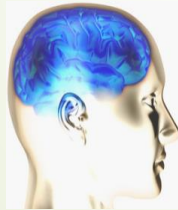# Teaching Students How to Learn: Designing Courses that Build Successful, Self-Directed Deep Learners
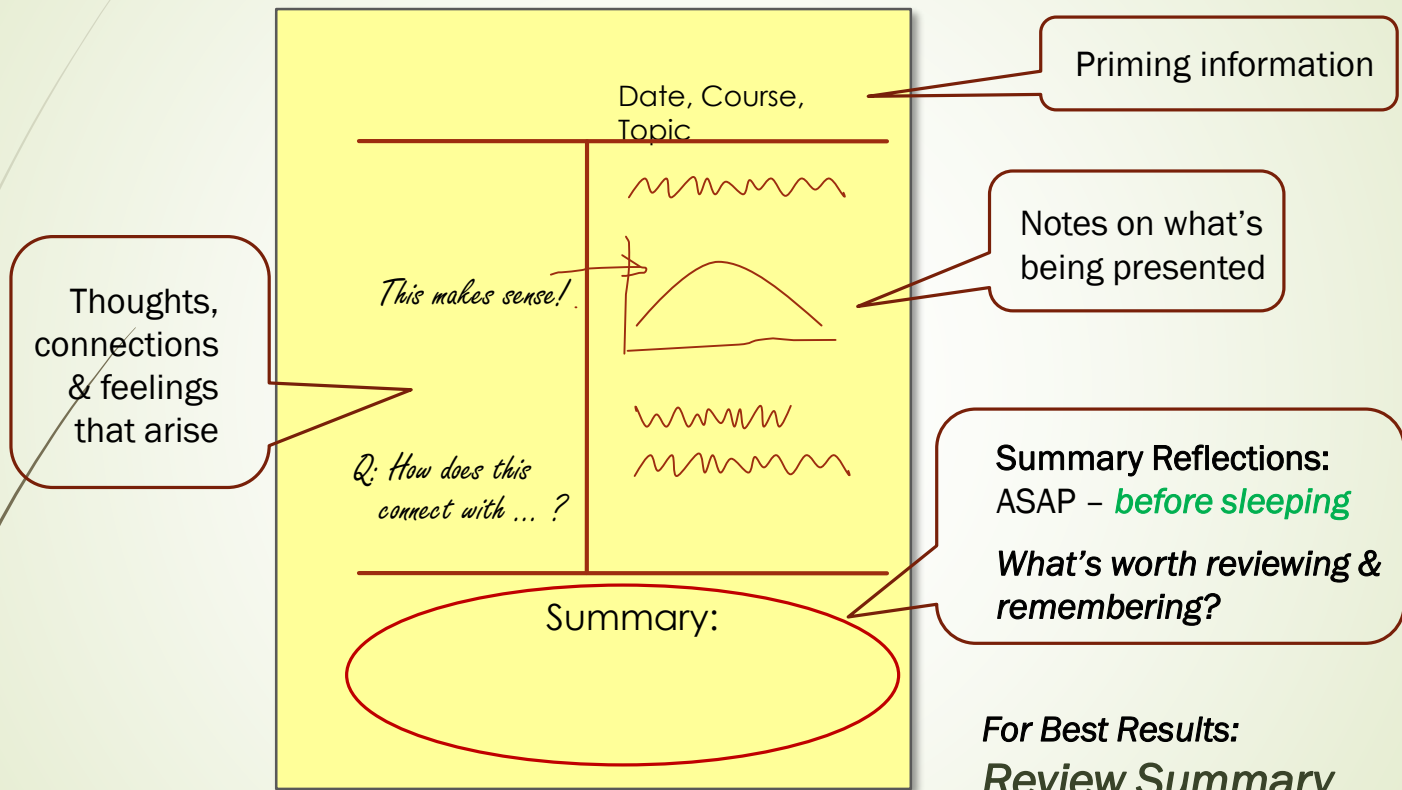
SENCER Summer Institute -- 2018

