Welcome to Learning, Media, and Technology

DO NOW: Get in groups of 2-3. Discuss your personal edtech history. Are your experiences similar or different? What stands out as really great or terrible in your history with edtech?

Agenda (1-2:30pm Eastern)

Getting Started (1:05-1:30)
- Your edtech history
- Assignment #1
- Starting with learning theory

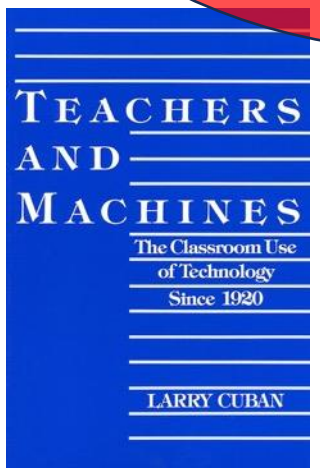
Cognitive Load Theory: (1:30-2:25)
- Drawing models of cognitive architecture
- From models of cognitive architecture to instructional principles

Part I: Foundations

Theories of Teaching and Learning:
Cognitive Load Theory (*Mens*)
Situated Learning (*Manus*)

Image by Justin Reich generated in DallE.

EdTech and MIT
MIT Museum and Gen AI
CS and Equity in Mass.
Online Learning for Teachers



EdTech Before the Internet

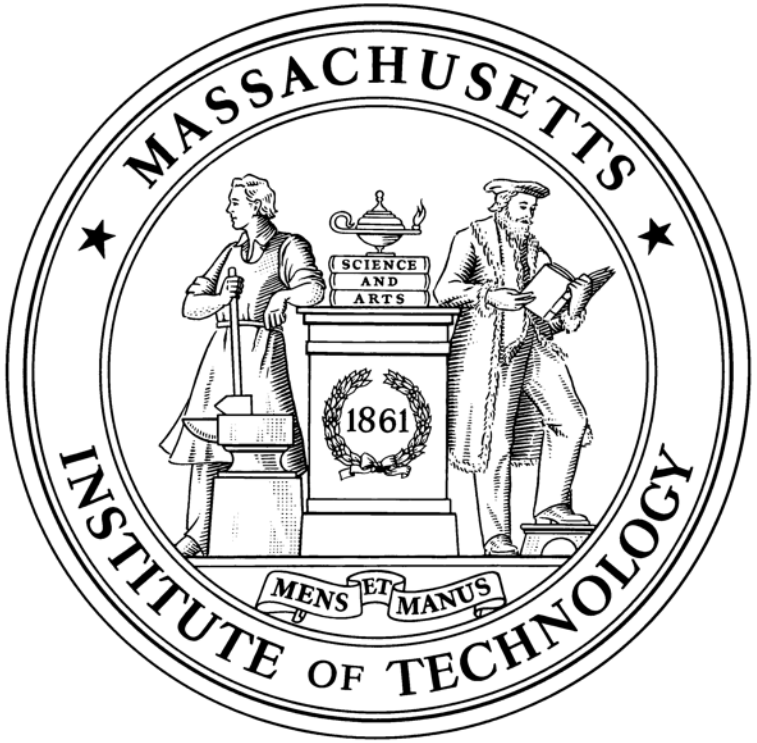
Larry Cuban's *Teachers and Machines*

Changing Practices in Schools

Justin Reich's *Iterate: The Secret to Innovation in Schools*

Assignments

- Assignment #1- EdTech From a Learning Science Perspective
  - Evaluate an education technology and identify its pedagogical roots. Then, reimagine the technology from alternative pedagogical perspective.
  - Example: Scratch is a community-centered platform for learning creative computing. It's inspired by constructivism.
    - Connect specific features of Scratch with specific principals of constructivism
    - Redesign Scratch through instructionism



Education:
Filling Pails or Kindling Flames?

