



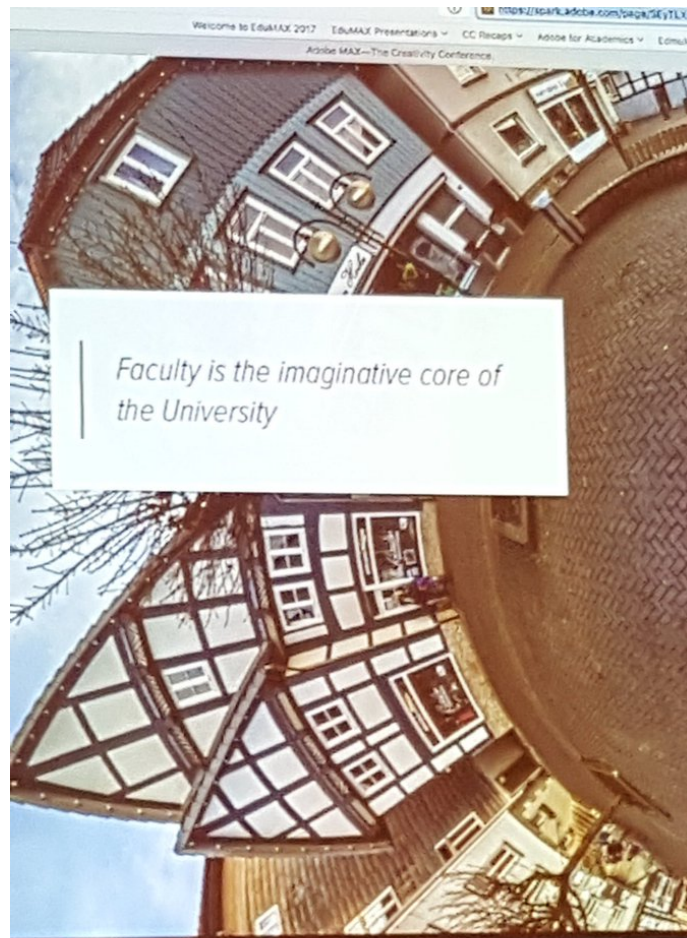
CLEMSON  
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# The New Science of Learning: Applications for our Courses

OTEL: Office of Teaching Effectiveness and *Innovation*

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Slide contributions by UTK doctoral student Sara Nasrollahian  
Mojarad



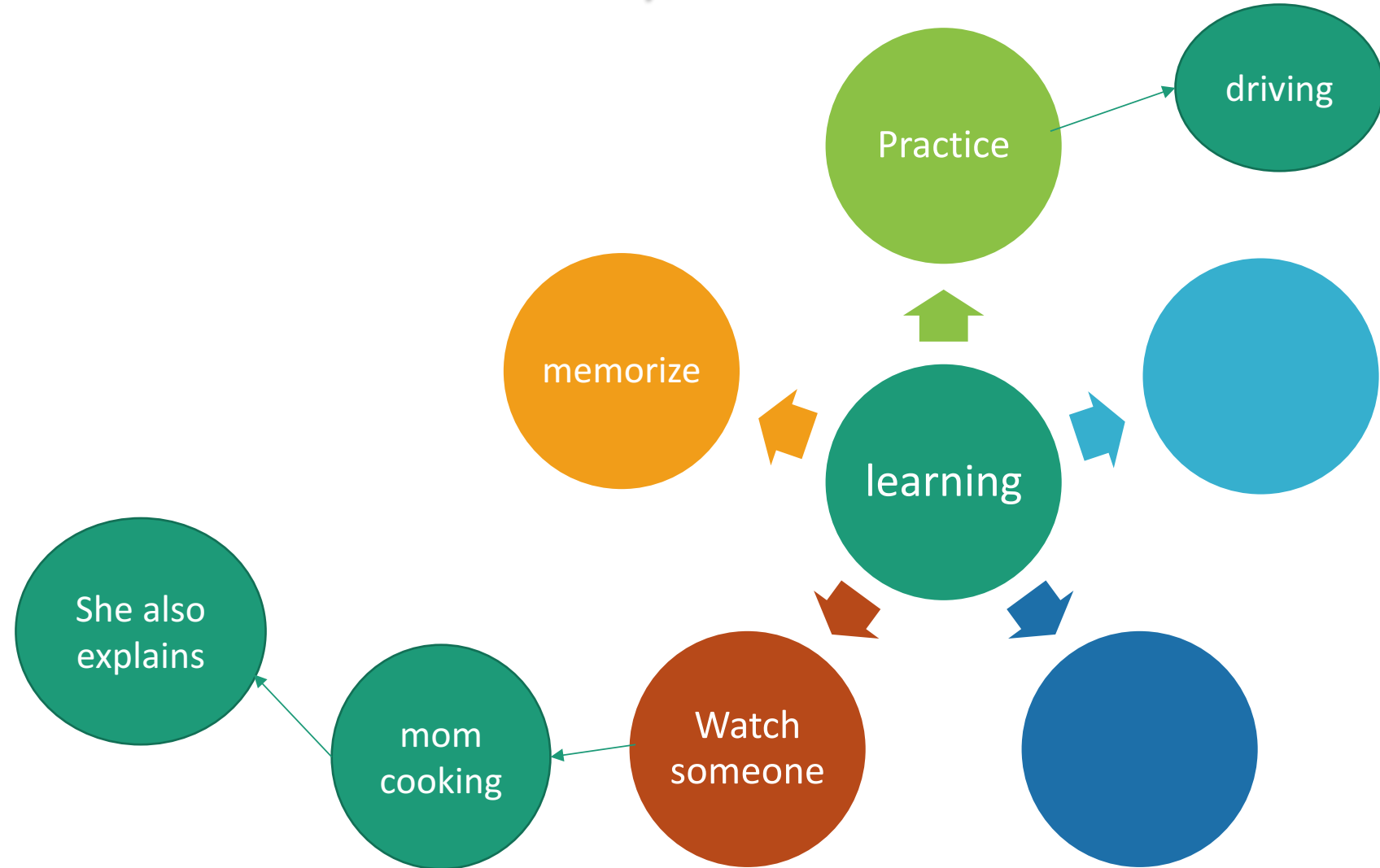
Who am I?

