

A modern classroom or meeting room with several students seated at round tables, working on laptops. A man in a dark sweater and blue pants stands at the front, presenting to a whiteboard. The whiteboard contains technical diagrams, including a circuit diagram with resistors and a lens diagram. The room has blue acoustic panels on the wall and a large video wall displaying a grid of student faces. The text "Hacking the Classroom: Advancing Critical Thinking & Higher Order Skills with Cost Effective Spatial Design and Socratic AI" is overlaid in large white font across the center of the image.

Hacking the Classroom: Advancing Critical Thinking & Higher Order Skills with Cost Effective Spatial Design and Socratic AI

Chelsea Leach & Jerry Brown

Learning Objectives

- ✓ Changing Learning Landscape and How to Leverage the Critical Thinking by Design Toolkit (Socratic AI framework)
- ✓ Implement a Socratic AI workflow that structures claims, evidence, counterarguments, and synthesis aligned to Bloom's Taxonomy and Webb's Depth of Knowledge.
- ✓ Findings: Analyze data and behavioral insights to understand how spatial cues combined with structured questioning improve reasoning, transfer, and cognitive engagement.
- ✓ Applying evidence-based design and low-cost spatial interventions (lighting, acoustics)

*How might we design
better Learning
Environments with the
elements that engage and
empower learners and
educators?*

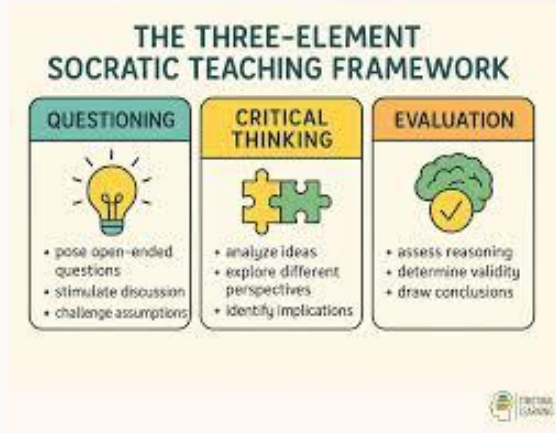
The Changing Learning Landscape

A traditional Chinese garden scene featuring a pond, a pavilion, and lush greenery. The background is a soft-focus image of a garden with a pond, a pavilion, and trees. The text is overlaid on a semi-transparent white box.

Schools need to create resilient workplaces that can adapt quickly.

“Learning without thought is labor lost; thought without learning is perilous. - Confucius

“Critical thinking is not something you do once with an issue and then drop it. It requires that we update our knowledge as new information comes in.” - Daniel Levitin



Forces
Changing
Learning,



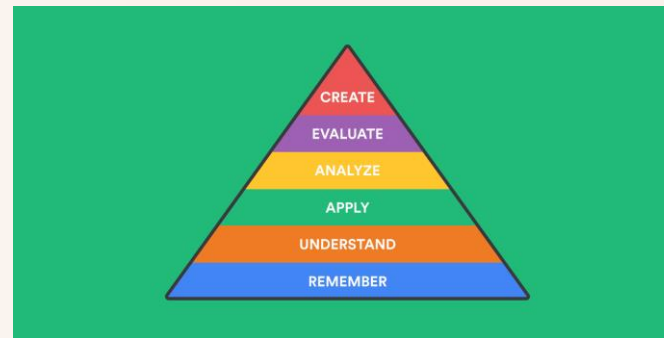
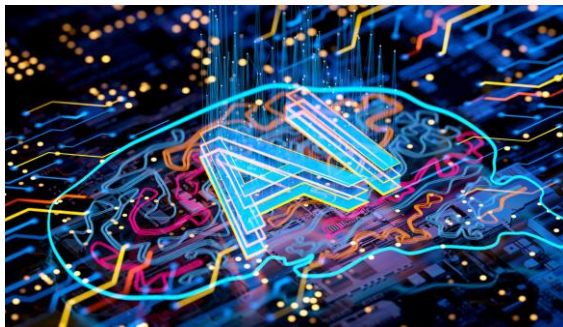
Shape
Human
Centered
Learning



How we
Learn



Adaptable
Learning
Spaces



THE INDUSTRIAL REVOLUTION



1.