Stephen Carroll, PhD

Metacognitive Notes

Problem: Low Success/ Graduation Rates

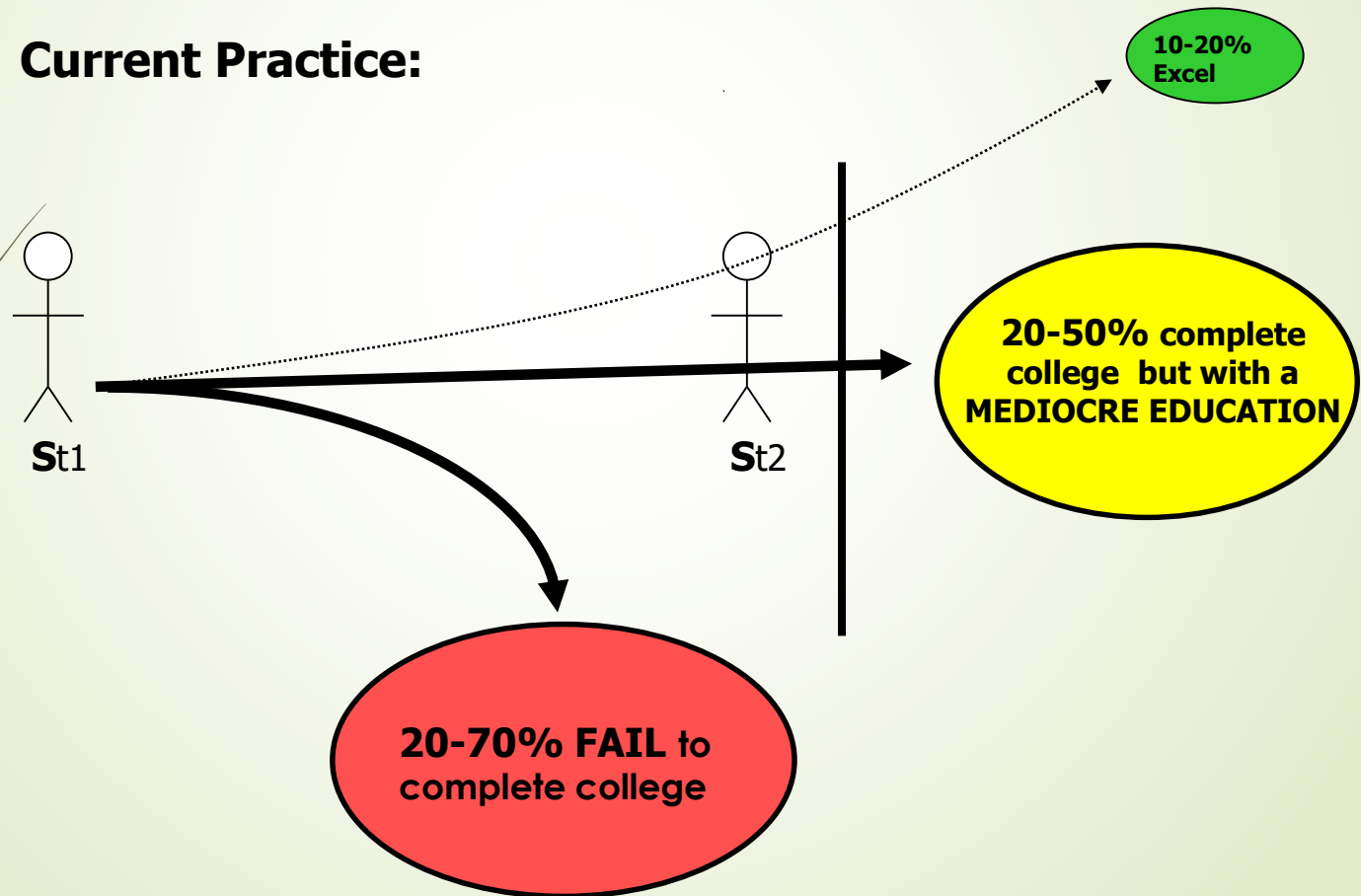|	United States
Percentage of students who graduate within 150% of nominal time	49*

Problem: Low Success/ Graduation Rates

	United States
Percentage of students who graduate within 150% of nominal time	49*

This number has changed very little over the last 45+ years.

Apparent Cause: Pedagogies Based on Passive Learning

Current Practice:

10-20% Excel

20-50% complete college but with a MEDIOCRE EDUCATION

20-70% FAIL to complete college

St1

St2

Apparent Cause: Outdated Pedagogy

- **PASSIVE LEARNING** (an oxymoron)
- Students' existing (high school) learning *habits* aim at low-level thinking skills and passive, dependent learning. They are taught not to risk or to engage.
- In college those learning habits don't work well.
- Consequent motivation and engagement problems further erode students' confidence, academic performance—and learning.
- Poor learning skills severely limits their potential for success in college—and in 21st century life.

Root Cause: Focus on Teaching

We don't teach students *how to learn*.

➡ We have learned a lot about how people learn over the past 15 years.

➡ Why don't we use what we've learned to improve our students' learning?

➡ Epistemological gap
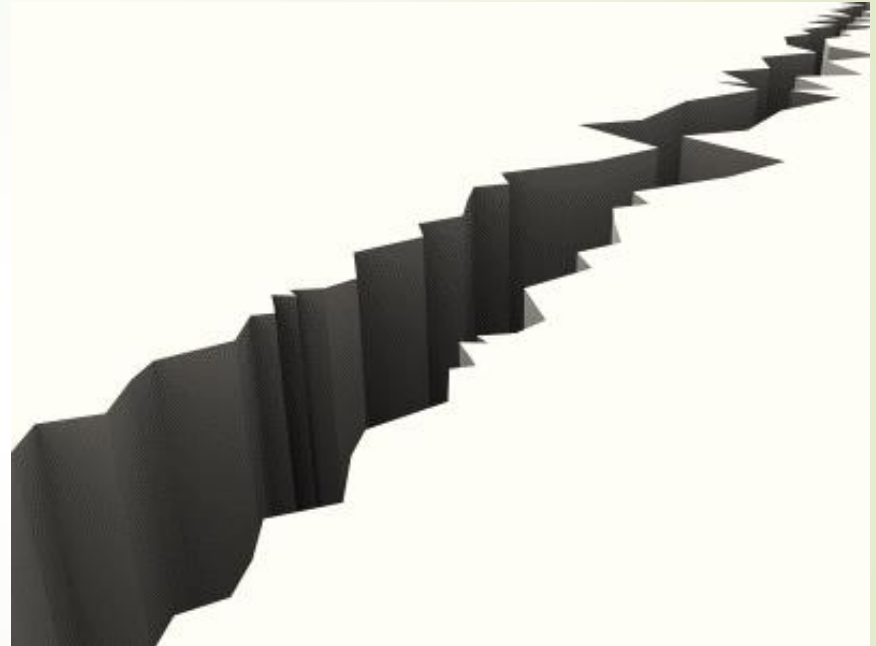
Epistemology of Teaching
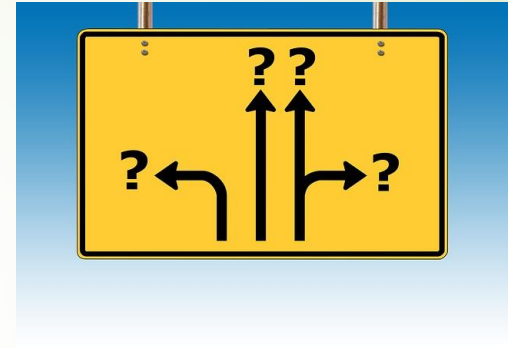
What are your most important goals as a teacher?

(Quickly jot down 2-3 of your most important goals.)

Epistemology of Learning

What is learning?

- What does it mean to learn something?

- How can you tell when you've learned something?

