December Teaching Symposium

Accepting Not Knowing as Part of the Learning Process

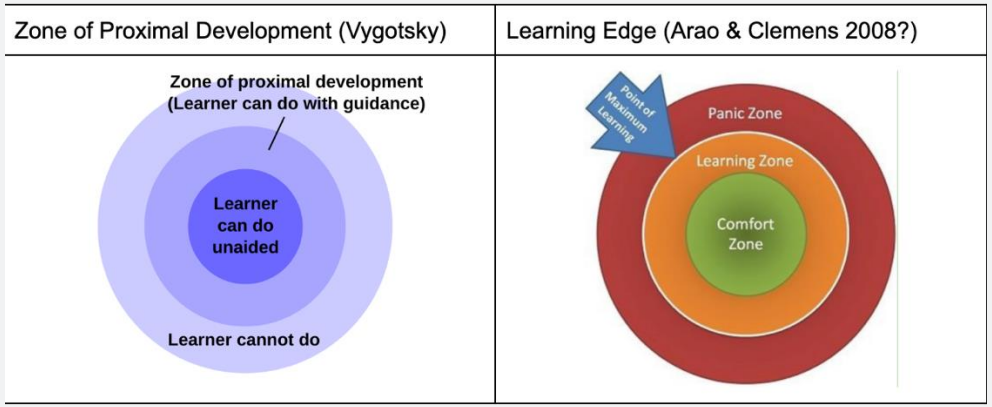
THURSDAY, DECEMBER 12TH 2024

CELT Learning Sciences Workshop Series 2024-2025

Session #1: Strategies to Engage and Deepen Learning (October 9th 2024)

Session #2: Sticking With It When Learning Feels Hard (October 30th 2024)

Session #3: Applying the Science of Learning to Large Lecture Classes (November 20th, 2024)



December 2024 Teaching Symposium on the Learning Sciences: Accepting Not Knowing as Part of the Learning Process, Thursday, December 12, 9:30am-2:00pm.

https://provost.tufts.edu/celt/events/learning-sciences-series-2024-2025/

Today's Agenda

10am Keynote & Panel

Accepting Not Knowing as Part of the Learning Process

12pm Lunch (JCC 280)

1pm Workshops*

Play Space - Applying Learning Sciences in Your Classroom (JCC 280)

Applying Learning Science and EdTech Tools in Online, Hybrid, and In-Person Courses (Zoom)

Recall a time when you struggled to learn something, but ultimately this led durable and meaningful learning.

Activity (5 min breakouts)

1. Think about your story for a moment before you are paired off (in Zoom breakouts or in the room).
2. You will have 1-2 min to share your story with a partner.
3. Focus on listening when your partner is speaking
4. When we come back together, I will give you a moment to jot down notes, so you will be prepared to share your partner's story later this morning.

Recall a time when you struggled to learn something, but ultimately this led durable and meaningful learning.

Why did we do this?

- Activate prior knowledge, make personal connections
- Build Community
- Mix it Up – maintain focus & attention

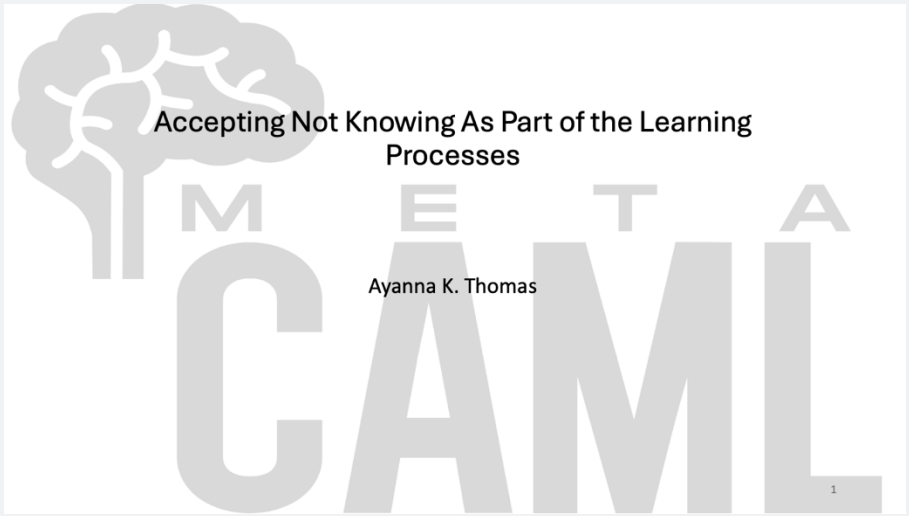
Throughout today, try to relate lessons from this story to what you are hearing

Keynote: Accepting Not Knowing as Part of the Learning Process

Dr Ayanna Thomas

Professor and Dean of Research for Arts and Sciences, The School of Arts and Sciences

Professor, Psychology



Accepting Not Knowing As Part of the Learning Processes

Ayanna K. Thomas

The Fear of Not Knowing

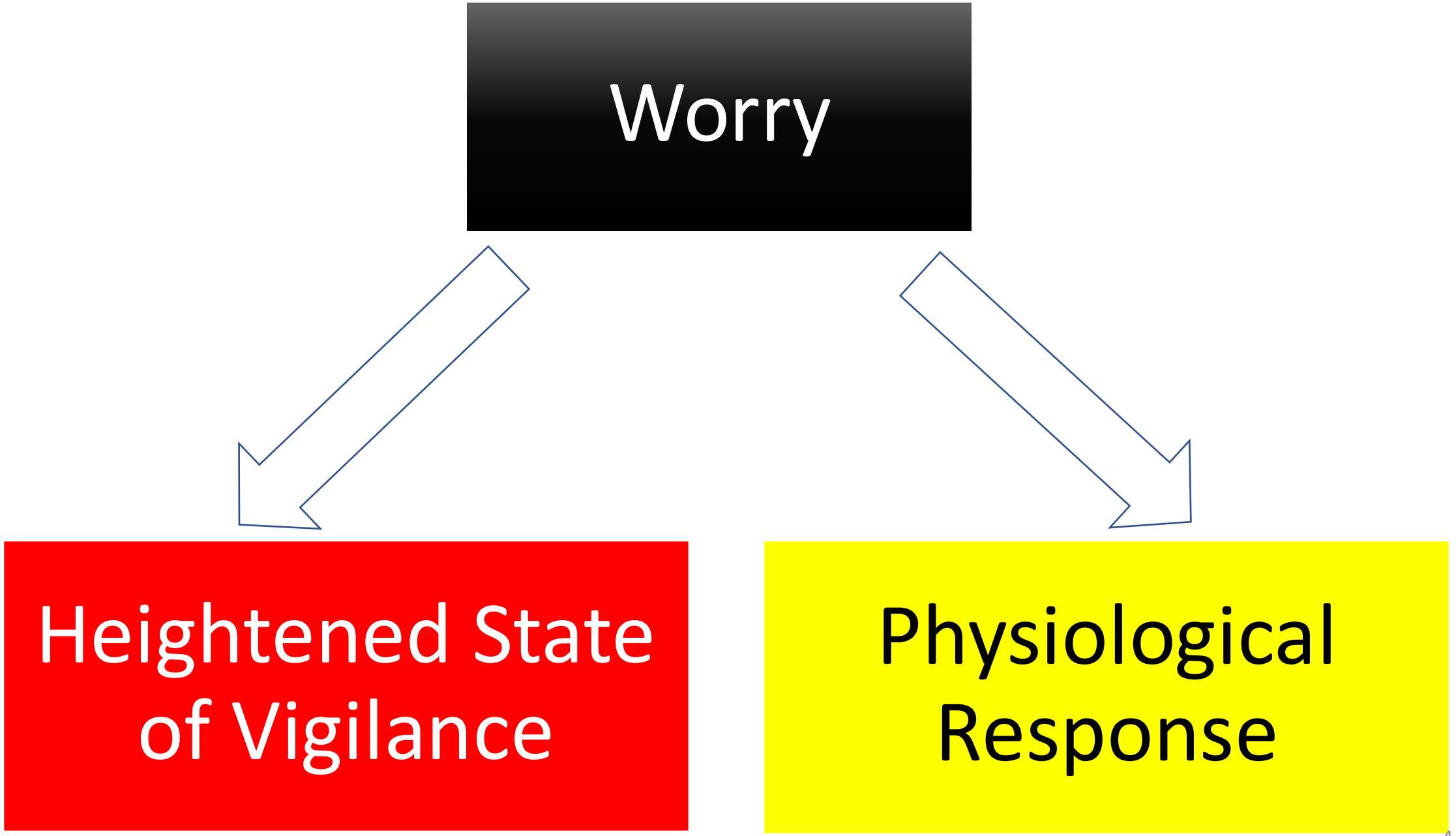
What causes feelings of stress and anxiety in the classroom?

What are some ways to manage stress in the classroom?

What cognitive processes may be influenced by feeling anxious in the classroom?

A Desire to Do Well

- Students' desire to do well on tests can lead them to experience anxiety
- This subjective feeling causes students to focus attention on how they feel as opposed to the task at hand
- Folk wisdom…manage anxiety by "calming down"
- This is even the advice offered by one of the largest testing organizations in the United States


Worry
Heightened State of Vigilance
Physiological Response

Moran, 2016

What are stressors that students face in the classroom?

Testing or retrieval practice

The pros and cons of retrieval practice

Stress and anxiety but also robust stress-resistant memories

Tension between the value of test-taking for long-term retention and the emotional cost of test taking?

What do students understand and how does it effect their engagement?

Directly considering meta-cognitive tradeoffs?

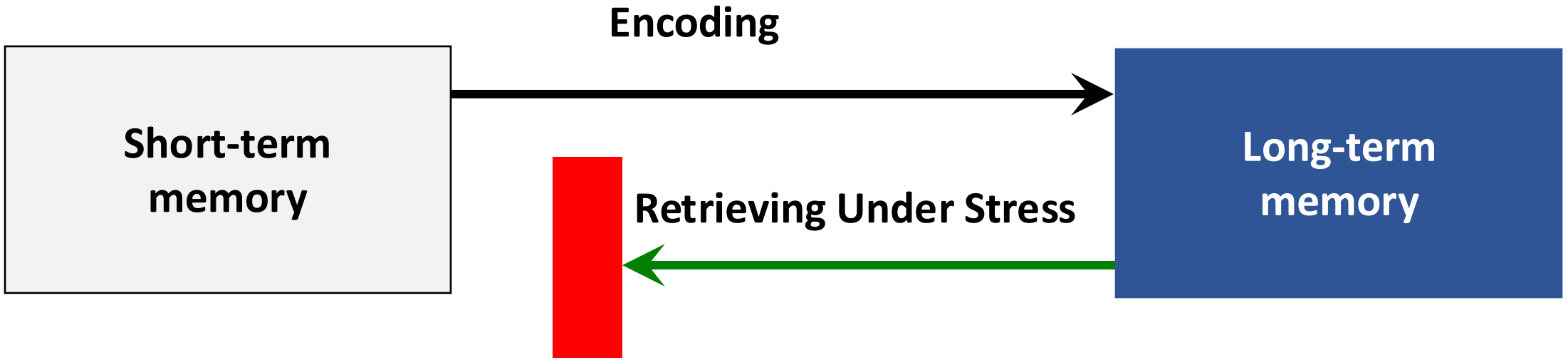
Evidence for how students make tradeoffs between conflicting goals

