What All Teachers and School Leaders Need to Know About the Learning Brain?

(in the Age of AI)

A collaboration between

THE CENTER *for* TRANSFORMATIVE
TEACHING & LEARNING
AT ST. ANDREW'S EPISCOPAL SCHOOL

ACIS
ASSOCIATION *of* COLORADO
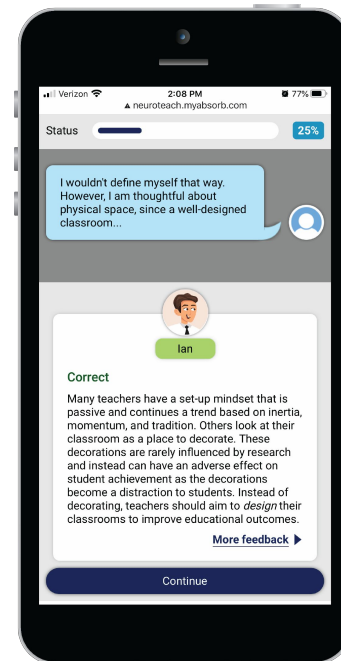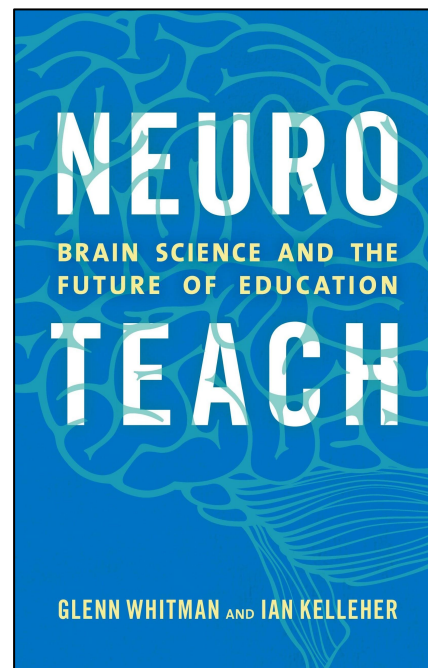INDEPENDENT SCHOOLS

History Teacher, Student Advisor & Soccer Coach
Executive Director of the Center for
Transformative Teaching and Learning

Co-author of *Neuroteach: Brain Science and the Future of Education*
Co-designer of Neuroteach Global
gwhitman@saes.org
Follow on Twitter @gwhitmancttl

2007

What is the next frontier
for teacher training—
to take good teachers and
make them great,
and great teachers and
make them expert?

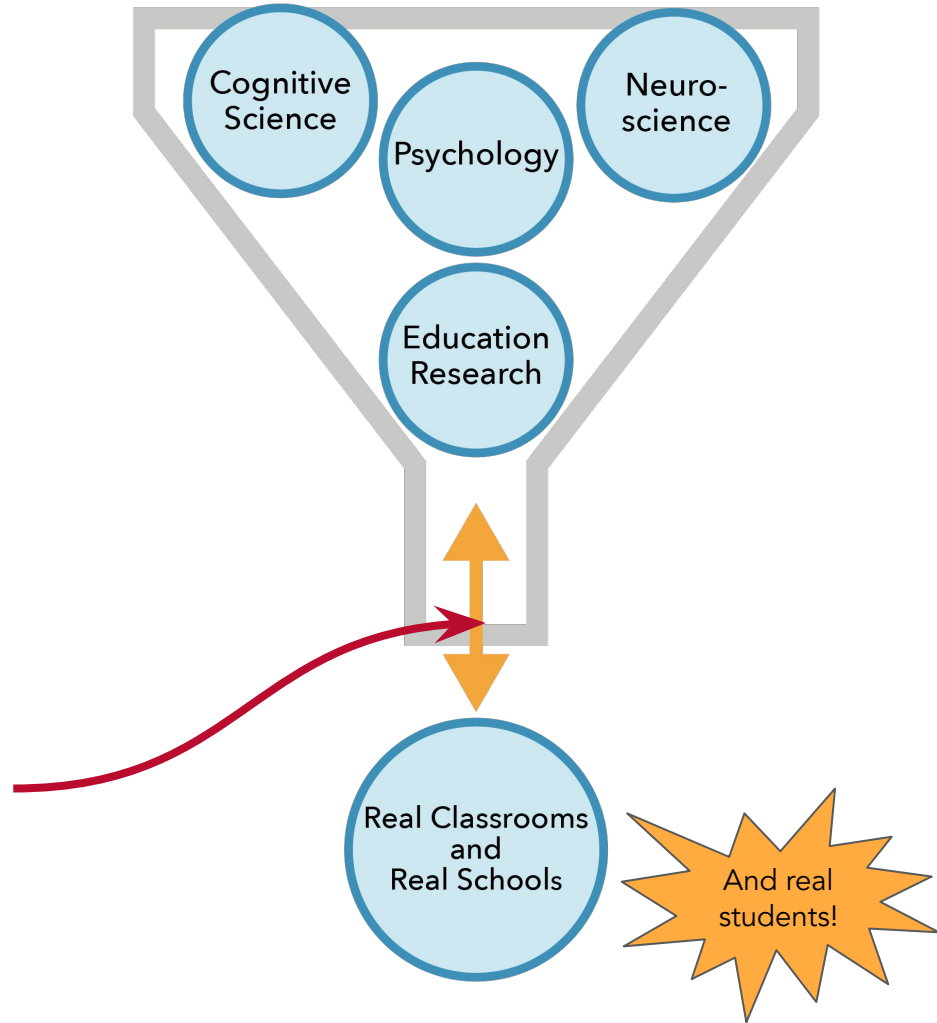# THE CENTER *for* TRANSFORMATIVE TEACHING & LEARNING ™
AT ST. ANDREW'S EPISCOPAL SCHOOL

The CTTL's mission is to create and innovate in the field of Mind, Brain and Education Science research.

Because every child deserves a teacher who understands how the brain learns.
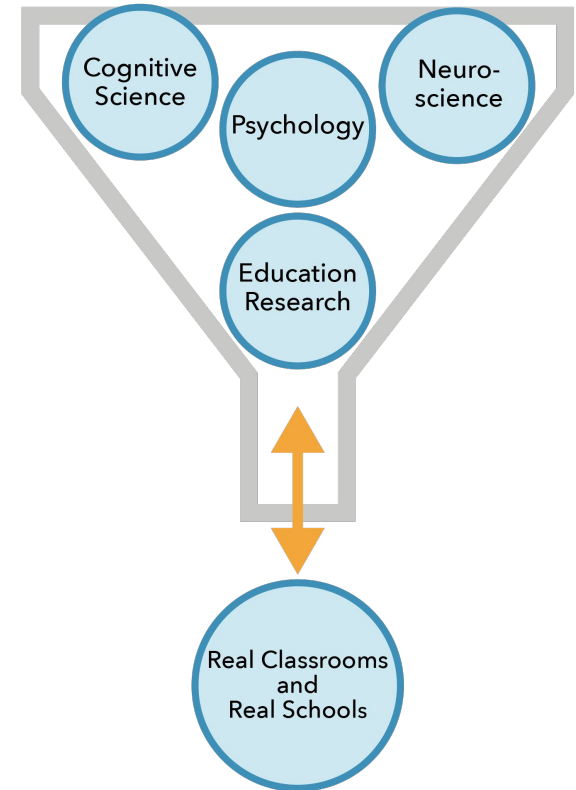
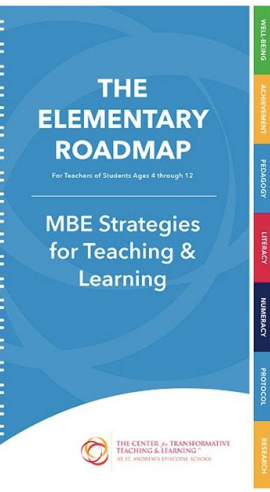# How can MBE inform, validate, and transform your instructional design and student learning?

Arts Integration

Attention

Belonging

Constrained Choice

Cognitive Load

Daily Schedule

Disciplinary Literacy

Dual Coding

Emotion and Cognition

Engagement

Executive Functions

Feedback

Formative assessment

Homework

Knowledge Richness & Transfer

Literacy/Science of Reading

Memory

Metacognition

Mindsets for learning

Motivation

Multiple modality instruction

Multitasking

Neuromyths (eliminate!)

Neuroplasticity

Novelty

Play

Project/Problem Based Learning

Self regulation

Sleep

Spaces where learning happens

Stress

Summative assessment

Technology Use

Transfer

Well-being and Joy

Cognitive Science

Psychology

Neuro-science

Education Research

Real Classrooms and Real Schools

From Research to Classroom to Student

NEURO TEACH

BRAIN SCIENCE AND THE FUTURE OF EDUCATION

GLENN WHITMAN AND IAN KELLEHER

Tia Henteleff

AS WE BEGIN

Dispositions of Mind, Learning, and the Brain in Early Childhood

JOHN CATT FROM HODDER EDUCATION

Status — 25%

I wouldn't define myself that way. However, I am thoughtful about physical space, since a well-designed classroom...

Ian

Correct

Many teachers have a set-up mindset that is passive and continues a trend based on inertia, momentum, and tradition. Others look at their classroom as a place to decorate. These decorations are rarely influenced by research and instead can have an adverse effect on student achievement as the decorations become a distraction to students. Instead of decorating, teachers should aim to *design* their classrooms to improve educational outcomes.

More feedback ▶

Continue

THE EARLY CHILDHOOD PLACEMAT

For Teachers of Students Ages 2 Through 5

MBE Strategies for Teaching & Learning

THE CENTER for TRANSFORMATIVE TEACHING & LEARNING AT ST. ANDREW'S EPISCOPAL SCHOOL

THE ELEMENTARY ROADMAP

For Teachers of Students Ages 4 through 12

MBE Strategies for Teaching & Learning

THE CENTER for TRANSFORMATIVE TEACHING & LEARNING AT ST. ANDREW'S EPISCOPAL SCHOOL

THE PLACEMAT

MBE Strategies for Teaching & Learning

Version 3.0

THE CENTER for TRANSFORMATIVE TEACHING & LEARNING AT ST. ANDREW'S EPISCOPAL SCHOOL

WELL-BEING | ACHIEVEMENT | PEDAGOGY | LITERACY | NUMERACY | PROTOCOL | RESEARCH

Mind, Brain, and Education Science

Effort Grades

"Coaching the Student-Athlete's Brain"

Diversity, Equity & Belonging

AI

Personalized Learning

Science of Reading and Disciplinary Literacy

Common language & framework

Daily Schedule

Coaching teachers for professional growth

Learning demystification

Course learning progression development (formative assessment, feedback, summative assessment)

PBL vs. PBL

Social & emotional learning

ST. ANDREW'S
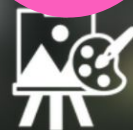## *at a* GLANCE

100%

research-informed teachers

720

enrollment

50%

students of color

25

MS clubs

6:1

student to teacher ratio

13

average class size

What percentage of your school's faculty, staff, and administration have foundational and accurate knowledge of how the brain learns?

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What's Your MBE-IQ?

