Wisdom is not the product of schooling but the lifelong attempt to acquire it.
- Albert Einstein

Overview of Learning

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A Chinese Saying

I hear and I forget,

I see and I remember,

I do and I understand.

Discovery Learning Initiative (DLI)
and
Discovery Learning Center (DLC)

- a new, unique facility of the College of Engineering, CU Boulder

- opinions about discovery learning
  - Hirsch, E. D. (1996) The Schools We Need And Why We Don't Have Them, Doubleday, New York.
  - Mayer, R. E. (2004) "Should There Be a Three-Strikes Rule Against Pure Discovery Learning? — The Case for Guided Methods of Instruction," American Psychologist, 59(1), pp. 14-19.

"Discovery Learning" — Characterized by E.D. Hirsch

- The phrase refers to the teaching method which sets up projects or problems so that students can discover knowledge for themselves through hands-on experience and problem solving rather than through textbooks and lectures. Progressivists made discovery learning the chief or exclusive form of teaching starting with the "project method".

- The premise is true that knowledge acquired on one's own, with difficulty and by expending lots of time and effort, is more likely to he retained than knowledge presented verbally. It is also true that knowledge gained in a realistic context as part of an effort to solve a problem is likely to be knowledge that is well understood and integrated.

"Discovery Learning" (E.D. Hirsch) - continued

- Unquestionably, then, discovery learning is an effective method—when it works. But there are two serious drawbacks to preponderant or exclusive reliance on discovery learning.
    - First, students do not always make on their own the discoveries they are supposed to make; in fact, they sometimes make "discoveries" that aren't true. Hence, it is essential to monitor students to probe whether the desired learning goal has been achieved, and if not, to reach the goal by direct means.
    - Second, discovery learning has proved to be very inefficient. Not only do students sometimes fail to gain the knowledge and know-how they are supposed to gain, but they do not gain it very fast. Research into teaching methods has consistently shown that discovery learning is the least effective method of instruction in the teacher's repertory.

“Basic” Skills in the Age of Computational Media

- question: if most job-relevant knowledge must be learned on demand what is the role of “basic” education?
- what is the critical background knowledge which makes learning on demand feasible?
- question: do “basic skills” change their meaning under the influence of technology?

Some Claims about Learning

- people learn best when engrossed in the topic, motivated to seek out new knowledge and skills because they need them in order to solve the problem at hand

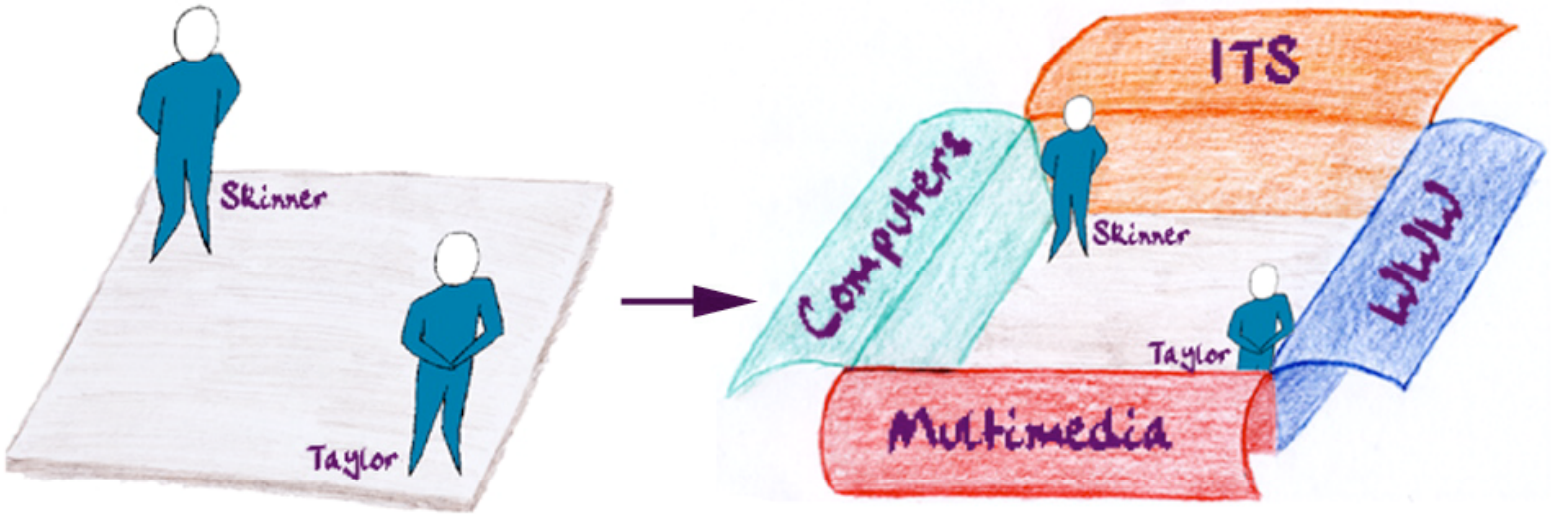
- real learning — the way we learn is trying something, doing it and getting stuck. In order to learn, we really have to be stuck, and when we're stuck we are ready for the critical piece of information. The same piece of information that made no impact at a lecture makes a dramatic impact when we're ready for it.