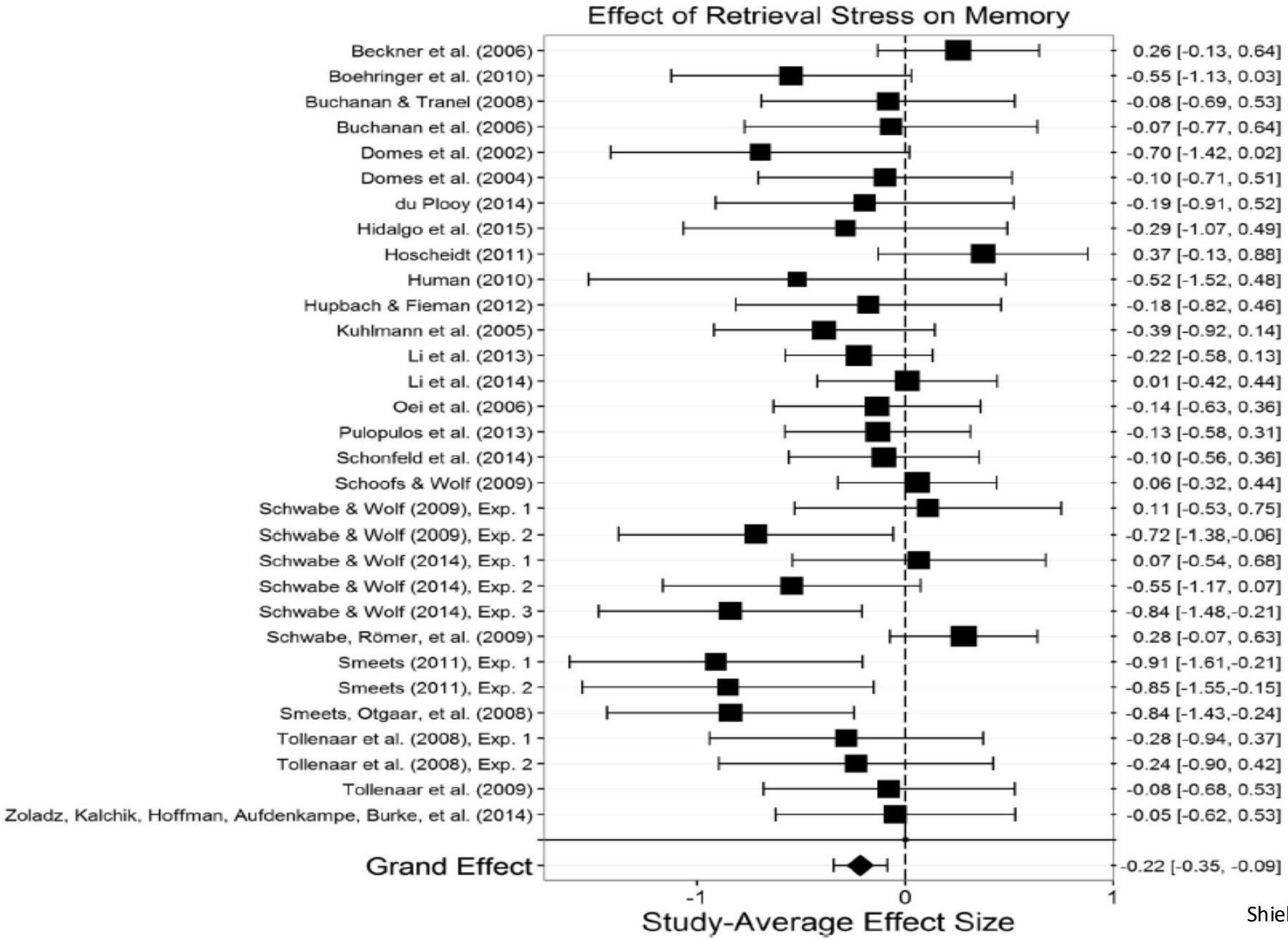
Stress and Anxiety

- Stress is a physiological response that corresponded to a neuroendocrine cascade
- That cascade can occur in the absence of the subjective feeling of anxiety
- Feeling anxious can also occur in the absence of this hormonal cascade

Acute Stress Impacts Learning and Performance

Failing to Retrieve…





Shields et al. (2017)

The Testing Effect

- Taking a memory test enhances later retention

- Approximately 200 empirical articles since 2006 publication of Roediger & Karpicke (Psychological Science)

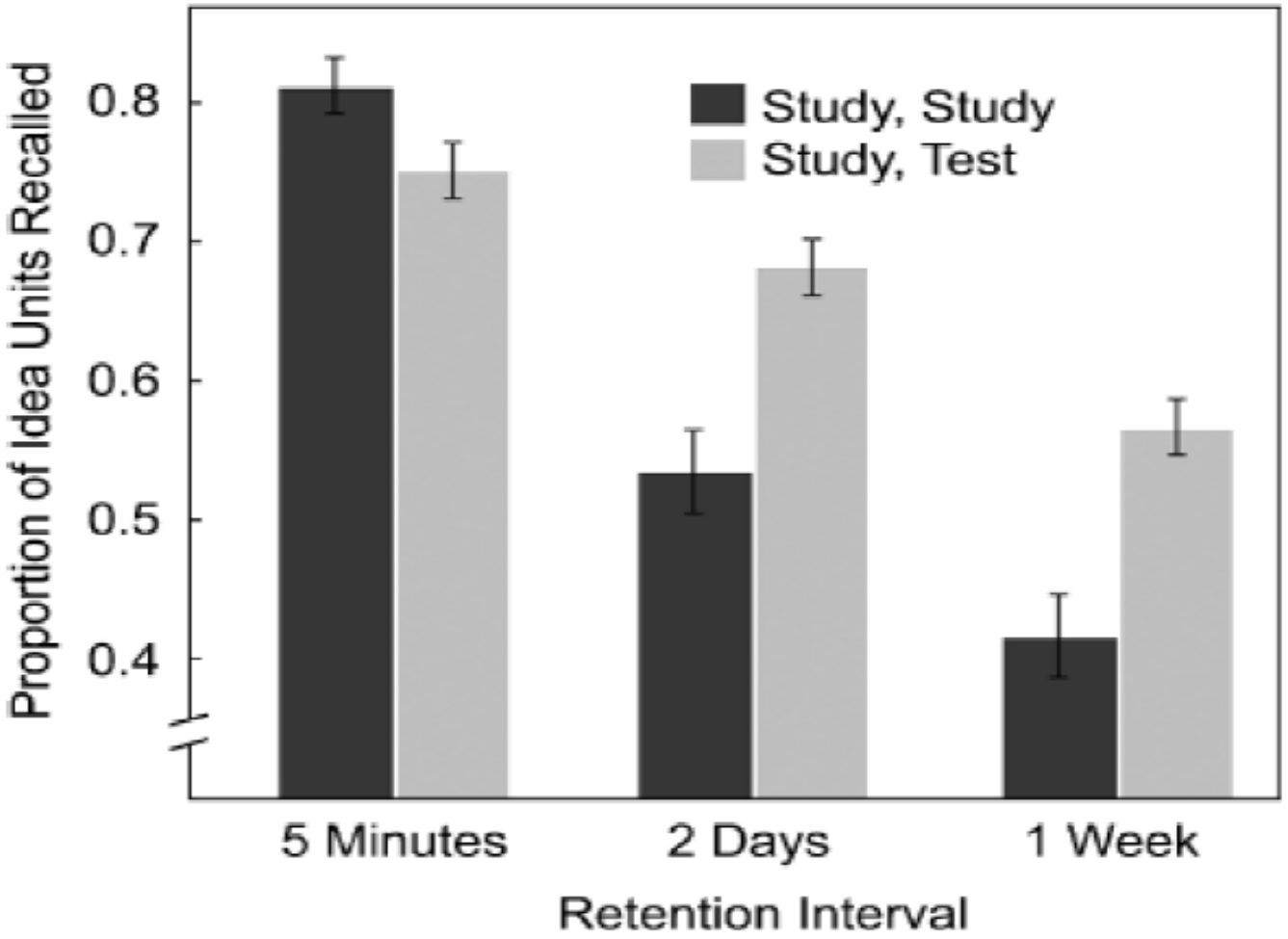


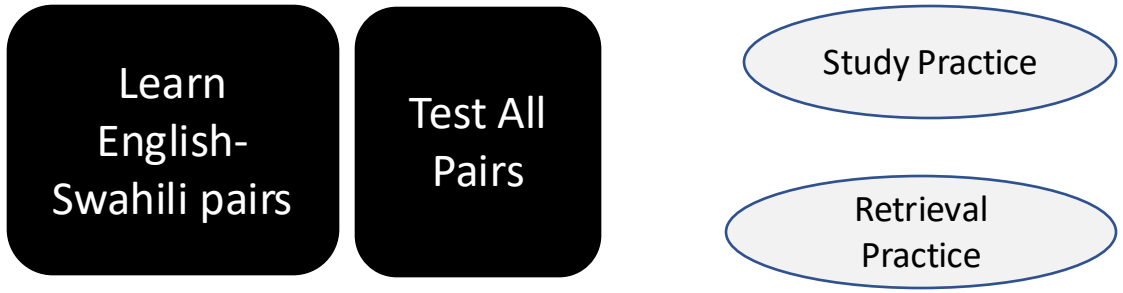
Fig. 1. Mean proportion of idea units recalled on the final test after a 5-min, 2-day, or 1-week retention interval as a function of learning condition (additional studying vs. initial testing) in Experiment 1. Error bars represent standard errors of the means.

Roediger & Karpicke, 2006

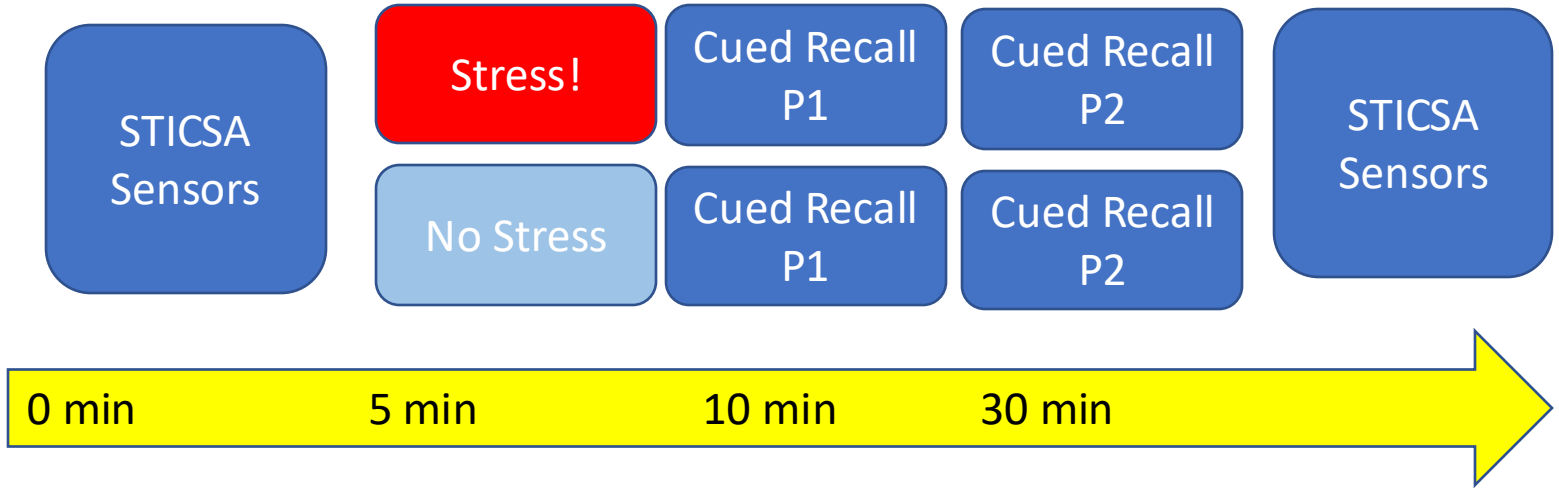
Testing as a Learning Tool

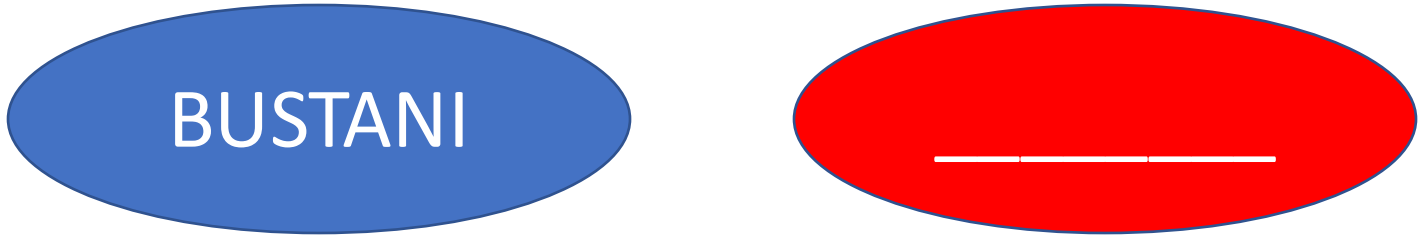
What Happens When Testing Occurs One Week Later?