TAKE THE DIAGNOSTIC   SEE SAMPLE RESULTS

The **NeuroEducation Confidence Diagnostic** (NECD for short) is a free diagnostic tool for helping schools and districts gauge key elements related to teacher efficacy. Developed by the team at The Center for Transformative Teaching & Learning, the NECD measures an educator's influence, knowledge, and confidence around the science of teaching and learning. It's for **teachers** who want to identify gaps in their knowledge and confidence, as well as **school and district administrators** who want to get an overall picture of the organizational strengths and gaps in learning science knowledge and confidence in classroom practices. **The NECD measures the following areas**:
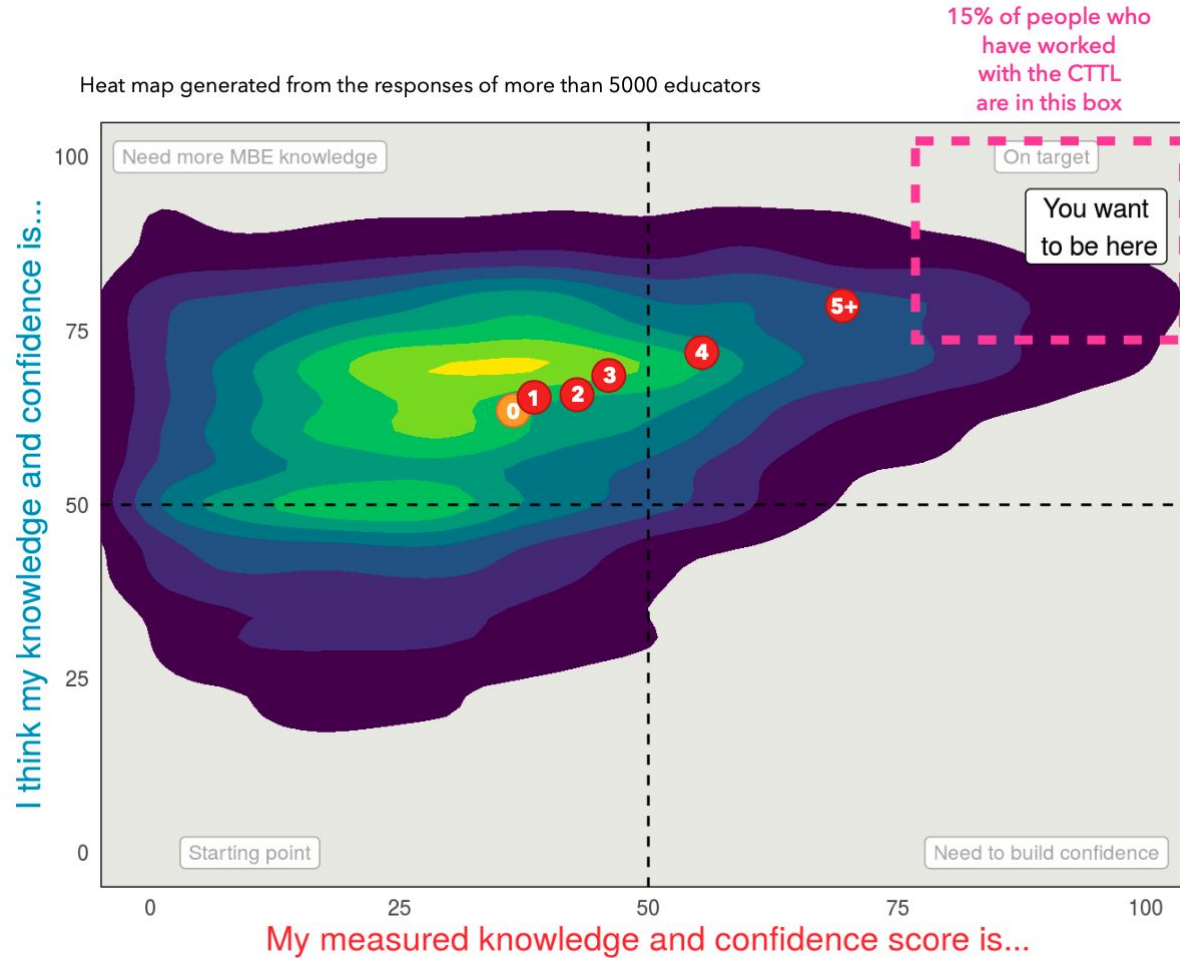
- How much change can teachers affect within the school
- Teacher's self reported knowledge of learning science and their confidence to apply it in the classroom
- Evaluation of learning science scientific concepts and their application

What does your school or district get from the CTTL when they complete the NECD? Take a look at this fictional example from Springsteen Academy.

Only **20% of teachers and school leaders** (in a self-reported CTTL survey) have foundational understanding in the Science of Learning

4. Knowledge and confidence in MBE increases as you work with the CTTL

15% of people who have worked with the CTTL are in this box

Heat map generated from the responses of more than 5000 educators

Need more MBE knowledge

On target

You want to be here

Starting point

Need to build confidence

I think my knowledge and confidence is...

My measured knowledge and confidence score is...

What All Teachers and School Leaders Need to Know About the Learning Brain?
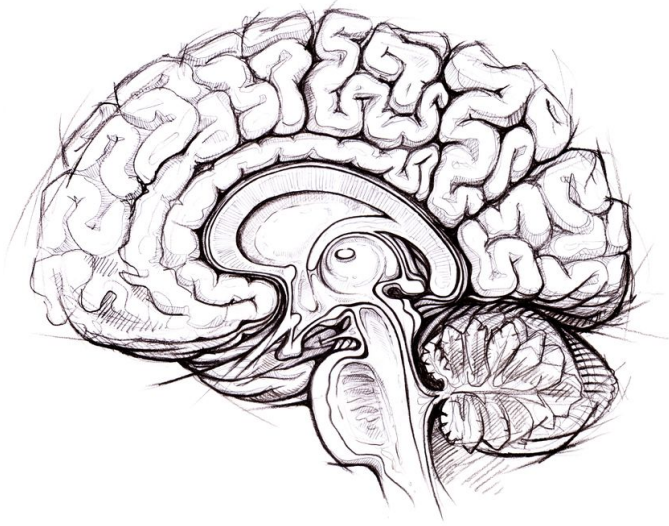
(in the Age of AI)

MBE Bite

Demystify Student and Adult Learning with Neuroplasticity and Neuroanatomy
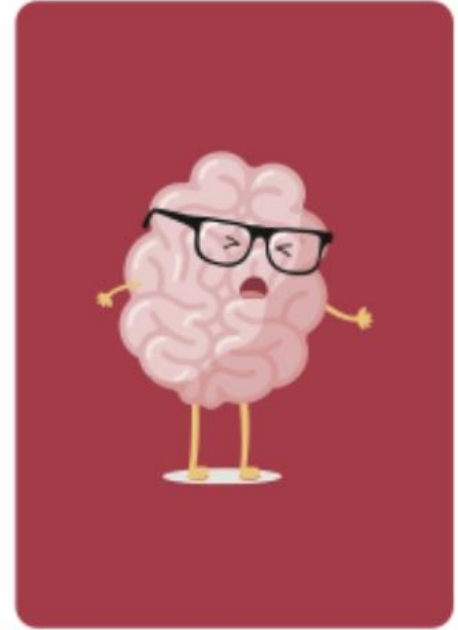
What are two things no student will ever forget to bring with them to your school each day?

The human brain is "set" at an early age.

TRUE   FALSE

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FALSE

The human brain is "set" at an early age.

Neuroplasticity exists throughout our life – our brain alters over time in reaction to our environment and experiences. It is never "set" as neurons are being formed, connected, and pruned, and thus our brain is able to learn all through our life.

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Citation: F

12

Amygdala
Corpus Callosum
Hippocampus
Limbic System
Myelination
Neuroplasticity
Neurotransmitter
Prefrontal cortex
Pruning

What if teachers, school leaders, and students knew a little bit more about neuroscience, neuroanatomy (and how learning happens in the brain)?

What neuroanatomy should all teachers know to inform their instructional design and work with students?
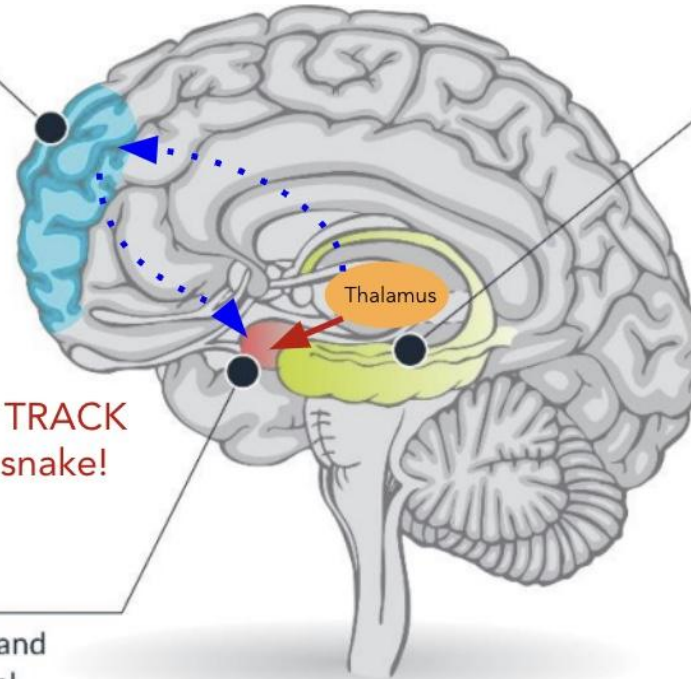

Prefrontal Cortex
Regulates thoughts, emotions, behavior

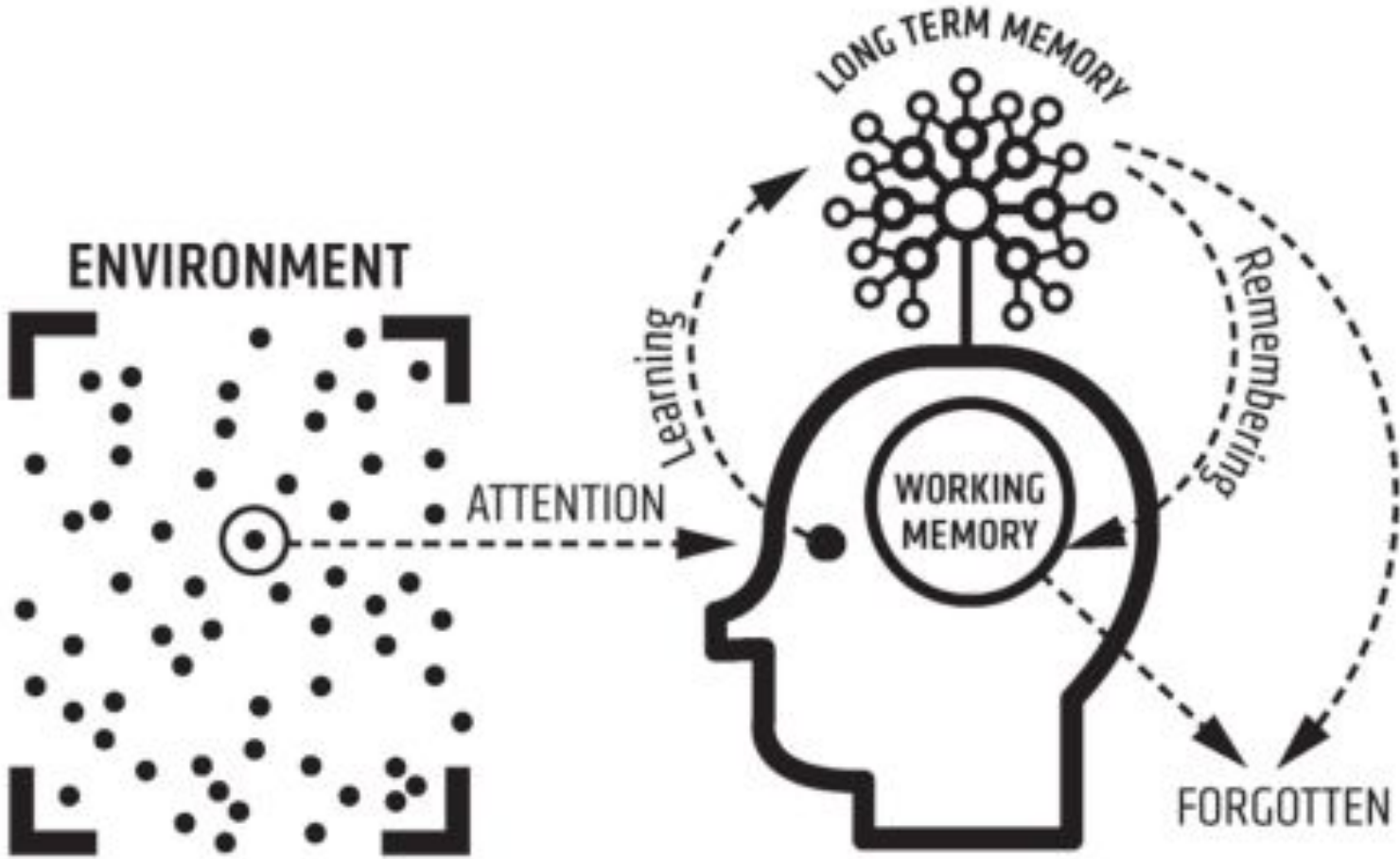**SLOW ROAD**
Oh it's a stick

FAST TRACK
Aaa snake!