# Learning Outcomes

- Review the role of brain learning process
- Assess your own knowledge of learning
- Add information to your knowledge bank
- Evaluate methods of teaching and learning that fit with brain functions



Please draw a map of your current knowledge  
(both formal and informal) of HOW PEOPLE LEARN



Now, draw a map of your current teaching practices:





# Discussion

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- Share ideas
- Look at differences and similarities

# The hi/story of learning...



# Behaviorism

- Based on stimulus-response association.
- Reinforcement is essential.
- The learner goes through trial and error when s/he faces a new problem.
- The more the similarities between classroom setting and real world situation, the better the learning is transferred

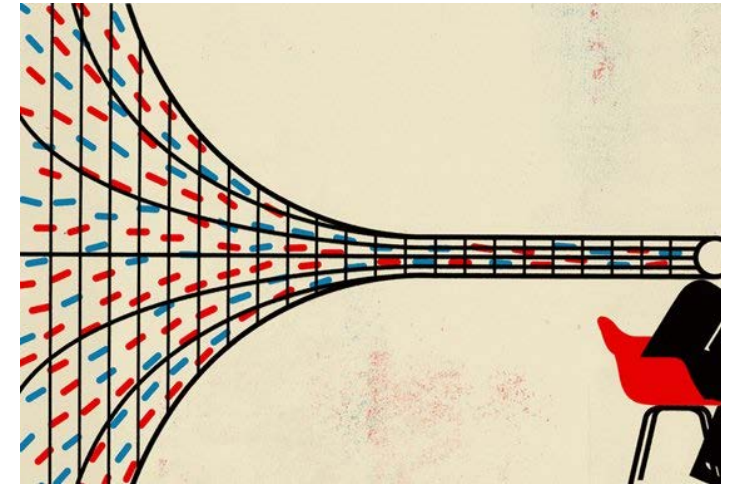
*Learning is “constructed”*





# Cognitivism

- Is based on information processing and insights.
- Learning is independent from reinforcement.
- Focuses on reflecting rather than trial and error.
- Is based on transference of the principles rather than similarities of situations.
- *Aligns well with critical thinking literature*



Noam Chomsky



Chomsky in 2017

# “Brain-Based Learning”

- Both behaviorism and cognitivism are incorporated in human learning process; they are integrated from birth to death.
- Learning in childhood is based more on association of action and reaction (experience).
- Perceptions are critical facilitators of this integrated learning.
- The older we get, the more we learn through processing of information (relating new to old information, recalling and remembering, reflecting).



