Universal Design for Learning in the Science Classroom

Successful STEM Education Conference
San Francisco, CA – Feb. 1, 2016
Samantha Daley, EdD

AFFECTIVE NETWORKS:
THE **WHY** OF LEARNING

Engagement

For purposeful, motivated learners, stimulate interest and motivation for learning.

RECOGNITION NETWORKS:
THE **WHAT** OF LEARNING

Representation

For resourceful, knowledgeable learners, present information and content in different ways.

STRATEGIC NETWORKS:
THE **HOW** OF LEARNING

Action & Expression

For strategic, goal-directed learners, differentiate the ways that students can express what they know.

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D4
Gates D5 - D13
D3
D13
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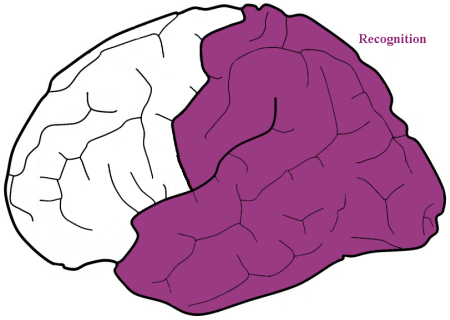
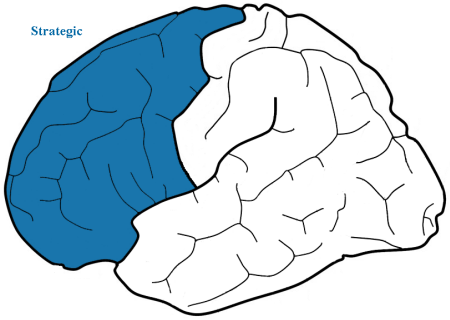
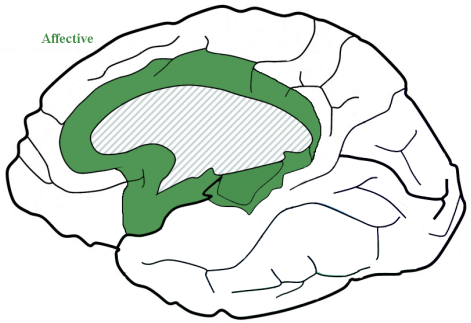
We need a model to let us consider this infinite variability…