Amygdala
Reacts to stress and emotional arousal

Thalamus

Hippocampus
Stores learning and memory

What if teachers, school leaders, and students knew a little bit more about neuroscience, neuroanatomy (and how learning happens in the brain)?

TURNAROUND FOR CHILDREN

From Tom Sherrington's book: Rosenshine's Principles in Action, illustrated by Oliver Caviglioli

Neuroplasticity:
The lifelong ability of the brain to change its organization as a result of experiences.

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TEACHING & LEARNING™
AT ST. ANDREW'S EPISCOPAL SCHOOL

THINK DIFFERENTLY AND DEEPLY

The Transformational Classroom:
How Research in Educational Neuroscience
Enhances Teaching and Learning

VOLUME 5

https://www.thecttl.org/think-differently-deeply/

The Power of Plasticity, the Impacts of Stress, and the Awesome Responsibility of Educators

DR. GREG DUNN AND EVA SHULTIS

As a Biology teacher and Mind, Brain & Education research translator, discovering Dr. Greg Dunn's neuroscience artwork felt like finding a Rosetta Stone of scientific communication. In a single blast of perception, his images convey a level of complexity that takes more than a thousand words to approximate. The opportunity to collaborate with him through The Center for Transformative Teaching and Learning (CTTL) and share his art with the students and educators we work with is an honor and a delight. He actually created the first piece in this article, Myelination II, with educators in mind: we had a conversation about the foundational concept of neuroplasticity, in which I bemoaned the lack of images that do it justice. The next time we spoke, he had created one. The second image, Winding Paths to the Self, achieves his self-proclaimed goal of "hitting the viewer in the limbic system" (the emotional processing center of the brain) and is even more powerful if you understand the biological story it's telling. This article is inspired by and in conversation with Dr. Dunn's two images and my attempt to tell the story they evoke for me, as well as the sense of purpose and self-authorship I draw from them as an educator and a human with a brain.

The Most Important Concept To Understand About Your Brain

The power of our brain lies in its neuroplasticity: its ability to change in response to experience. The brain is a living structure that continuously modifies itself, and any learning we do involves a physical change in its synaptic connections: the approximately 30-nanometer sized gaps between one neuron and the next, where neurotransmitter molecules such as serotonin, dopamine, or adrenaline carry the signal forward. Researchers estimate there are 86 billion neurons in the human brain, and each neuron can form a synaptic connection with 1,000 to 10,000 others, generating a level of complexity that's hard to wrap your mind around. This network of connections holds our memories, thought processes, and patterns of behavior. A single neuron is not intelligent on its own — rather, our intelligence emerges from the concerted action of circuits of billions of neurons, just as waves emerge from the movement of countless water molecules. Similarly, our personality and sense of identity emerge from the lifelong strengthening, weakening, and reconfiguring of the connections that make up our most-traveled neural pathways. In this way, the whole is greater than the sum of its parts. And just as you can't step in the same river twice, our

Synapse Density - see, think, wonder
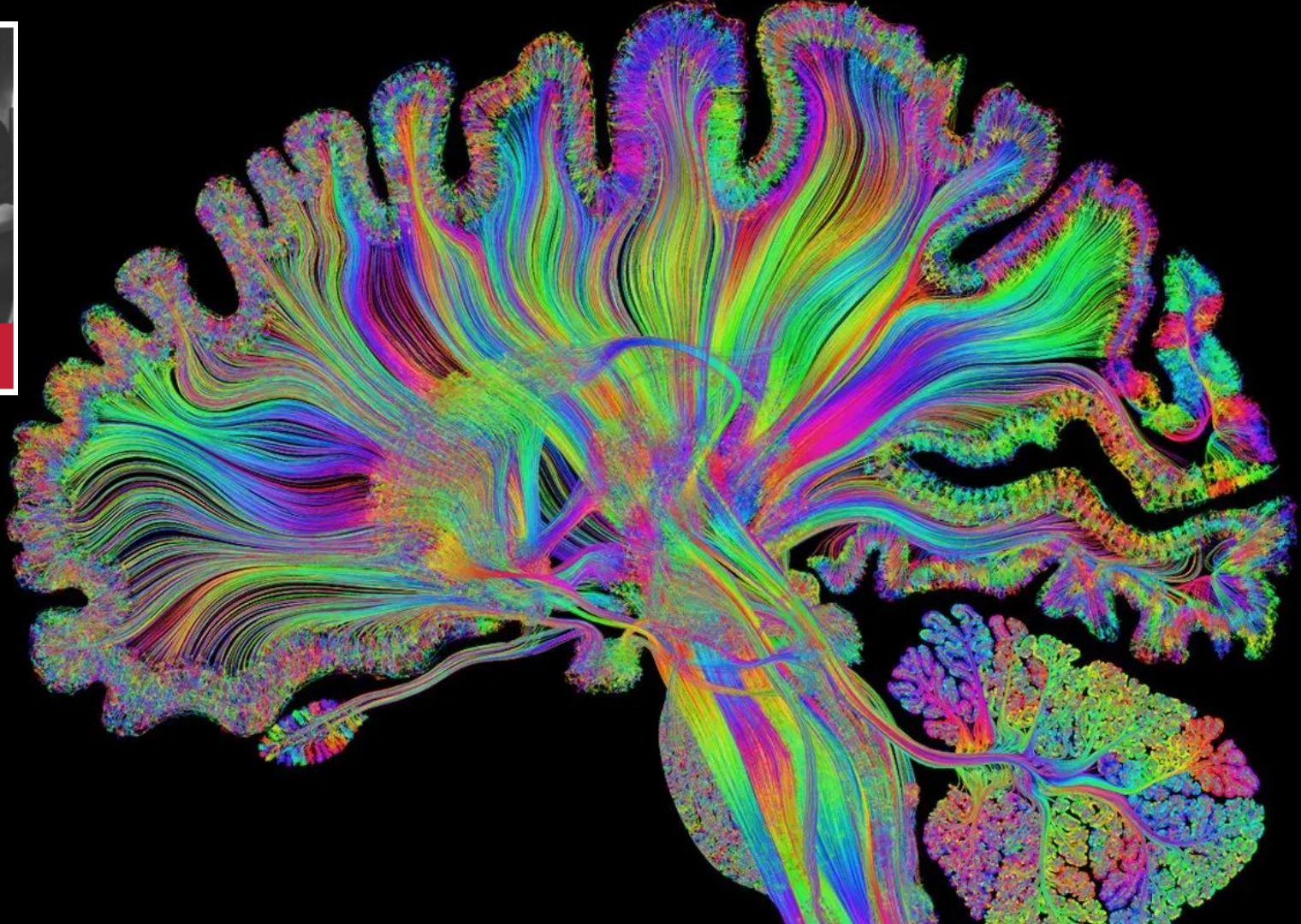

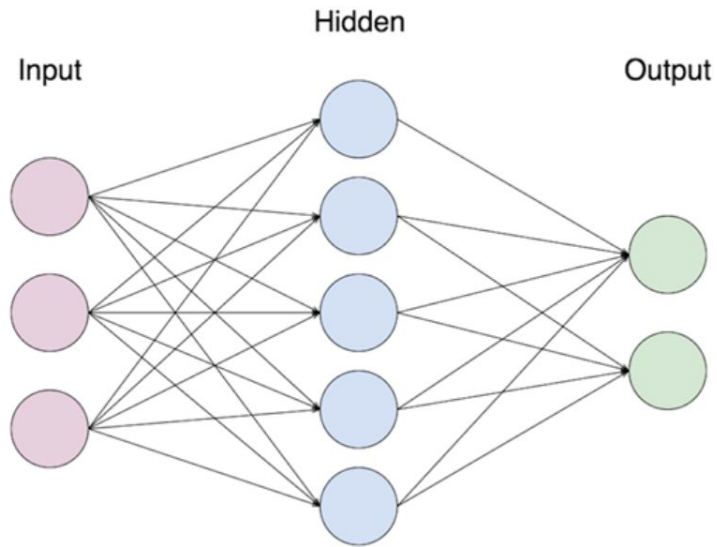at birth   at 6 years   at 14 years
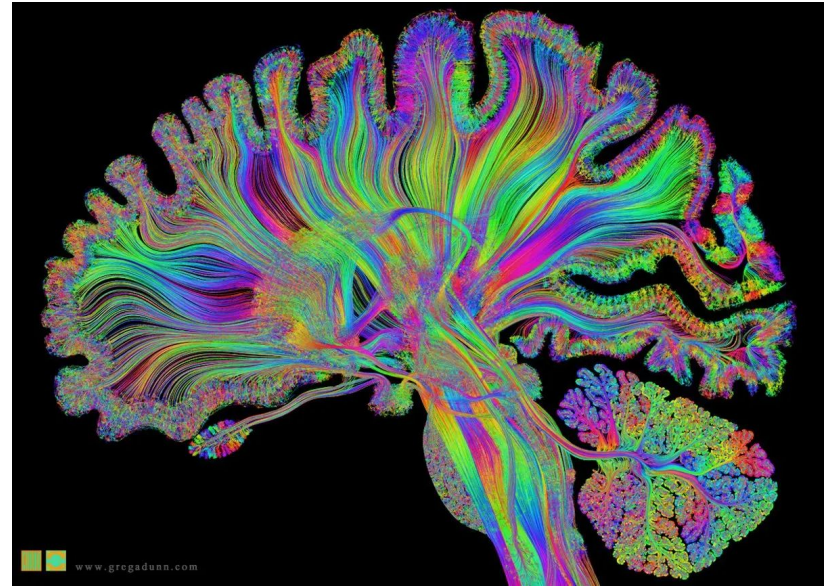
Synaptic growth

Pruning

Greg Dunn

"Step-by-step Guide to Building Your Own Neural
Network From Scratch"

Greg Dunn

Neuroplasticity aligned teaching learning strategies

(which do you already use?)