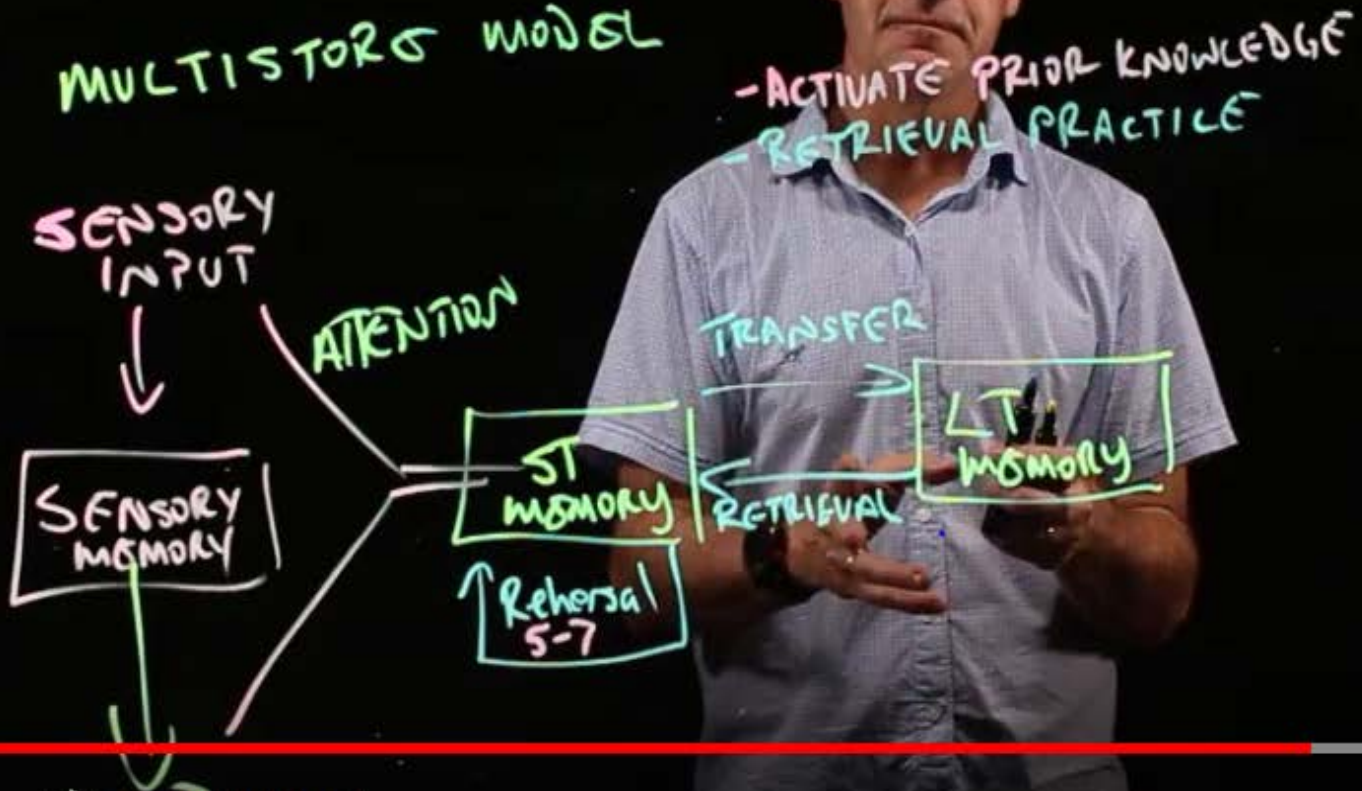


# The New Science of Learning

# HOW WE LEARN



## MULTISTORE MODEL

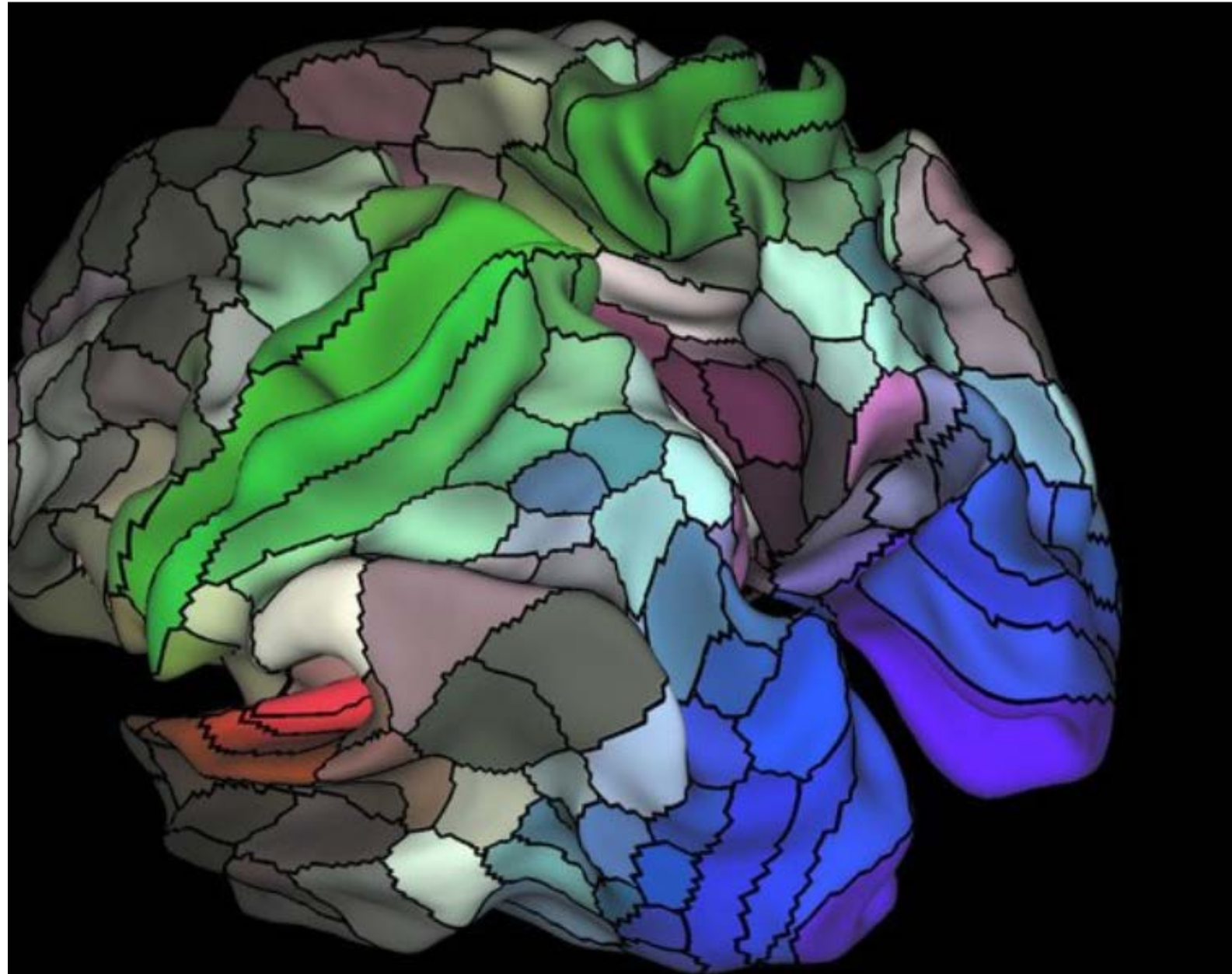


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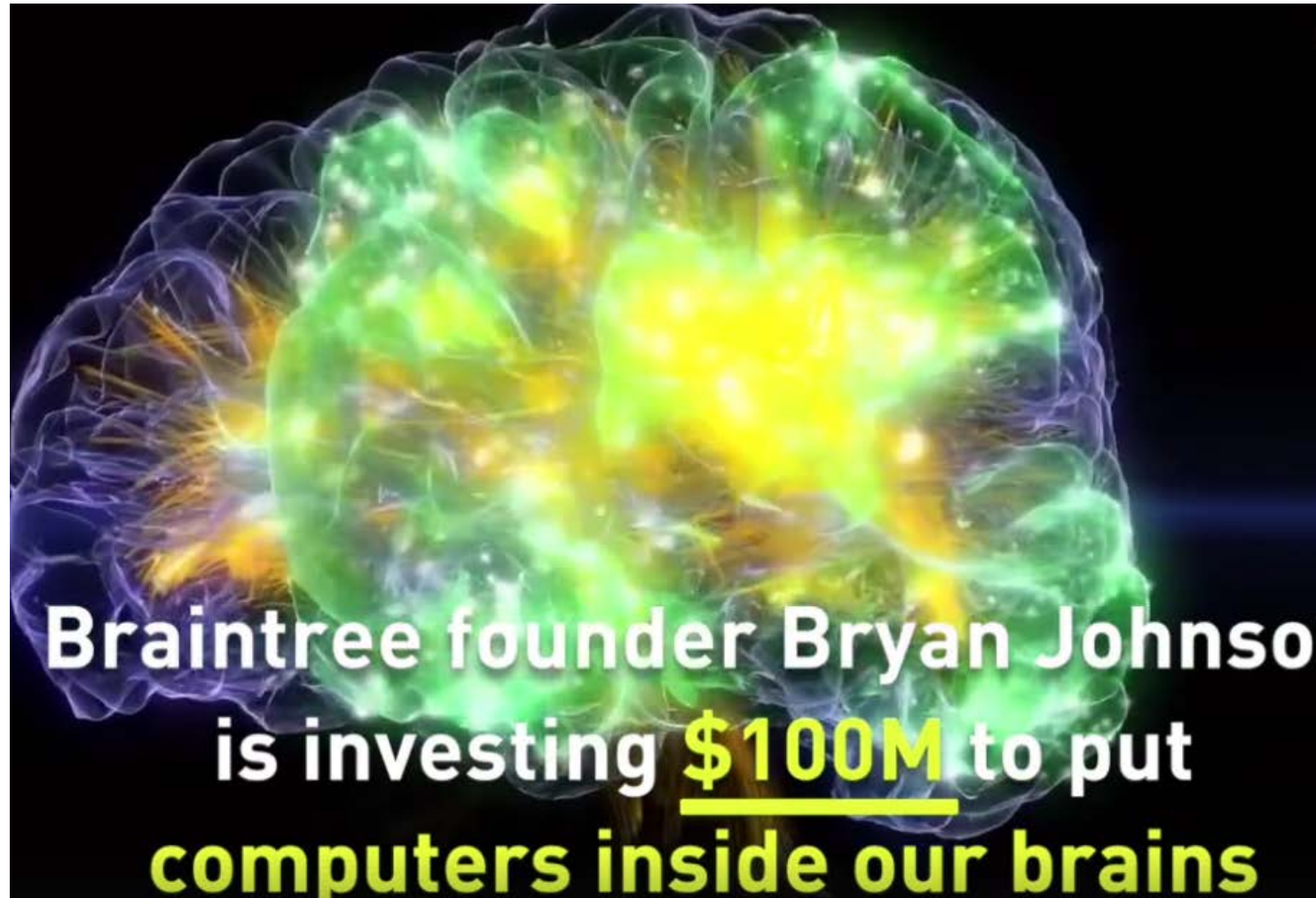