Three major dimensions of how learners vary

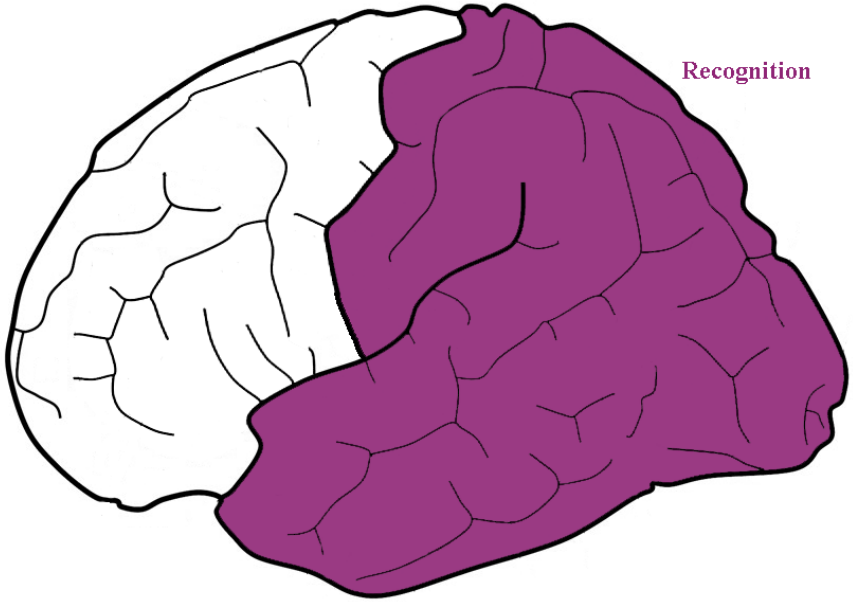






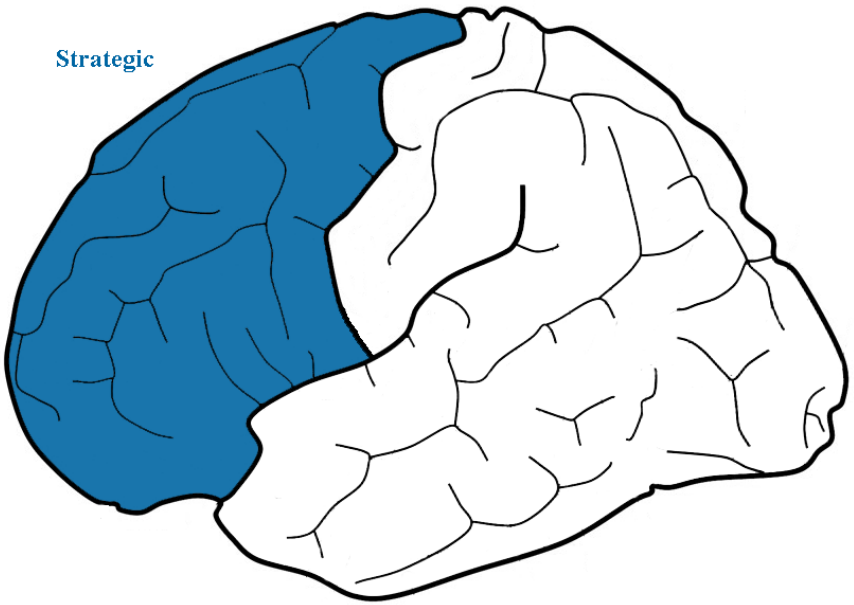
Recognition Network: "what of learning"

Identify & interpret patterns of sensory information from the environment.



Strategic Networks: "how of learning"

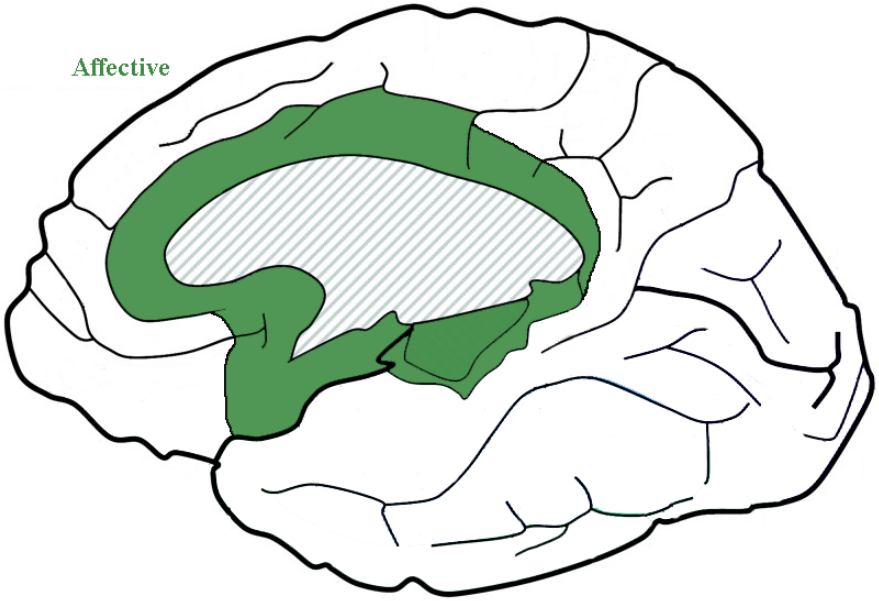
Plan, execute, and monitor actions on the environment.