- Retrieval practice

- Metacognition and Visible Thinking Routines

- Using teacher feedback to improve as a learner

- Spaced and interleaved practice

- Elaboration and concept mapping
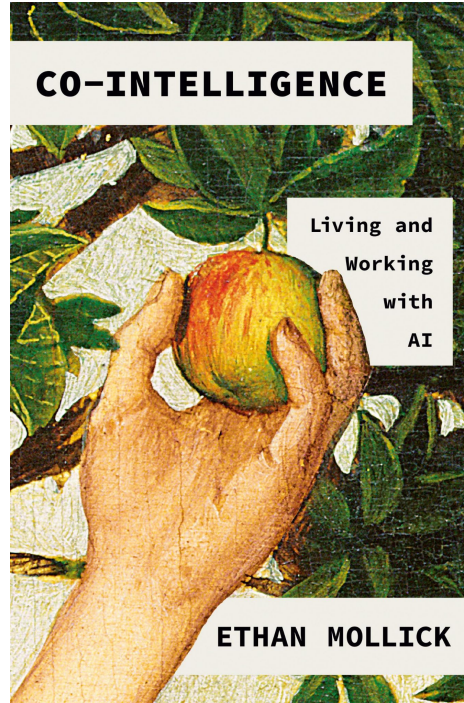
- Academic and social belonging

Memory is the residue of thought

Prof. Dan Willingham, UVA

Learning happens when you think hard

Prof. Rob Coe, Durham University (UK)

Where in the use of AI are students thinking harder than the technology?

CO-INTELLIGENCE

Living and Working with AI

ETHAN MOLLICK

Brave New Words

How AI Will Revolutionize Education (and Why That's a Good Thing) ☼

Salman Khan
Founder of Khan Academy

"A timely master class for anyone interested in the future of learning in the AI era." —Bill Gates

MIT Technology Review

Shroom speak
Monitoring moods in the classroom
What we learned from learning to code

AI is coming for the classroom.

Meet the teachers who believe it could improve education.

GPT

Using AI to Implement Effective Teaching
Strategies in Classrooms: Five Strategies,
Including Prompts

Dr. Ethan Mollick   Dr. Lilach Mollick

Wharton School of the University of Pennsylvania & Wharton Interactive

March 16, 2023

Abstract: This paper provides guidance for using AI to quickly and easily implement evidence-based teaching strategies that instructors can integrate into their teaching. We discuss five teaching strategies that have proven value but are hard to implement in practice due to time and effort constraints. We show how AI can help instructors create material that supports these strategies and improve student learning. The strategies include providing multiple examples and explanations; uncovering and addressing student misconceptions; frequent low-stakes testing; and distributed practice. The paper provides guidelines for how AI can support each strategy, and discusses both the promises and perils of this approach, arguing that AI may act as a "force multiplier" for instructors if implemented cautiously and thoughtfully in service of evidence-based teaching practices.

Large Language Models (LLMs) like ChatGPT are already being adopted in classrooms in ways that can both help and hurt learning. Instructors can use it to teach new kinds of lessons, reduce workloads, and help with research and lesson planning (Mollick & Mollick, 2022; Walton Family Foundation, 2023). Students are using it to assist them in learning, but also to cheat and large category of classroom use that has mostly been use — extending the ability of teachers to impleme

unesco
International Institute for Higher Education in Latin America and the Caribbean

25 YEARS
Promoting Higher Education for All

ChatGPT

and Artificial Intelligence in higher education

Quick start guide

Portrait created by DALL.E 2, an AI system that can create realistic images and art in response to a text description. The AI was asked to produce an impressionist portrait of how artificial intelligence would look going to university. Concept by UNESCO IESALC.

Education 2030

Artificial Intelligence (AI) in Independent Schools

VERSION 1.1

NAIS
National Association of Independent Schools

ATLIS
Association of Technology Leaders in Independent Schools

OFFICE OF Educational Technology

Artificial Intelligence and the Future of Teaching and Learning

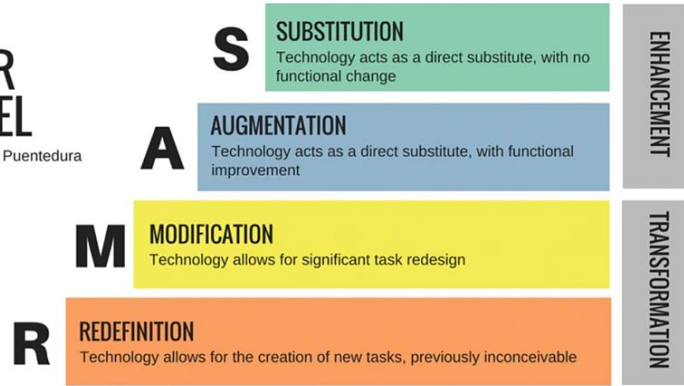Insights and Recommendations

May 2023

OECD Education Working Papers No. 218

Trustworthy artificial intelligence (AI) in education: Promises and challenges
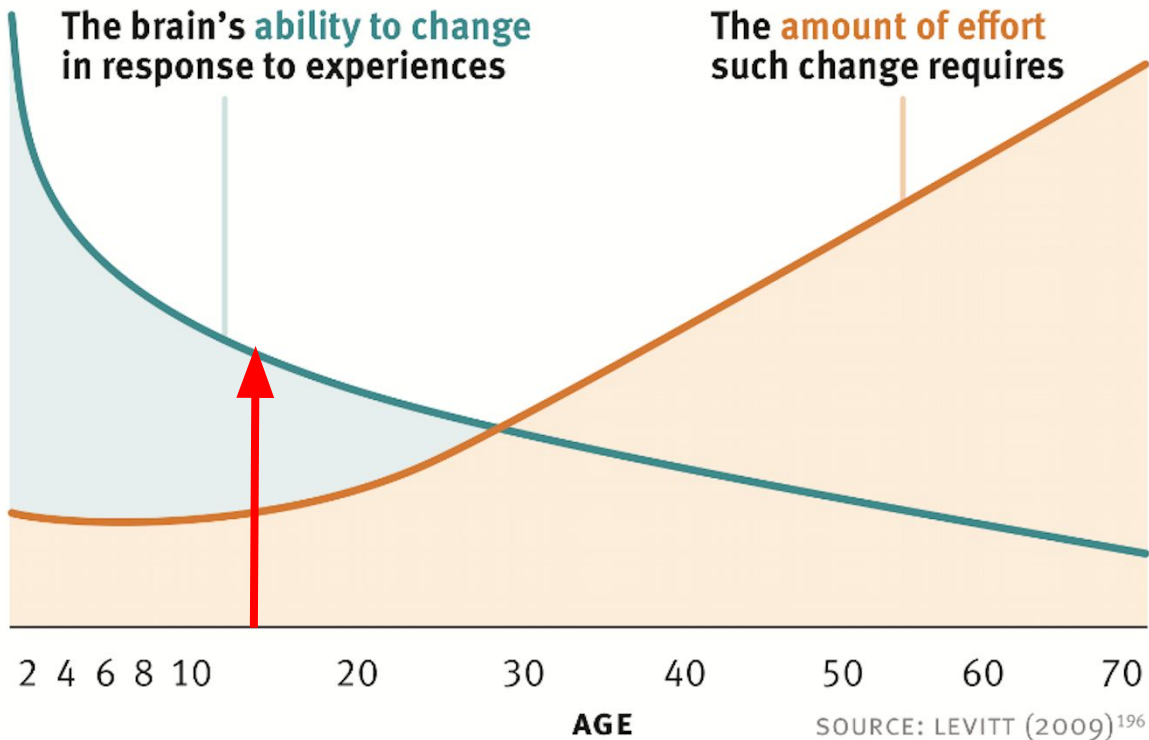
Stéphan Vincent-Lancrin, Reyer van der Vlies

AI?

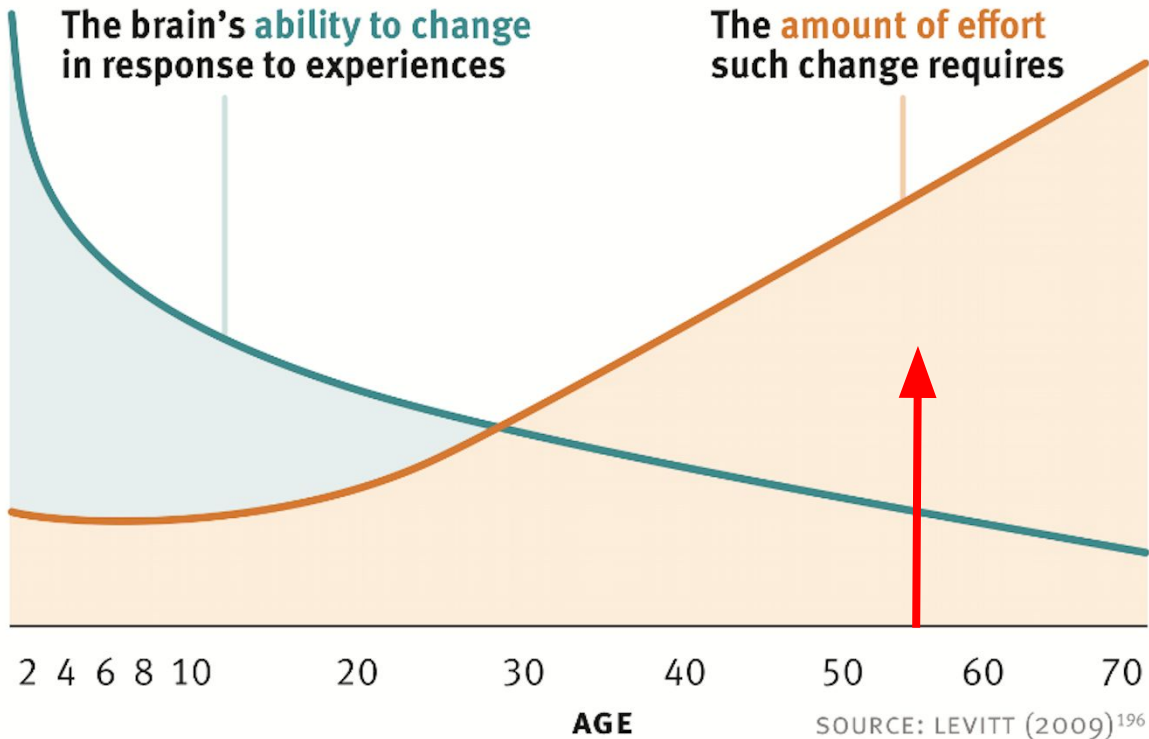THE SAMR MODEL
Dr. Ruben R. Puentedura

S **SUBSTITUTION**
Technology acts as a direct substitute, with no functional change

A **AUGMENTATION**
Technology acts as a direct substitute, with functional improvement

ENHANCEMENT

M **MODIFICATION**
Technology allows for significant task redesign

R **REDEFINITION**
Technology allows for the creation of new tasks, previously inconceivable

TRANSFORMATION

By Lefflerd - Own work, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=47961924

"The real value of AI comes not from having it emulate old ways of solving problems, but, instead, by helping us unlock new capabilities."
(Ethan Mollick)

The brain's **ability to change** in response to experiences

The **amount of effort** such change requires

AGE

SOURCE: LEVITT (2009)[196]

As shown by this conceptual graph, drawn from multiple studies on humans and animals, the brain's plasticity is strongest in the first few years after birth. Thus, it is easier and less costly to form strong brain circuits during the early years than it is to intervene or "fix" them later.

How might this graph inform how you think about learning for your child or children?

Harvard Center on the Developing Child

The brain's **ability to change** in response to experiences

The **amount of effort** such change requires

AGE

2 4 6 8 10   20   30   40   50   60   70

SOURCE: LEVITT (2009)[196]

As shown by this conceptual graph, drawn from multiple studies on humans and animals, the brain's plasticity is strongest in the first few years after birth. Thus, it is easier and less costly to form strong brain circuits during the early years than it is to intervene or "fix" them later.