Learning is…

- Greater Understanding (50-70%)

- Skill Acquisition (25-35%)

- Total ≈ 90% (Theory-in-use)

Learning is…

- Greater Understanding (50-70%)

- Skill Acquisition (25-35%)

- Total ≈ 90% (Theory-in-use)

These are lower-order thinking skills on Bloom's taxonomy

Learning is…

- Affective change (5-15%)

- Habit formation/integration (>5%)

Espoused Theory

Learning is…

▶ …a relatively durable change in behavior caused by experience.

▶ …a change in the neuron patterns in the brain.

(Goldberg, 2009)

A Teacher's Definition of Learning

- Learning is the ability to use information after significant period of disuse… ***and***

- The ability to use the information to solve problems that arise in a context different (if only slightly) from the context in which the information was originally taught. (Robert Bjork, *Memories and Metamemories, 1994)*

Habit makes Character

- We *are* what we repeatedly do. Excellence, then, is not an act, but a *habit*.

- Good habits formed at youth make all the difference.
                    ~Aristotle

- Character is simply habit long continued.

                    ~Plutarch

Epistemology of Learning

Our existing epistemologies of learning lead to cramming and forgetting—and failure (surface approach).

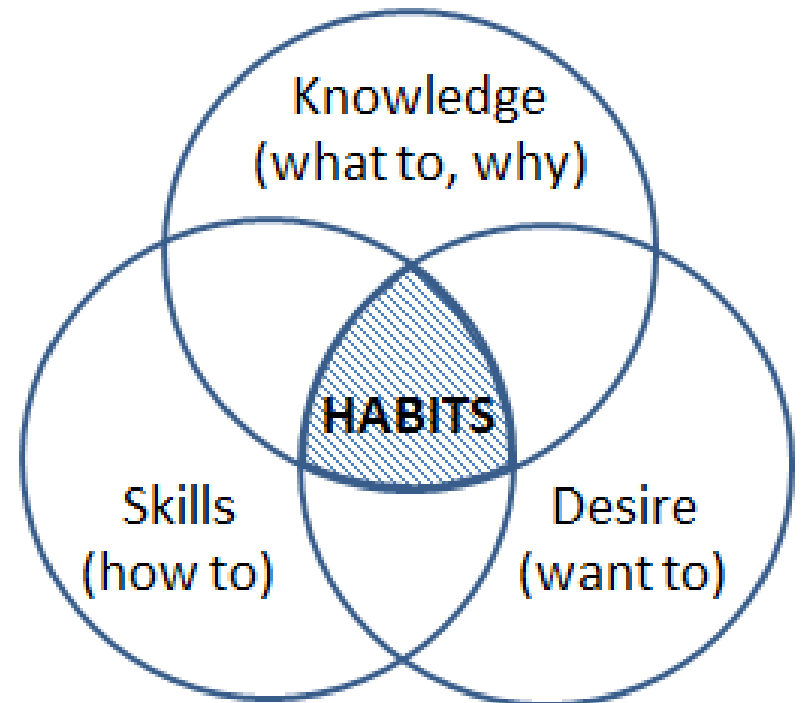"Mr. Osborne, may I be excused? My brain is full."
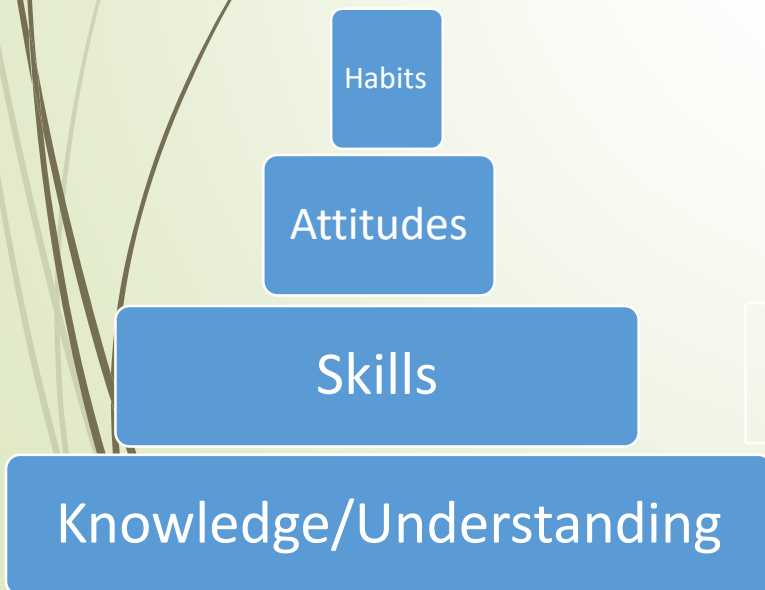
Epistemology of Learning

Facilitating *durable learning* depends on changing attitudes and forming new habits. (You only keep what you value and use regularly.)

Learning is Forming New Habits

- Fueled by attitudes and desires (emotion)
- Supported by skills and understanding

Habits

Attitudes

Skills

Knowledge/Understanding

Knowledge (what to, why)

Skills (how to)

HABITS

Desire (want to)