DAY 1



Day 2 (ONE WEEK LATER)

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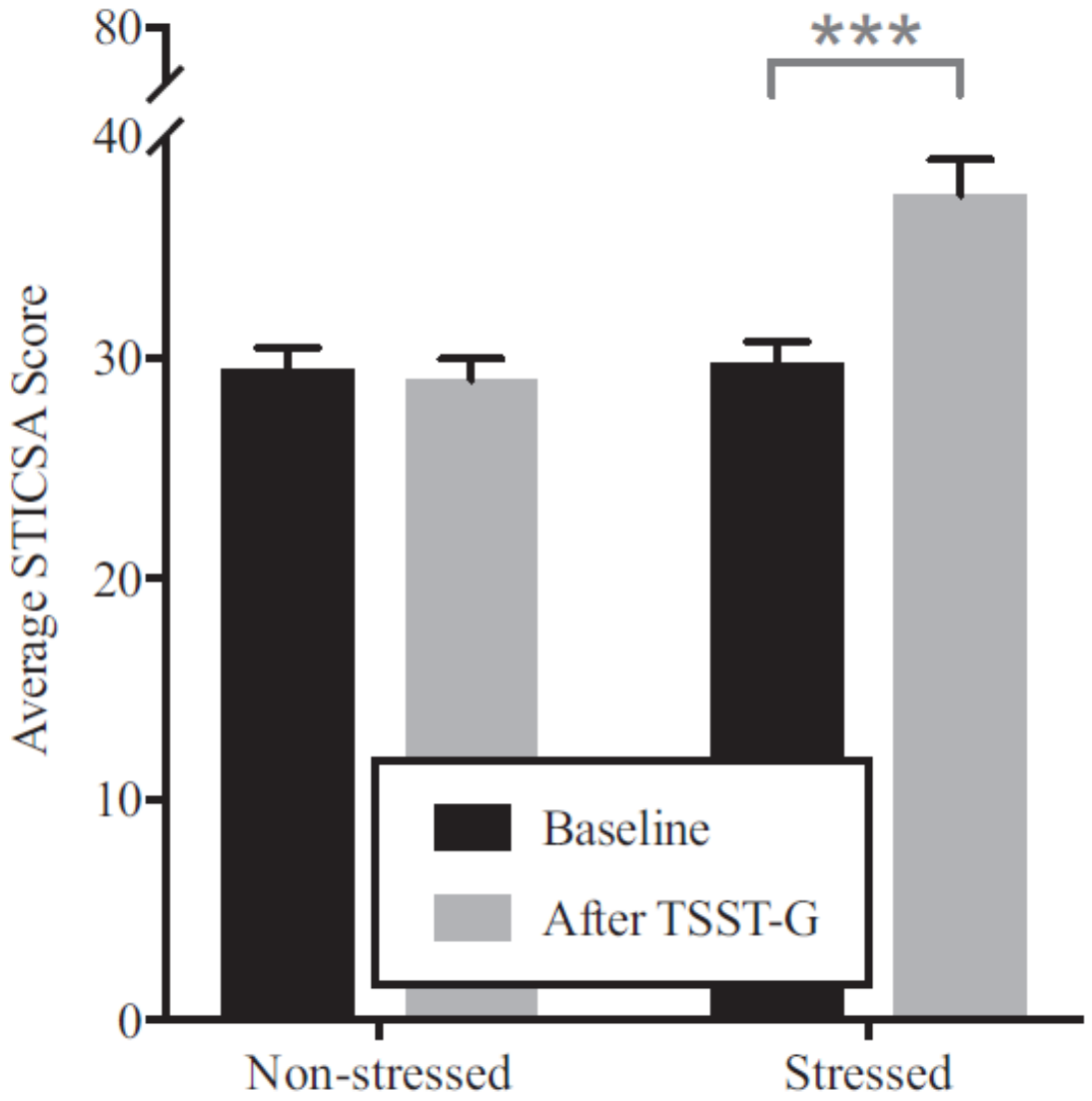
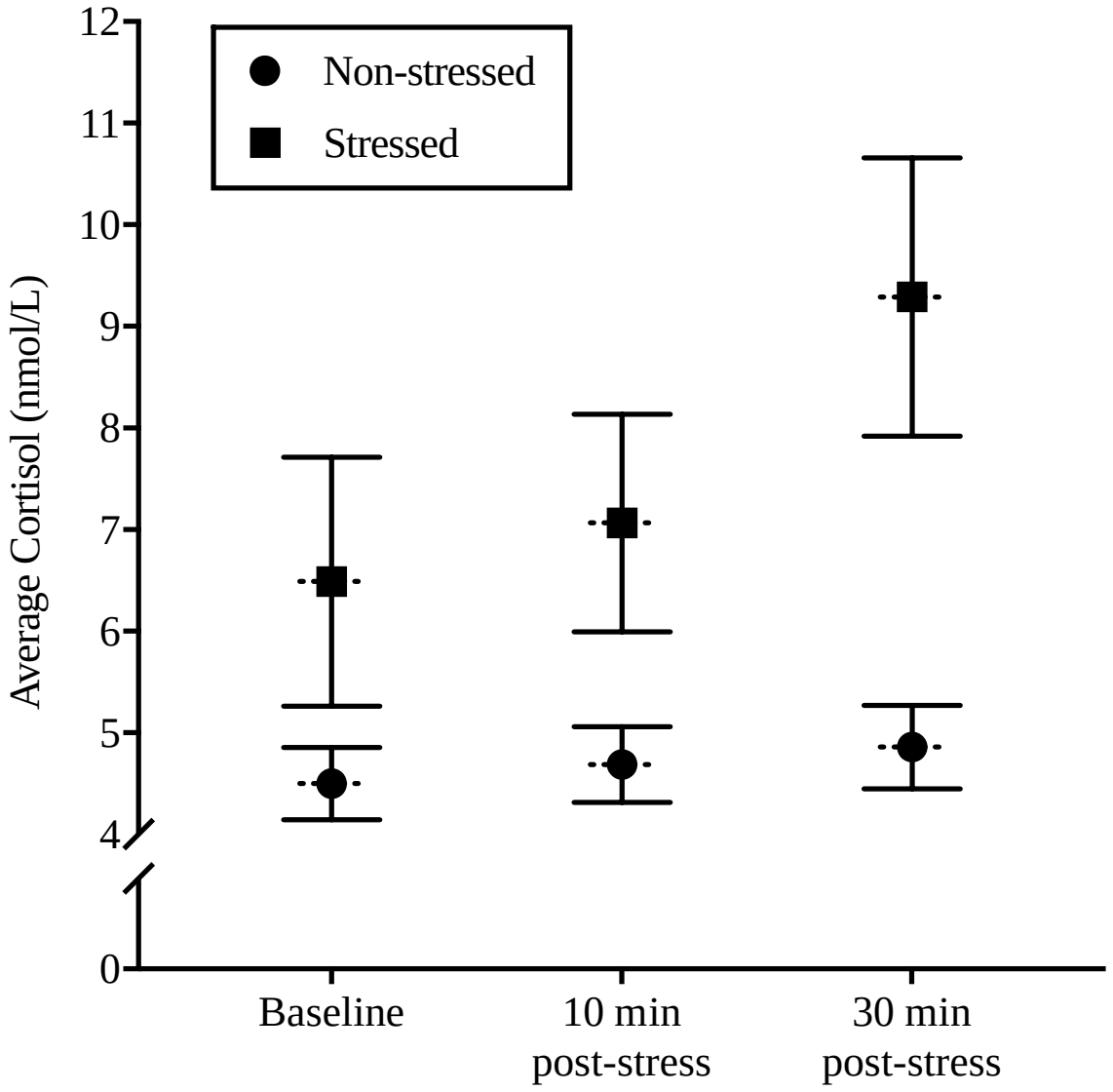
State-Trait Inventory for Cognitive & Somatic Anxiety (STICSA)

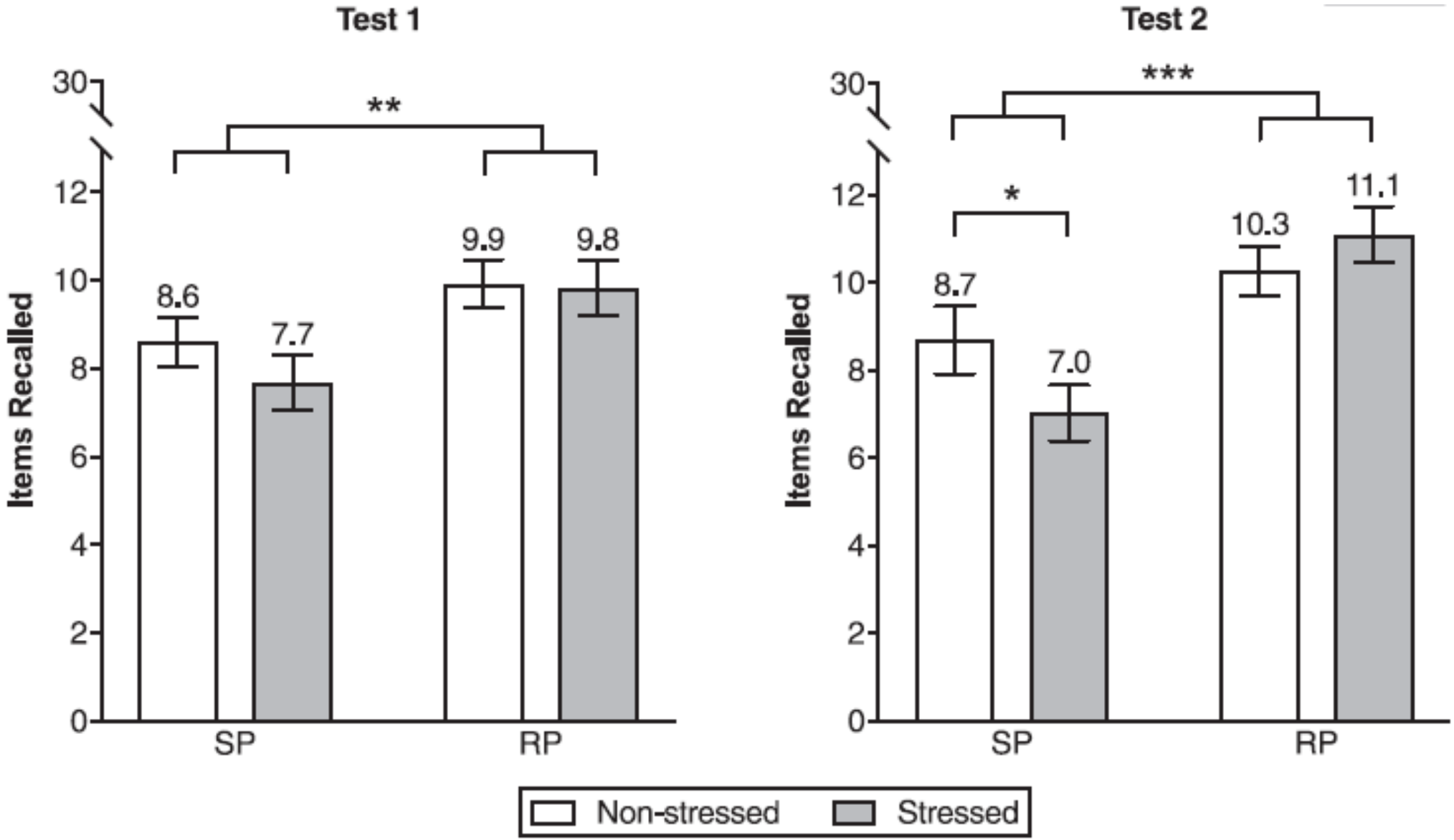


Smith, Floerke, & Thomas (2016)

Average Cortisol Concentrations



Smith, Floerke, & Thomas (2016)



Smith, Floerke, & Thomas (2016)

Retrieval Practice and Context-Independent Retrieval

- Effortful recollection that requires retrieval of contextual information relies on brain regions within the executive control network, explaining why stress typically impairs episodic retrieval.