How might this graph inform how you think about the adult learner and professional development in your school?

Harvard Center on the Developing Child

Currently
Struggling
Student

Currently
Just Fine
Student

Currently
an Academic
Star

All students and employees can learn

All students and employees want to learn

Evidence-informed practices can help everyone meet their full potential

Currently Struggling Student

Currently Just Fine Student

Currently an Academic Star

MBE, AI and Learner Variability

Suggest three different pathways for a novice, emergent, and advanced student to meet the following learning progression for a high school history class: . create interpretations of a historical period, person, or event from multiple perspectives, identities and voices.

To meet the learning progression of "create interpretations of a historical period, person, or event from multiple perspectives, identities, and voices," students can progress through novice, emergent, and advanced levels as follows:

Novice Level:

1. **Research and Presentation**: Novice students can begin by selecting a specific historical event or figure. They should conduct research using readily available secondary sources (textbooks, websites, encyclopedias) to gather basic facts and information about the event or person.
2. **Simple Narrative**: Create a basic narrative or summary of the event or person's life, focusing on the most common viewpoints and perspectives that are widely accepted. The novice student's interpretation should aim for clarity and understanding rather than depth and complexity.
3. **Class Presentation**: Present their findings to the class in a straightforward manner, summarizing the key points of the event or individual's life.

Emergent Level:

1. **Diverse Source Analysis**: Emergent students should progress to analyzing a broader range of sources, including primary sources, memoirs, and accounts from different perspectives. They should identify conflicting viewpoints and perspectives on the chosen historical topic.
2. **Compare and Contrast**: Develop the ability to compare and contrast different perspectives on the same event or individual. For instance, if studying the American Revolution, they should compare British, American, and Native American perspectives on the conflict.
3. **Reflective Essay**: Write a reflective essay that presents a balanced interpretation of the historical topic, acknowledging various perspectives and voices. This essay should synthesize the viewpoints they've uncovered and provide a nuanced understanding of the event or person.

Advanced Level:

1. **In-Depth Research**: Advanced students should engage in in-depth research, seeking out less commonly explored perspectives, identities, and voices. This may involve delving into academic journals, conducting oral history interviews, or analyzing underrepresented groups' experiences.
2. **Complex Analysis**: Develop the ability to critically analyze the biases and motivations behind various perspectives. This involves a deep understanding of the socio-political and cultural context of the time.
3. **Historiographical Essay**: Write a historiographical essay that not only presents a comprehensive and nuanced interpretation of the historical topic but also evaluates the evolution of historical interpretations over time. They should address how different historians and scholars have analyzed the topic and the impact of evolving historiography.

The above pathways offer a structured progression from novice to advanced levels, helping students develop their ability to create interpretations of historical periods, figures, or events from multiple perspectives, identities, and voices. These pathways encourage critical thinking and historical analysis skills as students advance in their understanding of historical complexity.

What questions do you have?

Why should a family or families choose an independent school for their child or children?

Which of the following is the most <u>time consuming</u> in a teacher's job?

A. Providing feedback/grading essays, projects, or tests

B. Designing a class period

C. Creating a summative assessment for a unit or topic

D. Administrative tasks (emails, reports)

Which of the following has the most **potential to improve** the learner?

A. Providing feedback/grading essays, projects, or tests

B. Designing a class period

C. Creating a summative assessment for a unit or topic

D. Administrative tasks (emails, reports)

Does feedback increase student achievement?
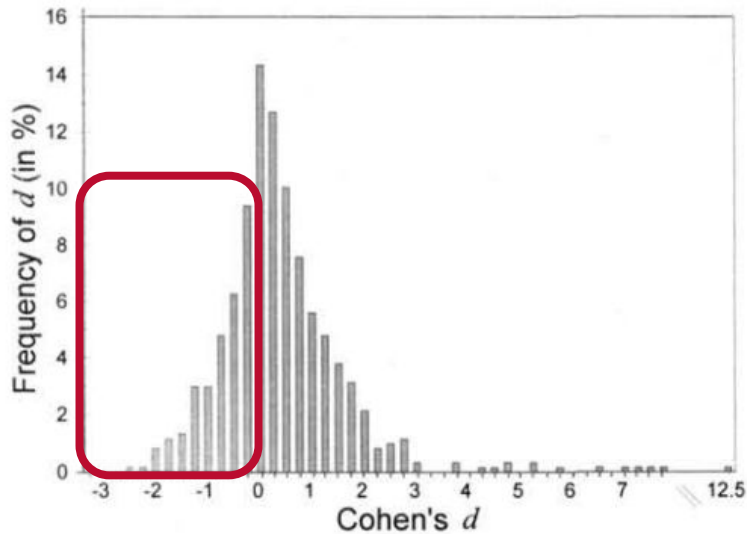
Figure 1. Distribution (histogram) of 607 effects (*d*s) of feedback intervention on performance.

Kluger and DeNisi (1996)
Meta-analysis of 3000 studies on feedback.
131 papers met their criteria; more than 600 studies

On average, feedback increases student achievement BUT...

38% of the effect sizes were negative!
That means feedback *decreased* student achievement

Why might this happen? Post thoughts in chat.

Toolkit findings

Promising

May be worth it

Not worth it

Effect Size (months gain)

10

0

Feedback

Meta-cognitive

Peer tutoring

Homework

Pre-school

1-1 tutoring

Summer schools

ICT

Smaller classes

AfL

Parental involvement

Learning styles

Individualised learning

Sports

After school

Arts

Ability grouping

Performance pay

Teaching assistants

£0

£1000

Cost per pupil
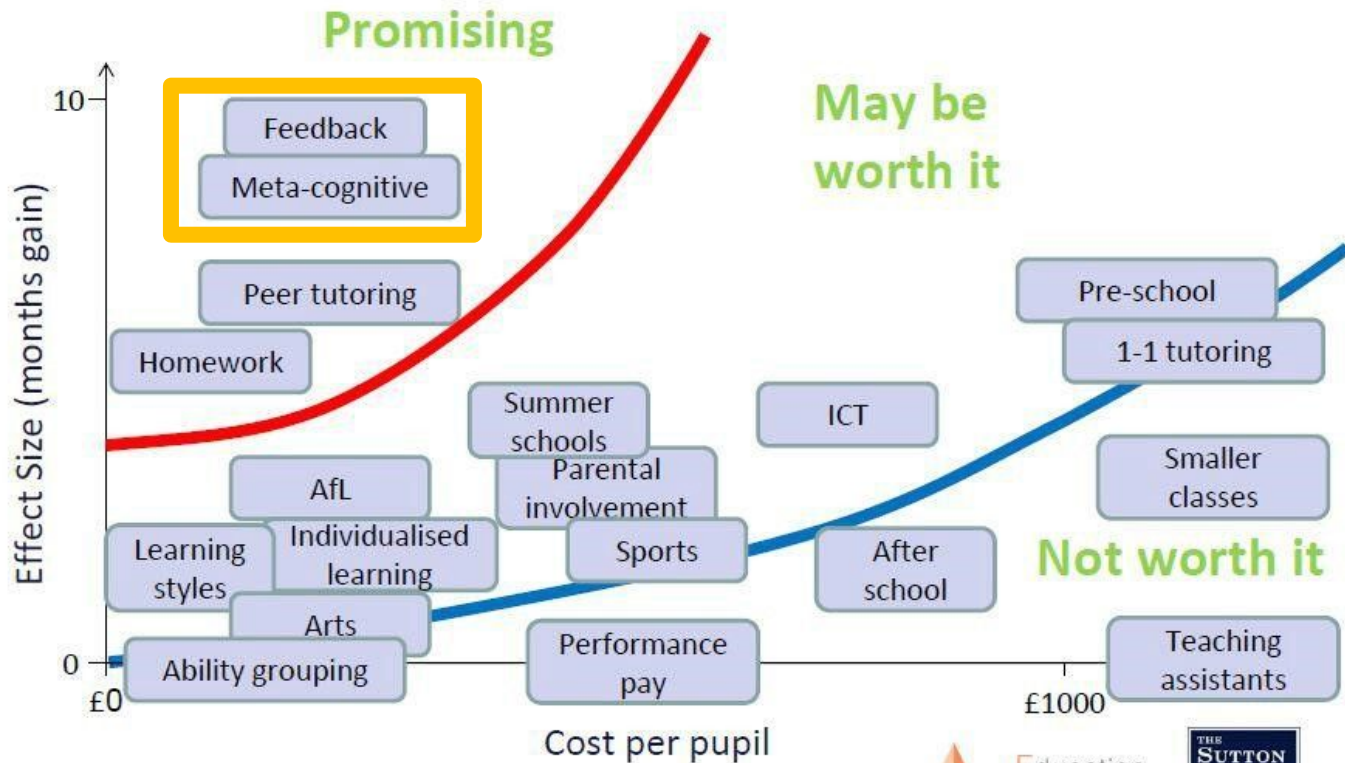
Education Endowment Foundation

THE SUTTON TRUST

Giving students feedback without a grade has more impact than when a grade is included.

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TRUE

Giving students feedback without a grade has more impact than when a grade is included.
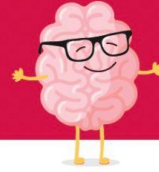
Research studies have shown that feedback with no grade has the greatest impact on performance and attitudes toward learning. They also show that feedback plus a grade has a similar effect to giving just a grade – so the feedback is essentially wasted.

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Citation: J

35

The purpose of feedback should be to IMPROVE THE STUDENT, not the piece of work

Dylan Wiliam

Feedback should be more work for the student than for the teacher

Dylan Wiliam

Feedback, no matter how well designed, that is not acted upon by the student is a waste of time.

Dylan Wiliam

How might you as the student receive this feedback?

Would you be motivated or demotivated to revise this writing assignment?

What do students need to make feedback useful?

- Emotionally, I take the feedback well
- It's the right amount – not too much
- I can understand the feedback
- I know what my next step is
- I have a chance to use the feedback

Women in Early America: How did the Roles and Rights of Women Change Throughout?

The English Language is complex, in fact there are over a 1 million words known and rising daily. Even so, the words women, female or woman, are all derived from men, male, or man vocabulary. Women are thought as less than men, the incomplete sex, so its not a surprise that throughout early American History men had all the power, roles and rights. 143 years ago women were given the right to own property. The first college and education opportunities for women were created 141 years ago. And obviously very fast and swiftly, women were given the right to vote 103 years ago. But that is, according to the law, which very commonly was defied and ignored when related to the rights of minorities. Men would continue throughout history to believe that Women's main purpose was motherhood and to maintain for their husbands. In truth, from the start of Colonial America, to the aftermath of the Revolutionary period, women have held important roles in America's evolution. Anne Hutchinson, Abigail Adams, Deborah Sampson are just some of the examples of Women that changed the course of history for America while hidden in the shadows by Men with power. Researching Women's rights and roles throughout early American history, information can be limited and misleading, with gaps in credit due to Women and their roles for important events. Women's roles throughout the early evolution of America were essential to America's survival.

Roughly 245 years ago America was born and wouldn't have survived until today without Women. No, I'm not simply talking about women giving birth to children and that's why we exist, although that's what commonly was perceived as Women's main role throughout history. In truth, Women were essential to the survival of America all the way from the first ship arriving in Colonial America.

United States/European History to 1860
Research Paper First Draft Grade Sheet (2023)

Student's Name: _Noah O._

"There is never a moment when a historical question is settled, about which over time there is not some debate. The process of revising and reinterpreting history is what historical scholarship is always about."

