2020

2:30 - 3:30 pm ET

Slides: bit.ly/UDL-Formative-Assessment

Acknowledgement

We acknowledge that we are sited on the lands of the Massachuset, Pawtucket, and Wampanoag tribal nations. We acknowledge these legacies to stop the continued erasure of indigenous people and histories, and to re-center our understanding of the lands that we use as having been part of indigenous life and culture. To recognize the land is an expression of gratitude and appreciation to those whose territory we reside on, and a way of honoring the people who have been living and working on the land from time immemorial.

Poll question 1

Formative assessment is a type of testing.

True or false?

Poll question 2

If a tree falls in a forest and no one is there to hear, it makes a noise.

True or false?

Objectives

- Understand what formative classroom assessment truly is
- Learn about a future-reaching research project to support effective formative classroom assessment during science instruction for diverse learners
- Learn how UDL can inform the design of assessment instruments and dashboards to promote effective classroom formative assessment

Today's speakers

- **Bob Dolan**

Senior Innovation Scientist, CAST

- **Kim Ducharme**

*Director of Educational User Experience
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Additional CAST team members

Jose Blackorby

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and the KU ATLAS team leads

Meagan Karvonen

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Gail Tiemann

Outline

1. What is formative classroom assessment?
2. I-SMART project
3. Testlet design
4. Teacher dashboard
5. Questions & answers

1. What is formative classroom assessment?

- 2. I-SMART project**
- 3. Testlet design**
- 4. Teacher dashboard**
- 5. Questions & answers**

What do we want to know about students?

- Standards-aligned knowledge, skills, and abilities?
- Learning attitudes, beliefs, preferences?
- Current affective state?
- ...

Why do we want to know this?

- Teacher/system accountability
- Graduation/promotion decisions
- Identify supports, scaffolds, accommodations
- To plan subsequent instruction or remediation
- ...

What is formative assessment?

*An assessment functions formatively to the extent that **evidence about student achievement** elicited by the assessment is interpreted and **used to make decisions** about the next steps in instruction that are likely to be better, or better founded, than the decisions that would have been taken in the absence of that evidence.*

— Dylan Wiliam (2009)

What is formative assessment?

*Formative assessment is a planned, ongoing **process used by all students and teachers during learning and teaching** to elicit and use evidence of student learning to improve student understanding of intended disciplinary learning outcomes and **support students to become more self-directed learners.***

FAST SCASS (2018)

What else might formative assessment help with?

UDL tells us to provide options

Can formative assessment help determine which ones, for whom, and under what conditions?



What it's not

*The core problem lies in the **false, but nonetheless widespread, assumption that formative assessment is a particular kind of measurement instrument**, rather than a process that is fundamental and indigenous to the practice of teaching and learning.*

Margaret Heritage (2010)

Back to falling trees in empty forests

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

But implementing formative assessment is *hard*

- Supporting teachers in learning and applying formative assessment as an instructional technique is critical (e.g., Shepard, Wylie, Popham, Stiggins)
- Consider need for
 - Professional development
 - Classroom-level support

Poll question 3

There's a role for formalized tools in formative assessment.

True or false?

But implementing formative assessment is *hard*

- Supporting teachers in learning and applying formative assessment as an instructional technique is critical (e.g., Shepard, Wylie, Popham, Stiggins)
- Consider need for
 - Professional development
 - Classroom-level support
- Consider potential for
 - Item banks
 - Classroom tools/techniques/technologies
 - Teacher-centric “data dashboards”

