Situated Learning

DO NOW: Turn to a partner. Why would babies be a big problem for cognitive load theorists.

https://www.washingtonpost.com/science/2024/02/02/how-humans-learn-language-ai-child/

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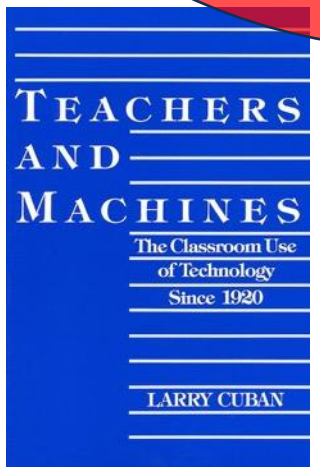
Part I: Foundations

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*

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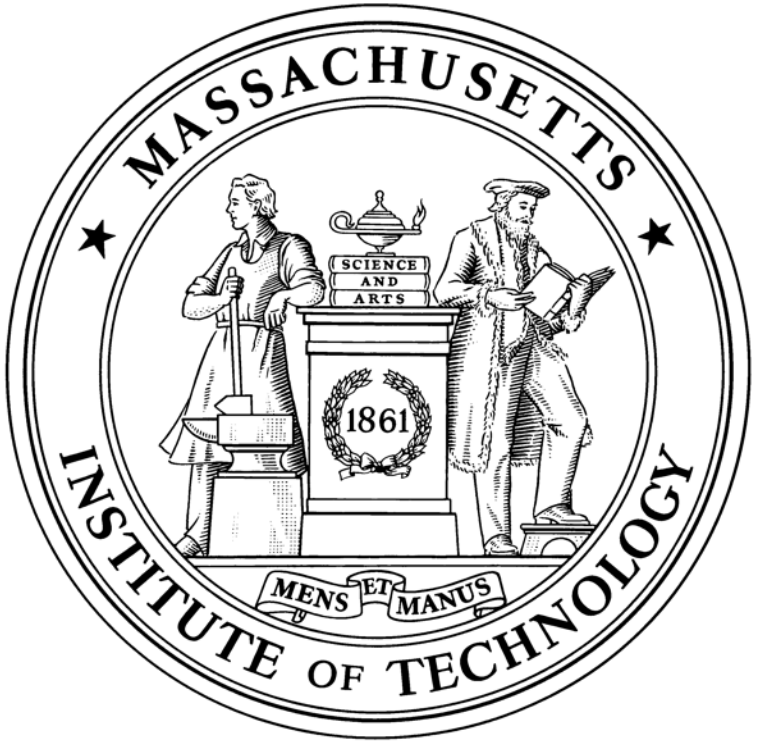

Education:
Filling Pails or Kindling Flames?

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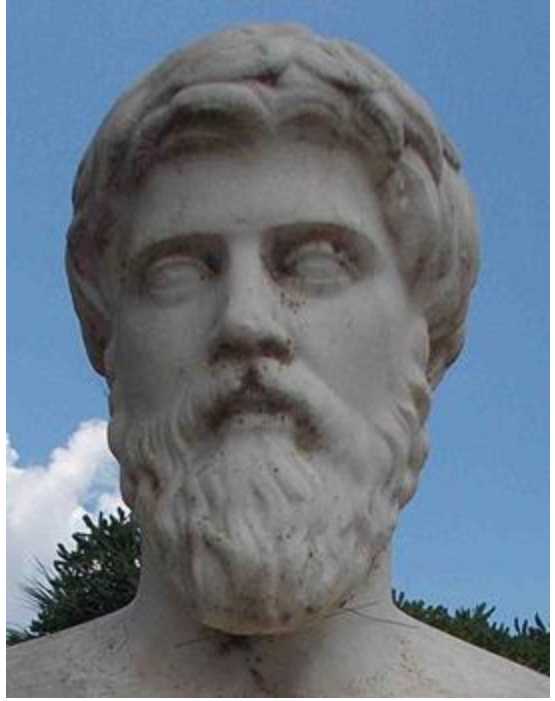
TEACHING SYSTEMS LAB



For the mind does not require filling like a bottle, but rather, like wood, it only requires kindling to create in it an impulse to think independently and an ardent desire for truth.
Plutarch (~50 AD), *On Listening*

Translation from 1927 Loeb Classic

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ANNALS OF EDUCATION DECEMBER 11, 2017 ISSUE

SUCCESS ACADEMY'S RADICAL EDUCATIONAL EXPERIMENT

Inside Eva Moskowitz's quest to combine rigid discipline with a progressive curriculum.