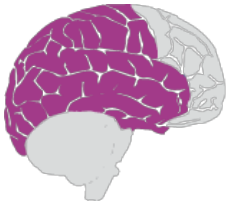
Affective Networks: "why of learning"

Evaluate & set priorities for attention

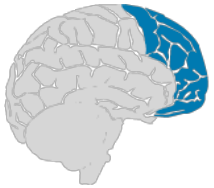
and action



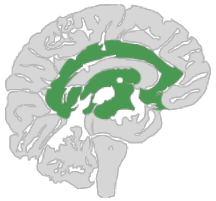
UDL Framework



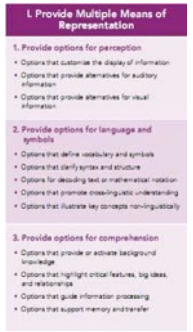
Provide Multiple Means of Representation

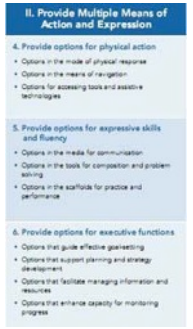


Provide Options for Action and Expression



Provide Multiple Means of Engagement





I. Provide Multiple Means of Representation

1: Provide options for perception

1.1 Offer ways of customizing the display of information

1.2 Offer alternatives for auditory information

1.3 Offer alternatives for visual information

2: Provide options for language, mathematical expressions, and symbols

2.1 Clarify vocabulary and symbols

2.2 Clarify syntax and structure

2.3 Support decoding of text, mathematical notation, and symbols

2.4 Promote understanding across languages

2.5 Illustrate through multiple media

3: Provide options for comprehension

3.1 Activate or supply background knowledge

3.2. Highlight patterns, critical features, big ideas, and relationships

3.3 Guide information processing, visualization, and manipulation

3.4 Maximize transfer and generalization

Resourceful, knowledgeable learners

II. Provide Multiple Means of Action and Expression

4: Provide options for physical action

4.1 Vary the methods for response and navigation

4.2 Optimize access to tools and assistive technologies

5: Provide options for expression and communication

5.1 Use multiple media for communication

5.2 Use multiple tools for construction and composition