- Automatic and context-independent retrieval, such as semantic memory retrieval, recruits neocortical and striatal (regions that fall within the salience network).

- Repeated retrieval results in semantic-like memories, making them resistant to acute stress effects at the time of retrieval

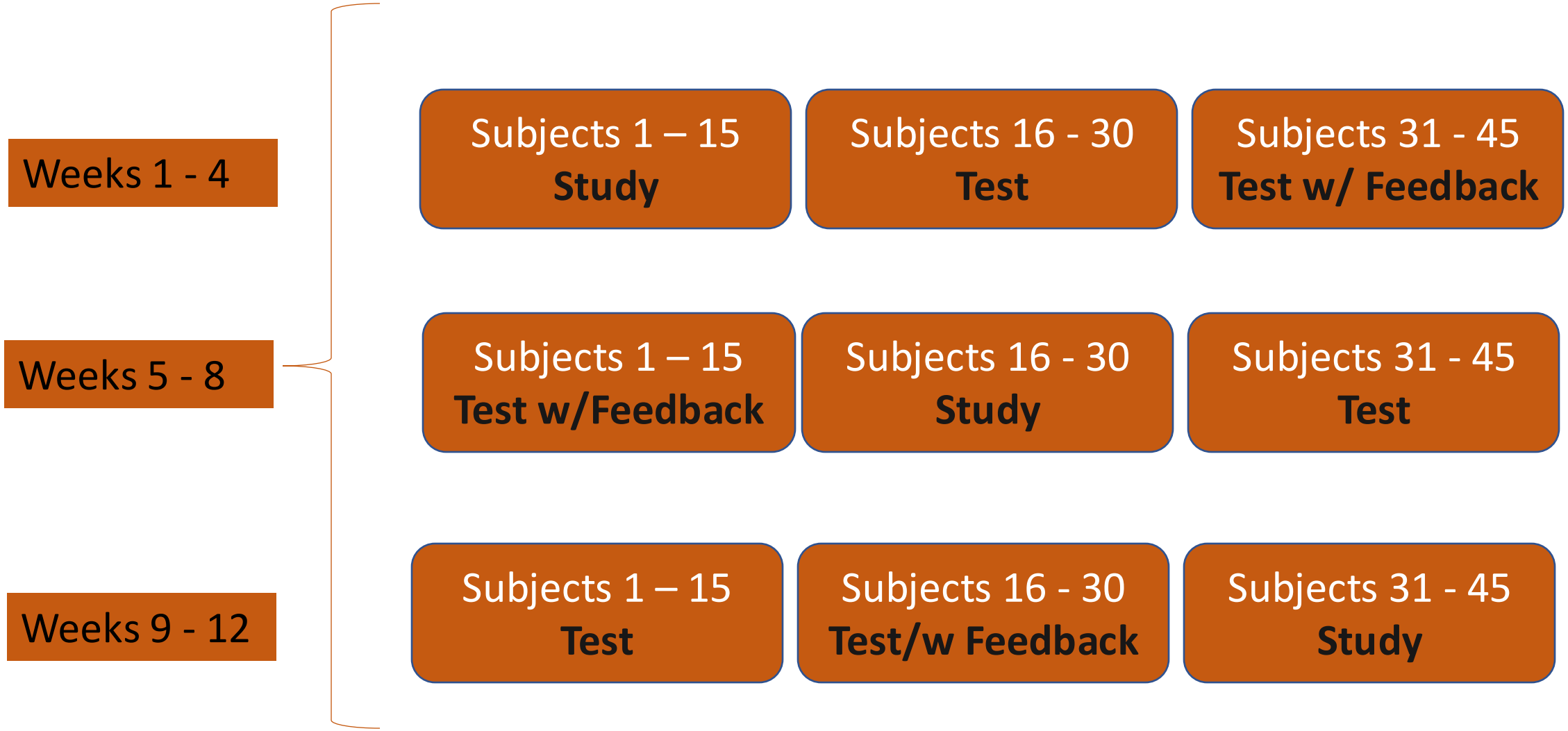
Smith, Race, Davis, & Thomas (2019)

Pros and Cons for Effortful Learning

Positive Effects
Improves long-term retention
Has implications for transfer and application of knowledge
Improves monitoring accuracy

Negative Consequences
In the short-term increases errors
Results in negative emotions
Increases stress
Reduces confidence

Bjork (1975); Bjork & Bjork, (2011); Bjork & Linn, (2006); Miller & Geraci, (2014); Ott (2017); Sarason & Sarason, (1990); Wenzel, (2022)



Thomas et al., 2020

32 Interval Study Sessions

Unit Cumulative Exams Every 6 lectures

3 Individual
3 Collaborative

Repeated and New Questions

All Multiple Choice

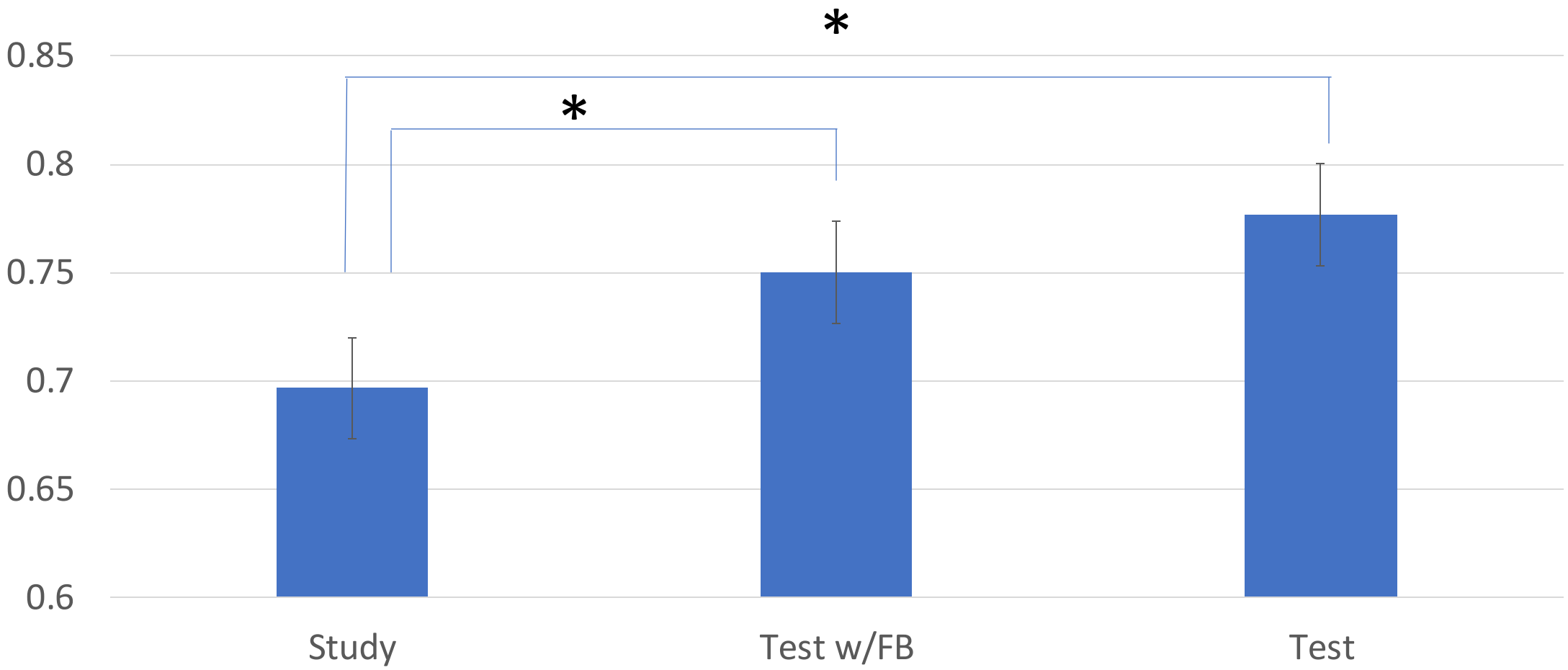
Cumulative Final Exam

Multiple Choice
Repeated and New Questions

6 Essay Questions

Transfer to Related Concepts:

Interval Practice to New Questions on Cumulative Exams



Thomas et al., 2020

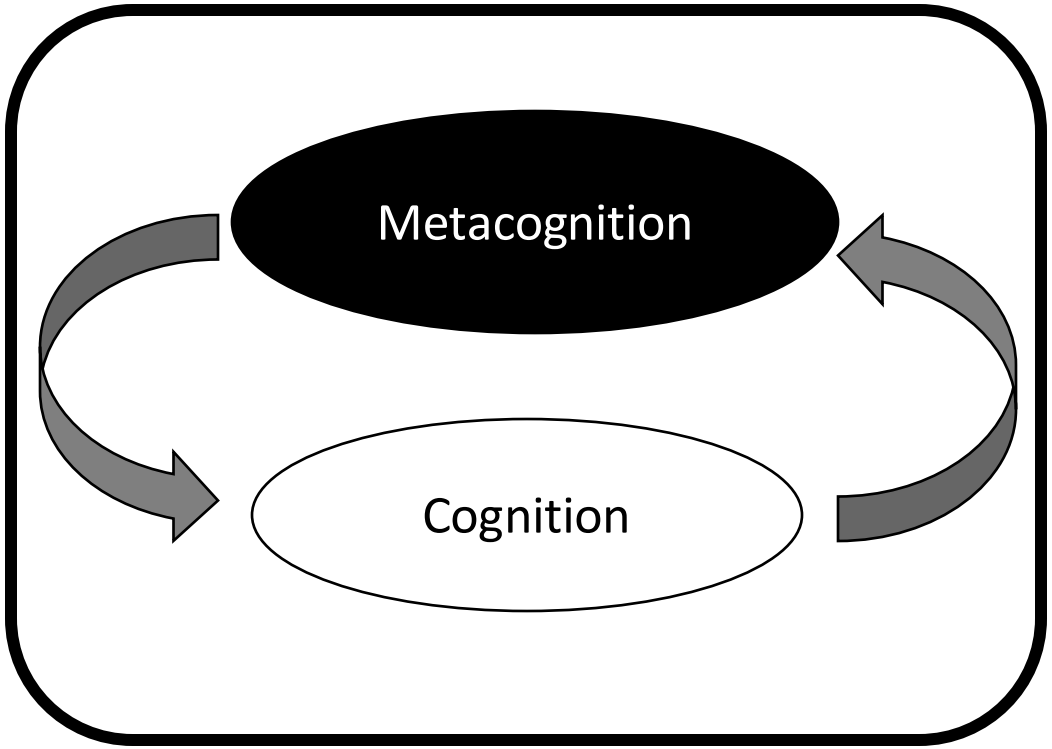
Testing as a Learning Tool

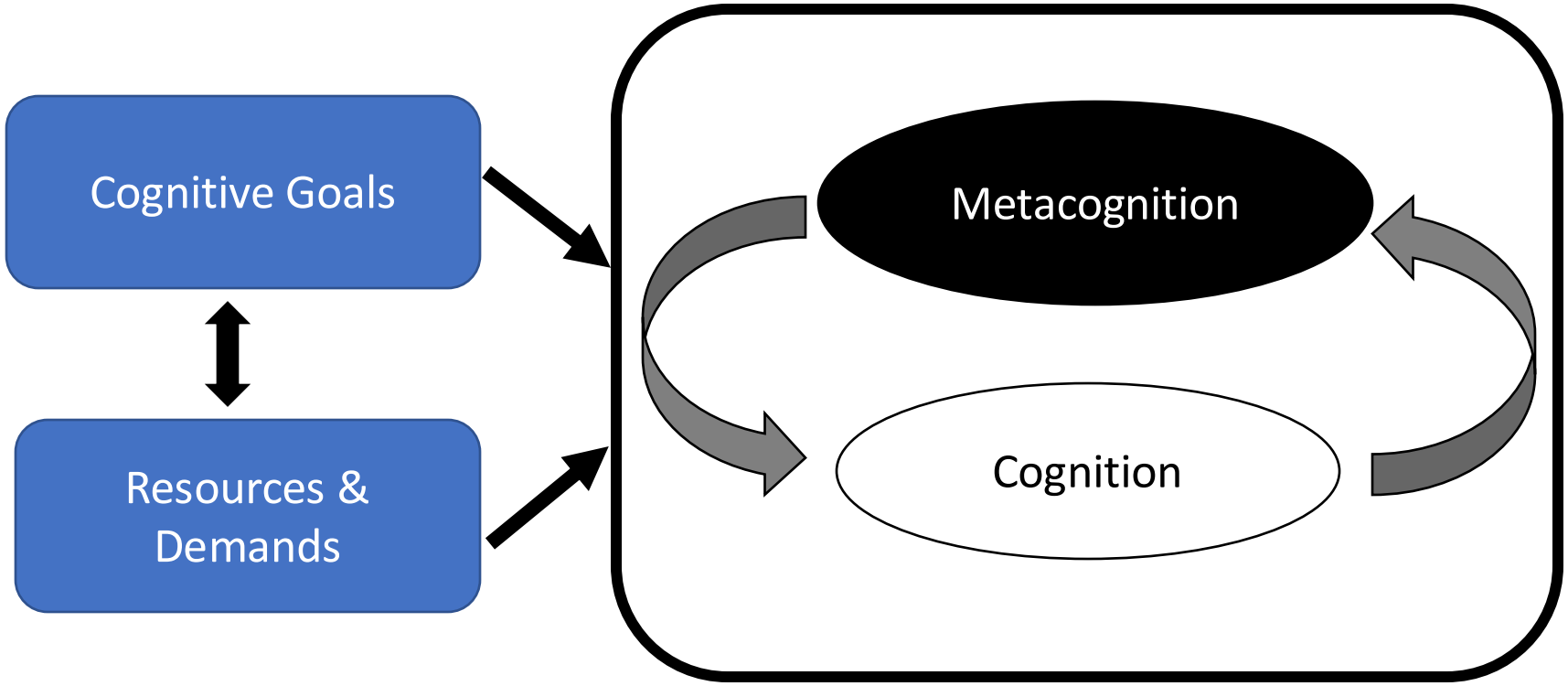
- Retrieval practice as a robust memory strategy
- Stress resilience through retrieval practice
- Retrieval practice and the robust memory trace
- Context dependency effects

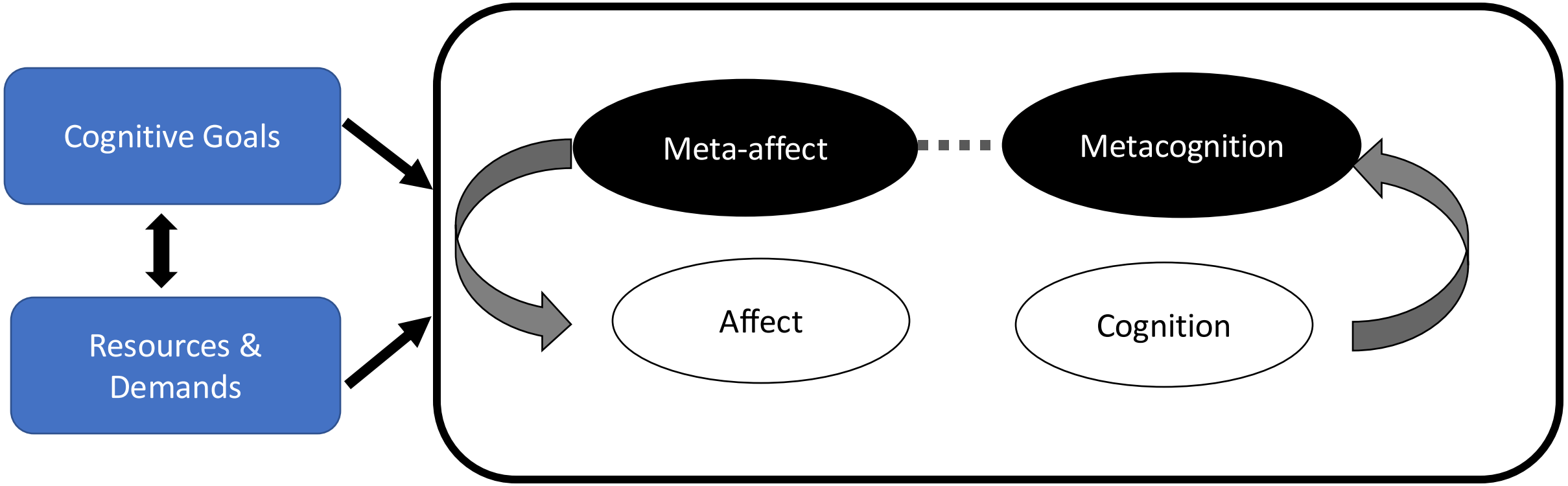
When are Students More Likely to Expend Effort?

- They perceive the course as more important
- They have a higher need for cognition
- They have a desire to master the learning task

Rea et al. (2022); Weissgerber et al., (2016, 2018)


Metacognition
Cognition


Cognitive Goals
Resources & Demands
Metacognition
Cognition


Cognitive Goals
Resources & Demands
Meta-affect
Metacognition
Affect
Cognition

What do Students Think about Effortful Learning?

"Which study strategy do you think is more effective for learning: retrieval practice or study practice?"

65%

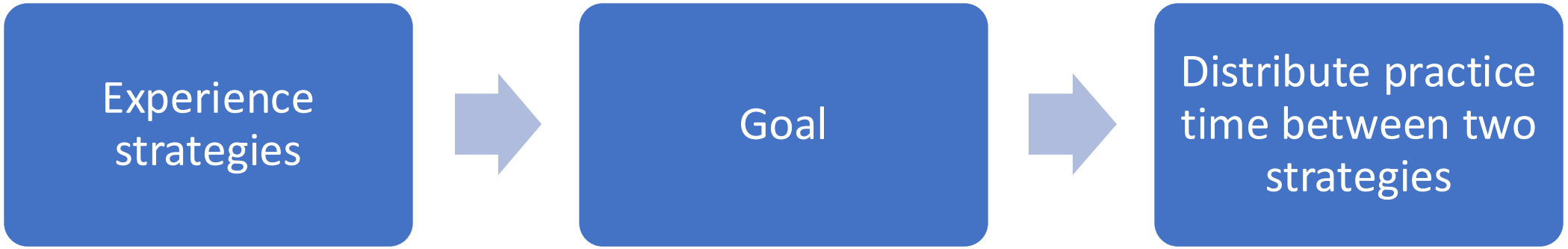
"Which study strategy do you think might induce anxiety and frustration while studying: retrieval practice or study practice?"

90%

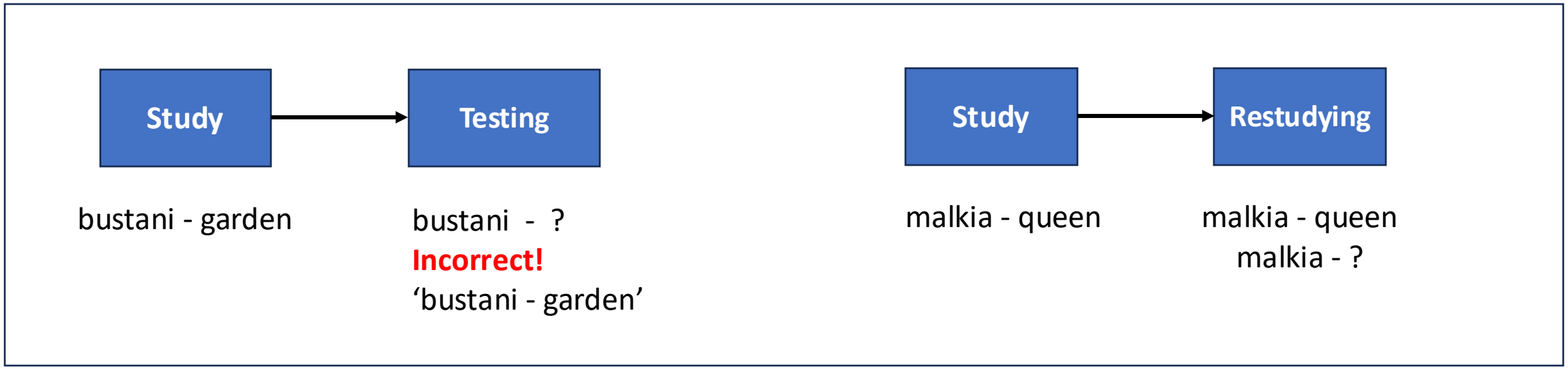
335 people sampled

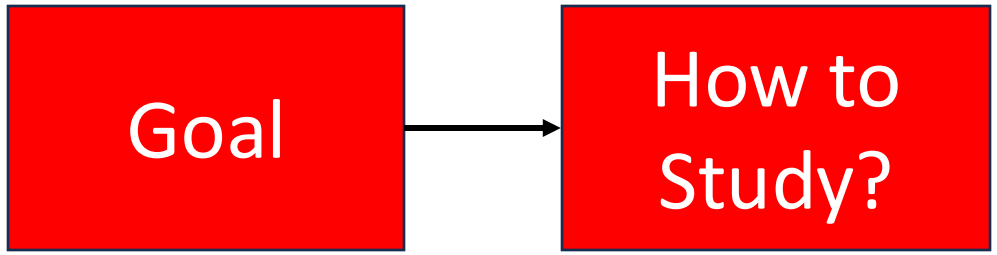
Do & Thomas, in progress

How do Goals Influence Study Strategies?



What Will People Choose To Do?