By Rebecca Mead

For nearly a century, public education in America has been influenced by two opposing pedagogical approaches: traditionalism and progressivism. Broadly speaking, in the traditional approach to education a teacher imparts knowledge to students through direct instruction, and embodies a disciplinary culture in which obedience is both prized and rewarded. The purpose of the classroom is to equip all students to meet measurable academic standards. At a progressive institution, a teacher develops a curriculum but urges students to treat it as a staging ground for their own intellectual discoveries, often through hands-on activities and group work. Allowances are made for differences in the way individual students learn. Progressivism was inspired, in large part, by the work of John Dewey, the American philosopher and educational theorist, who died in 1952. For Dewey, the classroom was not simply a place for acquiring academic credentials; it was also a venue in which students learned crucial values about being citizens in a democracy. Traditionalism is easily caricatured as rote learning—or, in the contemporary classroom, as endless test prep. Progressivism, in its most exaggerated form, can look like an absence of standards and discipline, and an unhelpful abdication of authority on the part of the teacher.

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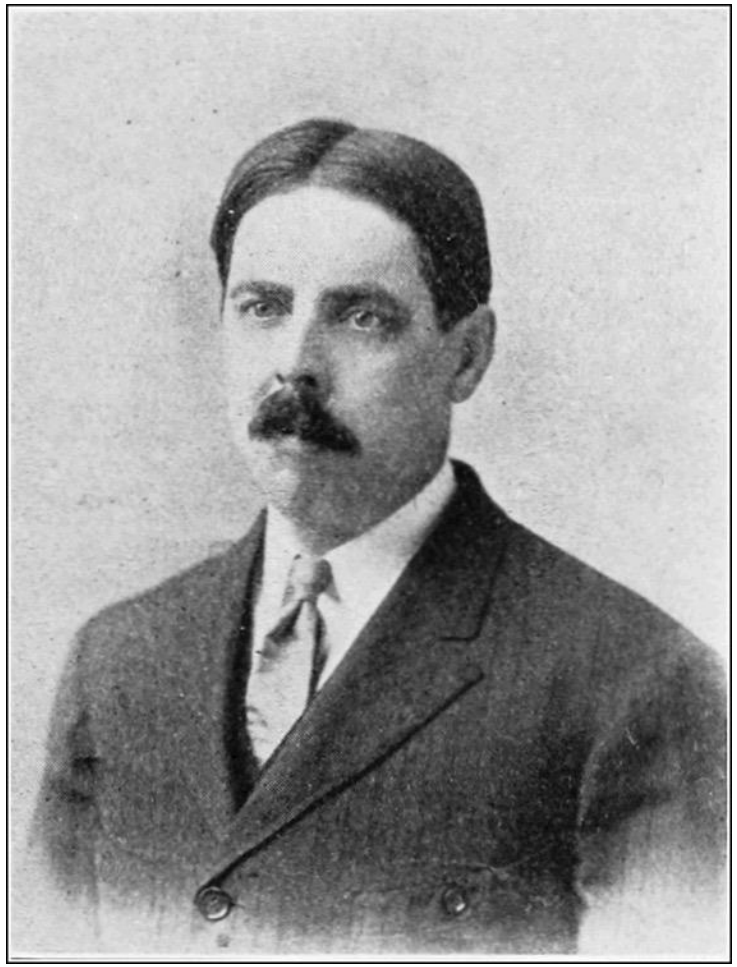