STEAM

First
Industrial
Revolution



2.

ELECTRICITY

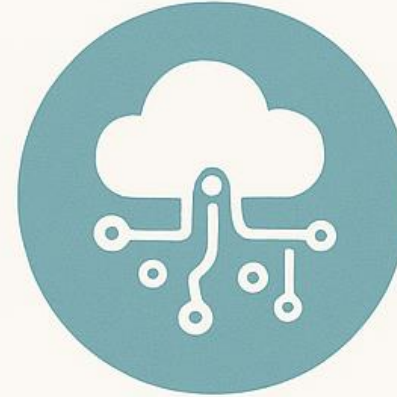
Second
Industrial
Revolution



3

AUTOMATION

Third
Industrial
Revolution



4

DIGITALIZATION

Fourth
Industrial
Revolution



5

**HUMAN-
CENTRIC**

Fifth
Industrial
Revolution

Classrooms Need to Respond to Forces Changing how students learn

Three Macro shifts



Learning Transformation

60% of Educators are now using AI in instruction. –Programs.com

Screen Based Learning

~80% of K–12 students now use digital devices in school, -Rand

Cognitive Crisis

Only ~47% of U.S. K–12 students report being engaged in school. –wifitalents.com



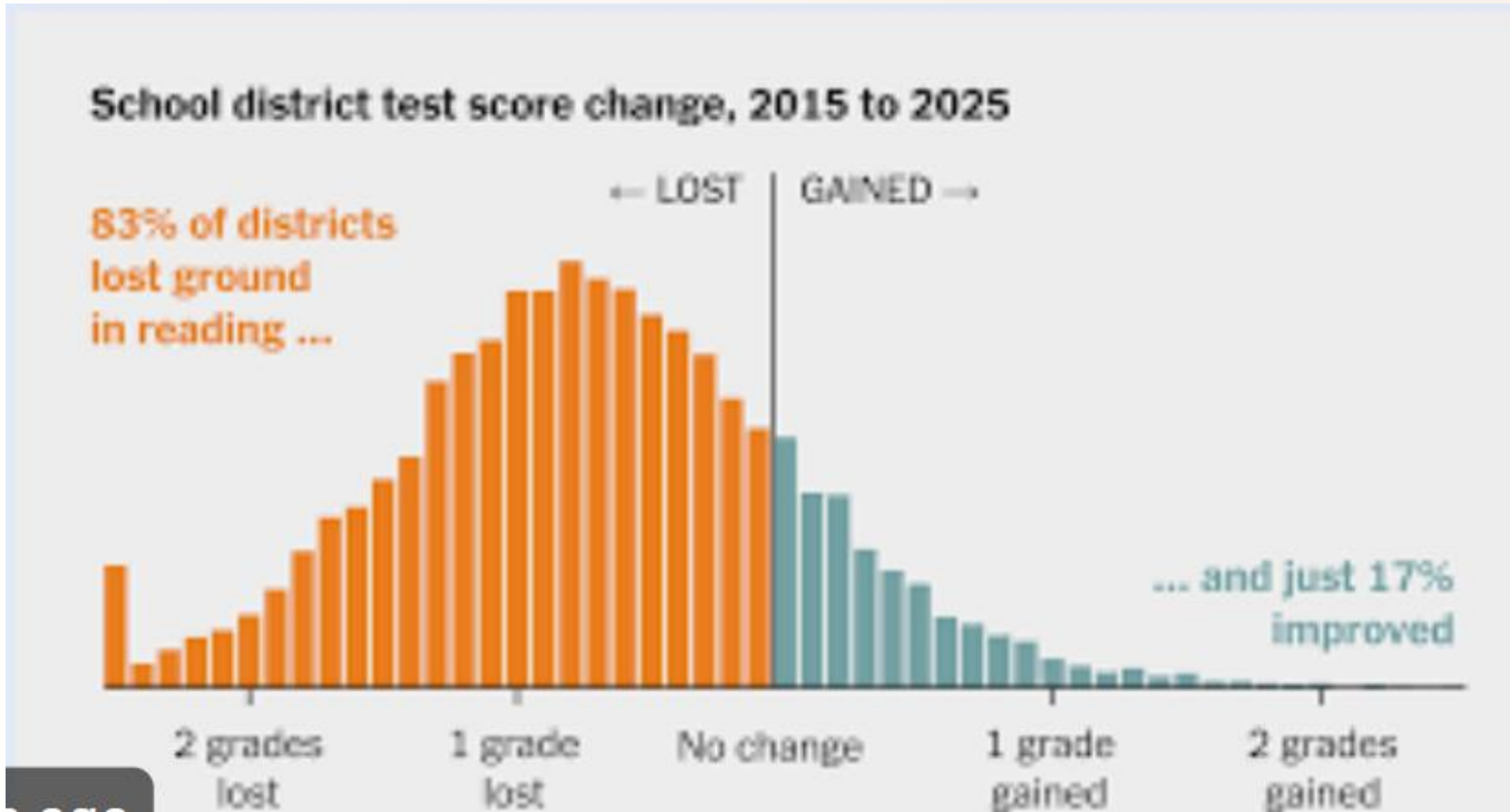
This Photo by Unknown Author is licensed under [CC BY-SA-NC](https://creativecommons.org/licenses/by-sa/4.0/)