TEACHING SYSTEMS LAB

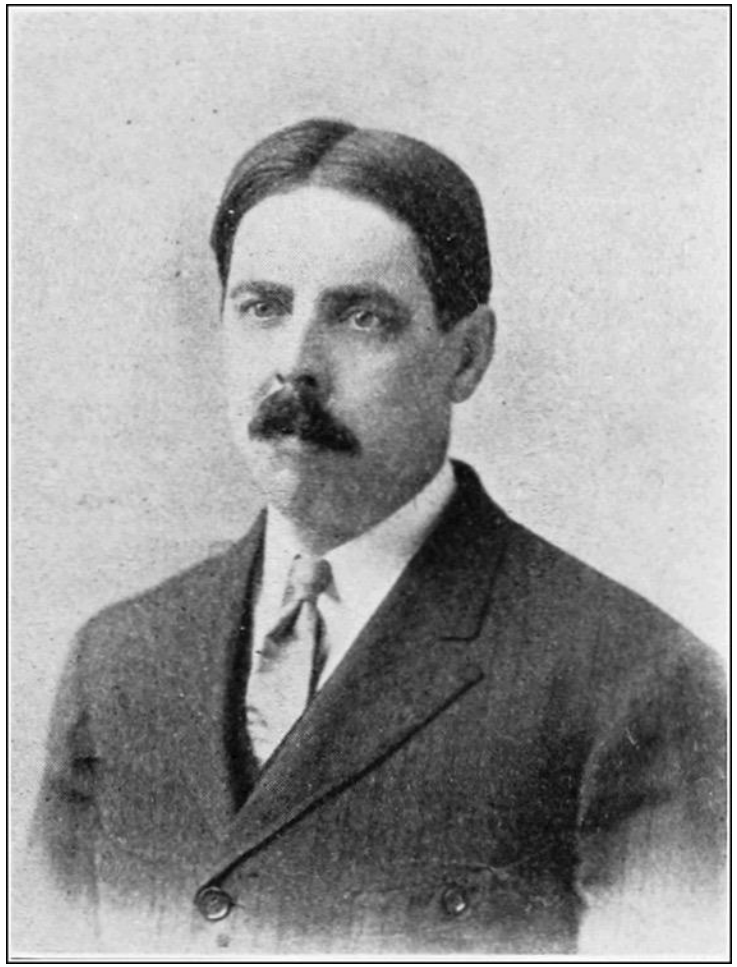
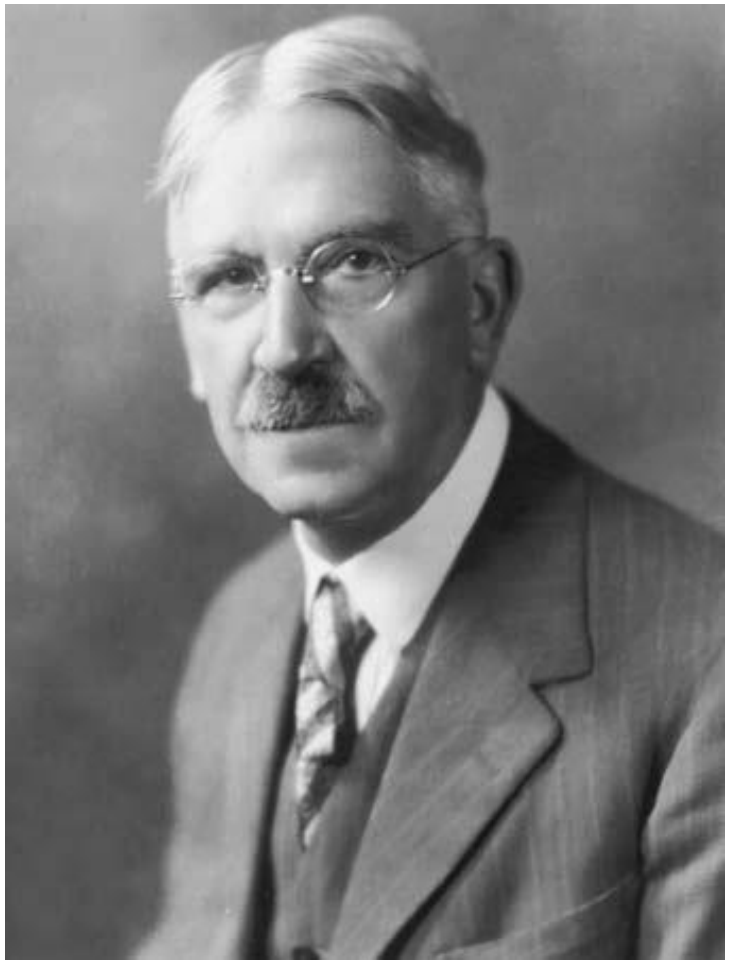


Image is in the public domain.