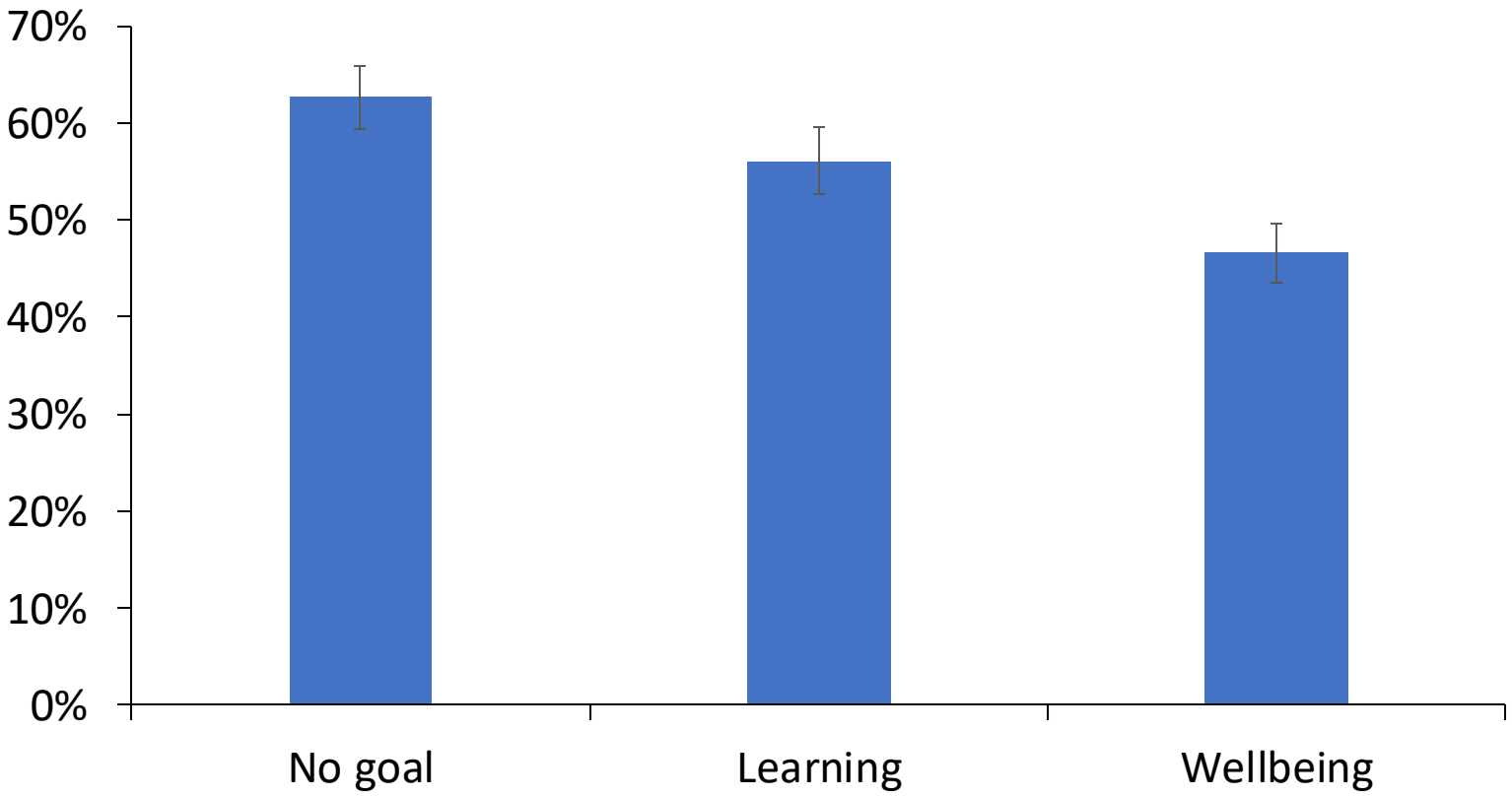
Learning Priority Scenario

A fellow student is studying new word pairs. **They know that certain study strategies are effective for learning. Their primary goal is to learn as many word pairs as possible.** After reviewing the word pairs once, they want to practice to stabilize learning. They are considering how frequently to incorporate retrieval practice and study practice into their practice routine. If you were in their position, how would you distribute the practice time between these two strategies?

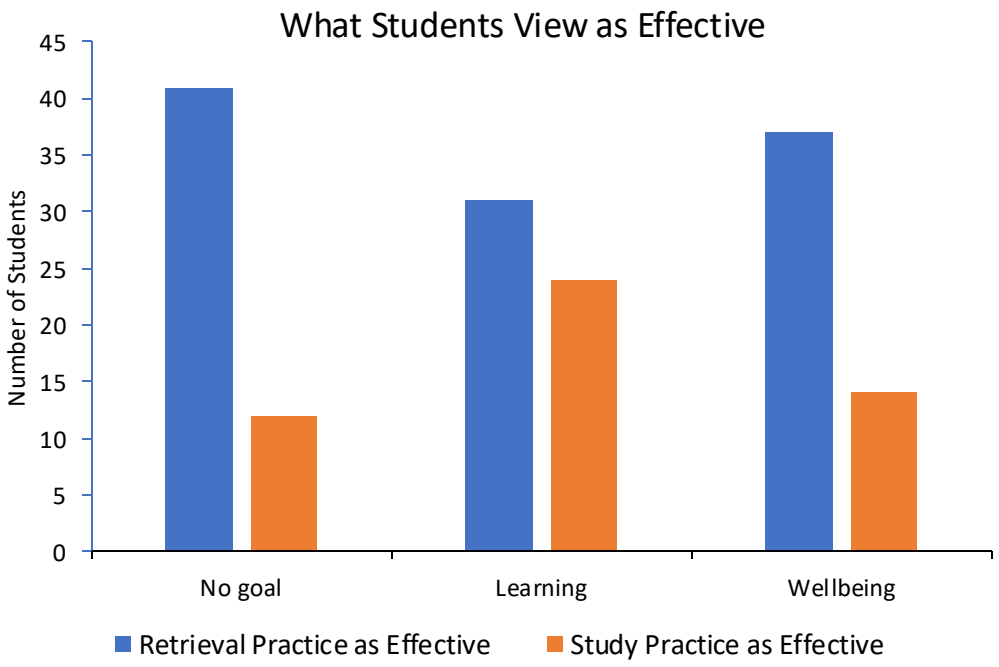
Emotional Wellbeing Priority Scenario

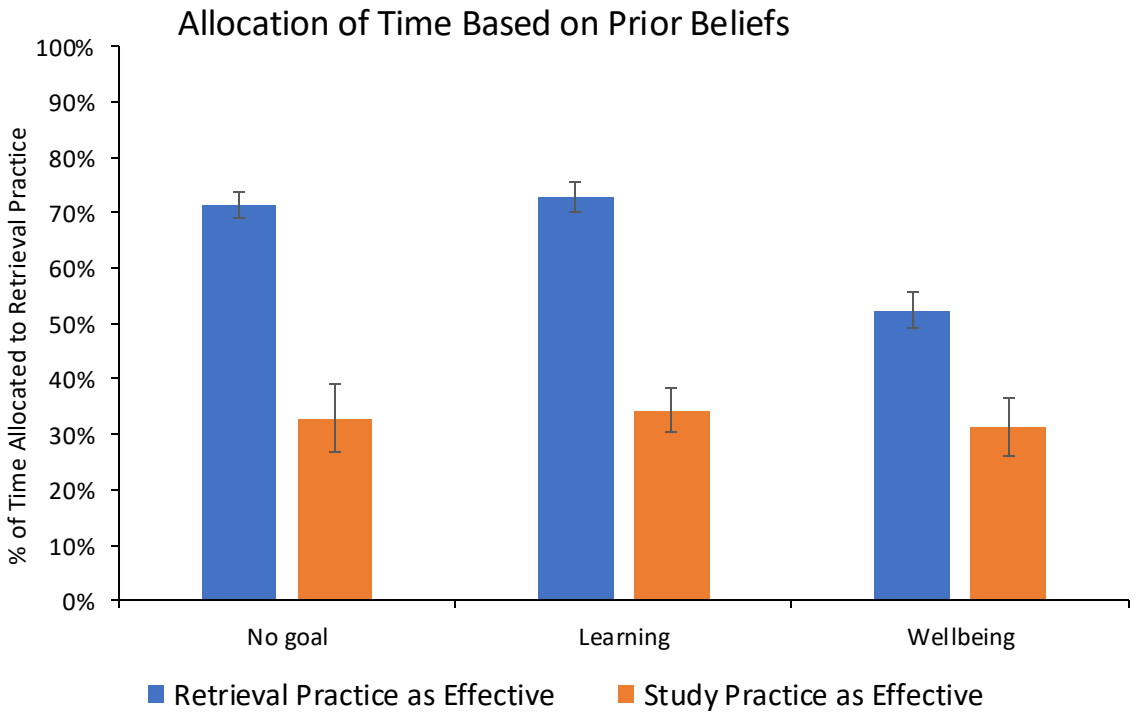
They know that certain study strategies may cause frustration and anxiety. Their primary goal is to safeguard their emotional well-being during their study sessions.

