

### Learning 101



### Remember....



Neurons that fire together, wire together.

Use it or lose it.

Merzenich

Block study (intense study in one sitting) is not as effective as spread out study







How neuroscience has changed my teaching

# Movement



minute



15%



**How long** do your students sit in class?

minutes

Block study (intense study in one sitting) is not as effective as spread out study





### Evidence-based Learning Strategies

No!

# Yes!

**Block Study** 

Spaced repetition Interleaving

Self-quizzing Dual Coding

Rereading Highlighting

More Time on Input More Time on Retreival



Jason Lowes

# What Paul Nation (2013) says that teachers (in order of importance) should be doing:

1.

3.

4.

2. Training the learners

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#### **Evidence-based Strategies**

Elaboration

- Spaced repetition
- \* Concrete examples \*
- \* Interleaving

- Dual coding
- \* Retrieval practice

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### Elaboration

 Associating to-be-learned information with other information already in memory.



# **Concrete Examples**

 Associating to-be-learned information with other information which is naturally associated with perceptual / motor experiences.







#### **Evidence-based Strategies**

- Elaboration
- \* Spaced repetition
- \* Concrete examples
- \* Interleaving

- Dual coding
- \* Retrieval practice

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# **Spaced Practice**

- How do we use spaced practice in the classroom:
  - Review
  - Homework (lagged homework)
  - Recycling
  - Curricular design with spaced practice
  - Quizzes and tests

# **Interleaved Study**

novelty, develops sense of problem type



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# **Retrieval Practice**



#### The focus is on getting information <u>in</u>.

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# **Retrieval Practice**



The focus is on getting information **<u>OUT</u>**.

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## **Retrieval Practice**

\* Ways to include it in the classroom





How neuroscience has changed my teaching

Sleep

Have you ever been to Tokyo?

# Why aren't these students remembering?



school nights

non-school nights

6 hrs, 5 nights 60% decrease

### Top I0% 7 hrs Bottom 9%





#### When a Learner Just Doesn't Get It



#### When a Learner Just Doesn't Get It







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#### When a Learner Just Doesn't Get It

"The brain regions used to think, plan, and reason mature two years later in those kids with high IQ scores....A child who is not reading or doing math like his peers may end up doing even better than them years down the road."

Jay N. Giedd

source: Smart Kids May Get a Slow Start: New Study Shows Intelligence Has More to Do With How a Brain Develops in Children Than Its Overall Size, RedOrbit When a Learner Just Doesn't Get It

Better Brain Punishment?



A researcher in Brazil gained fame for discovering the Jennifer Aniston neuron in the Hippocampus.

We only use about 10% (9.2-12.3%) of our brain.



















A single brain spot is associated with a number of related words. And each single word lights up many different brain spots. Together they make up **networks** that represent the meanings of each word we use...

#### Learning as Massive Redeployment