Stephen R. Covey, *The 7 Habits of Highly Effective People*

Epistemology of Learning

How we define *learning*

- shapes how students learn more than how we define teaching or our course goals

- because it defines how we *assess* learning.
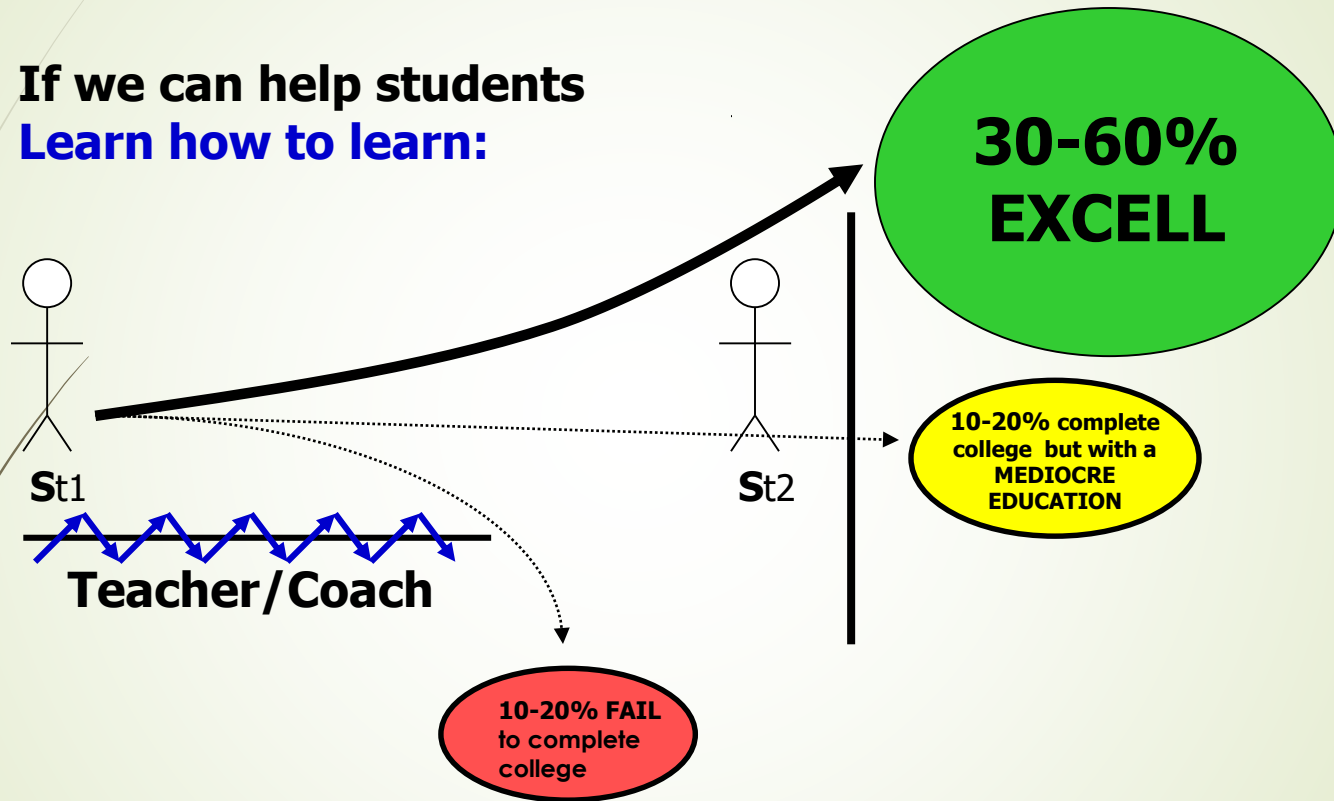
Which paradigm? What do we assess?

Assessment methods derive from the instructor's epistemology of learning:

We test to find out what students have learned, not whether we taught them well.

A Solution: Teach MetaLearning

If we can help students
Learn how to learn:

St1

Teacher/Coach

St2

30-60% EXCELL

10-20% complete college but with a MEDIOCRE EDUCATION

10-20% FAIL to complete college

Taking up to 20% of class time to teach metalearning yields better progress toward learning outcomes

Teaching MetaLearning

- Teach students **how to learn** for the 21st century
  - In an environment of rapid change, ability to learn quickly and effectively determines success in life
- Metalearning is based on current research in cognitive science, neurobiology and learning theory
- Ten years' worth of data and experience show that it makes a significant difference in students' learning
- *It's especially effective in making students more self-motivated and more self-directed learners*

CHANGED PRIORITIES AHEAD

MetaLearning's Promise

This is no panacea; it will be difficult at first. It will take everyone a while to unlearn old habits and to develop new ones. (It takes ~21 days to break in a new habit.)

The payoff is that your students will learn more, learn faster and retain what they learn longer—thus, *the performance of faculty will increase as well*.

Start with one day—the first day of class, perhaps.

Epistemology of MetaLearning:
6 Steps to Changing Learning Habits

Motivation	Help students discover self-motivations for learning
Alignment	Align their definitions of learning with ours
Mechanics	Teach students how learning works and derive guiding principles
Strategies	Derive strategies and tactics from principles
Practice	Develop effective learning practices
Maintain	Maintain those habits

Step 3: The ART of Learning

- **A** Acquire new material

- **R** Retain new material

- **T** Transfer use of new material
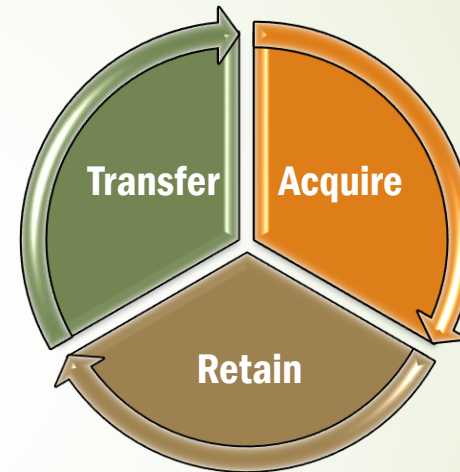
The ART of Learning.
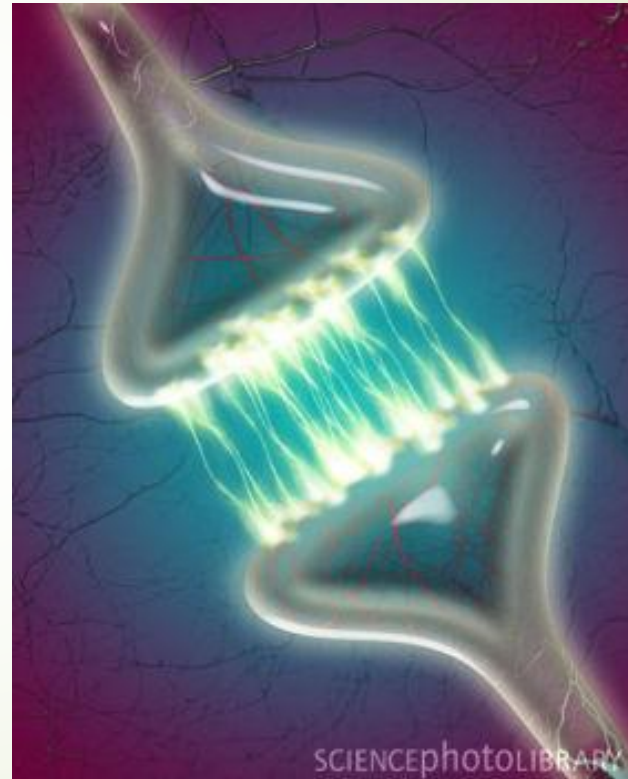
The **<u>A</u>** in ART is for **Acquisition**