# NY TIMES REPORT

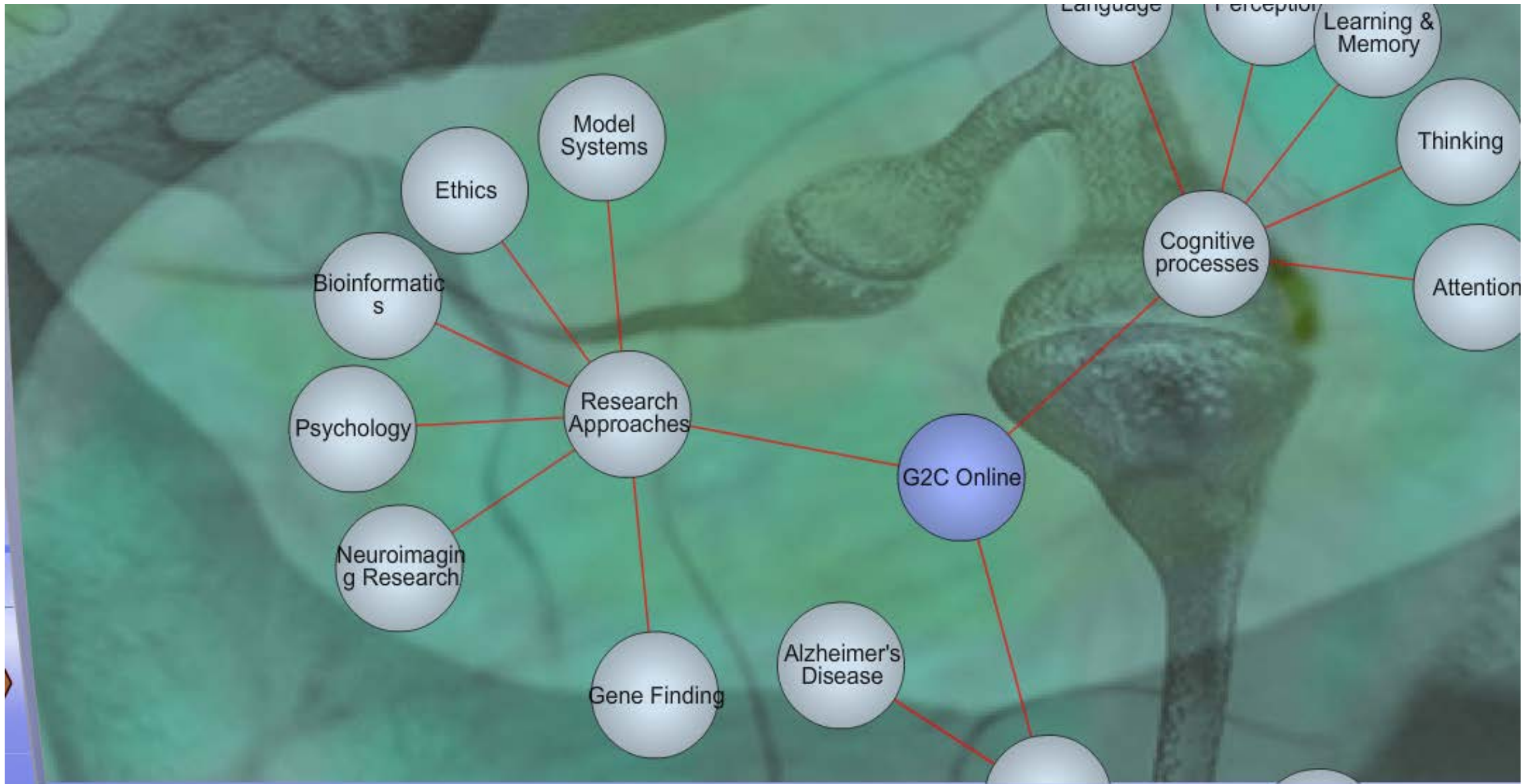
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2016/07/21/science/human  
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# AI and the Brain



- <https://www.facebook.com/futurism/videos/vb.352364611609411/642942149218321/?type=2&theater>



[GENES TO COGNITION http://www.g2conline.org/](http://www.g2conline.org/)

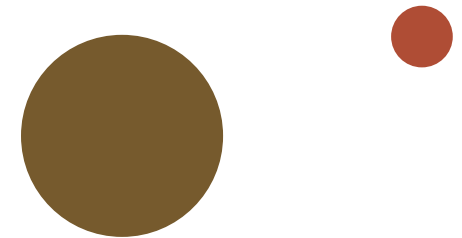
For example:

- Drink 8 Glasses of Water
- Use\_VARK Learning Styles...or any learning styles
- We are all Visual Learners
- We only are using 30% of our brains or 10% is not used



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# Beware of Brain Myths!





## What we know

- When you learn something new, there is a physical change in your brain.
- An anxious brain hinders learning and a curious brain facilitates it.
- New learning requires a considerable amount of practice and a meaningful connection to other information in order to become a more permanent part of memory.
- In learning situations, the person who is doing “the work” is learning, so students doing as much as possible is important.

# Brain-focused Learning Process

Perceiving	Perceiving Information
Processing	Processing Information
Retaining	Retaining Information
Retrieving	Retrieving Information

# Perception

- When you learn something new, there is a physical change in your brain.
- An anxious brain hinders learning and a curious brain facilitates it.