1. What is formative classroom assessment?

2. I-SMART project

3. Testlet design

4. Teacher dashboard

5. Questions & answers

Innovations in Science Map, Assessment, and Report Technologies

<https://ismart.works>



I-SMART

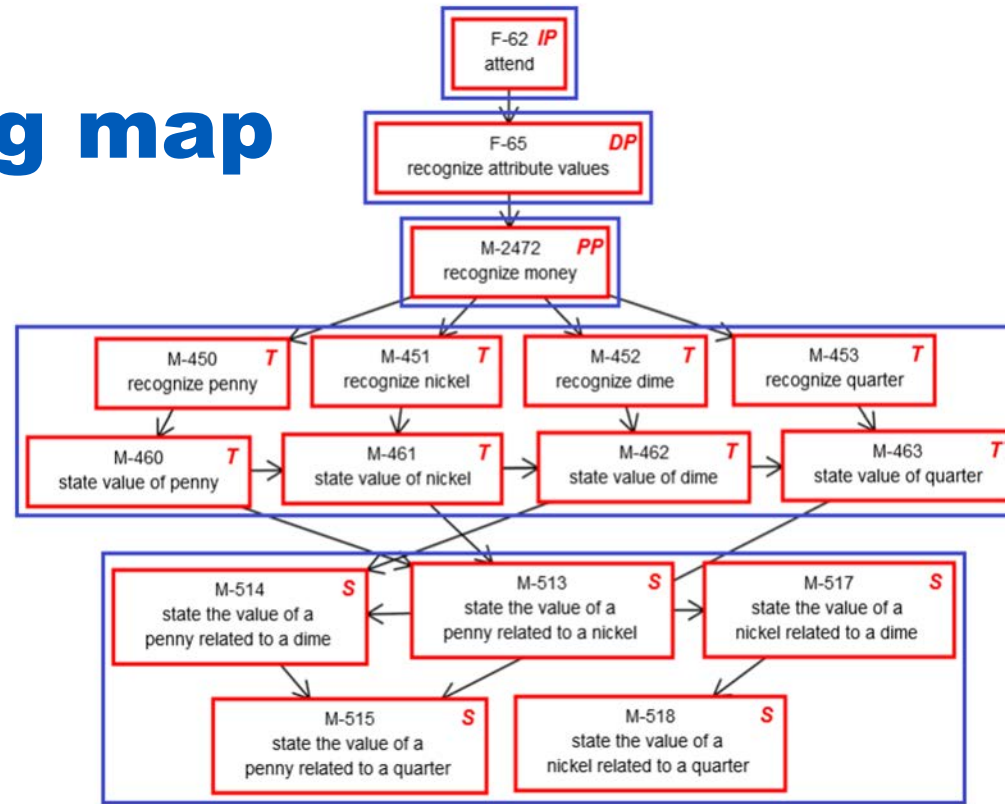
- Multi-state project funded through U.S. Dept. of Ed's *Competitive Grants for State Assessments* program
- Focused on developing innovative approaches to science assessments using principles of evidence-centered design and UDL
- Builds upon existing dynamic learning map (DLM) efforts in ELA, math, & science

I-SMART project goal

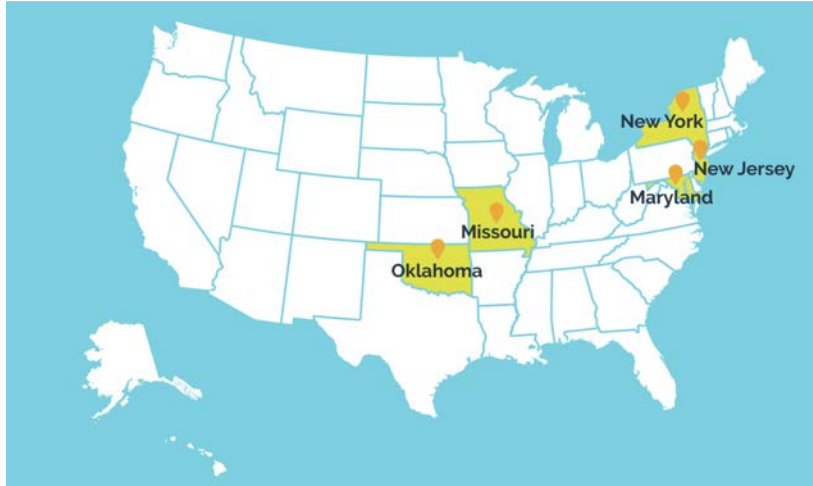
Improve achievement of multidimensional science standards for students with significant cognitive disabilities—and students generally struggling in science—through accessible, learning map model-based assessments and reporting tools

Dynamic learning map

Cognitive model that intentionally represent multiple pathways of learning



I-SMART team



Accessible Teaching, Learning,
& Assessment Systems



BYC
Consulting

I-SMART distinguishing features

- **Deep integration of UDL** into instructionally embedded tests, co-designed with students
- 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
- Actionable **dashboard** to support teacher use of test results to inform instructional decision making, co-designed with teachers through a UDL lens

1. What is formative classroom assessment?
2. I-SMART project

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The problem

Drop-in-out-of-the-sky assessments provide limited opportunity for students* to demonstrate their learning and limited opportunity for effective instructional decision-making

**The audience/population for this part of the project: Students without significant cognitive disabilities, but struggling to meet grade-level standards.*

Challenge

Applying UDL principles to design rich, engaging, instructionally embedded science assessments that support classroom formative assessment and provide state accountability data

Poll question 4

A single assessment instrument can serve both summative and formative purposes.

True or false?

What's are testlets?

- Instructionally embedded evaluations of student knowledge, skills, and abilities at different depths
- Presented as science phenomena to provide the contextual structure within the science narrative
- Science testlets cover both NGSS Disciplinary Core Idea (DCI) and Science and Engineering Practice (SEP)

Science learning map model neighborhood

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.