Hours Allocated to Retrieval Practice



Isolating Students Who Understood Retrieval Practice to be More Effective



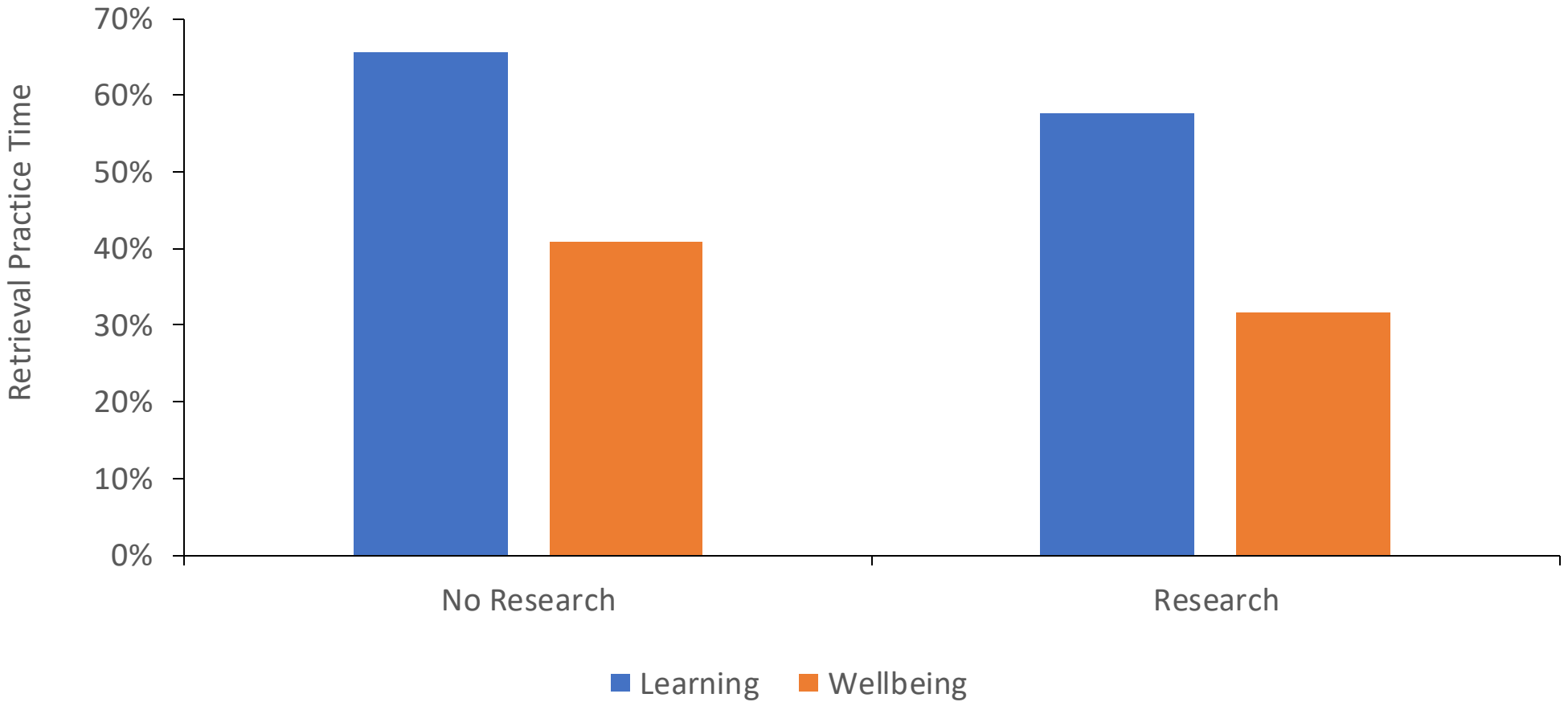


Providing Information w/o Experience

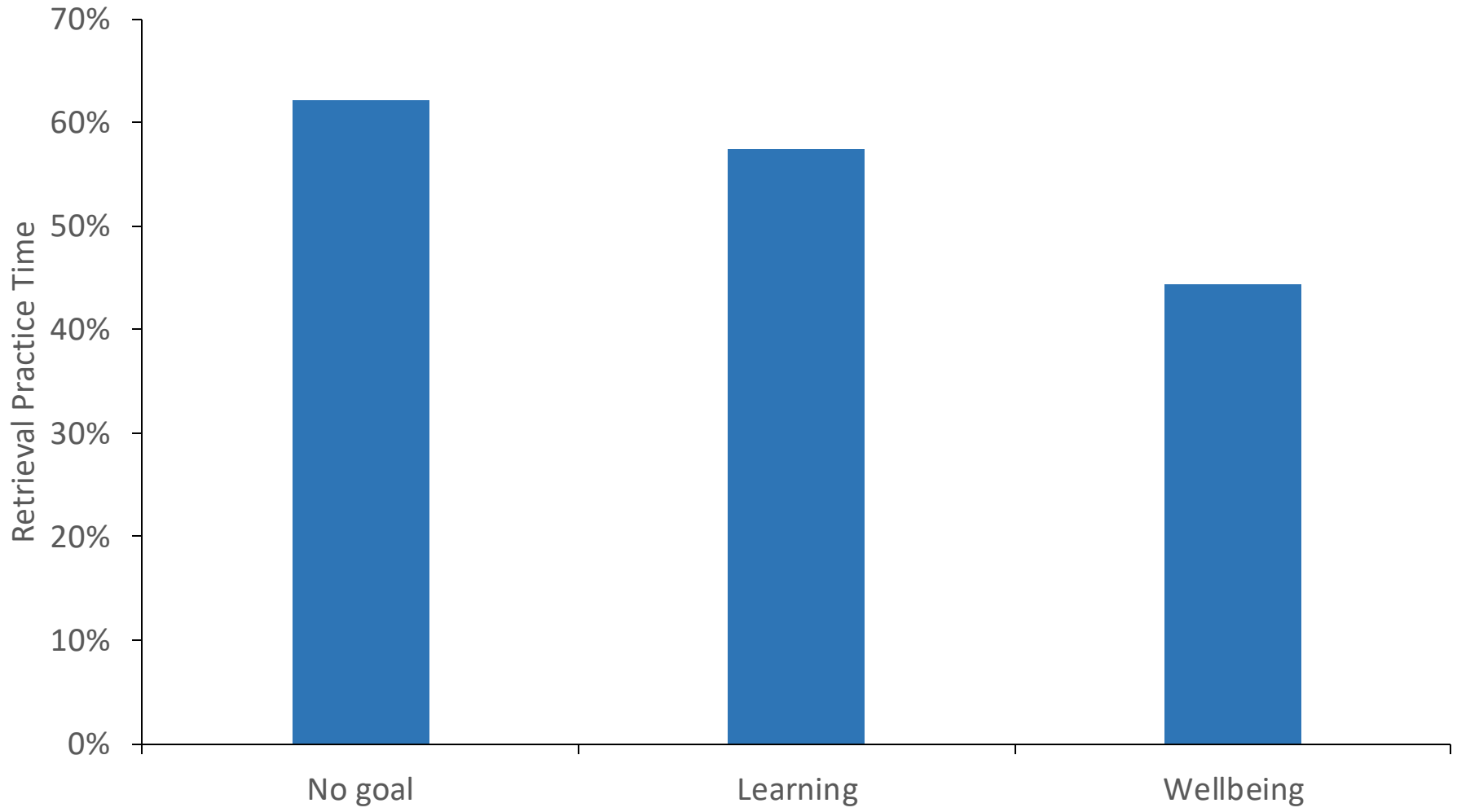
This study examines how students learn new vocabulary, focusing on two study strategies:

- **Retrieval practice:** This strategy involves repeatedly recalling word meanings from memory, such as by using flashcards and taking practice tests on each word's definition.
- **Study practice:** This strategy involves repeatedly reading and writing each word and its definition, such as by rereading the words and copying them into a notebook.

Information Didn’t Matter; Only Goals Mattered



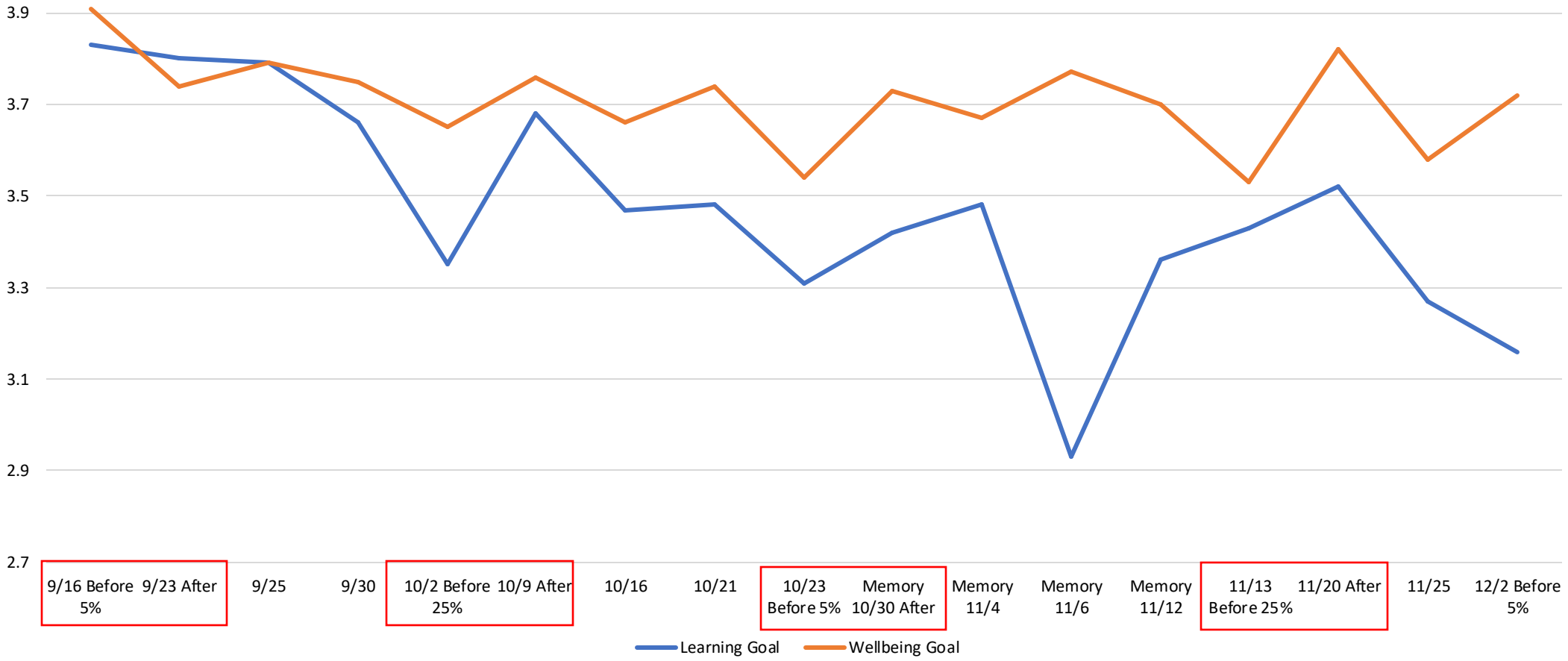
Allocation for Yourself Based on Goals



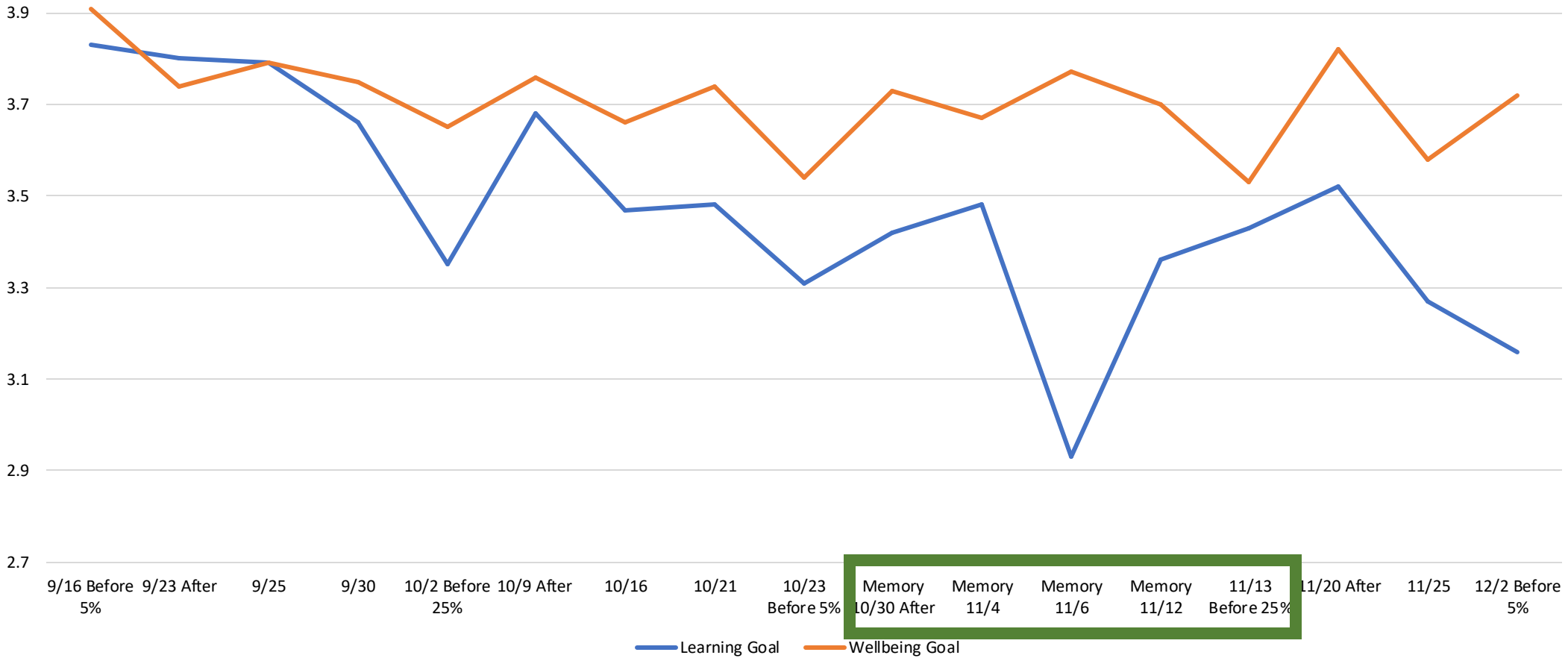
Classroom Implementation

- To what extent do you feel motivated to learn new materials? (LEARNING GOAL)
- To what extent do you want to relax and enjoy the class? (WELLBEING GOAL)
- Please select the practice type that best meets your current needs.