Describe the most challenging learning space that you have been in:

Characteristics:

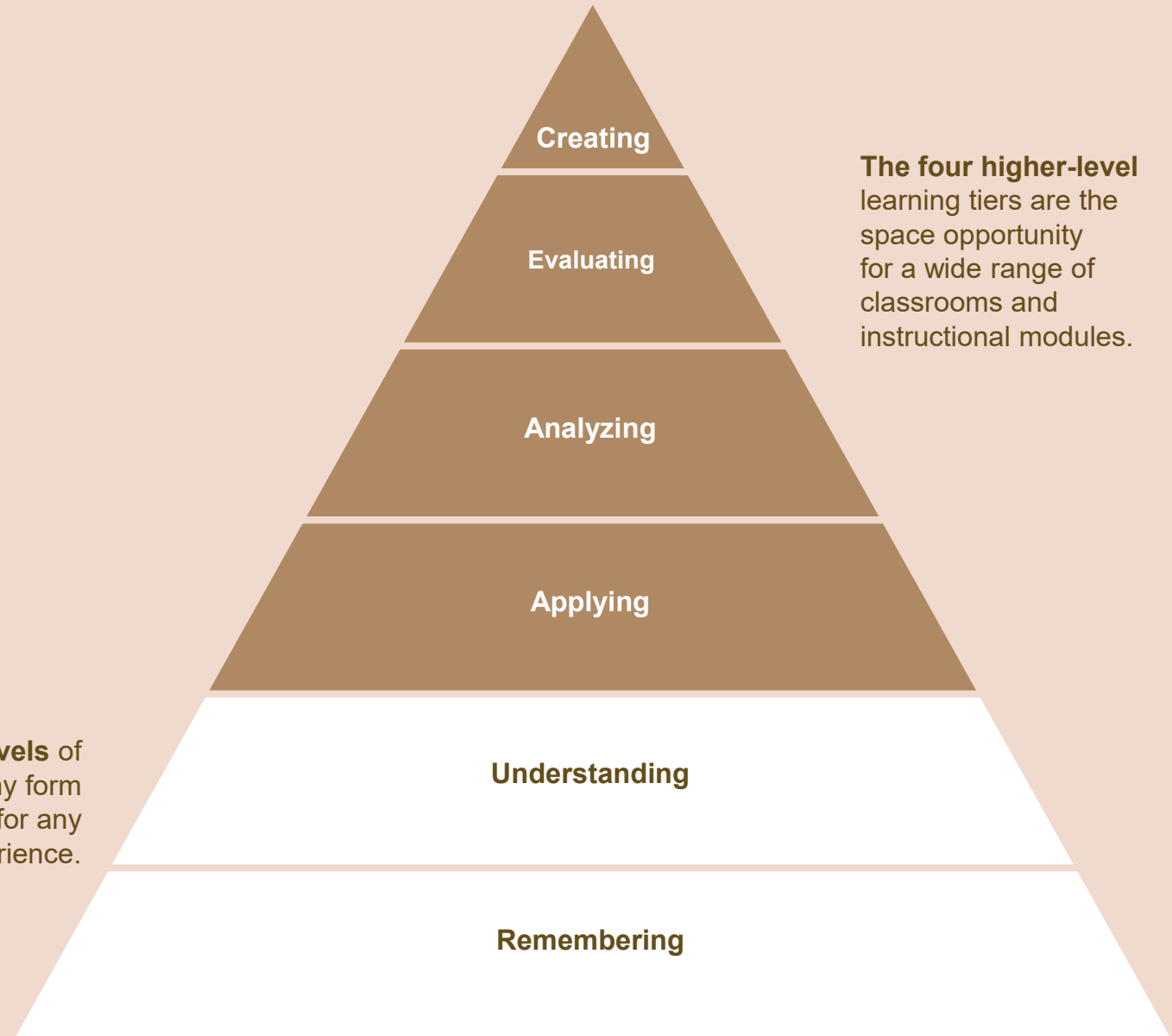
Steelcase[®]