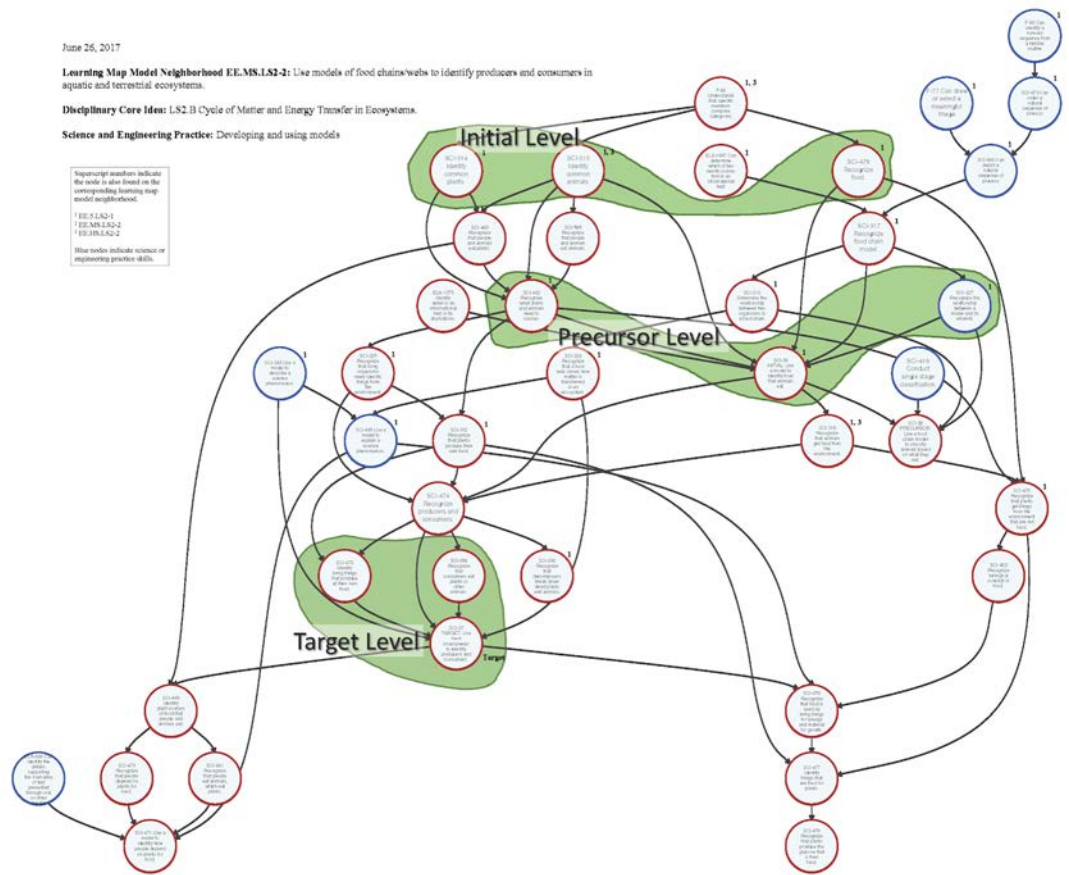
Disciplinary Core Idea: LS2.B Cycle of Matter and Energy Transfer in Ecosystems.

Science and Engineering Practice: Developing and using models

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

¹ EE-LS2-2-1
¹ EE-MS-LS2-2
¹ EE-LS2-2-2

Blue nodes indicate science or engineering practice skills.



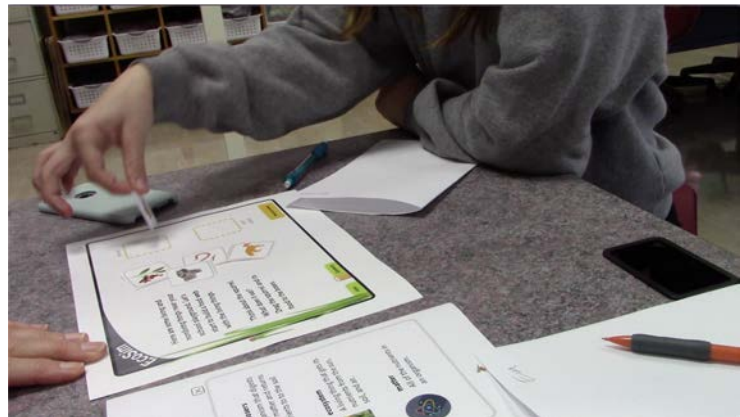
Testlet design approach

- Leverage UDL to provide students multiple means to demonstrate their knowledge, skills, and abilities
- Iterative co-design with students

Co-designing with students

Nodes for the middle school example:

1. Use a model to describe a feeding relationship between two living things. (SCI-324)
2. Recognize that people eat animals, which eat plants. (SCI-481)
3. Recognize that consumers eat plants or other animals. (SCI-656)
4. Recognize predation. (SCI-518)



Testlet prototype designs

2

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 Read aloud

EcoSim

Imagine you are the science expert helping the governor decide what to do about a problem in the ecosystem.

Choose an ecosystem to start. (psst: watch the videos to help you decide!)

Rainforest >
The jaguar population is declining.

Vacant lot near school >
The coyote population is declining.

Ocean >
The shark population is declining.

Hint Glossary

3 - ocean

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 Read aloud

EcoSim

Here's the governor's problem:
The population of shark is declining. Should we make laws to protect the sharks? Why or why not?

→

First, use the clipboard to think about the pros and cons.