Edward Thorndike

Education as Science of Delivery

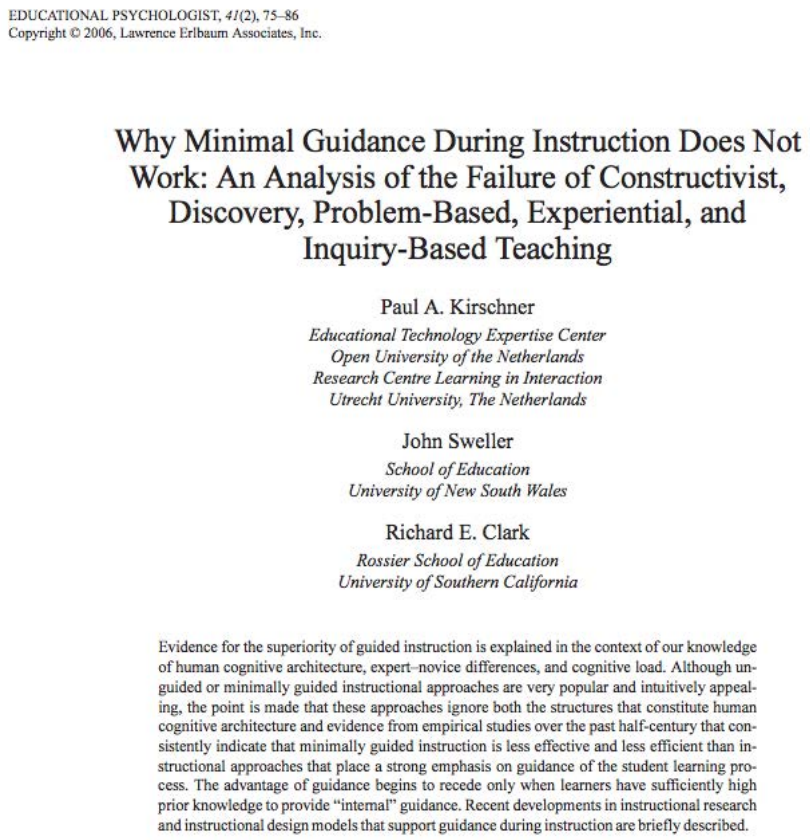


John Dewey

Education as Life

"One cannot understand the history of education in the United States during the 20th century unless one realizes that Edward L. Thorndike won and John Dewey lost."

-Ellen Lagemann



EDUCATIONAL PSYCHOLOGIST, *41*(2), 75–86

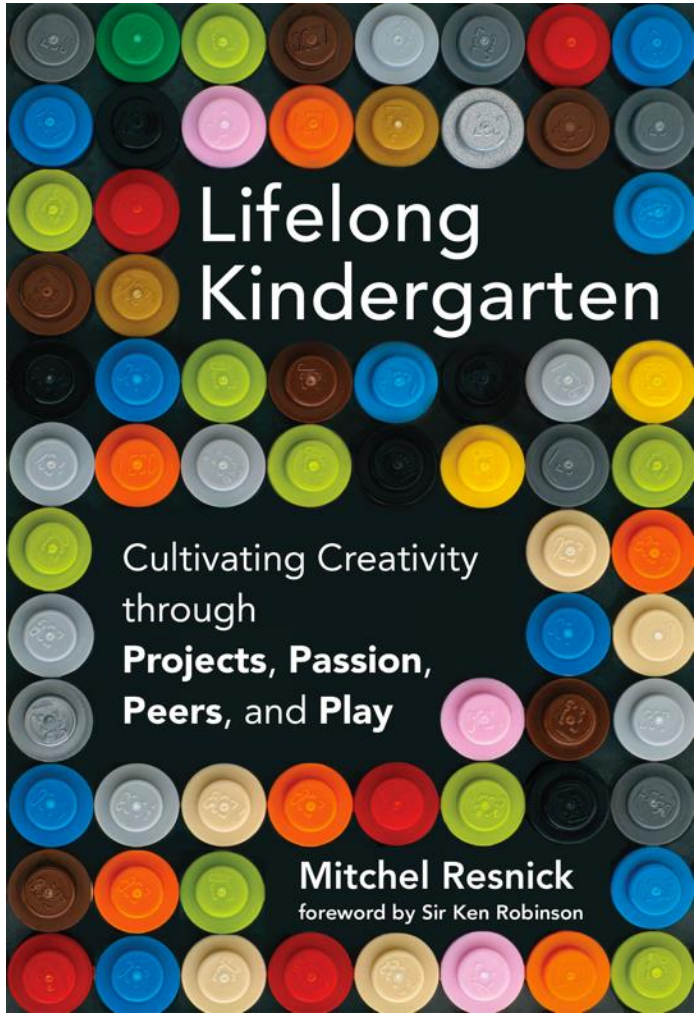
Why Minimal Guidance During Instruction Does Not Work: An Analysis of the Failure of Constructivist, Discovery, Problem-Based, Experiential, and Inquiry-Based Teaching