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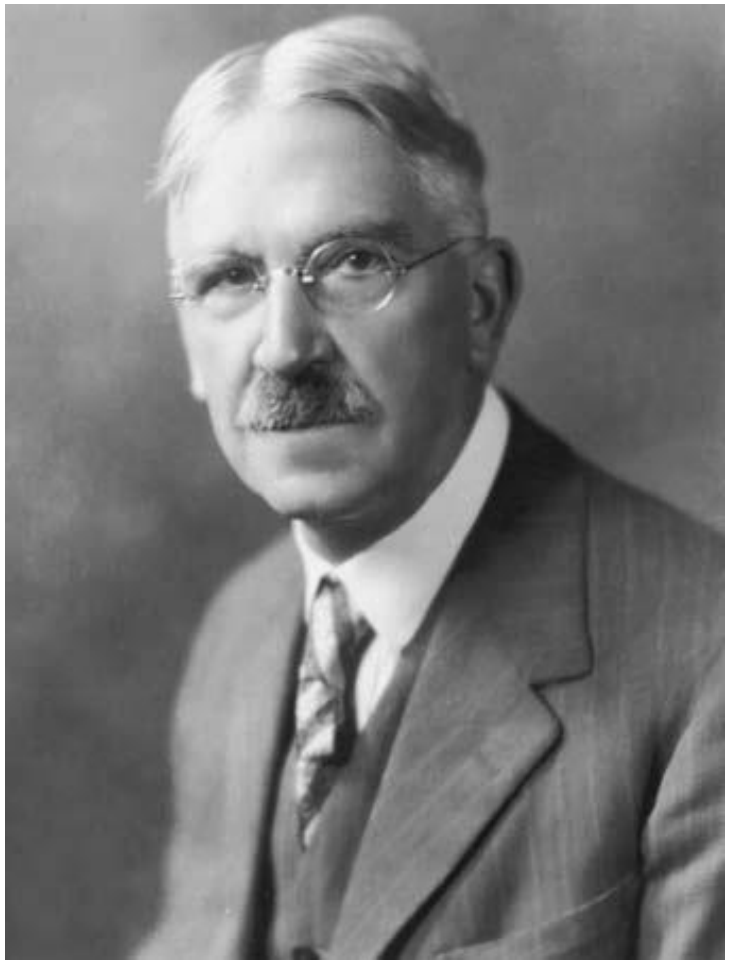
Edward Thorndike

Education as Science of Delivery



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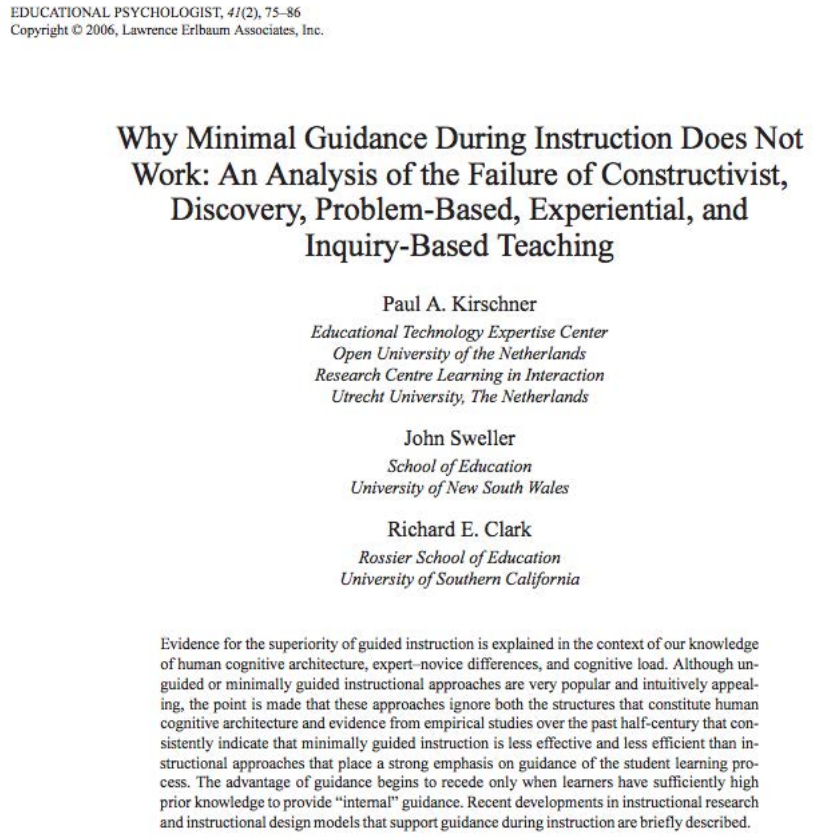
John Dewey