Should we make laws to protect sharks?	
Pros	Cons
One benefit would be...	One problem would be...
Yes	Yes

Hint Glossary

Testlet prototype designs

5


1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 Read aloud

EcoSim

Food webs show feeding relationships between two living things.

Put an arrow between two living things to show the feeding relationship.

Drag & drop:



Third consumer

Humans Sharks

Second consumer

Tuna Dolphins Seagull

First consumer

Shrimp Anchovies Fish

Producer

Seaweed Algae Phytoplankton

Hint Glossary Check my answer

6

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 Read aloud

EcoSim

When you put lots of feeding relationships together, it makes a food web. At the base of a food web are the producers.

Put more producers into the food web.

Third level consumer

Second level consumer

First level consumer

Shrimp

Producer

Seaweed

Phytoplankton

Sharks

Dolphins

Tuna

Hint Glossary Check my answer

Testlet prototype designs

8

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 Read aloud

EcoSim

Second level consumers (predators) eat first level consumers (prey).

Drag and drop the second level consumers into the food web.

Third level consumers

Second level consumers

First level consumers

Producers

Hint Glossary Check my answer

10a

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 Read aloud

EcoSim

Great — you have built the whole food web!

Before you move on, is there anything you'd like to add to your pros and cons list?
(Past: Click on the clipboard!)

Next

Third level consumer

Second level consumer

First level consumer

Producer

Hint Glossary



Testlet prototype designs

11

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 Read aloud




EcoSim

To advise the governor, think about what would happen by creating a storyboard. If there were no laws protecting sharks...

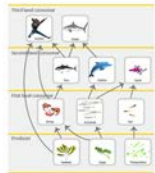
1  2 

1. First, the shark population is declining.

... what happens to the shark's prey?
(Drag & drop from the options below.)

More of the shark's prey (tuna) survive. Fewer of the shark's prey (tuna) survive. There is no change in the shark's prey.

 Psst! Use the food web for clues.




Hint Glossary Check my answer

12

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 Read aloud

EcoSim




To advise the governor, think about what would happen if there were no laws protecting sharks.

1  2  3 

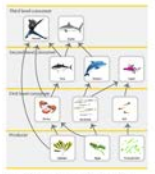
1. First, the shark population is declining.

2. More of the shark's prey (tuna) survive.

What happens to the tuna's prey?

There are fewer shrimp. There are more shrimp. There is no change in the number of shrimp.

 Psst! Use the food web for clues.

Hint Glossary

Testlet prototype designs

14a

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

Read aloud



EcoSim

To advise the governor, think about what would happen if there were no laws protecting sharks.

1. First, the shark population is declining.
2. More of the shark's prey (tuna) survive.
3. There are fewer shrimp.
4. There is more plankton.

As you can see, **many feeding relationships are impacted if we don't protect the shark. The ecosystem is less balanced.**

Next

Hint Glossary

15

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

Read aloud



EcoSim

Wow, you learned a lot about food webs and feeding relationships.

You built pros/cons list

you created a food web,

and created a storyboard!

Next

Hint Glossary

Testlet prototype designs

16

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 Read aloud

EcoSim

As an ecologist, what advice will you give the governor?

Your claim:

We **should** / **should not** (choose one) make a law to protect the predator.

Evidence:

Use evidence from these tools to support your claim to the governor:

- ☐ pros and cons list
- ☐ food web
- ☐ cause & effect storyboard

Hint Glossary

When finished adding all your evidence, click "next" to continue. Next

17a

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 Read aloud

EcoSim

Should we make laws to protect sharks?

Pros	Cons
If we make a law, more sharks would live. <small>edit</small>	One problem would be they would go after surfers. <small>edit</small>
The ecosystem will get imbalanced if the shark population continues to decline. <small>edit</small>	Sharks would eat too many big fish, like tuna. <small>edit</small>

Add evidence from your list:

Say what would happen if we don't protect the sharks by using any other evidence you think is important from your pros/cons list.

If we don't make a law to protect the sharks ...

Save

Hint Glossary

Testlet prototype designs

17b

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

Read aloud 



Add a note from your food web:
Say what would happen if we don't protect the sharks by using evidence from the food web.

The food web shows ... 

Save

Hint **Glossary**

18

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

Read aloud 

Make any final edits to your letter, then send it to the governor!


Here is your final advice for the governor.