- "*A major illusion on which the school system rests is that most learning is the result of teaching*" — Ivan Illich (in "Deschooling Society")

- learning and teaching are not inherently linked:
  - much learning takes place without teaching
  - much teaching takes place without learning

Learning and Media

Adding Technology to Existing Educational Practice

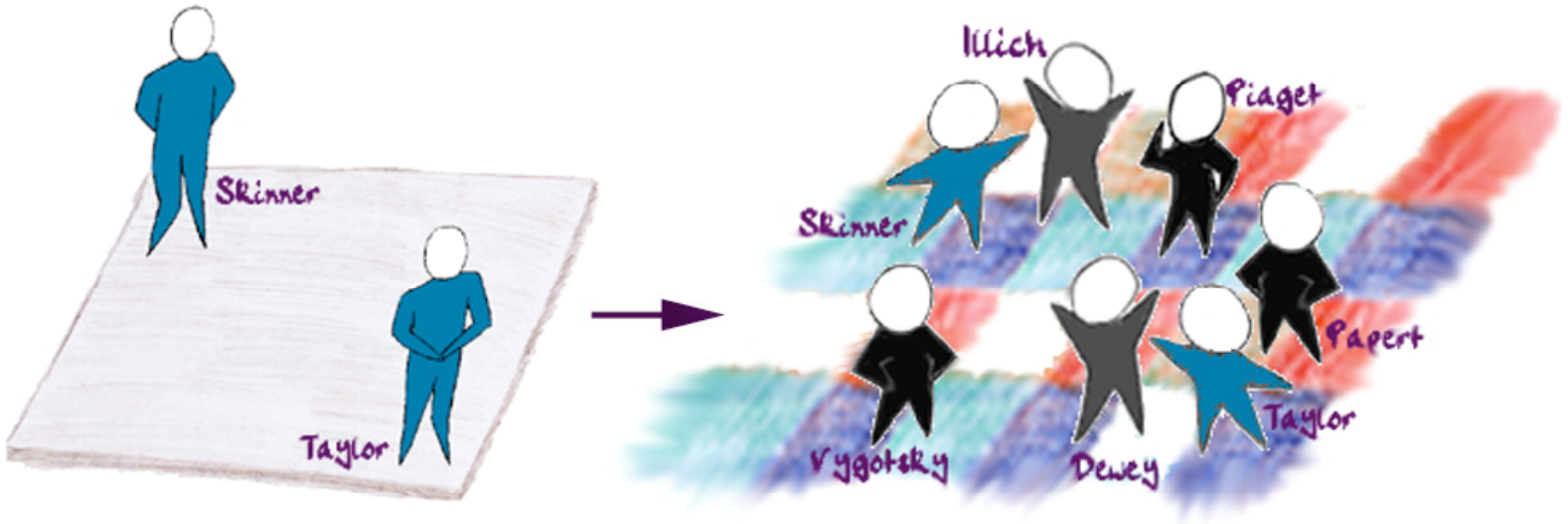


Current Education

Current Education
wrapped in Technology

Learning and Media

Rethinking, Reinventing and Reengineering Educational Theory and Educational Practice