Mnemonic:
<u>A</u>ctively
<u>B</u>uild
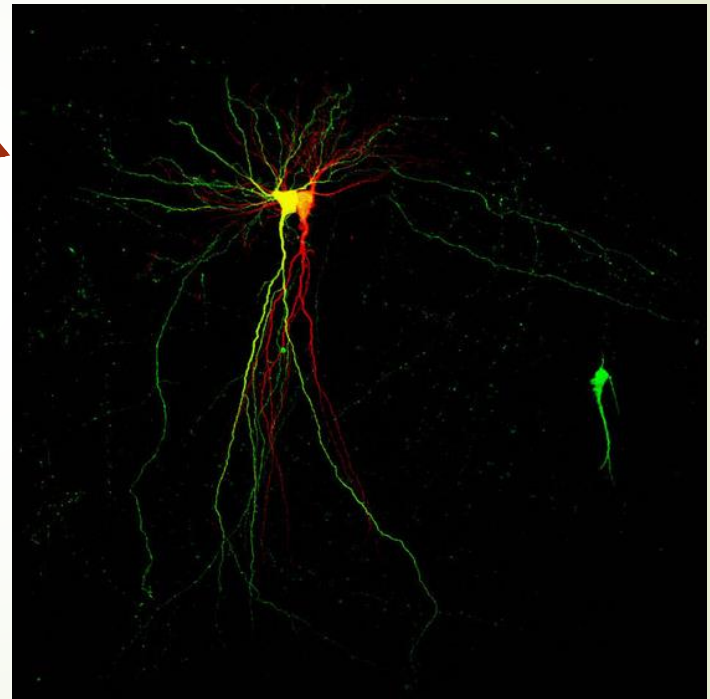**<u>C</u>onnections**

#1 Learning IS Making Connections

Learning ONLY happens when it is active and intentional.
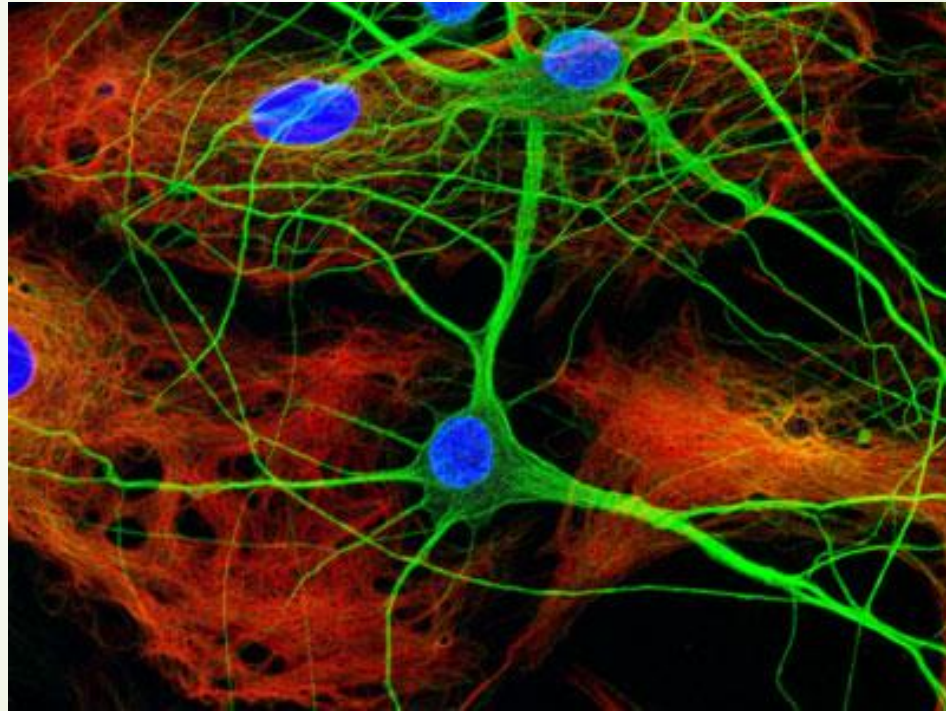
Keeping students engaged is vital

Learning IS making connections: Neurons that fire together wire together

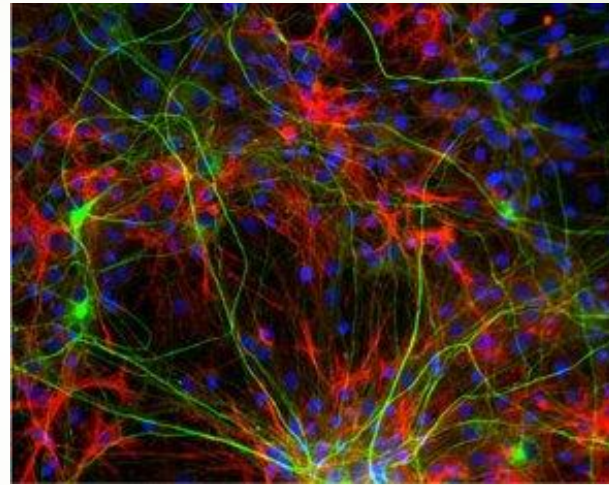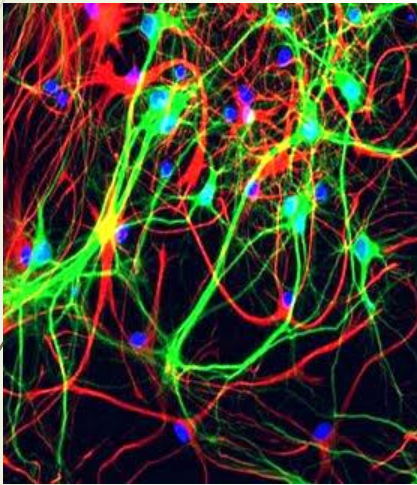2 pyramidal neurons forming a synapse

Focus teaching on helping students connect new information to old (not on uptake of content). Analogies!