Dear Governor,

As an ecologist, I think you **should** make a law to protect sharks. [edit](#)

Here is why:

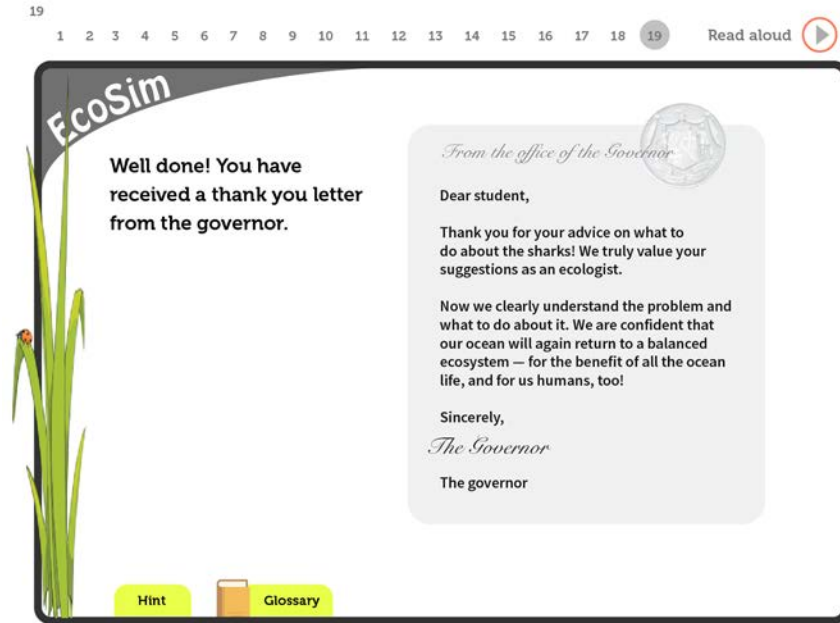
- **Some benefits** I think are important are... [edit](#)
- **The food web shows** that everything is connected. We will upset the balance if we don't protect sharks. [edit](#)
- **The storyboard shows** how the ecosystem will get imbalanced if the shark population continues to decline. [edit](#)







Hint **Glossary**

I'm ready to send my advice to the governor.

Testlet prototype designs



Glossary

Term & Definition	Image	Example
ecologist someone who studies the relationships of organisms with their environment	 Ecologist from the National Park Service	<i>I saw an ecologist at the town park studying the different plants and animals that live there.</i>
ecosystem the complex community of living and non-living things	 A grassland ecosystem	<i>A living thing that gets its nutrients from the sun, soil, and air.</i>
producer an organism, often a plant, who makes its own food using energy from the sun	 Trees in early autumn	<i>When I look out my window, I see grass and trees- those are the producers.</i>
first level consumer also called an herbivore,		<i>Some first level consumers I see around school are</i>

1.1

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

Read aloud

EcoSim

Welcome to EcoSim!
You are about to go on a journey as a scientist. You will be helping the governor of your state solve a problem with the ecosystem

But first, we want to let you know that there are many tools you can use on this journey. Try them out!

Read aloud:
Click on the read aloud button to hear the computer read to you.
Click again to stop.

Next

Hint

Glossary

Speech to text:
Click in the text box, then on the microphone to speak instead of type.
Click again to stop.

Testing, testing, 1, 2, 3 ...

Next

Hints:
Click on the hint button to get a hint.
Click the X to close.

Next

Glossary:
Click on the glossary button to look up a word.
Click again to stop.

Done!



1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 Read aloud ▶

EcoSim

Imagine you are the science expert helping the governor decide what to do about a problem in the ecosystem.

Choose an ecosystem to start. (great! watch the videos to help you decide!)

Rainforest >
The jaguar population is declining.

Vacant lot near school >
The coyote population is declining.

Ocean >
The shark population is declining.

Hint Glossary

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 Read aloud ▶

EcoSim

Here's the governor's problem:
The population of shark is declining. Should we make laws to protect the sharks? Why or why not?

First, use the clipboard to think about the pros and cons.

Should we make laws to protect sharks?

NEWS
Humans are killing 100 million sharks every year

Hint Glossary

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 Read aloud ▶

EcoSim

Food webs show feeding relationships between two living things.

Put an arrow between two living things to show the feeding relationship.

Drag & drop

Third consumer
Second consumer
First consumer
Producer

Check my answer

Hint Glossary

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 Read aloud ▶

EcoSim

Second level consumers (predators) eat first level consumers (prey).
Drag and drop the second level consumers into the food web.

Second level consumers
First level consumers
Producer

Check my answer

Hint Glossary

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 Read aloud ▶

EcoSim

To advise the governor, think about what would happen if there were no laws protecting sharks.

1. First, the shark population is declining.
2. More of the shark's prey (tuna) survive.
3. What happens to the tuna's prey?

There are fewer shrimp.
There are more shrimp.
There is no change in the number of shrimp.

Hint Glossary

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 Read aloud ▶

EcoSim

As an ecologist, what advice will you give the governor?

Your claim:
We should / should not make a law to protect the predator.

Evidence:
Use evidence from these tools to support your claim to the governor:
☐ pros and cons list
☐ food web
☐ cause & effect storyboard

What finished adding all your evidence, click "next" to continue

Hint Glossary

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 Read aloud ▶

EcoSim

Add a note from your food web:
Any claim about whether or not I protect the sharks by using evidence from the food web.

Save

Hint Glossary

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 Read aloud ▶

EcoSim

Here is your final advice for the governor.

Write any final words for your advice, then send it to the governor!