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

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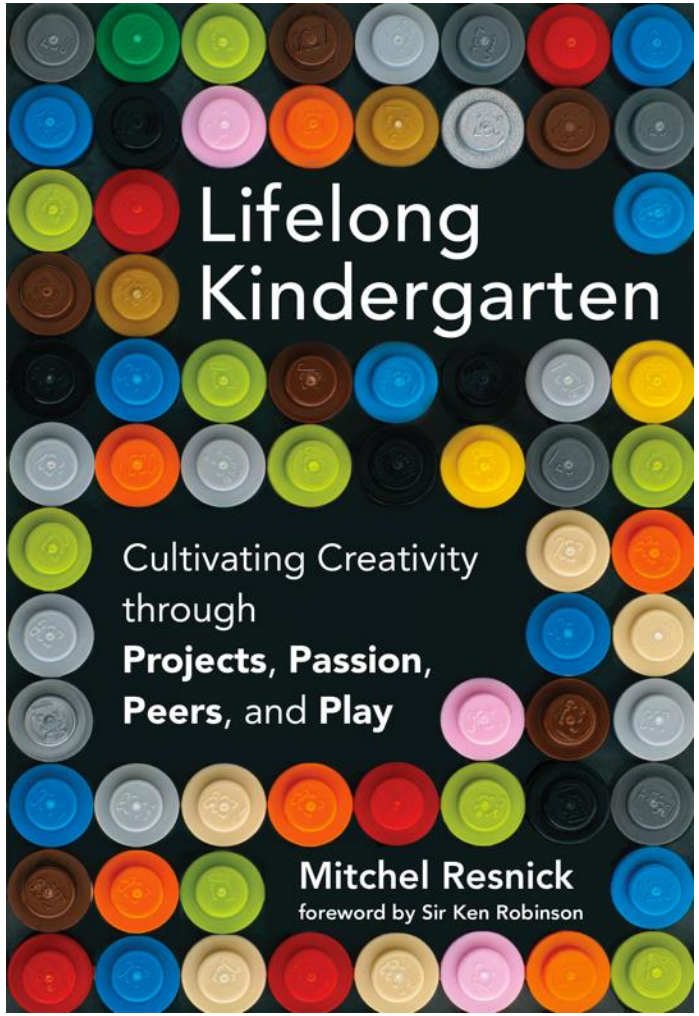
Evidence for the superiority of guided instruction is explained in the context of our knowledge of human cognitive architecture, expert–novice differences, and cognitive load. Although unguided or minimally guided instructional approaches are very popular and intuitively appealing, the point is made 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.