Ideas are patterns of neural firing

More complex ideas are more complex patterns—made up of smaller patterns

Get students to focus on patterns and meaning, not on facts and information

Learning IS Making Connections

- Learning has the physical and metaphorical structure of an analogy.

- Therefore we must teach analogically, not *de novo*.

- "Nothing we learn can stand in isolation; we can sustain new learning only to the degree we can relate it to what we already know." (Sci Am Mind, July 2010.)
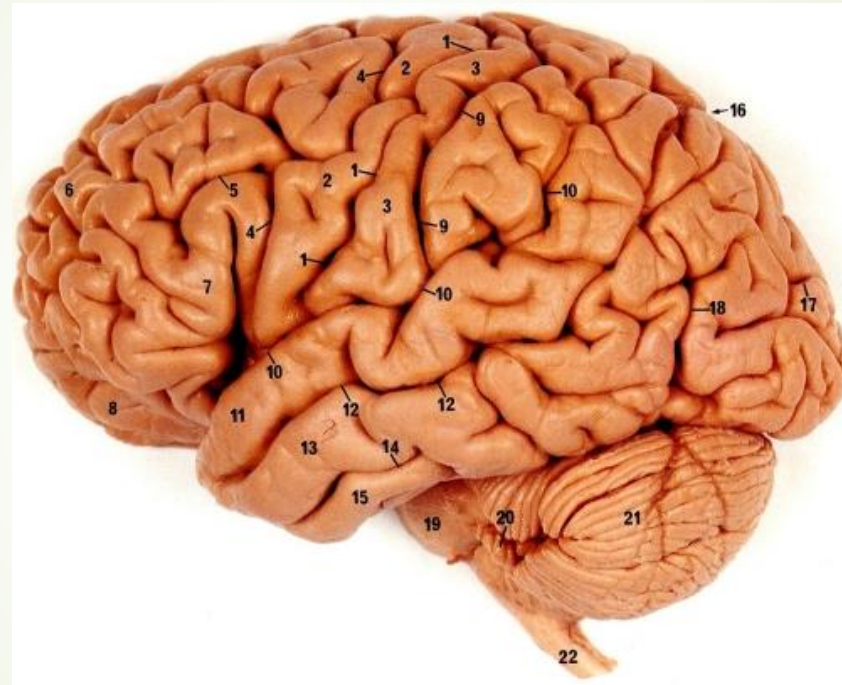
Focus on helping students make connections between what they know and what they are trying to learn

#2 Learning Changes the Brain

A Basic Brain—not very fold-ey

A Better Brain—more fold-ey

Make sure relevant learning happens every day in every class session (to increase plasticity)
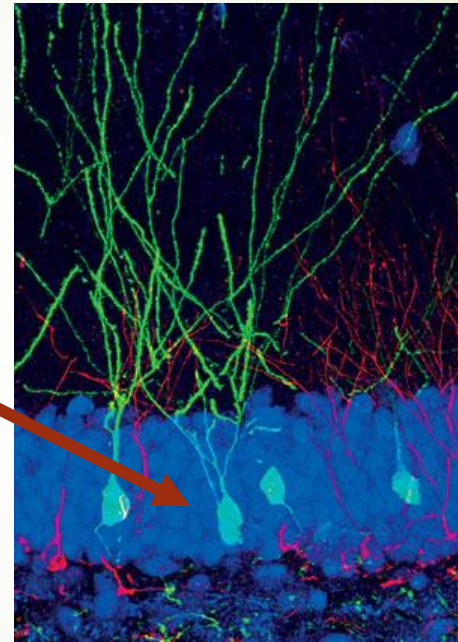
Learning Increases Brain Plasticity

- Therefore we need our students to regularly experience sustained, challenging learning tasks

- The more they learn, the better learners they will become

- Analogy: Like building muscle or learning a foreign language (use it or lose it/working makes it stronger)
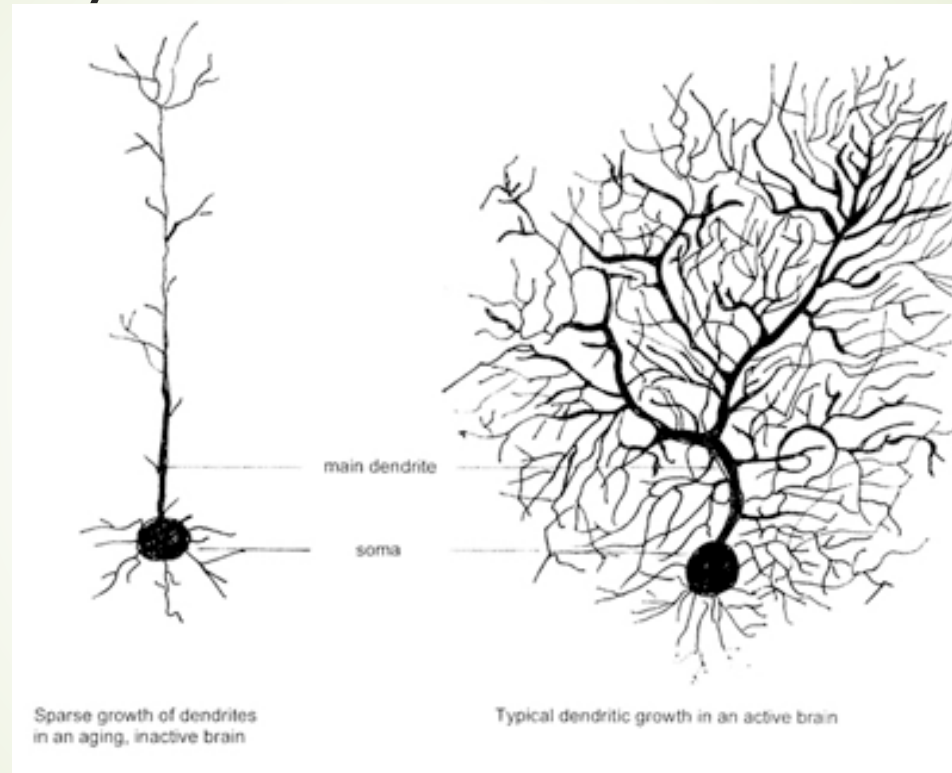
#3 Learning Hard Stuff Grows Your Brain

New Brain Cells Forming

Prefer the difficult path over the easy one: you'll learn more and feel better.

