How People Learn

Deep Learning Through Evidence-Based Course Design

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Goals:

1. Explore how learning sciences research informs evidenced based curriculum design.

2. Relate the principles of learning to the pedagogies used in the classroom.

3. Discuss take away ideas and some best practices for enhancing civic engagement in curriculum design.
What is learning?
Take one minute to write down your definition of what it means to learn.
I know I have learned something when I ......
What is learning?

Take 3 minutes to discuss the definition of learning at your table.
Typical Answers – I have learned something when I ……. 

**Understanding –**
just know or get it, can remember, understand the principles, make a connection to something new, being able to teach something

**Skills –**
can do something, use what you know, mastered a procedure or process

**Affective –**
am engaged, learn to like something, want to get involved, learn to appreciate, am inspired

**Habit –**
can do something automatically, integrate what I know into my life, have the ability to improvise based on what I know
What are characteristics of deep and surface learning?

**Attributes:**
- Active search for meaning
- Vigorous interaction with content
- Relate new ideas to previous knowledge
- Relate concepts to everyday experience
- Relate evidence to conclusions
- Examine the logic of the argument
- Confidence
- Higher long-term retention

**Surface Learner**
- Memorize for assessments
- Failure to distinguish principles from examples
- Focus on discrete facts without integration
- Unreflective about purpose and strategies
- Anxiety
- Low long term retention

**Deep Learner**
The synapse is a variable switch that can be modified by experience —> memory

The synapse is the cellular site of memory and learning

increased stimulation of a synapse will cause it to be more efficient —> i.e., making a memory

Learning is about making connections!
To understand this concept think of making a path across a field
Learning and memory are biological processes affected by nutrition, sleep, drugs, stress . . .

- Neuroactive drugs act on synapses.
- Learning is consolidated during sleep.
- Stress eliminates synapses.
To demonstrate how this complexity relates to learning, we will start with a test . . .

- you will be shown a series of questions, each followed by a word
- apply the question to the word and answer yes (Y) or no (N) on the response sheet

Ready? . . . GO!
1. Does the following word mean the same as **OUT-GOING**?

**RESERVED**
2. Does the following word contain the letter A?

SPONTANEOUS
3. Does the following word describe you?

FRIENDLY
4. Does the following word contain the letter S?

REALISTIC
5. Does the following word mean the same as CARING?

WARM-HEARTED
6. Does the following word contain the letter C?

PRACTICAL
7. Does the following word describe you?

SENSITIVE
8. Does the following word mean the same as **STUPID**?

**INTELLIGENT**
9. Does the following word contain the letter D?

IMPROMPTU
10. Does the following word contain the letter $K$?

TRUSTING
11. Does the following word contain the letter M?

CAUTIONOUS
12. Does the following word describe you?

SUSPICIOUS
13. Does the following word describe you?

OBVIOUS
14. Does the following word contain the letter O?

LOYAL
15. Does the following word mean the same as **ADULT**?

**MATURE**
16. Does the following word contain the letter B?

PRAGMATIC
17. Does the following word mean the same as CREATIVE?

IMAGINATIVE
18. Does the following word mean the same as HONEST?

TRUSTWORTHY
19. Does the following word describe you?

SHREWD
20. Does the following word contain the letter N?

ATTENTIVE
21. Does the following word describe you?

CALCULATING
22. Does the following word mean the same as FLIGHTY?

SERIOUS
23. Does the following word contain the letter H?

SENSIBLE
24. Does the following word describe you?

RESTRAINED
25. Does the following word mean the same as **PROUD**?

**HUMBLE**
26. Does the following word describe you?

QUIET
27. Does the following word describe you?

CRAFTY
28. Does the following word mean the same as \textbf{ASSERTIVE}?

\textbf{COMMANDING}
29. Does the following word mean the same as

**IMPULSIVE?**

**INTROVERTED**
30. Does the following word describe you?

SOBER
Now, turn over your answer sheet . . .

- write down as many of the **TARGET** words as you can remember in 2 minutes

Finished?
Now we’ll score the test
<table>
<thead>
<tr>
<th>Spontaneous</th>
<th>Cautious</th>
</tr>
</thead>
<tbody>
<tr>
<td>Realistic</td>
<td>Loyal</td>
</tr>
<tr>
<td>Practical</td>
<td>Pragmatic</td>
</tr>
<tr>
<td>Impromptu</td>
<td>Attentive</td>
</tr>
<tr>
<td>Trusting</td>
<td>Sensible</td>
</tr>
</tbody>
</table>

—> LETTER score
Score number of words remembered from this list:

reserved  trustworthy
warm-hearted  serious
intelligent  humble
mature  commanding
imaginative  introverted

—> WORD score
Score number of words remembered from this list:

<table>
<thead>
<tr>
<th>friendly</th>
<th>calculating</th>
</tr>
</thead>
<tbody>
<tr>
<td>sensitive</td>
<td>restrained</td>
</tr>
<tr>
<td>suspicious</td>
<td>quiet</td>
</tr>
<tr>
<td>obvious</td>
<td>crafty</td>
</tr>
<tr>
<td>shrewd</td>
<td>sober</td>
</tr>
</tbody>
</table>

—> SELF-REFERENCE score
Levels of Processing Test*
— typical results

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— typical results

What does this test mean for understanding the process of learning?