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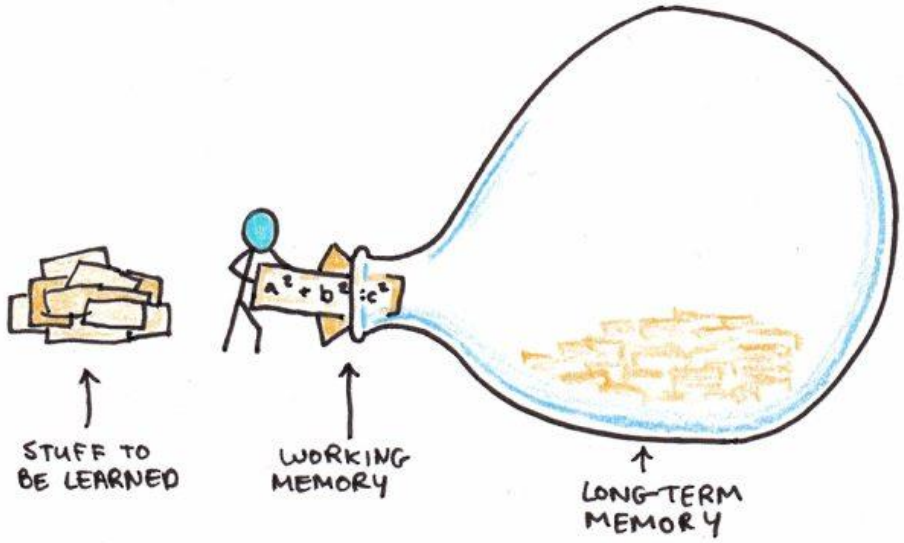
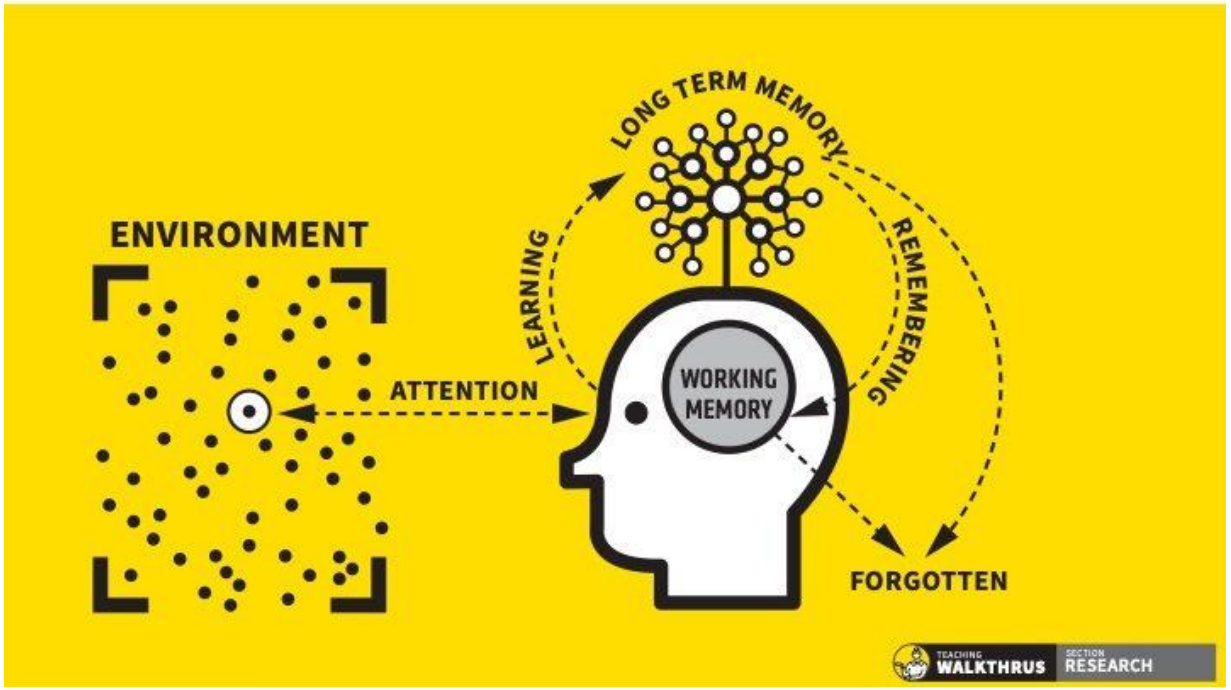
Models of Human Cognitive Architecture



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



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

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In this chapter, I propose to consider learning not as a process of socially shared cognition that results in the end in the internalization of knowledge by individuals, but as a process of becoming a member of a sustained community of practice. Developing an identity as a member of a community and becoming knowledgeably skillful are part of the same process, with the former motivating, shaping, and giving meaning to the latter, which it subsumes. It is difficult to move from peripheral to full participation in today's world (including workplaces and schools), thereby developing knowledgeably skilled identities. This is because the processes by which we divide and sell labor, which are ubiquitous in our way of producing goods and services (including "knowledge"), truncate both the movement from peripheral to full participation and the scope of knowledgeable skill. Taken to an extreme, these processes separate identity from intended forms of knowledgeable practice. This view implies that learning and failure to learn are aspects of the same social–historical processes, and points to relationships between knowledgeability and identity as an important focus for research.

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Why Generative AI Will Underperform Expectations in Education

It feels nearly impossible for technologists and educators to speak across domain expertise here, and I'm going to give it another try anyway.

DAN MEYER

JUL 19, 2023

33 15 Share

Here is where I imagine you, someone who understands AI technology but has never taught, and I, someone who *has* taught but has a twelve year-old's beep boop understanding of AI technology, might agree:

Students attend school to answer two questions.

1. Who am I?
2. How do I do this?

"Who am I?" encompasses all kinds of questions about identity, purpose, value, and belonging. It asks "Who am I in relation to *you?* In relation to my community? In relation to grownups and systems of power?" Maybe you haven't thought about that part of schooling for a long while, maybe because your *own* answers to those questions are quite well developed. I hope you can believe me that this question matters enormously to children.

Meanwhile, "How do I do this?" is a question about the ideas and tools of a discipline. In Mathworld, where I live, those questions might be "How do I add two fractions with different denominators?" or "How do I solve the equation 2x - 3 = 5?"