Current Education

Computer-supported & Computer-mediated Education of the Future

How the World Has Changed

dimension	old paradigm	new paradigm
information	scarce	plentiful
reproduction of documents	expensive and restricted	cheap
specialization	low	high
change within a human life time	slow	fast
interaction / collaboration	physical proximity	shared professional interests
economy	rigid, hierarchical organizations long-term personal identity	dynamic economy, flexibility, networking no long-term

Learning in Humans and Machines

- **machine learning** = subfield of AI concerned with programs that learn from experience
  - **applied learning systems — a practical necessity?**
    - to overcome the tedious work of programming
    - the ultimate form of knowledge acquisition in knowledge-based systems
  - **machine learning as a science**
    - understand human learning well enough to reproduce aspects of that learning behavior in computer systems
    - computer enforces a commitment to fine-structure process-level detail
    - exploration of alternative learning mechanism complementing human learning methods

- **in this course:** we are interested in computational media and environments in support of **human learning** (specifically in the context of design and collaboration)

Global Theories about Learning

- **B. F. Skinner (1904 – 1990)—** behavior is affected by its consequences. We reward and punish people, for example, so that they will behave in different ways. → programmed instruction, multiple choice questions

- **Jean Piaget (1896-1980) —** developmental psychology and genetic epistemology: how does knowledge grow? → children's logic and modes of thinking are initially entirely different from those of adults

- **Lev Vygotsky (1896-1934)** — social interaction plays a fundamental role in the development of cognition → computer-supported collaborative learning (CSCL)

- **John Dewey (1859-1952) —** application of his theory of knowledge to education: informal education, passion for democracy (public versus private schools) → self-directed learning, exploration of thinking and reflection, environments for learning

Jerome Bruner (1915 -): Education and Learning

- It is surely the case that schooling is only one small part of how a culture inducts the young into its canonical ways. Indeed, schooling may even be at odds with a culture's other ways of inducting the young into the requirements of communal living.

- What has become increasingly clear is that education is not just about conventional school matters like curriculum or standards or testing. What we resolve to do in school only makes sense when considered in the broader context of what the society intends to accomplish through its educational investment in the young.

- How one conceives of education, we have finally come to recognize, is a function of how one conceives of culture and its aims, professed and otherwise.

Global Theories about Learning

- **Ivan Illich** — convivial tools, deschooling society → learning webs

- **Seymour Papert** — constructionism → LOGO, Turtle Geometry

Some References about Learning

- Brown, J., Duguid, P. (1995) “Universities in the Digital Age”, At http://www2.parc.com/ops/members/brown/papers/university.html

- Bruner, J. (1996) *The Culture of Education*, Harvard University Press, Cambridge, MA.

- H. Gardner, The Unschooled Mind, Basic Books, Inc, New York.

- Illich, I. (1971) *Deschooling Society*, Harper and Row, New York.

- Noam, E. (1995) “Electronics and the Dim Future of the University,” *Science*, 270(10), pp. 247-249. at http://www.uta.fi/FAST/JH/noam.html

- Papert, S. (1980) Mindstorms: Children, Computers and Powerful Ideas, Basic Books, New York.

Answers by Students

<see Gerhard's summary file>

- Yingdan Huang — Constructionist Learning (Learning-by-making)
- Nick Todd — Apprenticeship learning
- Brian Brown — just-in-time learning
- Corey Davis and Jarret Lavalle — E-learning
- John Bacus — Constructionist Learning
- Peng Shao — "Apprenticeship Learning"
- Joe Zeles — Hands-on Learning
- Brian Sax, Jason Held, Andy Hoffner — Just-in-time learning
- Jessica Speir — A Passion For Learning