Learning Builds and Maintains Healthy Neurons

main dendrite

soma

Sparse growth of dendrites
in an aging, inactive brain

Typical dendritic growth in an active brain

Provide opportunities for learning that constantly
challenge students

Learning works best when it is difficult

- Therefore, we must teach our students to seek challenge

- Always prefer the difficult over the routine or the easy

- Optimal learning occurs in "flow state"—midway between boredom and anxiety

- Analogy: crosswords and sudokus

Rekindle students' love of learning by helping them find optimal levels of challenge

Difficulty Increases Engagement
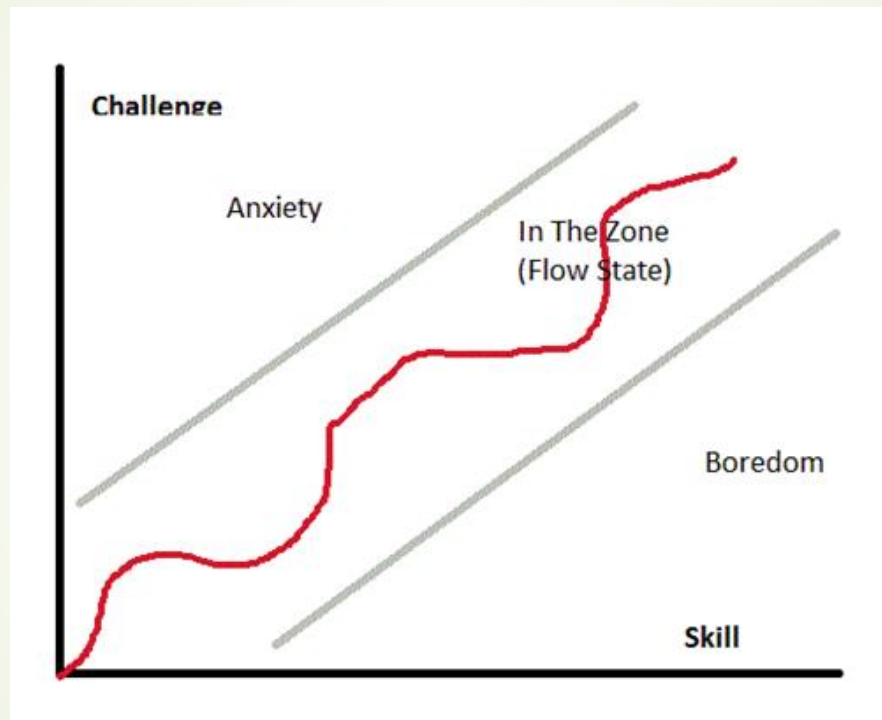
Based on *Flow*, by Mihaly Csikszentmihalyi (2002)
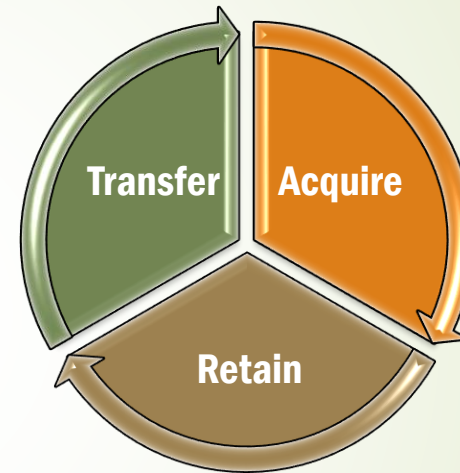
The ART of Learning: Habits of Acquisition

- Paying attention/active learning
  - Not multitasking (microbreaks)
- Seeking connections and analogies
- Focus on patterns
- Work your brain every day/practice
- Seek difficulty
- Note-Taking
- Reading strategies

Step 3: The ART of Learning

- **A** Acquire new material

- **R** Retain new material

- **T** Transfer use of new material

Reading Strategies

- Pre-Read
    - Determine context and purpose (motivation)
    - Scan the prominent features of the text (priming)
    - Think about what you know now (metacognition)
- Read Critically
    - Two highlighters and a pen (metacog & connections)
    - Reading journal or notebook (metacog & connections)
- Post-Reading
    - Review and reflect [pre-reading and notes] (metacog)
    - Summary before switching gears/before sleep (retain)
    - Review within 24 hours (retain)

Strategies and Tactics

▸ Get enough sleep—
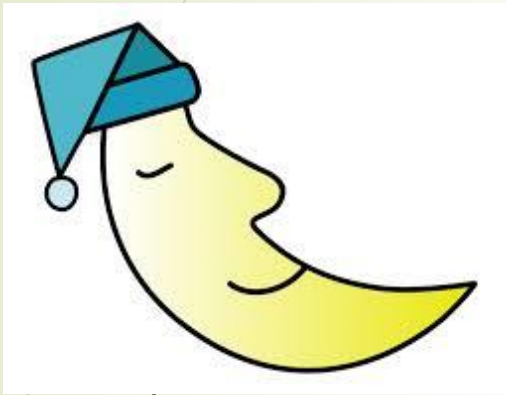
▸ New research shows that mental performance drops off quite sharply if you don't get *at least* six hours of sleep per night regularly. You cannot learn some things without this amount of sleep: long-chain reasoning problems, persistence, etc.