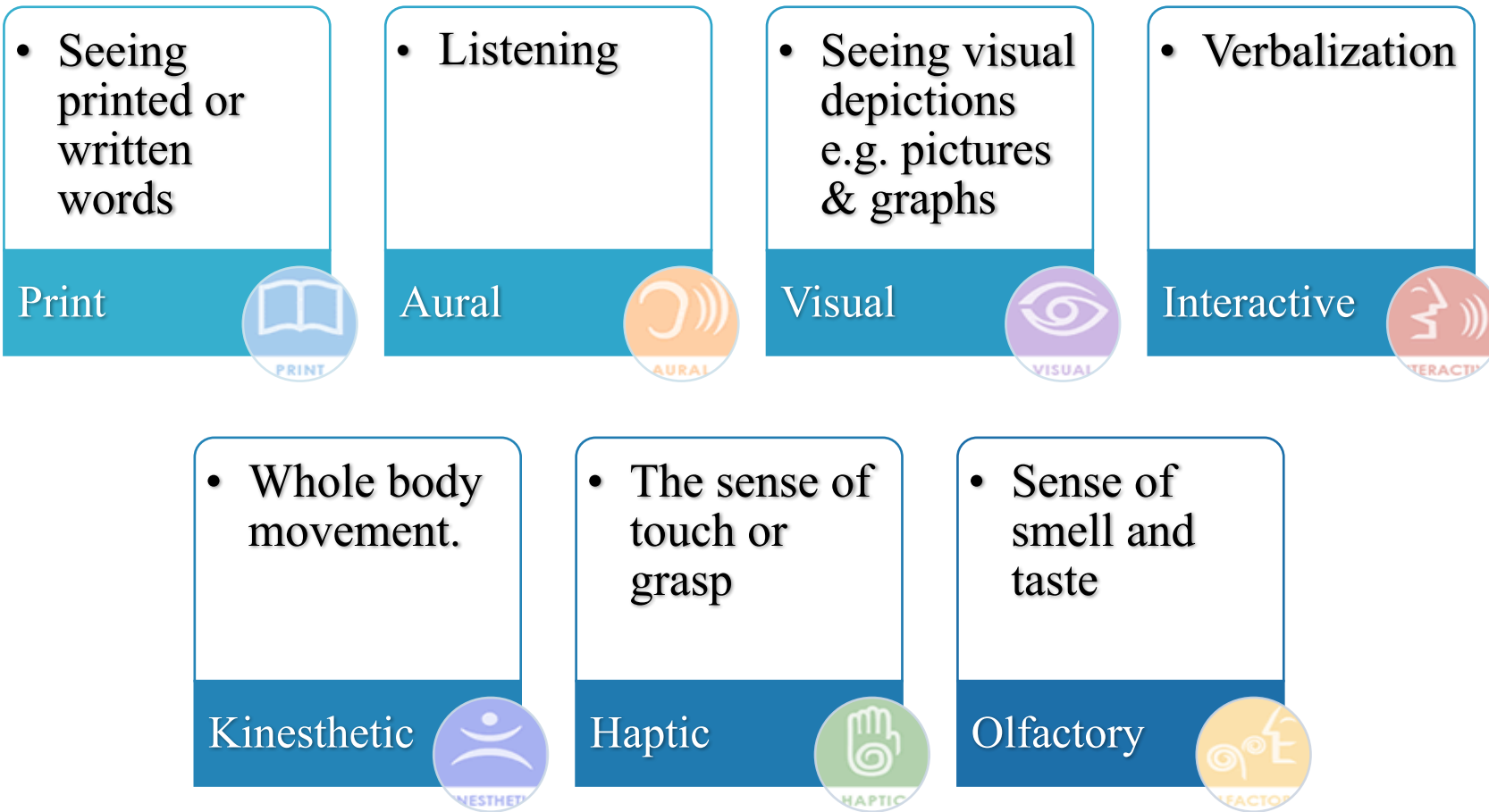


# “You Probably Believe Some Learning Myths”

- <https://www.npr.org/sections/ed/2017/03/22/520843457/you-probably-believe-some-learning-myths-take-our-quiz-to-find-out>
- <https://www.brainhq.com/brain-resources/brain-facts-myths/brain-mythology>



# Seven Perceptual Groups:





**AFTER SITTING  
QUIETLY**



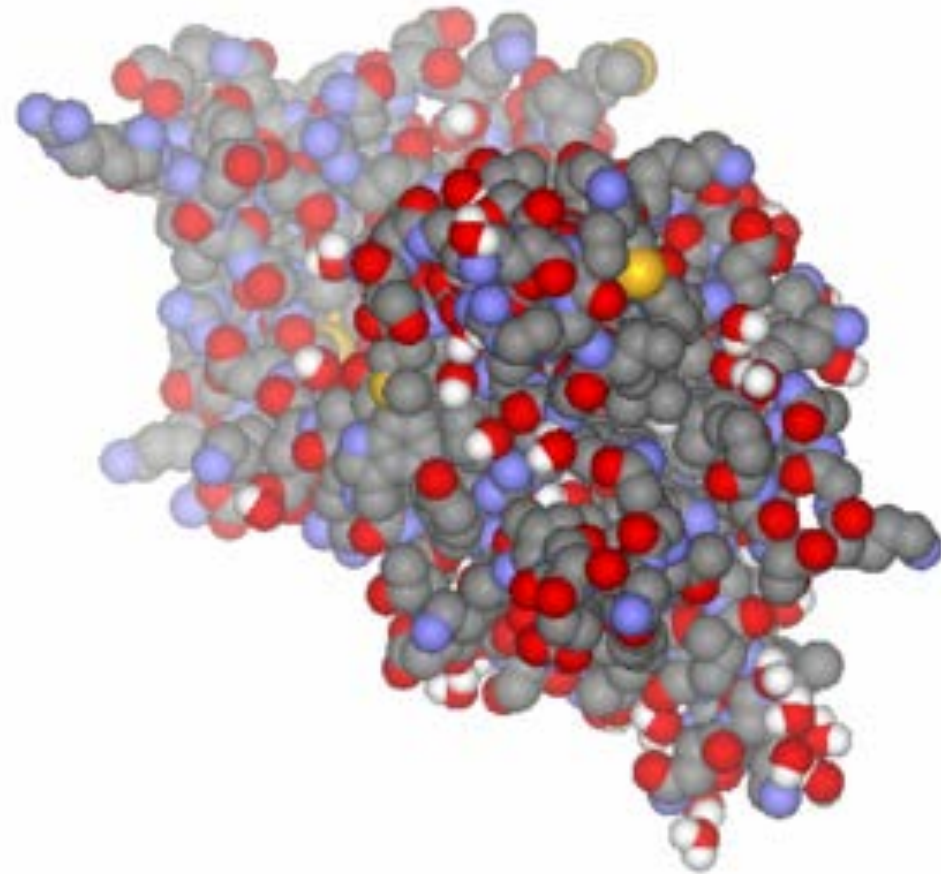
**AFTER 20 MINUTES  
OF ACTIVITY**



scan compliments of Dr. Chuck Hillman,  
University of Illinois

# BDNF

Brain-derived neurotrophic factor (protein) helps spur growth of new neurons, keeps brain cells functioning and growing.



