HS 525: Cognitive, Sociocultural and Critical Foundations of the Learning Sciences

Lecture 2: August 7, 2025

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What and why did we do in the first class?

- Norms of the class
  - All questions welcome
  - DIsagree with the argument and not the person
  - 25% grade for participation
- What, why, how and markers of learning

What are the central questions LS is concerned with? [VOTE]

1) What is learning? How does it happen?
2) How does learning happen? What can we do about it?
3) Why should we study learning?
4) How does learning happen?

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What are the main characteristics of the field of LS? [VOTE]

1) Use of machine learning for education
2) Design Science
3) Use of tech for learning
4) Empirical, interdisciplinary, action-oriented, contextualized
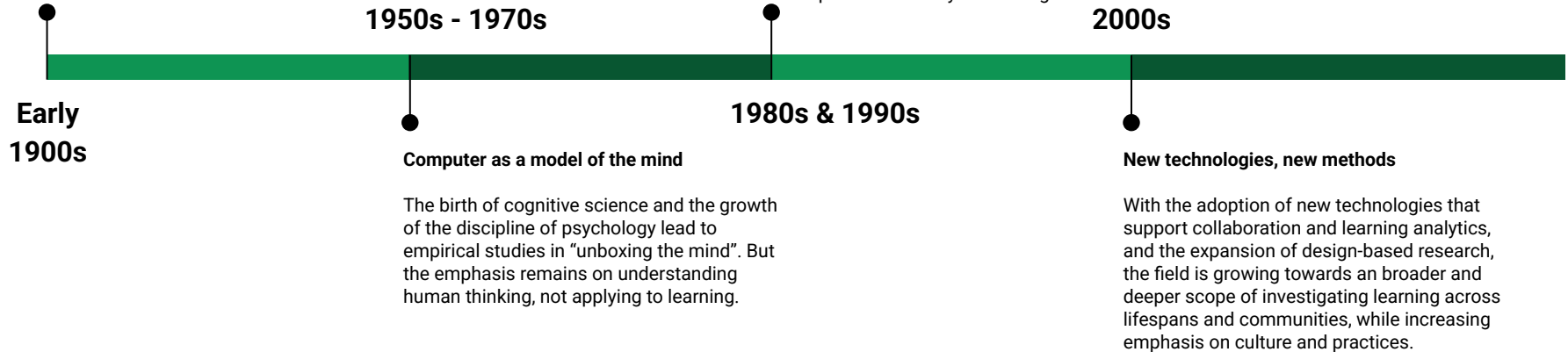
What are the learning sciences?

- An interdisciplinary field that studies how people learn and how to support learning
- Based on how experts work in the real world
  - importance of deep conceptual understanding that can be applied in new situations + practices => <u>redefining goals of education</u>
- Focus on learning, not just teaching - *how* people learn, ie, processes of learning
  - Transition from novice to expert
  - Building on prior knowledge
  - Concrete to abstract
  - Support learning
  - Externalization and articulation
  - Reflection
- Educational technology
- Create learning environments for authentic practices as a probe to study learning
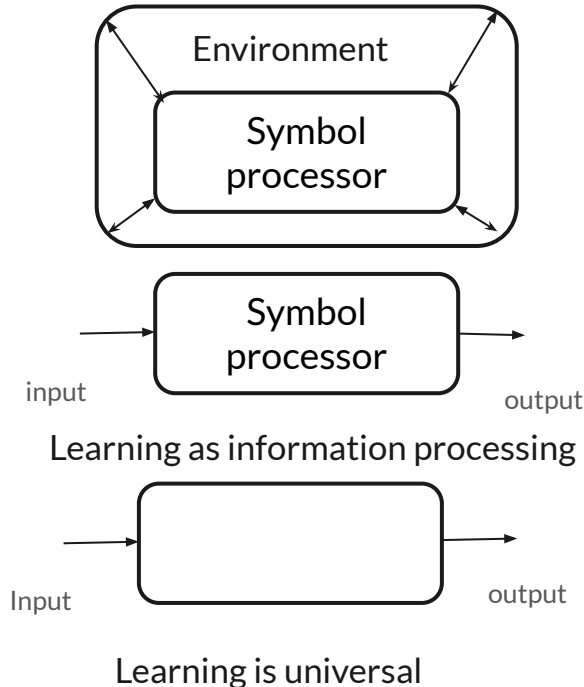
Timeline of the LS

Behaviourism v. Pragmatism

Learning begins to be studied as behavioural change - mind as "black box". Dewey on the other hand does contextualized research in education, with teachers as researchers.