Decade Decline in Math and Reading Scores



Levels of Human Cognition

The bottom two levels of Bloom's Taxonomy form the foundation for any learning experience.



THE SOCRATIC METHOD: GUIDED INQUIRY



Collaborate. Question. Discover.



Implement a Socratic AI workflow

Leverage the Critical Thinking by Design Toolkit (Socratic AI framework)

Welcome to the **Diverse Perspectives** module. We will examine how different social structures influence our lives, specifically focusing on the concepts of **Hierarchy** and **Equality**. Before we dive into specific historical groups or legends, we need to establish a shared vocabulary to help us analyze these complex ideas.

Level 1: The Foundation

To begin, I want to see how you define the basic structures of our society. Think about the world around you—your workplace, your community, or even a local organization.

Your Task: Briefly explain how either **hierarchy** or **equality** functions in a specific context (like a school or a business). How does that concept shape the way people interact in that space?

<https://claude.ai/share/48bd600e-83b6-4e76-842f-be958cde0c44>

THE PROBLEM: Most AI Workflows Bypass Cognition: **Solution:** AI becomes a scaffold for reasoning

Traditional AI Use

Ask

Copy

Submit

Result: Passive cognition

BEFORE: Student → AI → Answer

Socratic AI Use

Claim

Defend

Revise

Reflect

Synthesize

Result: Active cognition

AFTER: Student ↔ AI ↔ Peers ↔ Reflection ↔ Revision

THE SOCRATIC AI WORKFLOW - Designing Productive Cognitive Friction

Central Workflow Diagram

Step 1

CLAIM

↓ AI probes

Step 2

EVIDENCE

↓ AI challenges assumptions

Step 3

COUNTERARGUMENT

↓ AI asks "Why?" / "What evidence?"

Step 4

SYNTHESIS

↓ reflection + revision

Step 5

TRANSFER / APPLICATION



Findings

Analyze data and behavioral insights to understand how spatial cues combined with structured questioning improve reasoning, transfer, and cognitive engagement.