I hope we *both* agree that AI chatbots are more useful for one of those questions than the other. I hope we both agree that students should not type "Who am I?" into ChatGPT or Khanmigo. No good will come.

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Jordan (1989) has carried out extensive field research on Yucatec Mayan midwives whose apprenticeship is quite different—more effective and less exploitive—than that of the butchers in Marshall's study. These apprentices are peripheral participants, legitimate participants, and legitimately peripheral to the practice of midwifery. They have access to both broad knowledgeability about the practice of midwifery and to increasing participation in that practice. It is worth noting that it would be difficult to find evidence that teaching is the mode of knowledge "transmission" among the midwives. According to Jordan,

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of knowledge—transmission—among the midwives. According to Jordan,

> Apprenticeship happens as a way of, and in the course of, daily life. It may not be recognized as a teaching effort at all. A Maya girl who eventually becomes a midwife most likely has a mother or grandmother who is a midwife, since midwifery is handed down in family lines. . . . Girls in such families, without being identified as apprentice midwives, absorb the essence of midwifery practice as well as specific knowledge about many procedures, simply in the process of growing up. They know what the life of a midwife is like (for example, that she needs to go out at all hours of the day or night), what kinds of stories the women and men who come to consult her tell, what kinds of herbs and other remedies need to be collected, and the like. As young children they might be sitting quietly in a corner as their mother administers a prenatal massage; they would hear stories of difficult cases, of miraculous outcomes, and the like. As they grow older, they may be passing messages, running errands, getting needed supplies. A young girl might be present as her mother stops for a postpartum visit after the daily shopping trip to the market. Eventually, after she has had a child herself, she might come along to a birth, perhaps because her ailing grandmother needs someone to walk with, and thus find herself doing for the woman in labor what other women had done for her when she gave birth; that is, she may take a turn . . . at supporting the laboring woman. . . . Eventually, she may even administer prenatal massages to selected clients. At some point, she may decide that she actually wants to do this kind of work. She then pays more attention, but only rarely does she ask questions. Her mentor sees their association primarily as one that is of some use to her (''Rosa already knows how to do a massage, so I can send her if I am too busy''). As time goes on, the apprentice takes over more and more of the work load, starting with the routine and tedious parts, and ending with what is in Yucatan the culturally most significant, the birth of the placenta.[1]

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In short, when official channels offer only possibilities to participate in institutionally mandated forms of commoditized activity, genuine participation,

membership, and legitimate access to ongoing practice—of a practice considered worthy of the name—are rare. At the same time, schools and school-like workplace educational enterprises accord knowledgeable skill a reified existence, turning it into something to be "acquired" and its transmission into an institutional motive. This process generates pressures toward the trivializing decomposition of forms of activity. The result is a widespread generation of negative identities and misrecognized or institutionally disapproved interstitial communities of practice.

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Understanding Questions:

- Does situated learning define an equivalent to the "human cognitive architecture" in CLT? What is it?
- What does Resnick propose as a pedagogy that follows from the core insights of situated learning?

projects

passion

play

peers

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DO NOW: Draw a Venn Diagram of overlap and differences between