Learning as a design science

The use of computers for learning grows. Tensions rise between designing for and researching learning, and the inability to tease the two apart. New perspectives, ie, situated cognition grow in cognitive science and are adopted in the study of learning.

1950s - 1970s

2000s

Early 1900s

1980s & 1990s

Computer as a model of the mind

The birth of cognitive science and the growth of the discipline of psychology lead to empirical studies in "unboxing the mind". But the emphasis remains on understanding human thinking, not applying to learning.

New technologies, new methods

With the adoption of new technologies that support collaboration and learning analytics, and the expansion of design-based research, the field is growing towards an broader and deeper scope of investigating learning across lifespans and communities, while increasing emphasis on culture and practices.

Evolution of notion of learning

Environment

Symbol
processor

Symbol
processor

input → output

Learning as information processing

Input → output

Learning is universal

Late 1980s
onwards

↑

1950-1970

↑

EARLY 1900s

Philosophy -> Education as
practice and science
-> Learning embedded in
sociocultural contexts

Orientations of the LS

1. **Empirical:** Investigating learning scientifically
   a. Quantifying and qualifying to understand how learning happens and how well it happens
   b. Develop theories of learning
2. **Interdisciplinary:** Bringing together research/analytical methods from different disciplines
   a. Experimental and ethnographic
   b. Statistics and interaction analysis and microgenetic analysis and learning analytics
3. **Action-oriented/Use-inspired:** Pasteur's quadrant
   a. Designs for learning
   b. Design-based research
   c. Participatory approaches
4. **Contextualized:** Not meaningful to study learning outside of the context in which it is happening
   a. Holistic approach

History of the LS

	Empirical	Interdisciplinary	Contextualized	Action- or design-oriented
Early 20th century	Empirical study of learning is emerging from medicine, biology, physics	Education moves from pre-disciplinary to becoming a discipline	Contested: Deweyan vs behaviorist approaches	Educational interventions just beginning to be connected to research
1950s–1980s	Experimental paradigm entrenched in educational psychology.	Psychology is established as a discipline. Education becomes a quasi-discipline, with major branches in curriculum and instruction, and educational psychology. Cognitive science begins bringing disciplines together	"Methods wars" show tension between quantitative and qualitative (contextualized) approaches in education schools. Most research attempts to explain culture within cognitive framing	Instructional design and curricular design well entrenched in U.S. schools of education but separated from development of learning theory
1990–2000s	Education moves towards randomized, controlled clinical trials as "gold standard." Other forms of empiricism are contested. In contrast, learning sciences embraces eclectic empiricism, including new methods	Education is entrenched as a discipline. Learning sciences explicitly draws on cognitive sciences and computer science	Situated cognition becomes a mainstay in learning sciences as well as in mainstream education Learning sciences links to older theories in cultural-historical activity theory and ecological psychology.	Learning sciences differentiates itself from education research writ large by linking design and research through novel methodologies (design-based research). Learning sciences considers applied research in schools even as cognitive science becomes less applied
2000s–present	Learning sciences continues to link to new forms of empiricism, including new ways of modeling through learning analytics and educational data mining	As a community, learning scientists become more established while residing in many disciplinary departments (computer science, education, communication, psychology, information science, etc.)	Learning sciences moves from primarily investigating individual cognition to a much greater emphasis on practices, groups, culture and language, and identity	Learning sciences' design orientation continues to embrace school settings and technologies, but also moves towards designing learning environments across contexts and through the lifespan. Design-based research and variants are taken up by other disciplines