Paul A. Kirschner
Educational Technology Expertise Center
Open University of the Netherlands
Research Centre Learning in Interaction
Utrecht University, The Netherlands

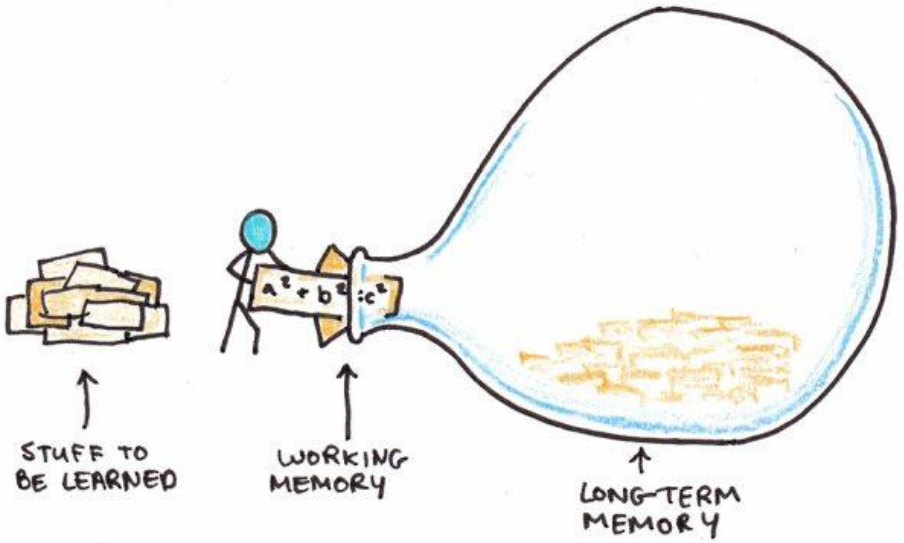
John Sweller
School of Education
University of New South Wales