-Historian Alan Brinkley, Columbia University

"Accuracy is a historian's duty, not a virtue."

-Housman qtd. in Carr

"The primary duty of the historian is to stay within the evidence."

-Historian Barbara Tuchman

Model:

_____ Does your first draft look like the model available at:
https://owl.purdue.edu/owl/research_and_citation/chicago_manual_17th_edition/cmos_formatting_and_style_guide/cmos_nb_sample_paper.html

Scholarly Historical Narrative Requirements:

_____ Do you have an effective ("compelling") introduction, that introducers the paper and historical context with dates (Limited to 250-350 words)?
yes Do you have a clear thesis that answers your historical question at the end of the first paragraph?
_____ Do you have a paper that is organized logically (often chronologically)?
_____ Do you have strong topic (TS) sentences for each paragraph?
_X_ Do you have a good balance between the student historian's interpretation and evidence and facts you select?
_X_ Do you have at least one primary (PS) or secondary (SS) scholarly source on each page of your paper? _Need more_
_X_ Do you use dates to set the historical context?
_yo_ Do you have a convergence of evidence, a "balanced" use of primary and secondary sources from different sources/perspectives?
_X_ Do you recognize the transnational history of your topic (where relevant) by including the geography of your topic?
_X_ Do you [Frame] quotes (making sure they are introduced by name or source and explained
_____ Do you have a conclusion that effectively sums up the major points of the paper and reaffirms what the writer was trying to prove (leaves the reader without any doubt and possibly wanting more)?

Ethical and Technical Requirements See Purdue Online Writing Lab for the following formatting requirements (https://owl.english.purdue.edu/owl/section/2/12/):

_____ Do you have a historically accurate and compelling title (with a subtitle) that makes the reader want to read your paper?
_____ Do you have a paper that meets the 8-10-page requirement?
_X_ Do you have properly formatted page numbers at the top right of the paper (Whitman 3)?

_____ Do you present all titles for books, journals, and magazines in *Italics*?

ARE THESE MY WORDS AND IDEAS?
_X_ Do you have properly formatted Chicago Style citations (footnotes) for direct quotes, paraphrasing of another's ideas, or researched data? _Watch spacing_
Looks great _X_ Do you have a properly formatted Bibliography (alphabetical order, indent second line of more)?

Mechanical Requirements:
_____ Did you check for spelling errors (SP)?
_X_ Did you check for Awkward or unclear sentences (AWK)?
_____ Did you check for Run-On Sentences (RO)?
_X_ Did you check for CAPITALIZATION of (Names, Proper Nouns, Historical Time Periods and Events etc.)
_____ Did you check for sentence fragments or incomplete sentences (FRAG)?
_____ Did you check for informal contractions (cannot vs. can't)?
_X_ Did you check for naked quotes (NQ) that are not framed (introduced and explained)?
_____ Did you check for the first person "I" (also avoid you, me etc.)?
_____ Did you check for using It's ≠ Possession?
_____ Did you check for the unclear "This" and other ambiguous pronouns)?
_____ Did you check for ending sentences with prepositions?
_____ Did you avoid US≠U.S.?
_____ Did you check for informal/conversational language versus academic language?
_____ Did you check for places to begin a new paragraph ¶?
_X_ Did you check for Word Choice (WC) or Wrong Word (WW)?
_X_ Did you check for writing in the past tense? _(PT)_

Submission Requirements:
_____ Do you include this completed checklist with your paper's first draft?
_____ Do you have an electronic copy of your paper in your "Scholarly Research Paper" folder in Google Drive?

Noah
A passionate start that is wanting for more scholarly
research and primary and secondary source evidence.

1. Focus on clarifying areas of unclear prose or grammar.

2. Add more PS quotes + SS quotes to support some of your current conclusions.

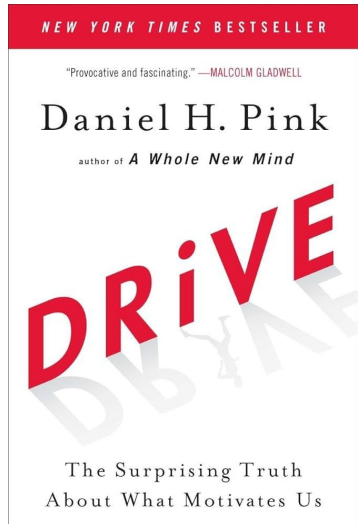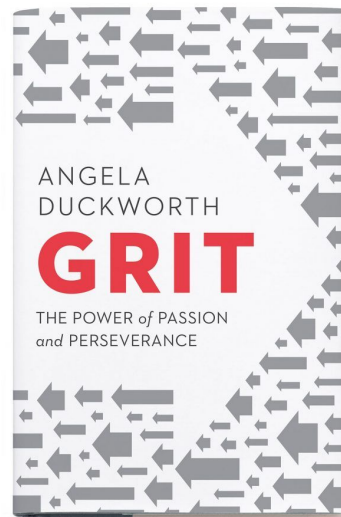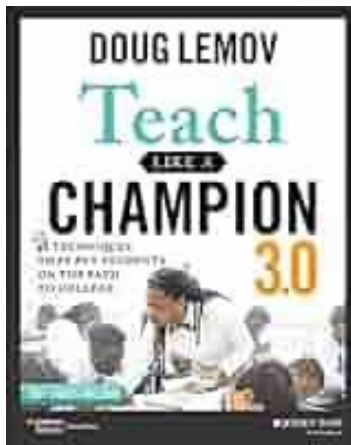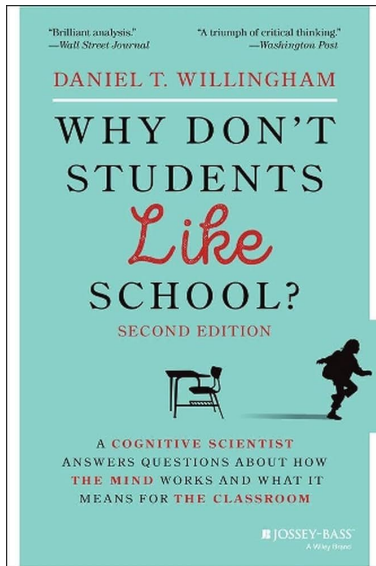_A solid effort can elevate this paper a great deal!_

10 to 25

The Science of
Motivating Young People

A Groundbreaking Approach
to Leading the Next Generation—
And Making Your Own Life Easier

DAVID YEAGER, PhD

"Wise
Feedback"

"Brilliant analysis."
—Wall Street Journal

"A triumph of critical thinking."
—Washington Post

DANIEL T. WILLINGHAM

**WHY DON'T
STUDENTS
Like
SCHOOL?**

SECOND EDITION

A COGNITIVE SCIENTIST
ANSWERS QUESTIONS ABOUT HOW
THE MIND WORKS AND WHAT IT
MEANS FOR THE CLASSROOM

JOSSEY-BASS
A Wiley Imprint

ANGELA
DUCKWORTH

GRIT

THE POWER of PASSION
and PERSEVERANCE

NEW YORK TIMES BESTSELLER

"Provocative and fascinating." —MALCOLM GLADWELL

Daniel H. Pink

author of A Whole New Mind

DRiVE

The Surprising Truth
About What Motivates Us

DOUG LEMOV

Teach
LIKE A
**CHAMPION
3.0**

**Optimizing the Power of
Choice: Supporting Student
Autonomy to Foster Motivation
and Engagement in Learning**

Miriam Evans[1] and Alyssa R. Boucher[1]

ABSTRACT— Choice plays a critical role in promoting students' intrinsic motivation and deep engagement in learning. Across a range of academic outcomes and student populations, positive impacts have been seen when student autonomy is promoted through meaningful and personally relevant choice. This article presents a theoretical perspective on the motivational role of choice in learning, based on self-determination theory. Theoretical principles and current research on student motivation and engagement are described. Conditions under which choice promotes students' intrinsic motivation are then presented.

THE CHALLENGE OF MOTIVATING STUDENTS

The seemingly unmotivated student poses a particularly frustrating challenge for teachers, as every teacher knows how incredibly fun and engaging learning can be. The joy of learning is demonstrated to us by children beginning at the earliest years. From the toddler with a blossoming vocabulary who wants to know the name of every object in sight, to the inquisitive preschooler's neverending questions, young children's natural curiosity and motivation to learn is abundantly evident. Yet, for some children, classrooms appear to act as a suppressant for their once insatiable appetite for learning. For many students, motivation appears to decrease steadily as they progress through school (Anderman & Maehr, 1994; Harter, 1981). An important

yet perhaps overlooked factor in students' decreasing motivation may be school environments that provide students progressively fewer opportunities for choice and decision making (Deci & Ryan, 2002; Otis, Grouzet, & Pelletier, 2005).

Most teachers believe that choice promotes motivation and learning (Flowerday & Schraw, 2000), a belief substantiated by much of the research on student motivation (e.g., Eshel & Kohavi, 2003; Hardre & Reeve, 2003). The positive impact of providing students with well-designed, meaningful choice has been demonstrated across academic domains and an array of student populations (e.g., Assor, Kaplan, & Roth, 2002; Martin, Mithaug, Peterson, Van Dyke, & Cash, 2003). And, yet, choice often plays a minimal role in students' learning experiences (Deci & Ryan, 2002; Otis et al., 2005). When choice is offered to students, it is typically in the areas of project topics, assessment, social arrangements, (e.g., seating and group membership) and classroom procedures (Flowerday & Schraw, 2000). However, many teachers feel threatened by the loss of control inherent in student choice (Flowerday & Schraw, 2000), or fear that offering students choice will reduce their productivity or lead to off-task behavior (Boggiano, Flink, Shields, Seelbach, & Barrett, 1993). When teachers do provide students with choice, they often do so discriminately. Research shows that low-income and racial minority students, low-achieving students, and students with disabilities are least likely to be provided with opportunities for choice (Duke, 2000; Flowerday & Schraw, 2000; Wehby, Symons, & Shores, 1995). Unsure of how to most effectively incorporate choice in the classroom, some teachers may forego choice altogether. The present article provides a theoretical rationale for the importance of choice for student motivation, and describes the conditions under which choice is most motivating.