Dear Governor,
As an ecologist, I think you should make a law to protect sharks. ...

Here is why:

- Some benefits I think are important are: ...
- The food web shows that everything is connected. We will upset the balance if we don't protect sharks. ...
- The storyboard shows how the ecosystem will get imbalanced if the shark population continues to decline. ...

I'm ready to send my advice to the governor

Hint Glossary

Next step

- Develop testlet prototypes
- Conduct cognitive labs/think-alouds with students spring 2021

1. What is formative classroom assessment?
2. I-SMART project
3. Testlet design

4. Teacher dashboard

5. Questions & answers

The problem

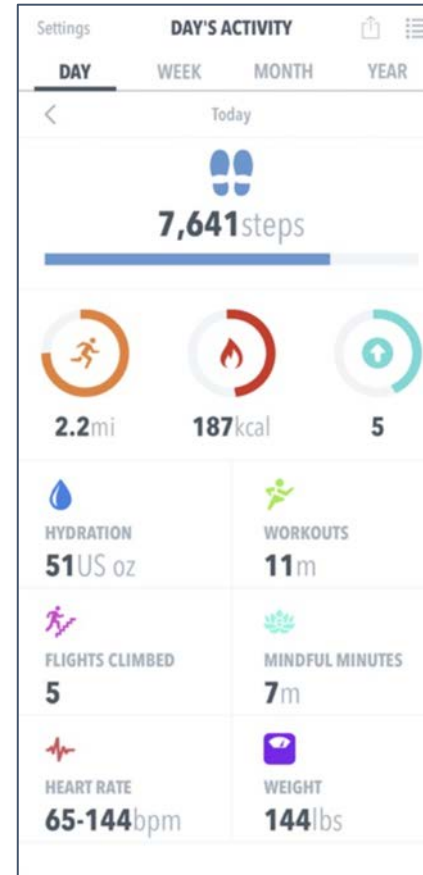
Teachers are swimming (drowning) in data generated by assessment instruments, generally presented in a unusable, unactionable ways

Challenge

Applying UDL principles to design a dashboard that supports teachers' use of learning map models during formative assessment

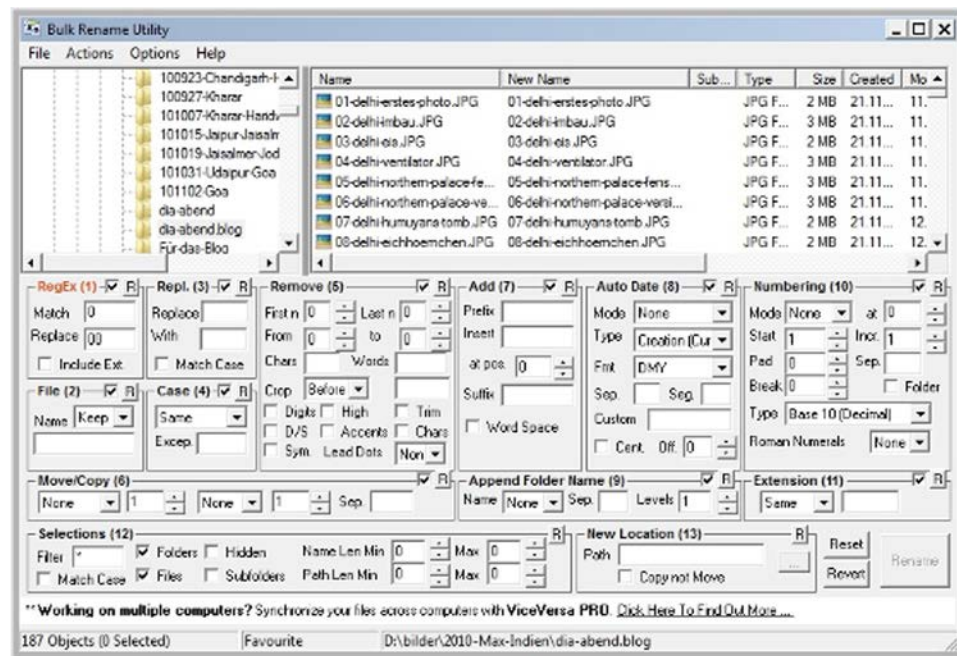
What are dashboards?

The good ...