5.3 Build fluencies with graduated levels of support for practice and performance

6: Provide options for executive functions

6.1 Guide appropriate goal-setting

6.2 Support planning and strategy development

6.3 Facilitate managing information and resources

6.4 Enhance capacity for monitoring progress

Strategic, goal-directed learners

III. Provide Multiple Means of Engagement

7: Provide options for recruiting interest

7.1 Optimize individual choice and autonomy

7.2 Optimize relevance, value, and authenticity

7.3 Minimize threats and distractions

8: Provide options for sustaining effort and persistence

8.1 Heighten salience of goals and objectives

8.2 Vary demands and resources to optimize challenge

8.3 Foster collaboration and community

8.4 Increase mastery-oriented feedback

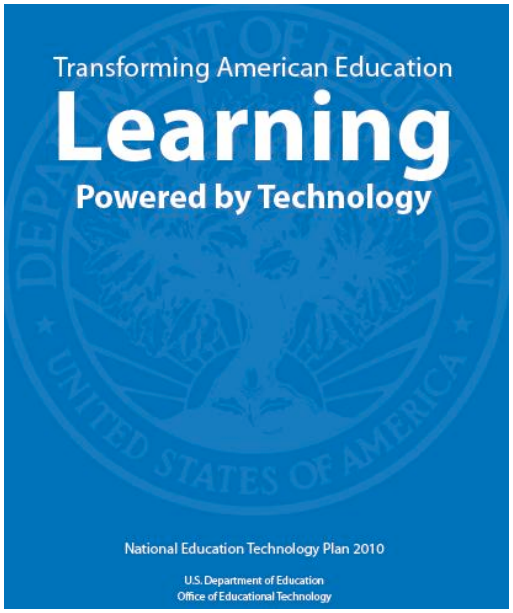
9: Provide options for self-regulation

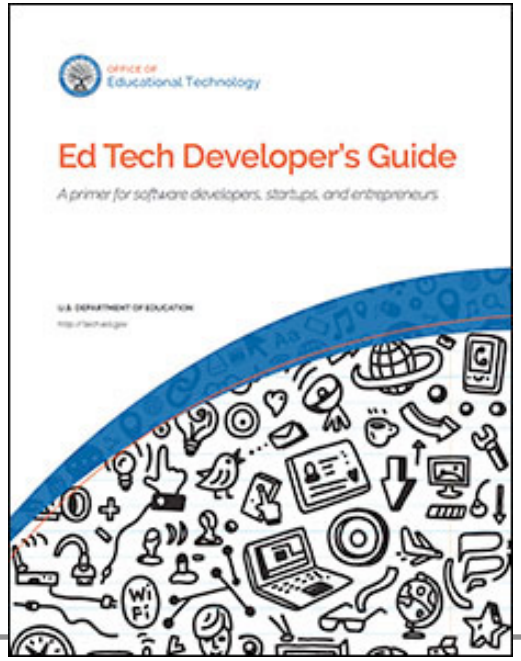
9.1 Promote expectations and beliefs that optimize motivation

9.2 Facilitate personal coping skills and strategies

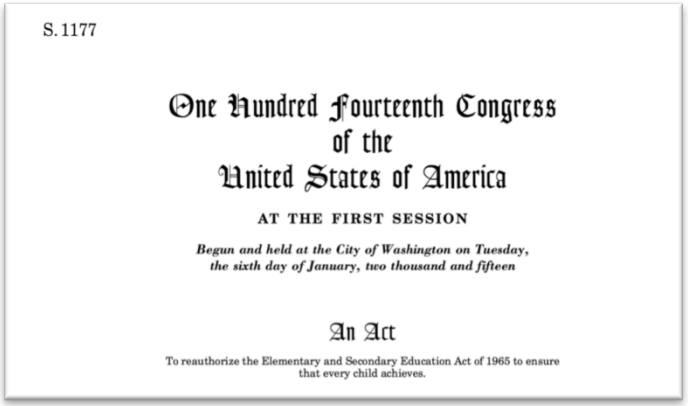
9.3 Develop self-assessment and reflection

Purposeful, motivated learners





Every Student Succeeds Act (ESSA)



S. 1177

One Hundred Fourteenth Congress
of the
United States of America

AT THE FIRST SESSION

Begun and held at the City of Washington on Tuesday, the sixth day of January, two thousand and fifteen

An Act

To reauthorize the Elementary and Secondary Education Act of 1965 to ensure that every child achieves.

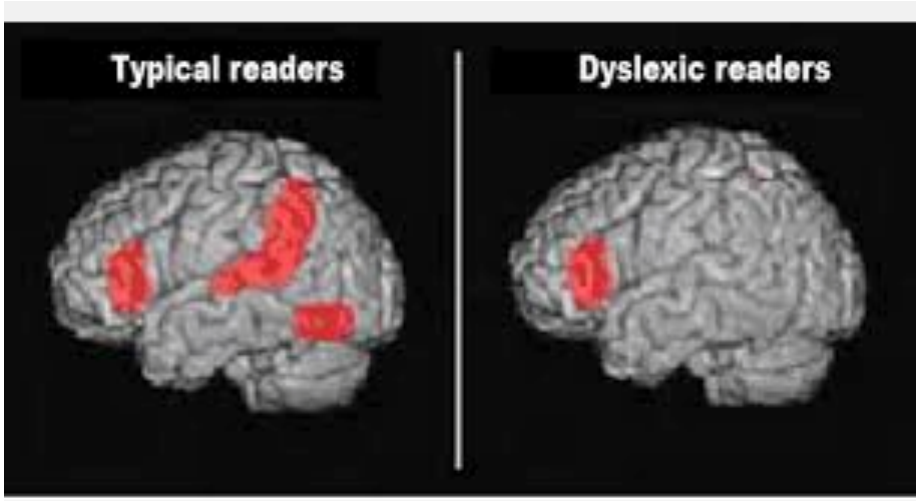
"**Universal Design for Learning (UDL)** means a scientifically valid framework for guiding educational practice that —