<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2504526/>

# Process and Retain

New learning requires a considerable amount of practice and a meaningful connection to other information in order to become a more permanent part of memory.





# Executive Functions

Planning

Problem solving

Working Memory

Attention

Verbal Reasoning

Inhibition

Initiation of Actions

Monitoring of Actions

# Self-regulated Learning Strategies

## Cognitive

- Organizing and transforming
- Goal setting and planning
- Seeking information
- Rehearsing and memorizing

## Metacognitive

- Self evaluating
- Keeping records and monitoring
- Environmental structuring
- Self-consequating
- Seeking social assistance
- Reviewing records

# Retrieval

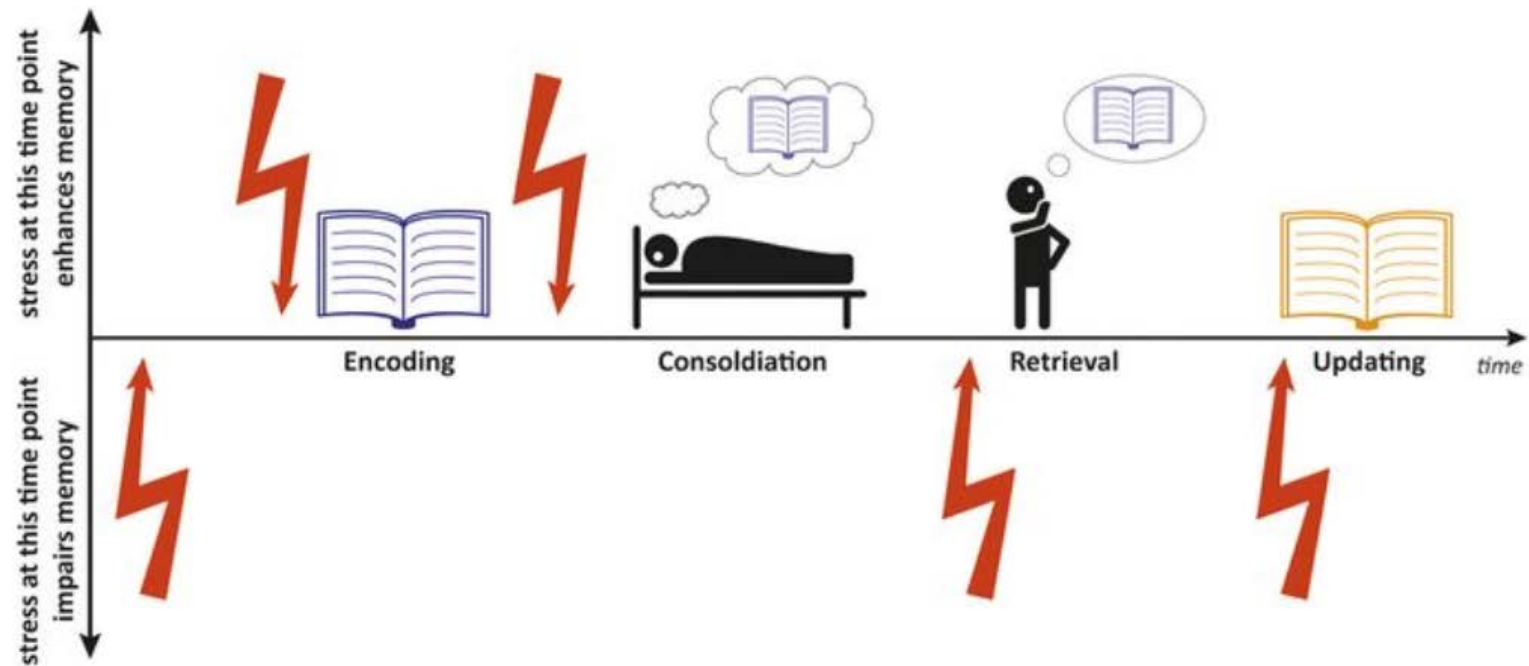
- In learning situations, the person who is doing “the work” is learning, so students doing as much as possible is important.



- While stress around the time of learning is thought to enhance memory formation, thus leading to robust memories, **stress markedly impairs memory retrieval.**

- Recent evidence further indicates that stress may hamper the updating of memories in the light of new information.

Figure 2



# How can you help?

- In your group, list ways of helping students learn better

For Processing

Retaining

&

Retrieval

# Top 10 Evidence Based Teaching Strategies

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Clear Lesson Goals

---

Share and model

---

Questioning to Check for Understanding

---

Summarize New Learning In A Graphical Way

---

Plenty of Practice

---

Provide Your Students With Feedback

---

Be Flexible About How Long It Takes to Learn

---

Get Students Working Together (in productive ways)

---

Teach Strategies Not Just Content

---

Nurture Meta-Cognition

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# Perceiving

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Clear Lesson Goals

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Share and model

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Questioning to Check for Understanding

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Summarize New Learning In A Graphical Way

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Plenty of Practice

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Provide Your Students With Feedback

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Be Flexible About How Long It Takes to Learn

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Get Students Working Together (in productive ways)

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Nurture Meta-Cognition

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# Processing and retaining

---

Clear Lesson Goals

---

Share and model

---

Questioning to Check for Understanding

---

Summarize New Learning In A Graphical Way

---

Plenty of Practice

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Provide Your Students With Feedback

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Be Flexible About How Long It Takes to Learn

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Get Students Working Together (in productive ways)

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Nurture Meta-Cognition

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# Retaining and Retrieving

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Clear Lesson Goals

---

Share and model

---

Questioning to Check for Understanding

---

Summarize New Learning In A Graphical Way

---

Plenty of Practice

---

Provide Your Students With Feedback

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Be Flexible About How Long It Takes to Learn

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Get Students Working Together (in productive ways)

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Teach Strategies Not Just Content

---

Nurture Meta-Cognition

---

Which ones  
do you use in  
your regular  
teaching  
practice?