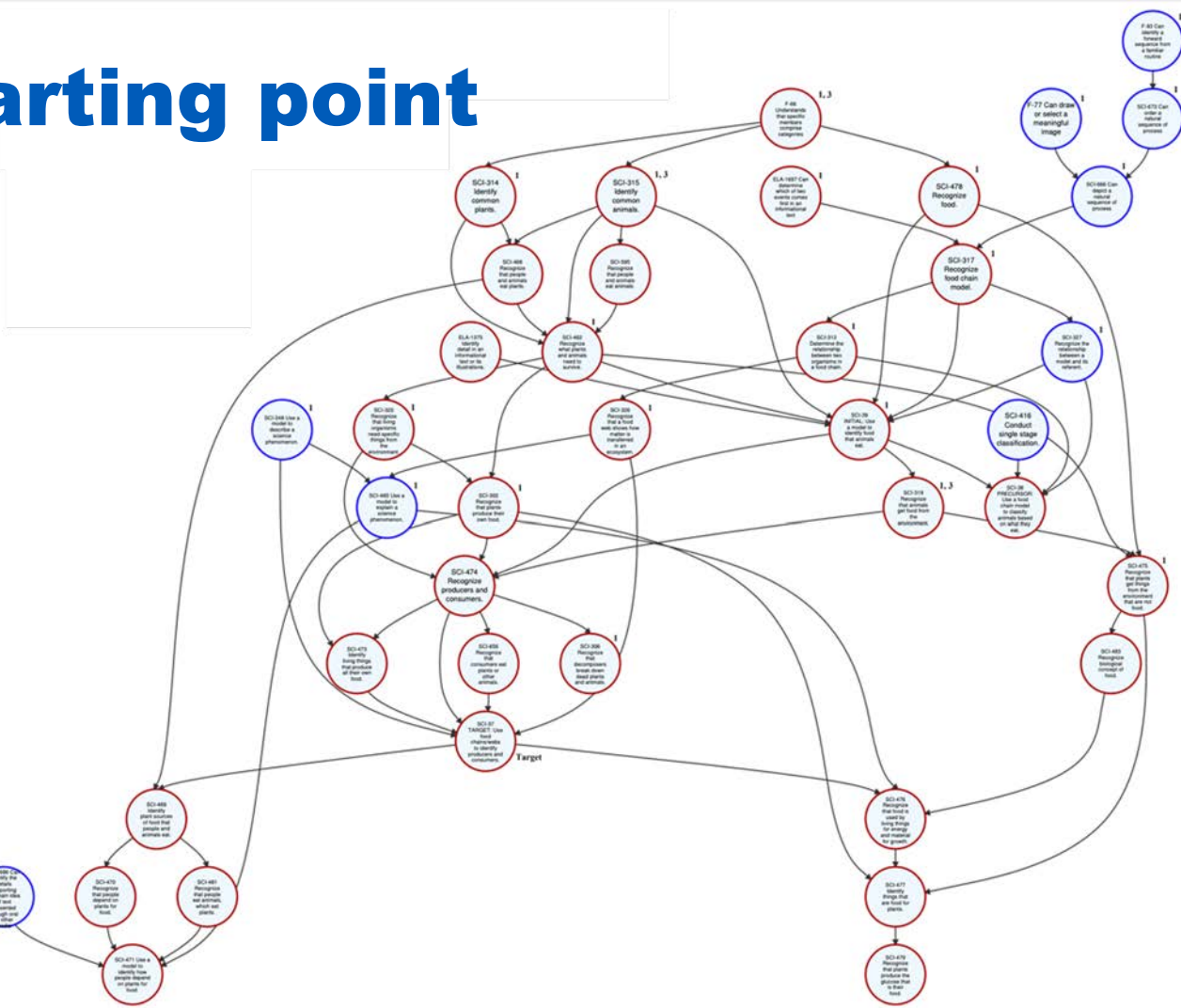


What are dashboards?

The bad and the ugly ...



Starting point



Poll question 5

Instructional planning using assessment results and learning maps is too complex to be effective.

True or false?

Dashboard design approach

- Leverage UDL to provide teachers a flexible interface and scaffolds that supports their use of learning map models in interpreting student testlet results for instructional decision-making
- Iterative co-design with teachers



Scaffolding map views

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

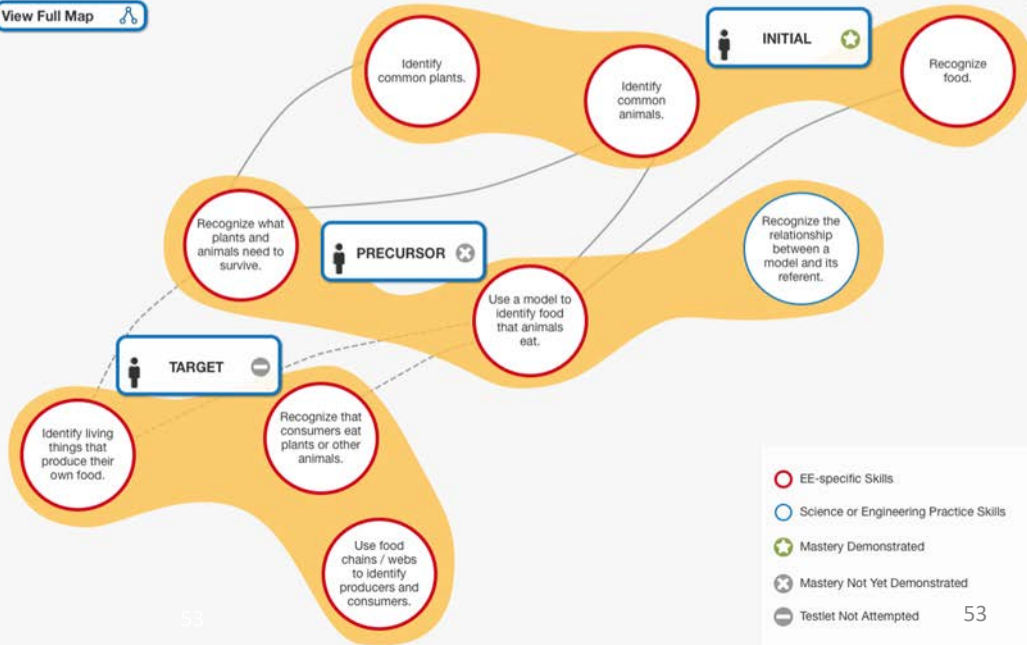
[Preview Map](#)