Think: Could we study learning without adopting an action-oriented perspective? How or how not? (Individual, 3 min)
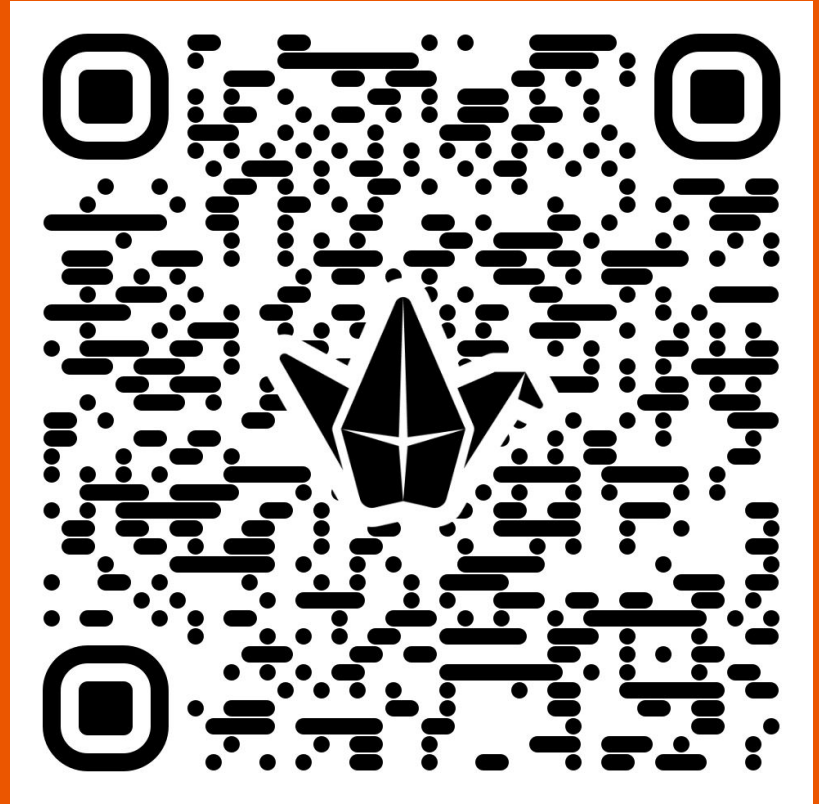
Pair: Justify your reason to your partner. Question your partners reasoning. Agree on a single answer and reason. (Pairs, 5 min)
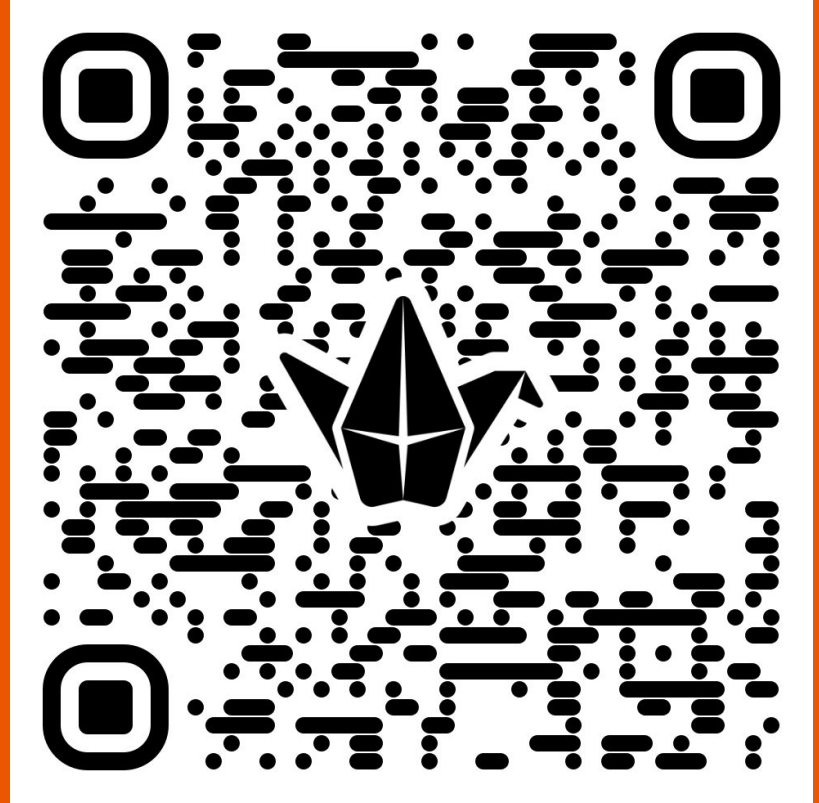
Share: Your Responses:

YES

1) Learning by observing and listening
2) Part of the learning
3) Cellular level may be possible to study, higher level - system of systems - emergent not possible to study
4) Collect data in natural conditions and analyse, just observe
5) Reflecting on your own experiences
6) Comparative analysis of existing classrooms
7) Participant observation - filtered behaviour - extended immersion is necessary

NO

1) If you don't intervene it's basically guessing
2) If we only observe, we don't get the whole picture
3) We learn by participating experientially in the process of learning - challenges
4) Learning between researcher and researched becomes cyclic
5) Looking through the lens that we have been taught- hierarchies are propagated
6)

Each one say one: <Wishful thinking>
As a student what future trend would you like to see in LS and why? (Individual, 3 min)

Responses:

1)

Next Class

1. Check Classroom regularly.
2. <u>Muddy points:</u> Please post your questions, concerns, criticisms, disagreements on the form alongside (anonymous).