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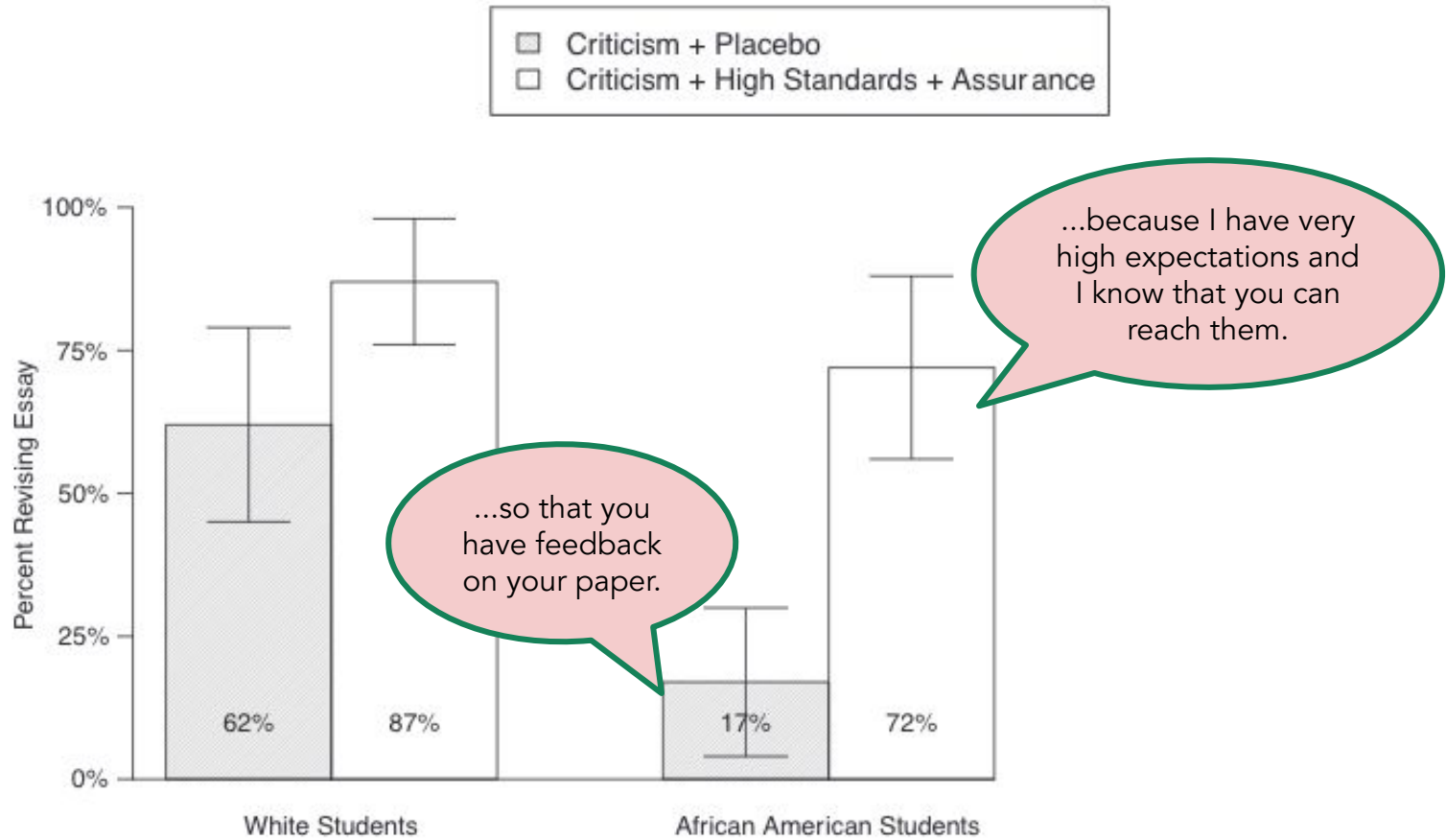
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David Yaeger, "Breaking the Cycle of Mistrust: Wise Interventions to Provide Critical Feedback Across the Racial Divide." *Journal of Experimental Psychology*

Yeager et al. (2014) American Psychological Association

Theories of Motivation

- Intrinsic and Extrinsic motivation

- Mindsets for learning
  growth, belonging, and purpose and relevance

- Self Determination Theory, Deci and Ryan, 1985
          autonomy, relatedness, and competence

- Expectancy, Value, Cost Theory, Barron and Hulleman, 2015

Motivate Lab

Chris Hulleman

DIRECTOR, PROFESSOR

Chris S. Hulleman is a professor of education and public policy at the University of Virginia. He is also the founder and director of the Motivate Lab, which collaborates with educational practitioners to help ameliorate systemic racism and inequality. His team develops and tests changes in educational practice that support the motivation of students from historically marginalized backgrounds in education. He received his BA from Central College (Iowa) in 1993 and his PhD in social and personality psychology from the University of Wisconsin–Madison in 2007. Prior to his career in psychology, he spent six years as a teacher, coach, and social worker. Chris is a second generation educator whose grandparents were tenant farmers in Iowa and Nebraska. He tries to emulate their hard work and persistence in the pursuit of social justice. One of his favorite childhood memories is eating his paternal grandmother's homemade fruit pies with plenty of ice cream.

CV | RESEARCHGATE PROFILE | PUBLICATIONS

chris.hulleman@virginia.edu

RETURN TO OUR TEAM

https://motivatelab.org/chris-hulleman

Is There a Place for AI in Feedback?

What are three specific suggestions to improve a high school history student's paper responding to the question: "To what extent was the Renaissance a period of 'rebirth'"?

The Renaissance, a time of rebirth

Rebirth is a description that can fit many periods, but none are as famous as the Renaissance. Many know the period from the 14th to the 17th century that swept across Europe as a time of new art and culture. Many works, like "The School of Athens" by Raphael, show this rebirth of art about classicalism, one of the many isms that penetrated the era. The Catholic Church had reigned supreme in Europe for many years, dominating through war and ideology. In the "Dark Ages" before the Renaissance, the church had maintained many ideologies and forced them on the European population. All to stay in control and maintain its regional power. One of these ideologies was that the Earth was the center of the galaxy and universe. When Galileo disproved this theory, the church put him in jail. A document from the Papal Inquisition of 1633 said, "Gallileo, by reason of the matters adduced in trial and by your confessed as above, have rendered yourself in the judgment of this Holy Office, vehemently suspected of heresy, namely, of having believed and held the doctrine– which is false and contrary to the sacred scripture–that the sun is the center of the world."[1] However, all the misinformation spread by the Catholic Church and its power was broken by the Renaissance. The Renaissance was a significant time of rebirth because of the social and cultural freedom it brought to Europe.

_____
[1] The Papal Inquisition of 1633

1. **Thesis Statement Clarification:**
   - The thesis statement should be more explicit and prominently placed, typically at the end of the introductory paragraph. The student should make it clear whether they believe the Renaissance was indeed a period of rebirth or to what extent it was. The thesis should encapsulate the main argument and provide a roadmap for the reader to understand the paper's focus.

   For example, they could revise the thesis statement to something like:
   "The Renaissance, a period of significant rebirth and upheaval, transformed Europe in various ways, from challenging the dominance of the Catholic Church to flourishing in arts and culture."

2. **Use of Historical Evidence:**
   - The paper should incorporate more specific examples and historical evidence to support the argument. While the student mentions Gutenberg and Martin Luther, these figures and their impact need more detailed explanation and context. Additionally, the paper could benefit from including other key figures, artworks, or inventions from the Renaissance period that illustrate the rebirth of knowledge and creativity.

   For instance, they can expand on the significance of Gutenberg's printing press by explaining its impact on the dissemination of knowledge and ideas, not just as a tool for reversing engineering.

3. **Counterarguments and Rebuttals:**
   - To provide a more well-rounded and persuasive argument, the student should address potential counterarguments. In this case, they could consider opposing views on whether the Renaissance was truly a period of rebirth. After presenting a counterargument, they should provide a rebuttal with strong evidence to support their position.

   For instance, when discussing the fall of the Catholic Church's power, the student might briefly acknowledge that some historians argue the fall was inevitable, then present evidence that highlights the Renaissance's role in accelerating it.

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THINK DIFFERENTLY AND DEEPLY
VOLUME 5

The Transformational Classroom:
How Research in Educational Neuroscience
Enhances Teaching and Learning

https://www.thectti.org/think-differently-deeply/

Giving Feedback that Works for Students and Now for Teachers

ANDREW SEIDMAN

Dr. Ian Kelleher, coauthor of "Neuroteach: Brain Science and the Future of Education,"[1] likes to employ a particular metaphor to describe the role teachers play in translating research into the way the brain learns into their own classroom practice. Kelleher invites teachers to imagine that they are a bridge, connecting the wealth of basic research on the one side of the canyon to their applied practices in their schools on the other. With the commitment of numerous schools around the country to train their faculty in Mind, Brain, and Education (MBE) strategies for teaching and learning, we are seeing more bridges being built each day. With the launch of Neuroteach Global[2] in 2020, educators and administrators have an even greater opportunity to close the gap and apply the best MBE practices to their classes.

Neuroteach Global's online platform invites educators and administrators to experience the impact that research-informed strategies can have on their students' learning through short, memorable, and experience-based lessons, known as missions. The platform was designed by those well-versed in MBE strategies and, as a result, it educates educators using these very same methods. When teachers submit their responses to a mission, a live grader, with classroom teaching experience, reviews their responses and provides feedback. Researchers have delved deeply into the role that feedback plays in memory formation, the development of a growth mindset, and overall improvement of

performance. Being a teacher of English and Psychology, as well as serving as a grader for Neuroteach Global, has given me some important insights into the way I give feedback to both my students and to my fellow educators, insights informed by the research.

Feedback Should Be Actionable

Whether it's given to students or educators, the most important thing about giving feedback is what those who receive it do with it. If it is specific, targeted, and helps you to get more of what you want from your students over the long-term, it's good feedback.[3] Early in my teaching career, I used to write comments on students' papers like "Good job!" or "This doesn't seem right". However, in retrospect, I should have realized that such feedback obviously raises more questions for the students. Moreover, such feedback doesn't really point the student in a direction to change their long-term behavior. Strong feedback invites others to take some kind of specific action. So, for example: "I like how you used the model thesis statement to craft yours! You should keep reviewing the models for future assignments" or "This paragraph jumps from one idea to the next; for our next writing assignment, consider using the list of transition words I provided".

The same is true with the feedback we provide on Neuroteach Global. For example, an early mission asks teachers to rewrite their teaching philosophy based on their knowledge of MBE. Some teachers will

What questions do you have?

MBE
Bite

Research-Informed
Daily Schedule and
Class Period
Design

(for deeper and healthier learning)

MBE Research-Informed Daily Schedule Design

Upper School Schedule (2024-2025)

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
8-8:30 Office Hours	8-8:30 Office Hours		8-8:30 Faculty Meeting	8-8:30 Office Hours
8:40 Morning Meeting	8:40 Morning Meeting	8:40 Morning Meeting	8:40 Morning Meeting	8:40 Morning Meeting
A 9-10	**E** 9-10	**Assembly** 8:55-9:50	**F** 9-10	**E** 9-10
10 min. transition	10 min. transition	10 min. transition	10 min. transition	10 min. transition
B 10:10-11:10	**F** 10:10-11:10	**B** 10-11	Chapel 10:10-10:45	**F** 10:10-11:10
10 min. transition	20 min. break		5 min. transition	
9&10 / 11&12 **C** 11:20-11:55 / **C** 11:20-12:25 Lunch 11:55-12:25 / **C** 12:30-1 / Lunch 12:25-1	**D** 11:30-12:30			
10 min. transition	5 min. transition			
	9&10 / 11&12 Lunch 12:35-1:05 / Advisory 1:05-1:35 / Advisory 12:35-1:05 / Lunch 1:05-1:35			
	10 min. transition			
D 1:10-2:10	**A** 1:45-2:45			
5 min. transition	5 min. transition			
G 2:15-3:15	**Activity Period** 2:50-3:15			

Middle School Schedule (2024-2025)