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## EBTS

Clear Lesson Goals

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Share and model

---

Questioning to Check for Understanding

---

Summarize New Learning In A Graphical Way

---

Plenty of Practice

---

Provide Your Students With Feedback

---

Be Flexible About How Long It Takes to Learn

---

Get Students Working Together (in productive ways)

---

Teach Strategies Not Just Content

---

Nurture Meta-Cognition

---

Which one  
will you focus  
on more this  
semester?

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## EBTS

Clear Lesson Goals

---

Share and model

---

Questioning to Check for Understanding

---

Summarize New Learning In A Graphical Way

---

Plenty of Practice

---

Provide Your Students With Feedback

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Be Flexible About How Long It Takes to Learn

---

Get Students Working Together (in productive ways)

---

Teach Strategies Not Just Content

---

Nurture Meta-Cognition

---

- Can my students organize information better?
- Should we do some planning?
- Do I give them a “pre-knowledge survey”?
- Do I want them to set a goal?
- Should they practice with new information?
- Should they evaluate their own knowledge and skills?
- Could “group work” or “pair share” activities help them with learning?
- Is the setting of the learning helpful?
- Are there distractors we should eliminate?

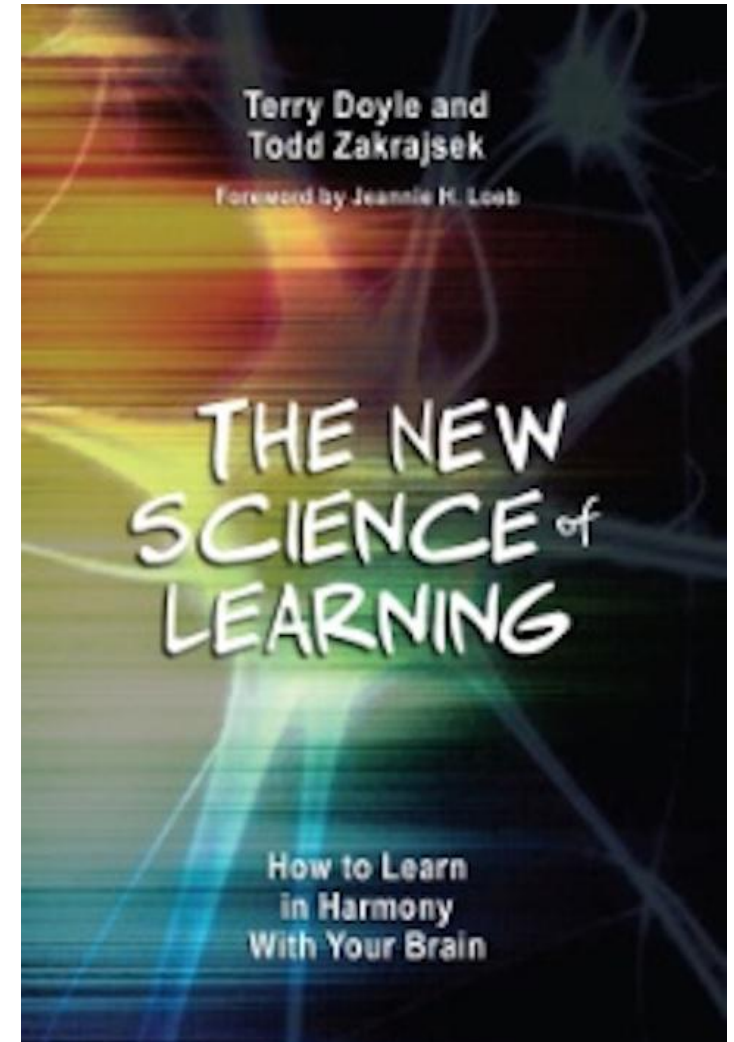




**Add a new strategy**

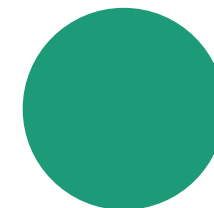
# Add to your map

What topic can you add and learn more about?





Thank you!



Extra “idea” slides



## **Frequent Practice:**

- 1. Good time management skills**
- 2. Time on task**
- 3. Work towards mastery**
- 4. Allow for repeat practice**
- 5. Use online games / apps for repeat practice**

# Tech Strategies for Learning

- [Smart Voice Recorder](#) (Droid) / [Smart Recorder](#) (iPhone, iPad) or **Evernote**
- [StudyBlue](#) (iPhone, iPad, Mac, Android, PC). UTK student comment: “StudyBlue was a fun way to study and I was actually engaged in what I was learning.” (UTK 2015 student)
- [iStudiez](#) (iPhone, iPad, Mac) . This is a multi-function tool (available in 25 languages) with daily, weekly, and monthly calendars, notifications, assignment management, and more. UTK student comment: “I ultimately rate this app with 5/5 stars because it has made time management much less stressful for me.  
A similar alternative on Android devices is [Timetable](#).
- See also [iProcrastinate](#) – Available on Mac, iPhone, and iPad
- [iAnnotate](#)(Droid, iPad)/ ([PDF Expert](#) for iPad and iPhone)
- [GroupMe](#) (iOS, Android, and Windows Phone) for group texting/sharing of ideas

*Thank you to Karen Brinkley for assistance with this list.*

# Ideas to support Cognition/Metacognition in Students

## **Guide learners' self-beliefs, goal setting, and expectations**

help students frame new information or feedback in a positive rather than a negative manner

(e.g., “keeping track of your homework assignments will help you manage this course successfully,” rather than “if you don’t keep track you will fail”)

provide specific cues for using self-regulatory strategies

## **Promote reflective dialogue**

teacher modeling of reflective practices (think aloud)

student practice with reflective dialogue

group discussions to think through problems/cases (collaborative learning)