Richard E. Clark
Rossier School of Education
University of Southern California

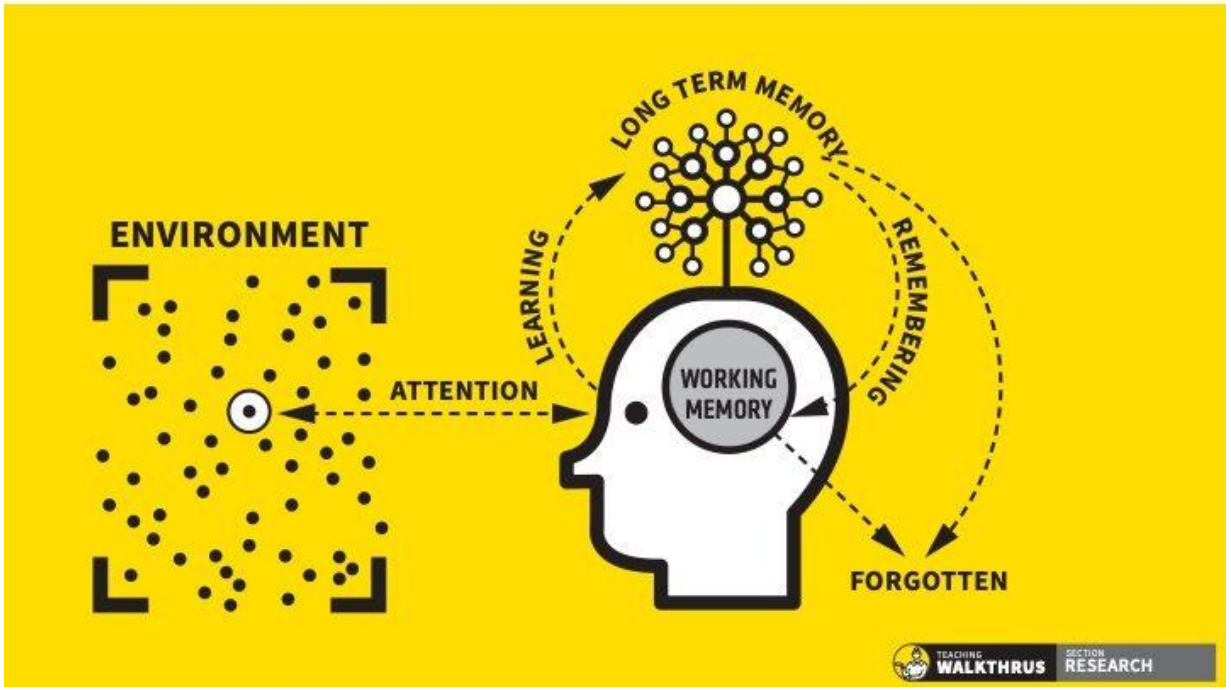
Evidence for the superiority of guided instruction is explained in the context of our knowledge of human cognitive architecture, expert–novice differences, and cognitive load. Although unguided or minimally guided instructional approaches are very popular and intuitively appealing, the point is made that these approaches ignore both the structures that constitute human cognitive architecture and evidence from empirical studies over the past half-century that consistently indicate that minimally guided instruction is less effective and less efficient than instructional approaches that place a strong emphasis on guidance of the student learning process. The advantage of guidance begins to recede only when learners have sufficiently high prior knowledge to provide "internal" guidance. Recent developments in instructional research and instructional design models that support guidance during instruction are briefly described.