Findings

Students Liked the Rigor and Challenge

Major Themes Student Reported:

- deeper thinking
- better understanding
- improved memory
- active participation
- collaborative reasoning
-

“It helps me actually understand the material.” –EDF 315 Student

“It challenges me to think critically.” – EDF 315 Student

94%

- Said Socratic AI Improved Learning

88%

- Persisted through all of the levels of the prompts

17

- Interviews

THE SPATIAL SHIFT

To Recognize Gains, Space Must Change

Traditional Classroom

fixed rows

teacher-centered

passive

consumption

isolated cognition



Inquiry-Centered Environment

collaborative cognition

flexible grouping

visible thinking

rapid share-outs

peer discourse

writable surfaces

movement between

modalities

Priority 1: Flexible Tables

Doing more with Less

Essential Flexible Elements

Priority 1

Mobile tables

Priority 2

Lightweight movable seating

Priority 3

- Writable surfaces
- vertical
- table-based
- portable

Priority 4

Mobile display / projection

Priority 5

Power access + charging mobility

“Small upgrades create exponential pedagogical flexibility.

4-6

- Standing Flexible or Height Tables allow for Collaboration, Movement, Group Discussion

10-12

- Mobil or lightweight chairs allow for quick set up of small, medium or large group discussions

10

- Portable whiteboards allows group work to become visible, groups become mobil

Creating experiences that:

Empower

Strong engagement allows for greater empowerment as people have more **agency and independence**.



Engage

Active and inclusive learning environments improve both student and teacher engagement.



Expand

Anyone can carry a learning mindset forward —positively impacting their **personal and professional growth** for years to come.

Design For Cognitive Movement

Four Spatial Modes

1. Individual Cognition

Focus / reflection / prompting

2. Small Group (2–3)

Prompt refinement / evidence discussion

3. Medium Group (4–5)

Counterarguments / collaborative synthesis

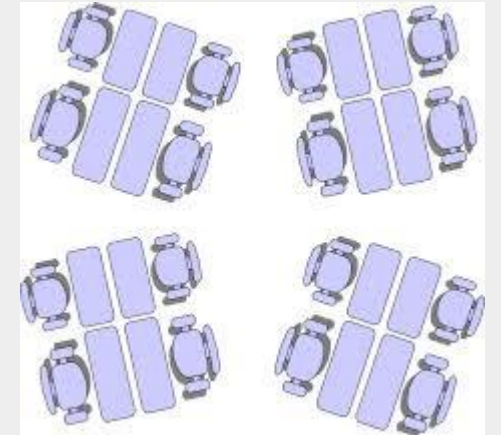
4. Whole Group

Socratic circle / **Designing for Cognitive Movement**

Horseshoe share-out

- The classroom becomes a learning environment- It is about adaptability

Flexible Tables



Whole Group



Priority 1: Focus on Flexible Tables

The Space Types











Tech Savy Flexible Classrooms



20 Students | 14' x 25' = 350 ft² | 17.5 ft² per student



* Dealer responsible for all options, finishes and power specifications



Tenor Chair | Verb Flip Top Table | Shortcut Chair | Cubb Stool | Coupe Tower | Flex Media Cart & Rails | Series 2 Stool
20 Students | 14' x 25' = 350 ft² | 17.5 ft² per student



Note: Dealer is responsible for power, finishes, options, and budget.



Biophilia in Learning Spaces



Ensemble Screens | Skomer & Ramsey | Elbrook Personal Table | Flex Media Cart



**Dealer to be responsible for final pricing and power specifications*

Biophilia in Learning Spaces



Campfire Lounge | Elbrook Personal Table | Border | Slope Stool | Campfire Big Table | Klip Stool
69 Students | 90' x 27' = 2,430 ft² | 35 ft² per student



** Dealer responsible for all options, finishes and power specifications*

Biophilia in Learning Spaces



Season Lounge | Jenny Chair | Away From The Desk | Elbrook Personal Table | Simple Table | Season Chairs
47 Students | 39' x 28' = 1,092 ft² | 23 ft² per student



* Dealer responsible for all options, finishes and power specifications



3-Person Ocular Coupe Tower Standing Height | Verb Flip Top Tables | Shortcut Chair & Stool | Sidewalk | Elbrook Team Table
Steelcase
LEARNING



4-Person Ocular Coupe Tower Seated and Standing Height | Shortcut Stool | Bindu Chair | Regard Double Sided Seating
Steelcase
LEARNING