(A) provides flexibility in the ways information is presented, in the ways students respond or demonstrate knowledge and skills, and in the ways students are engaged; and

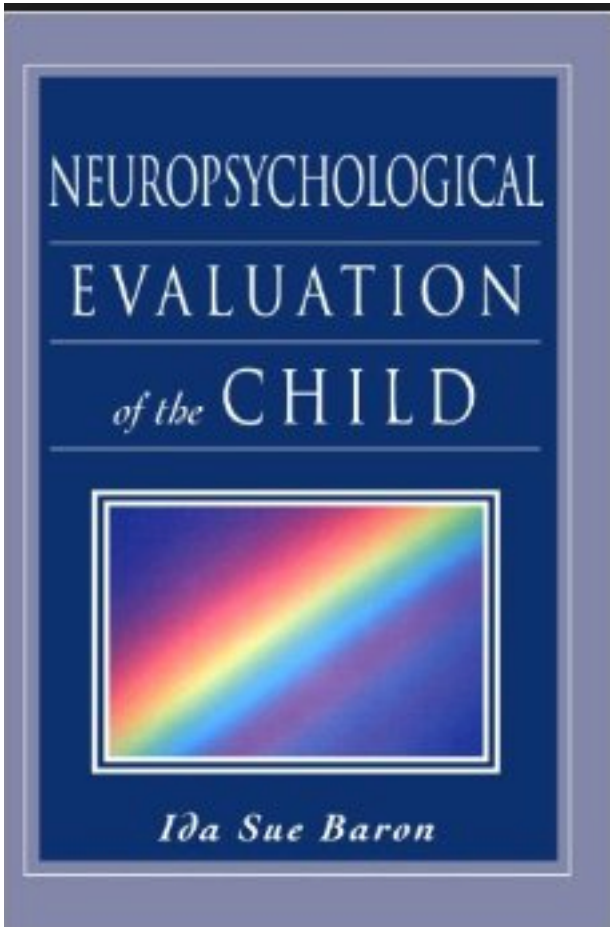
(B) reduces barriers in instruction, provides appropriate accommodations, supports, and challenges, and maintains high achievement expectations for all students, including students with disabilities and students who are limited English proficient."

Fixed, uniform, learning technologies

Diverse, varied, learners.