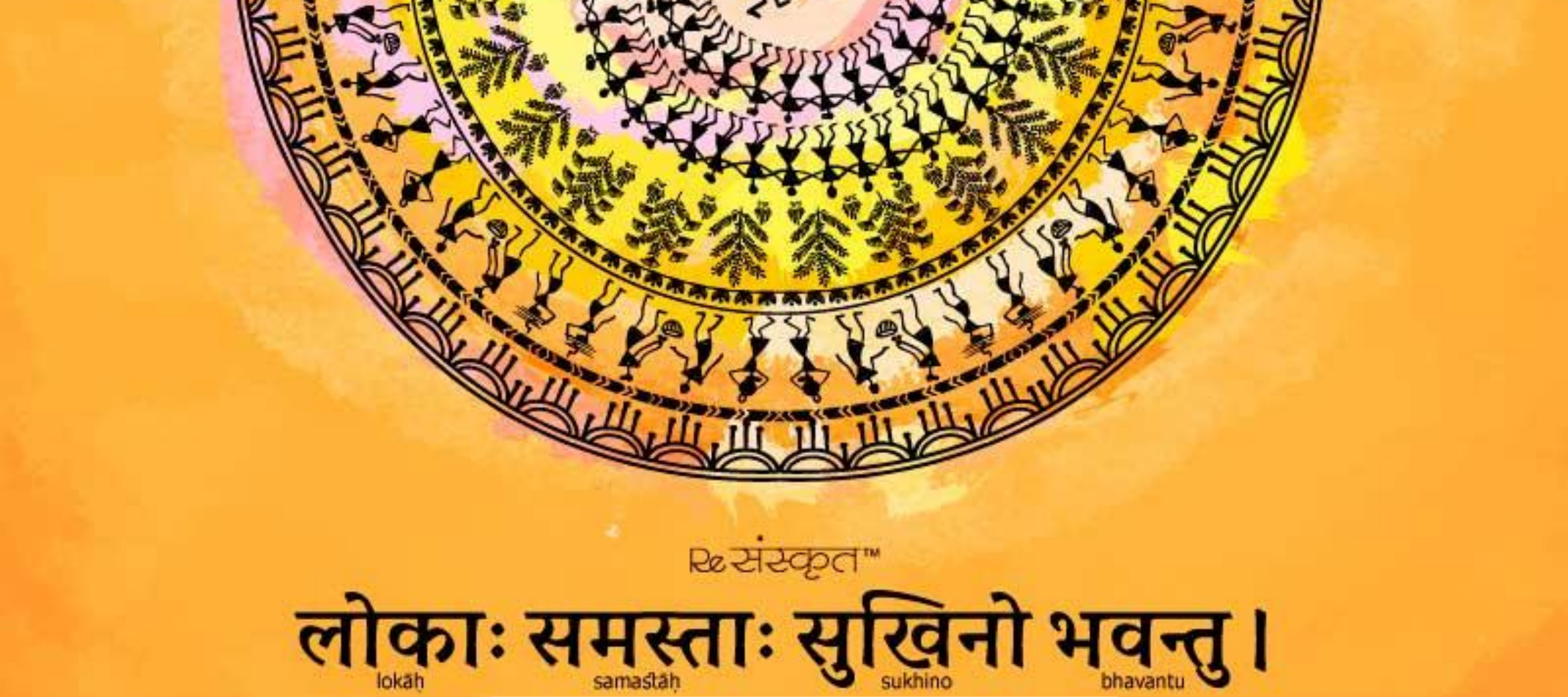
Models of Human Cognitive Architecture



https://www.scotthyoung.com/blog/2022/01/04/cognitive-load-theory/



https://teacherhead.com/2021/06/22/the-genius-of-dt-willingham-and-wdsls/



Re संस्कृत™

लोकाः समस्ताः सुखिनो भवन्तु।

lokāḥ samastāḥ sukhino bhavantu

resanskrit.com

Let the entire world be happy.

Mangal Mantra

सारा संसार सुखी रहे।

Instructional guidance follows from a particular view of cognitive architecture

Table I. Some Effects Studied by Cognitive Load Theory and Why They Reduce Extraneous Cognitive Load[a]

Effect	Description	Extraneous load
Goal-free effect	Replace conventional problems with goal-free problems that provide learners with a specific goal	Reduces extraneous cognitive load caused by relating a current problem state to a goal state and attempting to reduce differences between them; focus learner's attention on problem states and available operators
Worked example effect	Replace conventional problems with worked examples that must be carefully studied	Reduces extraneous cognitive load caused by weak-method problem solving; focus learner's attention on problem states and useful solution steps
Completion problem effect	Replace conventional problems with completion problems, providing a partial solution that must be completed by the learners	Reduces extraneous cognitive load because giving part of the solution reduces the size of the problem space; focus attention on problem states and useful solution steps
Split attention effect	Replace multiple sources of information (frequently pictures and accompanying text) with a single, integrated source of information	Reduces extraneous cognitive load because there is no need to mentally integrate the information sources
Modality effect	Replace a written explanatory text and another source of visual information such as a diagram (unimodal) with a spoken explanatory text and a visual source of information (multimodal)	Reduces extraneous cognitive load because the multimodal presentation uses both the visual and auditory processor of working memory
Redundancy effect	Replace multiple sources of information that are self-contained (i.e., they can be understood on their own) with one source of information	Reduces extraneous cognitive load caused by unnecessarily processing redundant information

[a]Reported by Sweller *et al.*, 1998.

Understanding Questions:

- According to CLT, what is the main bottleneck in the learning process?
- What are the goals of CLT-based instruction? What would end-state proficiency look like in a domain?
- What methods do CLT researchers use to evaluate instructional techniques?

Insights from readings:

- Pershan, Not a Theory of Everything
- Sweller, Story of a Research Program

CMS.595 Learning, Media, and Technology
Spring 2024