Letters: shallow analysis  
—> low retention

Words: intermediate analysis  
—> better retention

Self-reference: deeper analysis  
—> highest retention

*The processing of information influences learning & memory.*

Levels of Processing Activity – Rob Milner, UMMS
There are parallels to the levels of Bloom’s Taxonomy*

Levels of learning in the cognitive domain from simplest to most complex

Levels of Processing

Self-reference

Words

Letters

Knowledge

Comprehension

Application

Analysis

Synthesis

Evaluation

Teach through what matters in the life of the learners

Any object not interesting in itself may become interesting through becoming associated with an object in which an intense interest already exists. The two associated objects grow, as it were, together; the interesting position sheds its quality over the whole; and thus things not so interesting in their own right borrow an interest and then in turn becomes real and as strong as that of any natively interesting thing.

The most natively interesting object to a man is his own personal self and its fortunes. The moment a thing becomes connected with self fortunes, it becomes interesting.

Form all the facts there emerges a very simple abstract program for the teacher to follow: Begin with the interest of the student and offer him objects that have some immediate connection with these.

William James, *Talks to Teachers*, 1899
Principles of learning*

1. Learners bring prior knowledge
2. Learning depends on cognitive network
3. Practice consolidates learning
4. Feedback enhances learning
5. Learners must reflect on their own learning (metacognition)
6. Motivation directs learning
7. Learning has an emotional component

* http://www.cmu.edu/teaching/principles/learning.html
“I have been about the world—hopping here and there,” said the frog, “and I have seen extraordinary things.”

“Like what?” asked the fish.

“Birds,” said the frog mysteriously. “Birds!” And he told the fish about the birds, who had wings, and two legs, and many, many colors. As the frog talked, his friend saw the birds fly through his mind like large feathered fish.

Fish is Fish, Leo Lionni
It is important to draw out and work with the students’ pre-existing understandings –

How can you do that in your classroom?

Dialogues:
- Study circles (interest driven)
- Intercultural circles (identity driven)
- Deliberation (process driven)

Seminar Classes:
- Students have a voice

Reflection:
- Put ideas into writing

A Tiny World: A video produced by the Wisconsin Program for Scientific Teaching
The Peanut

Take 5 minutes to explore the peanut in front of you. Independent of others, write down all that characteristics that describe the peanut;

Next at your table share the description with others. Identify shared and unique descriptors.
**peanut (p’ nut’)n.**

1. Native to tropical America and widely cultivated in semitropical regions, having yellow flowers on stalks that bend over so the seed pods ripen underground.

2. The edible nut like oily seed of a peanut, used for food and a source of oil.

3. A small or insignificant person.

*American Heritage Dictionary*
Learning is cumulative, unlearning is harder than learning new information – take small steps along the way!
3. Practice consolidates learning and
4. Feedback enhances this learning

How do you learn a skill: music, sports?
For mastery, a subject must be taught in-depth, with many examples

Implications for teaching:
  teach with depth/cover less but go deeper
  survey vs theme courses

  test for understanding, not just facts
  assessments that span Bloom’s Taxonomy

  use progressive pedagogies to get to depth
  active, collaborative learning vs lecture alone
  make it relevant!

  provide experiences to link theory and practice

  challenge students to find different applications for the material
  link to writing, aesthetic response, effective citizenship
An example of the effects of practice and feedback on exam performance
5. Learners must reflect on their own learning (metacognition)

Metacognition: “knowing about knowing”

- self-assessment
- evaluating personal strengths & weaknesses
- planning & goal setting
- monitoring learning
- reflection

Essential for development as a self-regulated learner
How can you help your students reflect on their own learning

Provide insight into your own internal dialog

   tell them why you do what you do

   make a purposeful mistake and let them into your internal dialog in solving the problem

Explain your own goals and objectives to the students

Reflection and self inquiry are a practiced skill

   Write! Share!

Third Implication from NRC study
6. Motivation directs learning
7. Learning has an emotional component

Learners are motivated to learn, if:

- The activity is interesting stimulating &/or relevant.
- Success is achievable.
- There is a supportive environment.
Types of Motivation

**Extrinsic**
- badges
- competition
- fear of failure
- fear of punishment
- gold stars
- money
- points
- rewards
- ...

**Intrinsic**
- autonomy
- belonging
- curiosity
- love
- learning
- mastery
- meaning
- ...

http://blog.sqwiggle.com/psychology-setting-goals/
How would you design an activity, course or assignment keeping in mind the goal of intrinsic motivation of the student?
Examples of creating intrinsic motivation

• Relevance
  – Attention grabbers
  – Connections with prior knowledge
  – Learners get a choice in material or activity
  – Learners have a voice in goals
  – Using emotion to engage

Consider also the importance of self-efficacy –
  The learner believing they can learn
  (metacognition, remembrance of past success, feedback, learner to learner experiences)
Problem solving

• Data shows that solving problems is pleasure and triggers dopamine release

• But problems must be solvable!

Game Design

Designing Successful e-Learning: Forget What You Know About Instructional Design and Do Something Interesting
Michael W. Adora, 2007
Keller’s ARCS Model

Attention
uses surprise or uncertainty to gain interest.
stimulates curiosity by posing challenging questions or problems
Varies the elements of instruction.

Relevance
use examples and concepts that are related to the learner's experience and values
present the objectives and utility of the instruction, and either present goals for accomplishment or have the learner define them.
Use teaching strategies that match the motive profiles of the students

Confidence
Make learners aware of performance requirements
Provide multiple achievement levels that allow learners to set personal goals
Provide feedback that supports student’s recognition of their abilities

Satisfaction
Use newly acquired knowledge or skill in a real or simulated setting
Provide feedback and reinforcements that will sustain the desired behavior
Maintain consistent standards and consequences for task accomplishment

Source: http://ide.ed.psu.edu/IDDE/ARCS.htm
What are three ways you can utilize what we know about learning to design an activity in your classroom?
Thank you