EE List

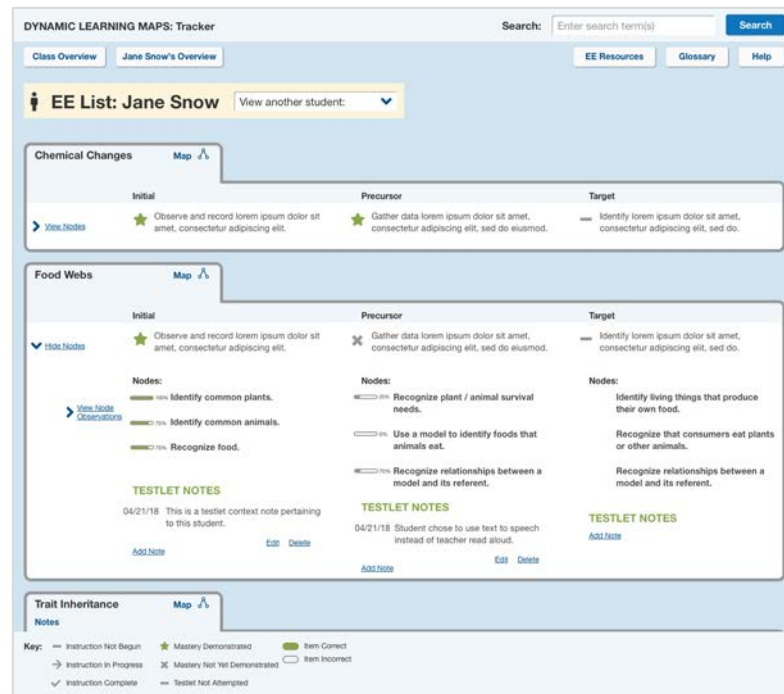
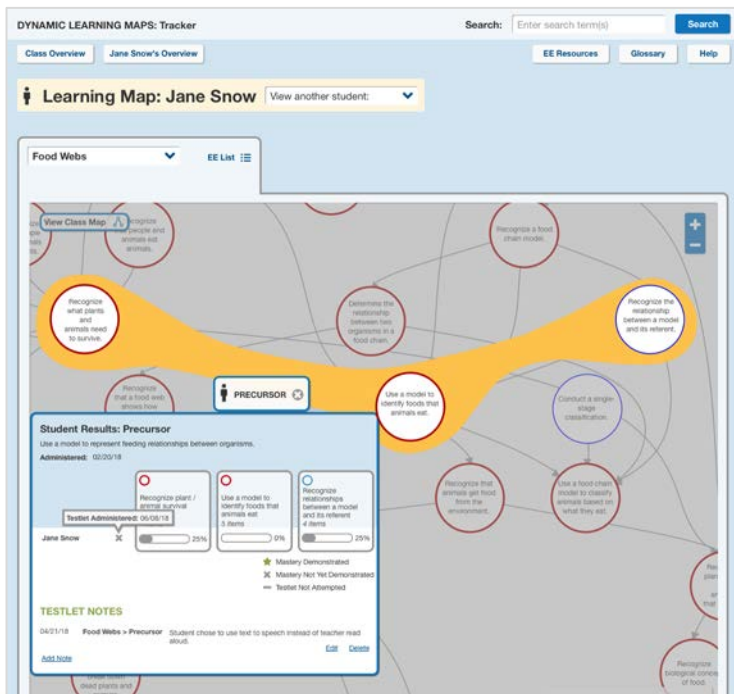
Instruction Initial Precursor Target



View Full Map



Multiple means of data representation



Next step

- Complete dashboard prototype development
- Conduct teacher usability/utility study (this summer)

Try out the design prototype: bit.ly/DLM-dashboard-prototype

Conclusion

Does UDL have a role to play in designing more equitable, next generation educational solutions?

We think so!

1. What is formative classroom assessment?
2. I-SMART project
3. Testlet design
4. Teacher dashboard

5. Questions & answers

The contents of this presentation were developed under a grant from the Department of Education. However, those contents do not necessarily represent the policy of the Department of Education, and you should not assume endorsement by the Federal Government.