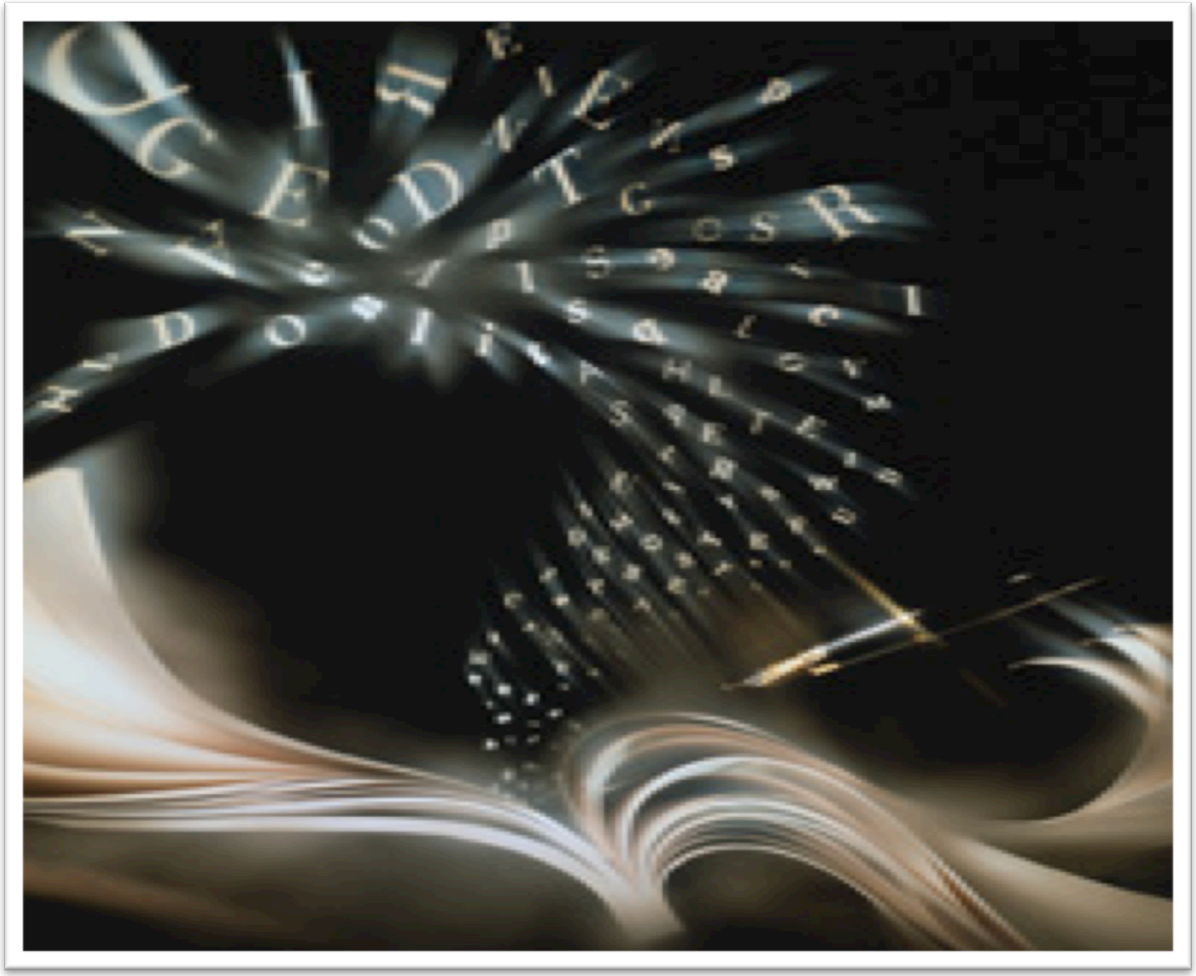


The Result?



Children are the problem

New media changes the equations



An example

Science Notebooks

- Can effectively support active science learning and development of scientific literacy (Hargrove & Nesbit, 2003; Klentschy, 2005)
- Opportunity for students to engage in authentic scientific practice
- Support students to reflect, revise their thinking, focus on “big ideas”
- Provide formative assessment data for teachers

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The nature of the task is critical