## **Provide corrective feedback**

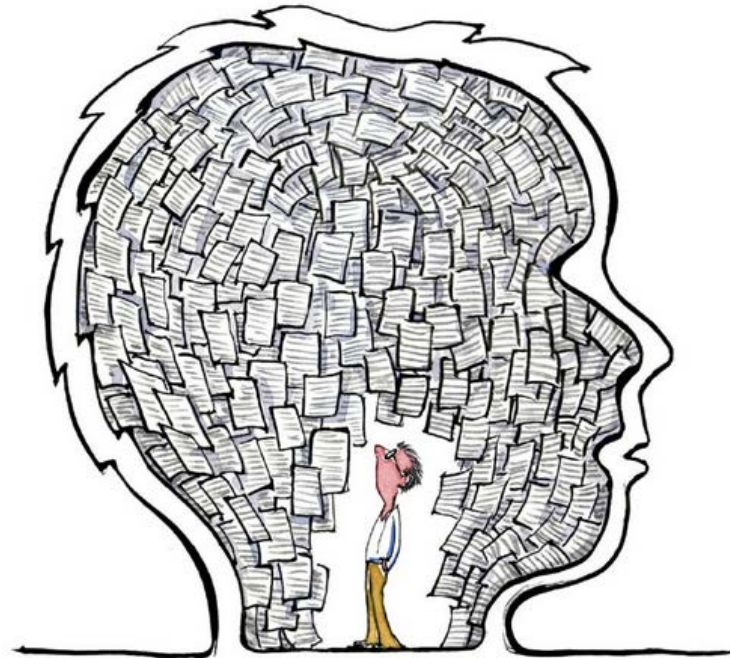
performance standards must be clear and perceived as attainable

phrase feedback (positive or negative) as a statement about the task of learning, not about the learner

# Nurture Metacognition

Metacognition is the ability to:

1. use prior knowledge to plan a strategy for approaching a learning task,
2. take necessary steps to problem solve,
3. reflect on and evaluate results,
4. and modify one's approach as needed.



# SUGGESTION 1: The Debrief

From **Ilva Mariani, Mathematics,**  
**Cerritos College**



Part I: Individually then as a group  
examine the content of the exam

1. What topics were covered by the exam?
2. What is something you remember from the exam as being especially important?
3. What are the topics/problems you did NOT know how to answer/complete?
4. Where can you find the information necessary for you to learn what you did not know at the time of the exam?

•

*Go back to each item in the previous question and write next to it where you can learn the material.*

# SUGGESTION 1: The Debrief



Part II: Individually then as a group

Discuss Preparing for the Exam

1. What did you do to prepare for the exam that made you more comfortable and more confident at the time of the exam?
2. What should you have done differently what kept you from being more comfortable and more confident at the time of the exam?

# Suggestion 2: The Exam Wrapper

- How do your students study for exams?
- What do they have trouble with?
- What questions could you ask them that would help them think about their habits?



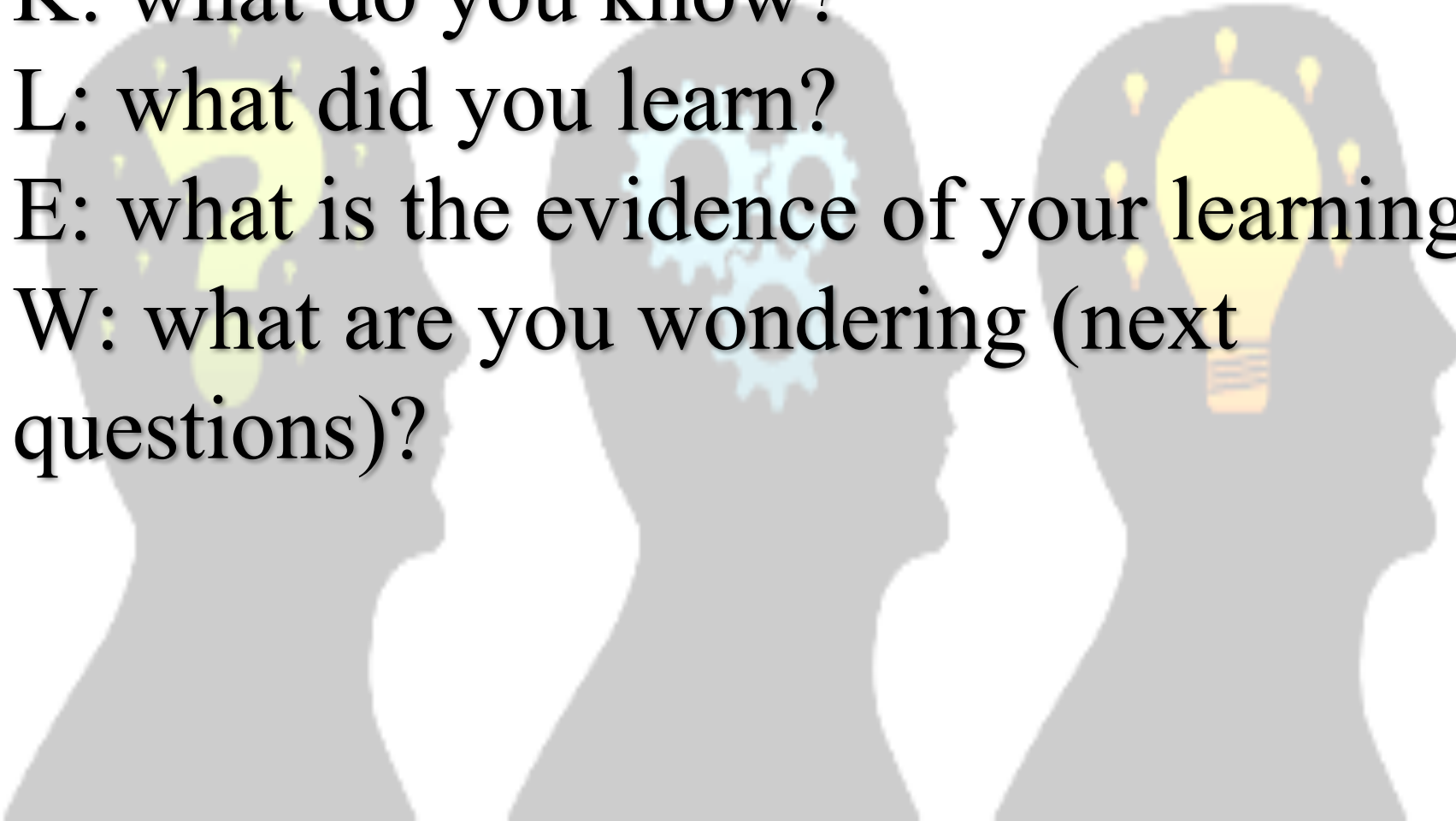
# Suggestion 3: KLEW for college

K: what do you know?

L: what did you learn?

E: what is the evidence of your learning?

W: what are you wondering (next questions)?





# Pair-share



When could you use:

1. a debrief?
2. an exam wrapper?
3. a mapping exercise?
4. KLEW
5. an app?