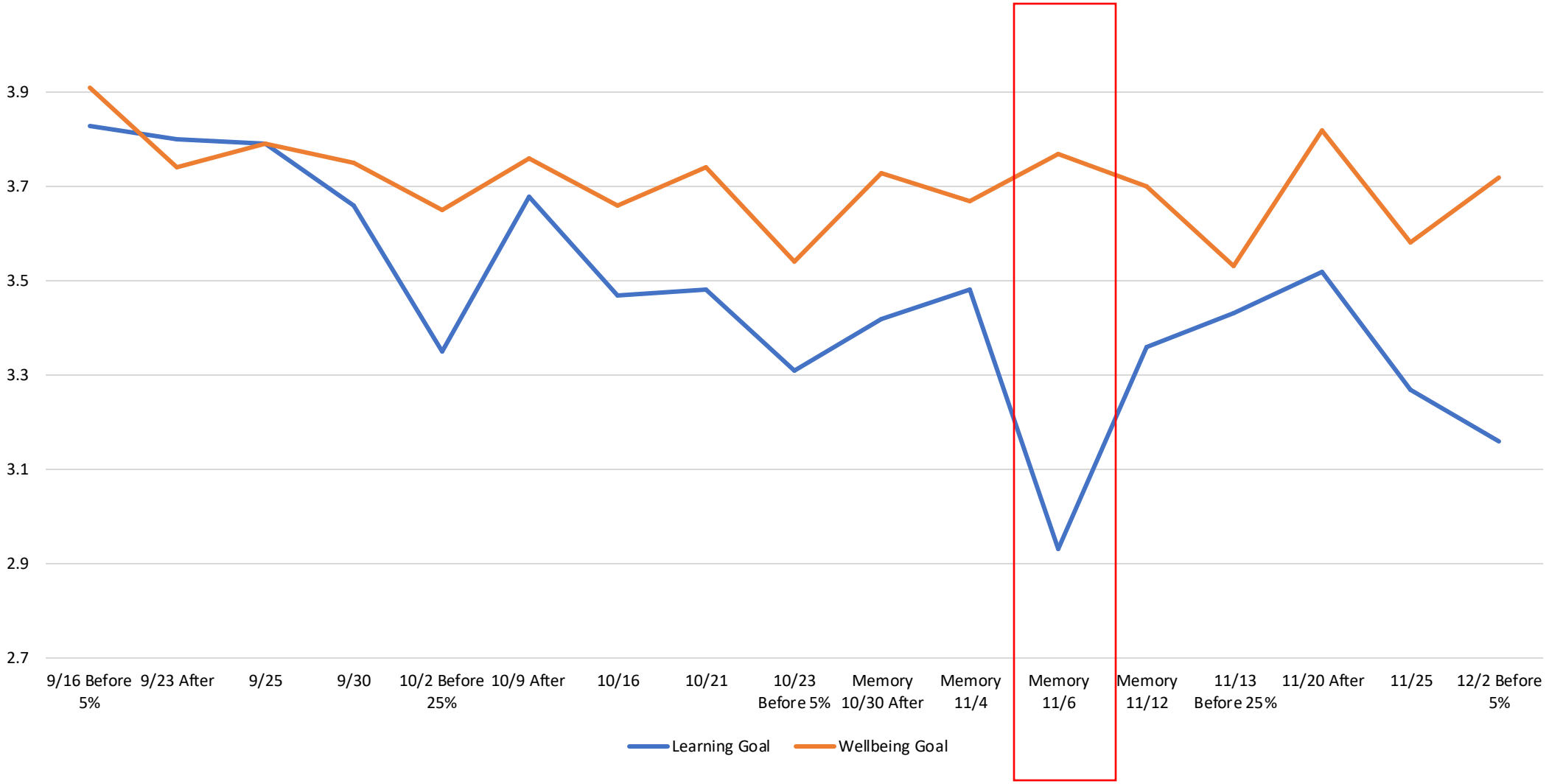
Shifting Goals

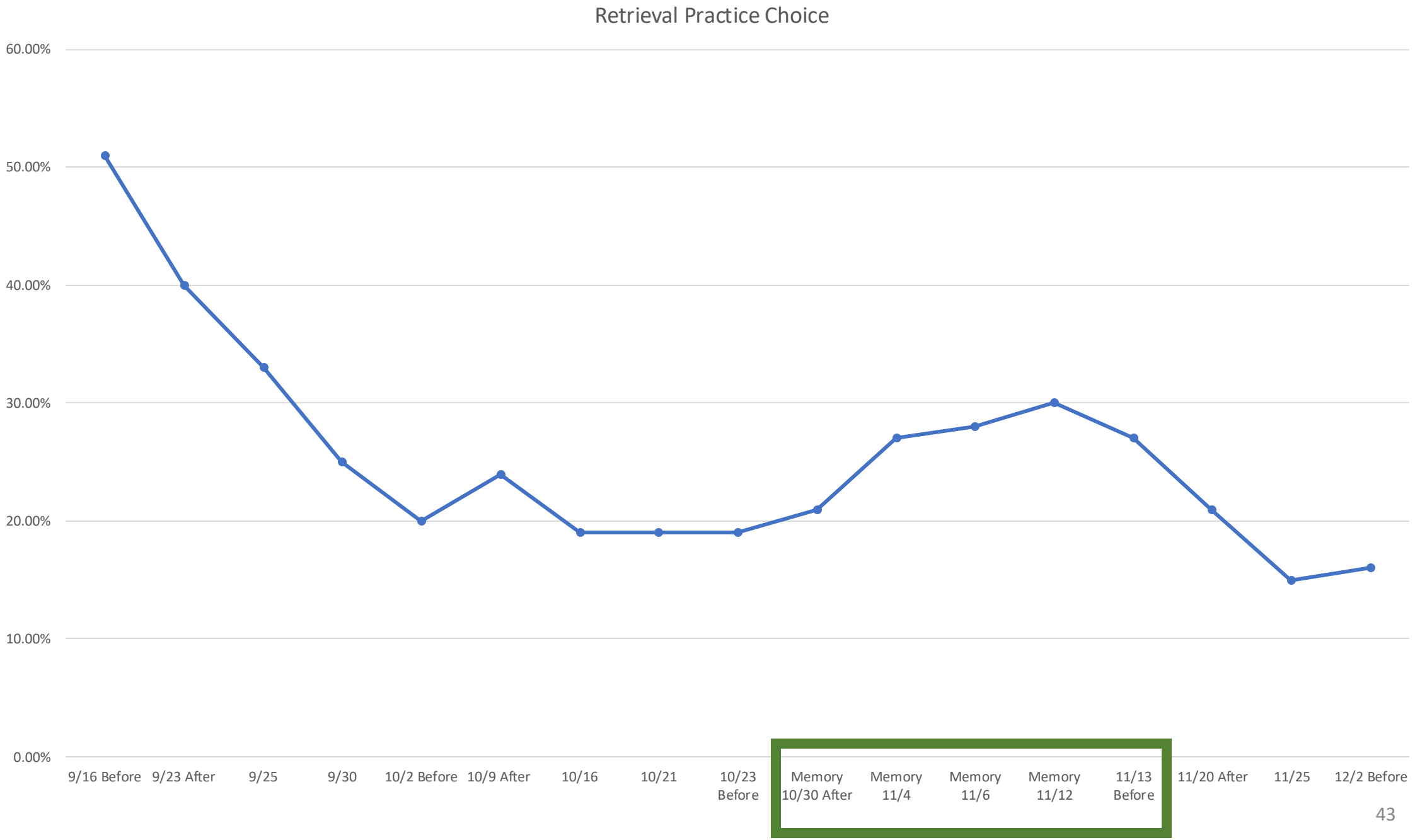


Shifting Goals



Shifting Goals




Retrieval Practice Choice
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
9/16 Before
9/23 After
9/25
9/30
10/2 Before
10/9 After
10/16
10/21
10/23 Before
Memory 10/30 After
Memory 11/4
Memory 11/6
Memory 11/12
11/13 Before
11/20 After
11/25
12/2 Before

Lab to the Classroom

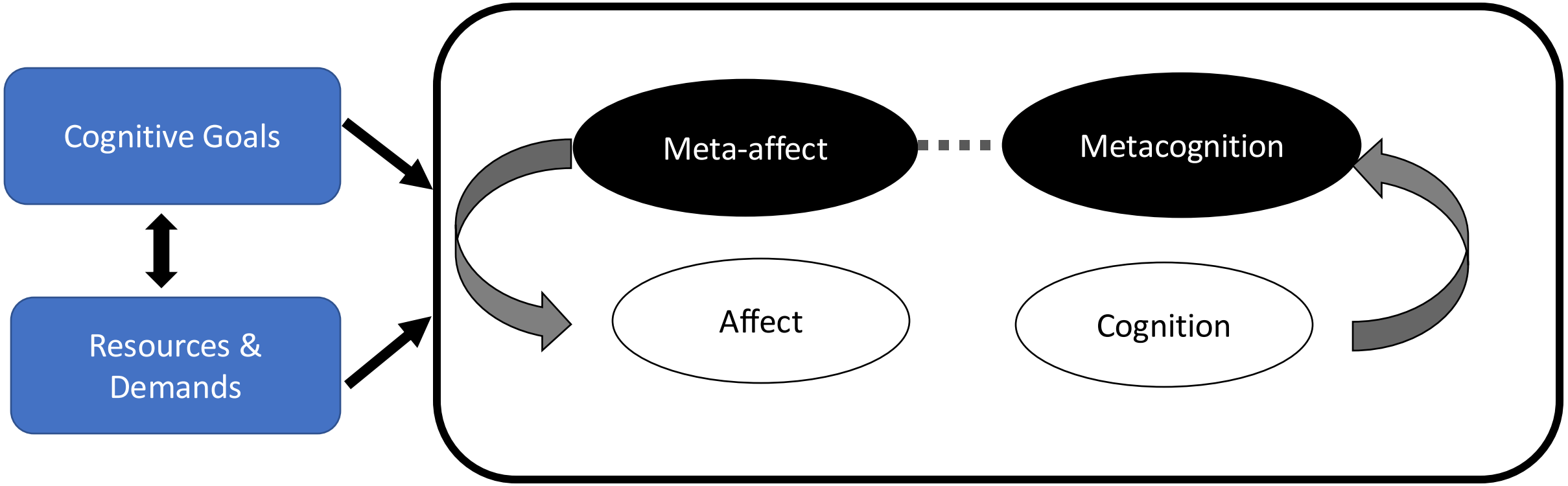
- Students' misperceptions
- Goals are multifaceted and dynamic
- Semester-long motivations are challenging to maintain
- Individual differences in choices

Effort and Wellbeing

- Students steer away from STEM courses
  - Research has shown that students are increasingly avoiding courses perceived to have **high workload and stress levels**

- Students consciously avoid courses they feel will impose a significant mental or emotional burden, even if those courses might be necessary for certain career paths.

Dyrbye, Thomas, & Shanafelt, (2005); Erickson, B., Peters, B. M., & Strom, S. (2021)


Cognitive Goals
Resources & Demands
Meta-affect
Metacognition
Affect
Cognition

NSF

Tufts
UNIVERSITY

Panelists

Lan Anh Do

Graduate Student, Psychology

Heather S. Nathans

Professor, Theatre, Dance, and Performance Studies, Nathan and Alice Gantcher Professor of Judaic Studies, Theatre, Dance, and Performance Studies

David Hammer

Professor, Education, Physics & Astronomy & Tisch College

Recall a time when you struggled to learn something, but that ultimately led to durable and meaningful learning.

Discuss with a new partner / share in the chat:

What was the story you heard from your partner before the panel?

How might aspects of their story relate to learning sciences ideas you encountered during the panel?

Responses are anonymous

When poll is active respond at **PollEv.com/cariecelt**

December 2024 Symposium Exit Ticket

https://PollEv.com/surveys/3zi8W4UzpbhYFbRcNKuAS/respond

Workshops

In Person Workshop: Play Space - Applying Learning Sciences in Your Classroom

JCC 280, 1-2pm

Join a hands-on, exploratory session designed to connect the themes from this symposium, "Accepting Not Knowing as Part of the Learning Process," with practical classroom strategies grounded in learning science. Guided by CELT staff, this workshop creates a "play space" where you and your colleagues can experiment with and adapt evidence-based practices that foster deep learning and resilience in the face of uncertainty.

Facilitated by Dana Leeman, Carie Cardamone, Heather Dwyer, Jean Otsuki (CELT)

Online Workshop: Applying Learning Science and EdTech Tools in Online, Hybrid, and In-Person Courses

Zoom, 1-2pm

Come explore educational technology tools to enhance student engagement and learning outcomes while applying key learning science principles across online, hybrid, and in-person teaching environments!

Participants will review essential learning science concepts—such as cognitive load theory, spaced repetition, and active learning—before considering practical applications for a variety of technological tools and strategies that align with these principles. From leveraging readily available Canvas features and collaborative platforms to introducing emerging multimedia resources and interactive learning tools, faculty will discover innovative ways to integrate technology into their courses effectively to improve student success. By the end of the session, participants will leave with an actionable plan to enhance their teaching practices using technology, ultimately fostering a more engaging and effective learning experience for their students.

Facilitated by Betsy Buford, Ally Leigh, and Jen Fidler (ETS)