▸ Teenagers need 9-10 hours of sleep for optimum brain performance.

▸ You'll perform better on the test if you are well-rested than if you have stayed up most of the night reviewing the material one more time.

Strategies and Tactics

▶ Exercise regularly and early—

   ▶ Moving blood and oxygen to your brain helps it work more effectively.

   ▶ BDNF makes it easier to make connections.
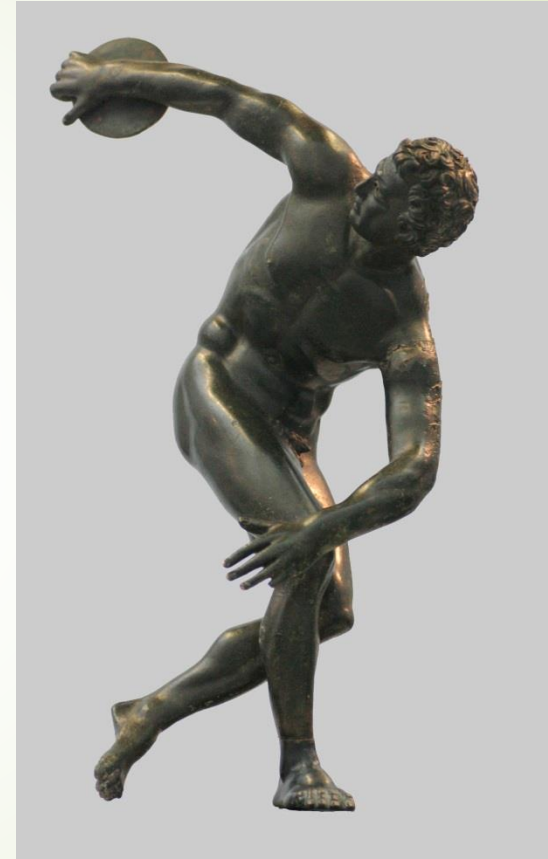
Strategies and Tactics

Make sure you are properly hydrated and nourished.

- Water is key. Even a modest amount of dehydration decreases your reasoning ability by 20%. (Don't overdo it—over-hydration also adversely affects cognition.)

- If what you eat comes through a car window or if the label lists ingredients with numbers, it isn't food.

- Color your plate: the best brain foods are blueberries, whole grains, oily fish, tomatoes, avocados, broccoli and nuts.

- Hard mental work is equally taxing to the body as hard physical work—you have to nourish it to sustain peak performance.

Strategies and Tactics

- Caffeine, Nicotine and Alcohol
  - Caffeine and sugar both inhibit learning and recall, especially in large quantities (>200 mg). When combined in *small* quantities, they can provide a boost (equivalent to a walk around the block).
  - Nicotine helps you form new connections so it is a useful aid to learning (*if* you already smoke).
  - Alcohol impairs the brain's ability to form new connections and to recall old ones. But... if you drink while studying, drink before the test too.

Step 5: Practice (verb and noun)

- Note-taking
- Reading strategies
- Finding analogies
- Seeking difficulty
- Classroom mantras

Prochaska's Change Model

1st – Pre-Contemplation

2nd – Contemplation

3rd – Planning

4th – Taking Conscious
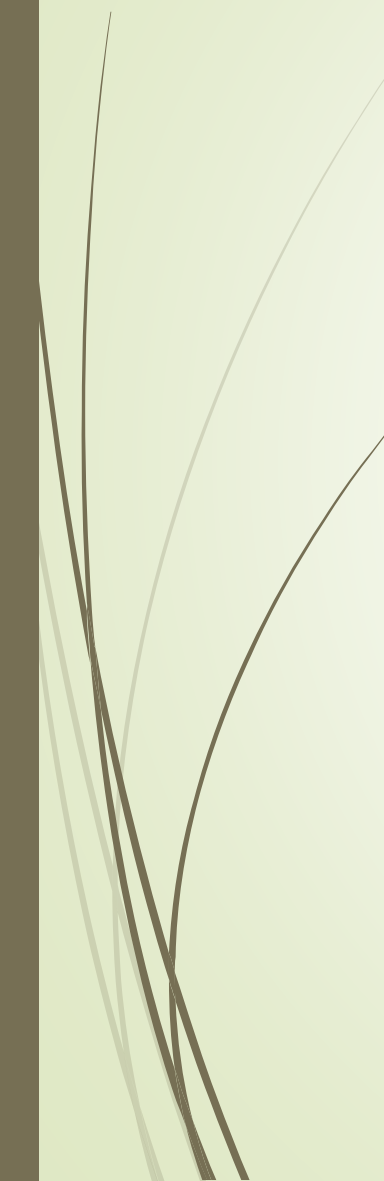   Action

5th – Maintaining
         the New Behavior

Maintaining a Good Thing for Life!

Taking Action

Relapses
or sliding
backwards
occasionally
is not unusual

Preparing for Action

Not
Ready
Yet

Thinking about it

Evidence MetaLearning Works

	Control	Metalearners (Jr)	Metalearners (Sr)
Dean's List (top 10% of class)	10%	40%	45%
Honor societies	X		3.2X
Campus Leadership positions	X	2.7X	

Evidence MetaLearning Works

The quality of the work my students do now is better in every way than the work my students did before I started using these methods.

Thank You!

Write your summaries

3-5 sentences

in 2 minutes

Scarroll@scu.edu

Inspiration

What Teachers Make

Thank You!

Write your summaries:
(What did you learn?)
3-5 sentences
in 3-5 minutes

scarroll@scu.edu
metalearninghabits.org

A Challenge:
Keeping Father Guido Away

The 5-Minute University

MetaLearning Activity

Brain Plasticity: What does this assignment require them to learn that they don't already know?	**Difficulty: In what way is this assignment difficult? What specific challenges does it pose to students?**
Connections: How does this assignment help students make connections from what they already know to the new material?	Habits: What new habits that will be essential to learning in your course does this assignment build?