instructionists/traditionalist//Cognitive Load Theory/pail fillers

and

constructionist/progressive/situated learning/flame kindlers

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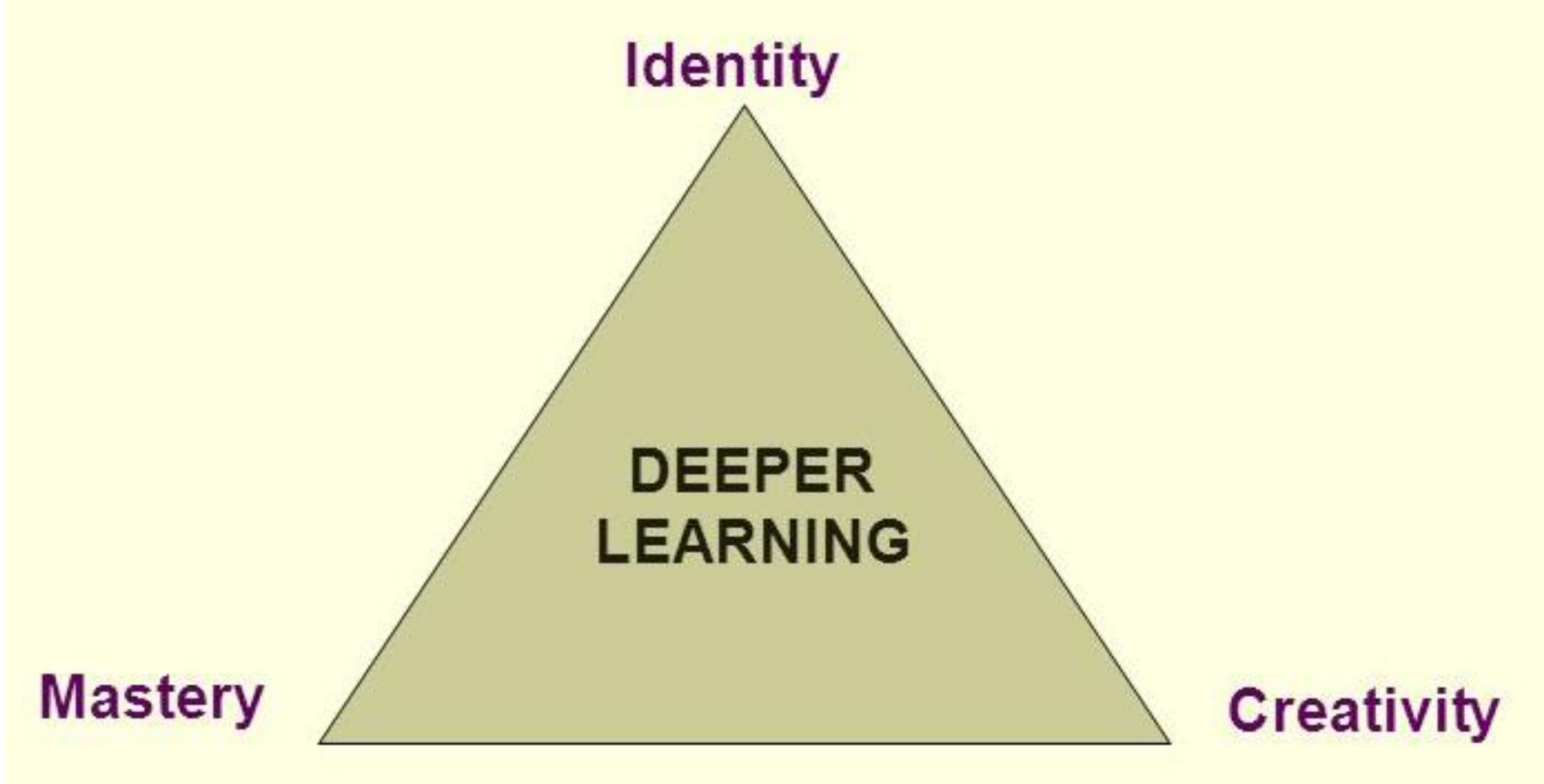

Slide from Jal Mehta and Sarah Fine, Harvard Graduate School of Education

Identity

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

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Mastery

Creativity

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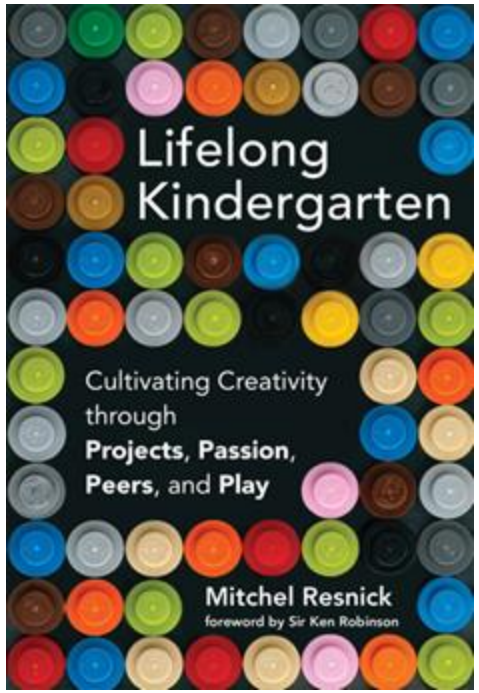
Identity