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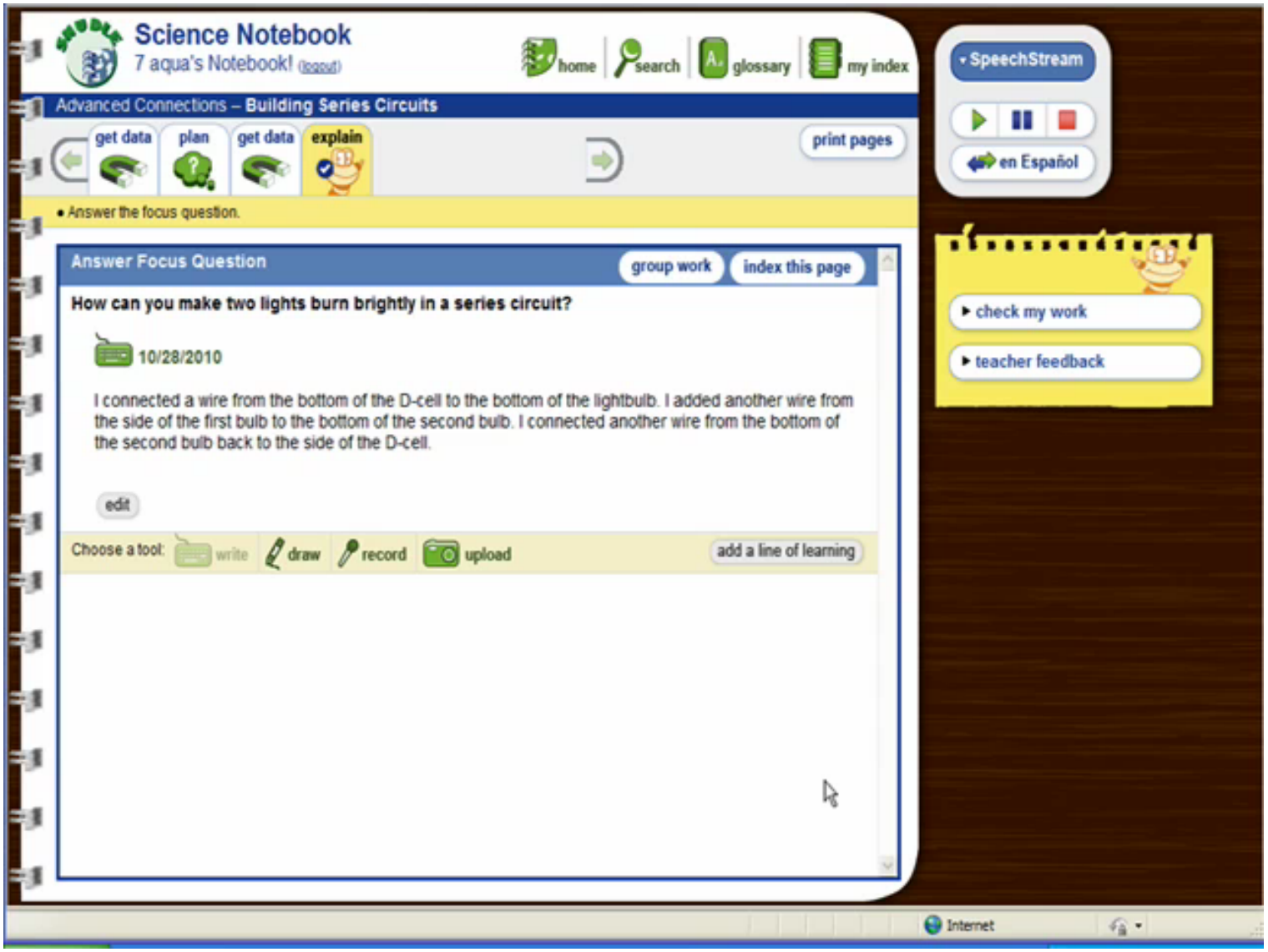
Science Notebook
7 aqua's Notebook! (logout)
home
search
glossary
my index
SpeechStream
Advanced Connections – Building Series Circuits
get data
plan
get data
explain
print pages
en Español
• Answer the focus question.
Answer Focus Question
group work
index this page
How can you make two lights burn brightly in a series circuit?
10/28/2010
I connected a wire from the bottom of the D-cell to the bottom of the lightbulb. I added another wire from the side of the first bulb to the bottom of the second bulb. I connected another wire from the bottom of the second bulb back to the side of the D-cell.
edit
check my work
teacher feedback
Choose a tool:
write
draw
record
upload
add a line of learning
Internet

SNUDLE vs Traditional Paper Notebooks in inclusive 4th-grade science classrooms (n=621)

- There was a significant impact of SNUDLE (γ = . 34, p<.01) use over and above that of traditional science notebooks – representing a 10% difference on average between treatment and control.

- SNUDLE raised the floor and the ceiling on content and process knowledge for all students

- Students of teachers who had more experience with science notebooking tended to use SNUDLE features more productively.

In their own words…

[video removed for permission reasons]

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