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
8-8:30 Office Hours	8-8:30 MS Faculty Meeting		8-8:30 Office Hours	8-8:30 Office Hours
8:40 Morning Meeting	8:40 Morning Meeting	8:40 Morning Meeting	8:40 Morning Meeting	8:40 Morning Meeting
A 9-10	**E** 9-10	**Assembly** 8:55-9:50	**F** 9-10	**E** 9-10
10 min. transition	10 min. transition	10 min. transition	10 min. transition	10 min. transition
B 10:10-11:10	**F** 10:10-11:10	**B** 10-11	Chapel 10:10-10:45	**F** 10:10-11:10
Recess - 11:10-11:25	Recess - 11:10-11:30	Recess - 11:10-11:20	5 min. transition	Recess - 11:10-11:30
Lunch - 11:25-11:55	Lunch - 11:30-12:00	Lunch - 11:20-11:50	**A** 10:50-11:50	Lunch - 11:30-12:00
5 min. transition	5 min. transition	5 min. transition	5 min. transition	5 min. transition
C 12-1	**Advisory** 12:05-12:35	**D** 11:55-12:55	Lunch - 11:55-12:25	**Advisory** 12:05-12:35
10 min. transition	5 min. transition	10 min. transition	Recess - 12:25-12:45	5 min. transition
D 1:10-2:10	**C** 12:40-1:40	**E** 1:05-2:05	**C** 12:50-1:50	**C** 12:40-1:40
5 min. transition	5 min. transition	5 min. transition	5 min. transition	5 min. transition
Study Hall 2:15-2:45	**A** 1:45-2:45	**Study Hall** 2:10-2:40	**Clubs** 1:55-2:40	**B** 1:45-2:45
5 min. transition	5 min. transition	5 min. transition	5 min. transition	5 min. transition
MS Sports 2:50-3:40	**MS Sports** 2:50-3:40	**MS Sports** 2:45-3:40	**MS Sports** 2:45-3:40	**MS Sports** 2:50-3:40

VOICES | PRACTICE AND IMPLEMENTATION STRATEGIES

Using Neuroscience to Launch a Research-Informed School Schedule

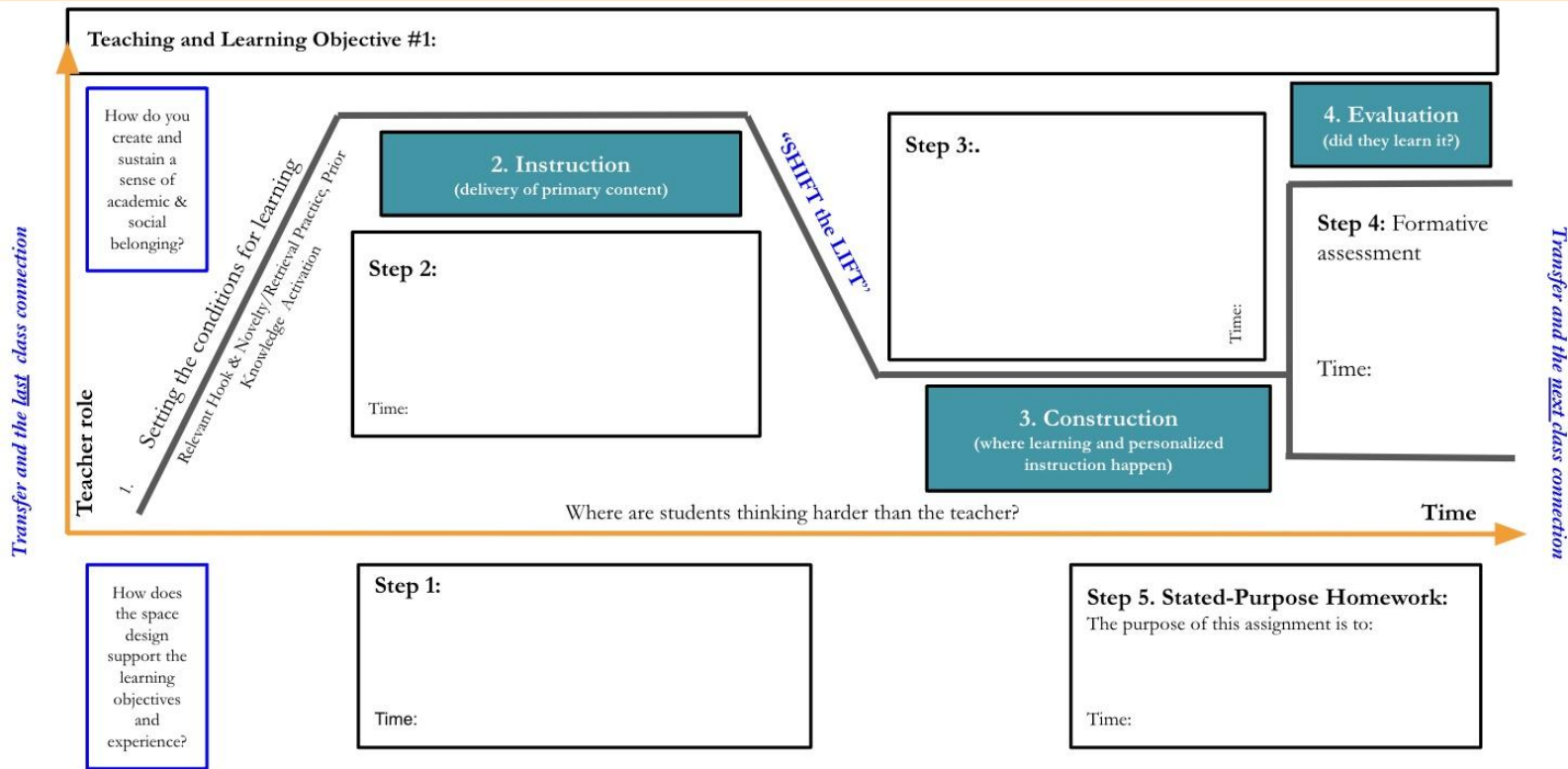By Glenn Whitman · Feb 20, 2019

OPINION | PK-12 SCHOOL MODELS

Don't Return to Your School's Pre-Pandemic Schedule. Improve It Through Brain Science.

By Glenn Whitman and Ian Kelleher · Jan 25, 2022

MBE Research-Informed
Class Period Design

WAIT: The average wait time teachers give is about 0.7 seconds – about 1 heart beat

Teaching and Learning Objective #1:

Transfer and the last class connection

How do you create and sustain a sense of academic & social belonging?

Teacher role

1. Setting the conditions for learning — Relevant Hook & Novelty/Retrieval Practice, Prior Knowledge Activation

2. Instruction
(delivery of primary content)

Step 2:

Time:

"SHIFT the LIFT"

Step 3:.

Time:

3. Construction
(where learning and personalized instruction happen)

4. Evaluation
(did they learn it?)

Step 4: Formative assessment

Time:

Transfer and the next class connection

Where are students thinking harder than the teacher?

Time

How does the space design support the learning objectives and experience?

Step 1:

Time:

Step 5. Stated-Purpose Homework:
The purpose of this assignment is to:

Time:

WORC the Room

THE CENTER for TRANSFORMATIVE TEACHING & LEARNING

ChatGPT Prompt:

Design an outline for a 60-minute middle school history class period with the learning objective:"**Students can explain the term geographic sectionalism within the New England, Middle, and Southern colonies**."

The class period must create a sense of belonging for all students. It must start with retrieval practice, have some direct instruction with checks for understanding, student collaborative time with peers, and conclude with a formative assessment to determine if students met the learning goal for this one class period.

0-5 Minutes: Welcome & Community Check-In
- ● Purpose: Establish a sense of belonging and set the tone for a collaborative learning environment.
- ● Activity: As students enter, greet them warmly and ask a quick question on the board, such as
  - ○ "What's one unique feature you think would make an area distinct or special?"
- ● Instructions: Invite students to quickly share their responses as a class warm-up.

5-10 Minutes: Retrieval Practice
- ● Purpose: Activate prior knowledge on the colonies and geographic differences.
- ● Activity: A quick quiz or short-answer exercise that covers:
  - ○ Basic geography of the 13 colonies.
  - ○ Climate and resource differences in New England, Middle, and Southern regions.
- ● Instructions: Students answer individually, then discuss answers in pairs. The teacher highlights key points that will be expanded on during direct instruction.

10-25 Minutes: Direct Instruction
- ● Purpose: Provide foundational understanding of geographic sectionalism.
- ● Activity: Teacher-led presentation using a map and visuals to illustrate:
  - ○ Definitions of sectionalism and geographic sectionalism.
  - ○ Characteristics of New England (e.g., rocky soil, small farms, trade), Middle (e.g., fertile soil, mixed agriculture, and industry), and Southern colonies (e.g., large plantations, cash crops).
  - ○ How these geographic differences influenced cultural and economic development.
- ● Instructions**: Encourage students to take notes using a guided note template with sections for each region.

25-40 Minutes: Collaborative Activity - Sectional Expert Groups
- ● Purpose: Encourage peer learning and reinforce understanding of sectionalism.
- ● Activity: Break students into three groups, each representing one of the colonial regions.
  - ○ Each group reviews key facts about their assigned region, then discusses how the geography might influence settlers' daily life and economy.
  - ○ Each group prepares a brief explanation to share with the class.
- ● Instructions: Provide students with question prompts (e.g., "How might the geography of your region affect the jobs people have?") and encourage groups to select a spokesperson.

What questions do you have?

How can MBE inform, validate, and transform your instructional design and student learning?

Arts Integration
Attention
Belonging
Constrained Choice
Cognitive Load
Daily Schedule
Disciplinary Literacy
Dual Coding
Emotion and Cognition
Engagement
Executive Functions
Feedback
Formative assessment
Homework
Knowledge Richness & Transfer
Literacy/Science of Reading
Memory

Metacognition
Mindsets for learning
Motivation
Multiple modality instruction
Multitasking
Neuromyths (eliminate!)
Neuroplasticity
Novelty
Play
Project/Problem Based Learning
Self regulation
Sleep
Spaces where learning happens
Stress
Summative assessment
Technology Use
Transfer
Well-being and Joy

Cognitive Science
Psychology
Neuro-science
Education Research
Real Classrooms and Real Schools

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Save the dates of these extraordinary learning events being brought to you by the CTTL!

✓ **SCIENCE OF TEACHING AND SCHOOL LEADERSHIP ACADEMY | JULY 15-18, 2024**

The Academy is the Center for Transformative Teaching & Learning's flagship Mind, Brain, and Education (MBE) conference for pedagogical, leadership, and professional development. The Academy is an opportunity to invest in understanding how the brain learns and how to create learning experiences that help all students of all ages flourish.

✓ **USA FESTIVAL OF EDUCATION | SEPTEMBER 28, 2024**

The Festival of Education, a renowned event created by Wellington College in the UK, is set to take place for a second time in the USA in 2024. Aimed at educators, this Festival provides an unparalleled platform for teachers to learn, grow and connect with other like-minded individuals in the field of education. Learn more at https://educationfestusa.com/.

3 SECRETS TO ELEVATING YOUR TEACHING | OCTOBER 24, 2024

Glenn Whitman, CTTL Director, will share key strategies – based on the science of how the brain learns – that enhance teacher effectiveness and create more opportunities for students to find success. This free learning event is a great way to jump start the school year for new and veteran teachers.

WINTER WEBINAR SERIES | JANUARY 30, FEBRUARY 6, AND FEBRUARY 13, 2025

The Winter Webinar Series is a space we dedicate to sharing our research connecting Mind, Brain, and Education science (MBE) with Belonging (DEB). This year's theme is Belonging and the Brain: Creating Conditions for Student Achievement. Learn more at https://thecttl.org/winter-webinar-series-2025 .

CTTL SPRING MBE WEBINAR | APRIL/MAY 2025

Join members of our research team and guest collaborators to review the fundamentals of MBE or deep dive into a particular topic within the discipline. This is a free learning event.

SCIENCE OF TEACHING AND SCHOOL LEADERSHIP ACADEMY | JULY 14-17, 2025

Gain insights from a curated group of leading researchers, seasoned educators, and thought leaders while engaging with hundreds of fellow teachers and school leaders from diverse educational settings worldwide.

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Email us at info@thecttl.org for support.

SCAN ME

Join us for a Deeper Dive into Belonging

https://www.thecttl.org/winter-webinar-series-2025/

Thank You!

Glenn Whitman

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@gwhitmanCTTL