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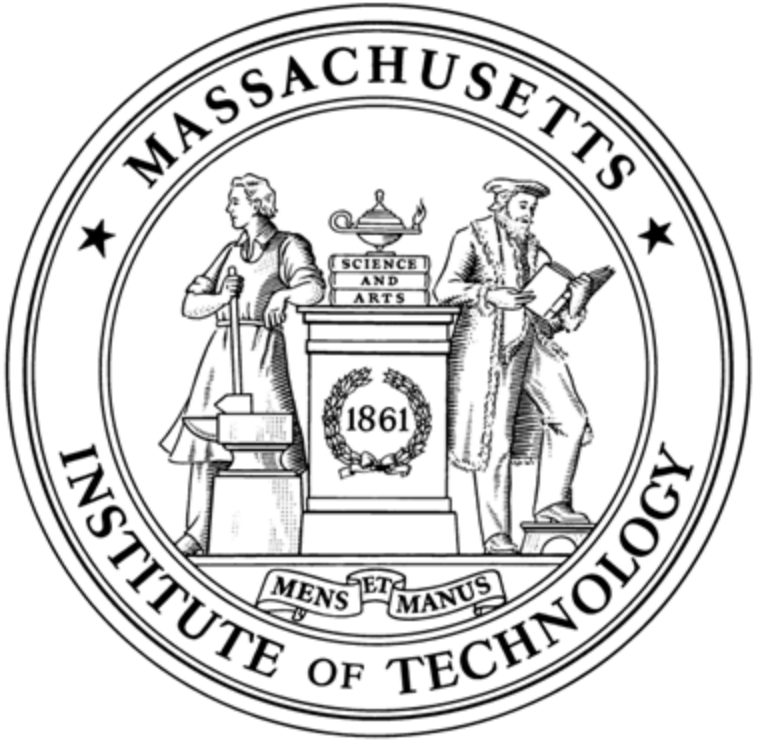

Mastery

Creativity

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The Knowledge-Learning-Instruction Framework: Bridging the Science-Practice Chasm to Enhance Robust Student Learning

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Received 30 August 2010; received in revised form 19 September 2011; accepted 11 December 2011

Abstract

Despite the accumulation of substantial cognitive science research relevant to education, there remains confusion and controversy in the application of research to educational practice. In support of a more systematic approach, we describe the Knowledge-Learning-Instruction (KLI) framework. KLI promotes the emergence of instructional principles of high potential for generality, while explicitly identifying constraints of and opportunities for detailed analysis of the knowledge students may acquire in courses. Drawing on research across domains of science, math, and language learning, we illustrate the analyses of knowledge, learning, and instructional events that the KLI framework affords. We present a set of three coordinated taxonomies of knowledge, learning, and instruction. For example, we identify three broad classes of learning events (LEs): (a) memory and fluency processes, (b) induction and refinement processes, and (c) understanding and sense-making processes, and we show how these can lead to different knowledge changes and constraints on optimal instructional choices.

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Table 4
Which learning processes are effective for which kinds of knowledge components (KCs)

Learning Processes (simpler on bottom)	Facts (constant–constant KCs)	Rules (variable condition KCs)	Principles (verbal KCs with a rationale)
Understanding & sense making	– nothing to explain	– implicit rule learning is more efficient	++ principles must be understood
Induction & refinement	– no generalization needed	++ rules must be induced	+ principles can be inert without associated rules
Memory & fluency building	++ facts must be memorized	+ rules (& instances) must be remembered (dual paths may help)	+ principles must be remembered, but can be reconstructed
	Knowledge Components (simpler on left)		

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Table 6

A possible correlation between the complexity of knowledge components (KCs) and the complexity of the instruction that best produces such knowledge

	Instructional Principles (simpler on bottom)	Chinese vocab	French articles	English articles	Algebra eq	Geometry rules	Chemistry rules	Help seeking skls	Physics prinpls	Chem models	Pressure concept
Understanding and Sense Making	Accountable Talk										+
	Collaboration				0						+
	Self-explanation			0	+	+			+		
	Worked examples				+	+	+				
Induction and Refinement	Diagram coordination					+				+	
	Feature Focusing	+	+								
	Feedback		+		+			+			
Mem & Fluency	Optimal Scheduling	+				+					
		Facts			Rules				Principles		

Knowledge Components (simpler on left)

Note. ''+'' indicates the corresponding instructional principle has been experimentally demonstrated to enhance robust learning efficiency for the corresponding kind of KCs. ''0'' indicates an experiment found no difference. An empty cell indicates absence of relevant experiments.

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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

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