



Center for  
**LifeLong  
Learning  
& Design**

University of Colorado at Boulder

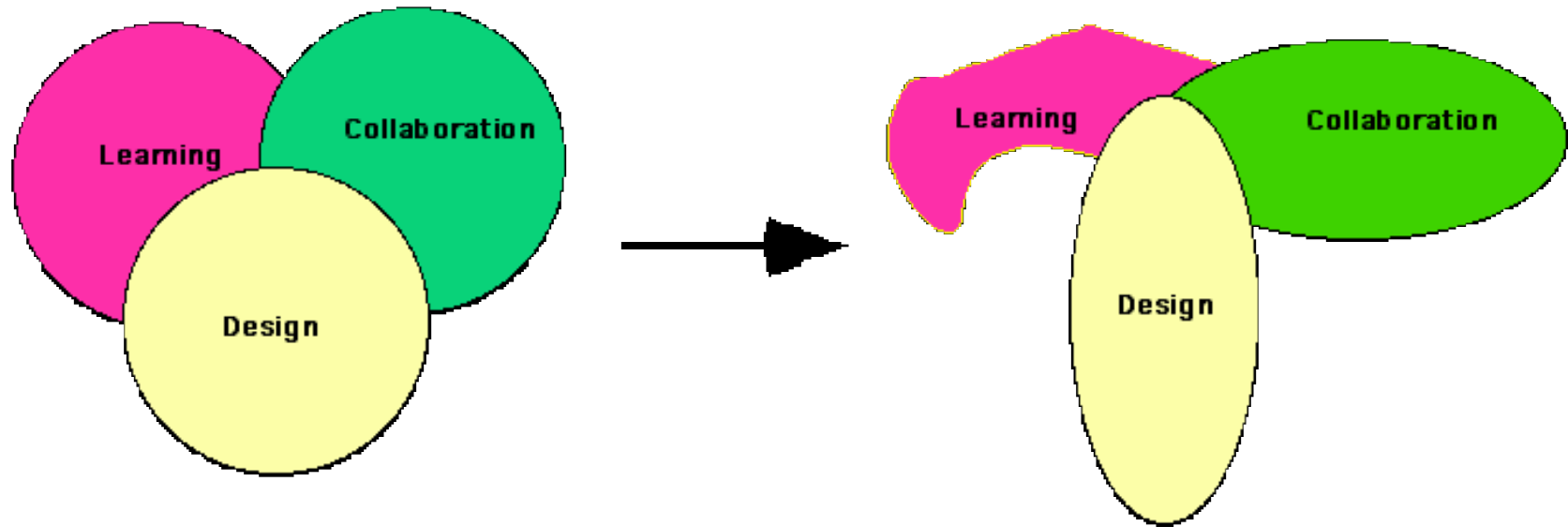
Wisdom is not the product of schooling  
but the lifelong attempt to acquire it.  
- Albert Einstein

# Design, Learning, and Collaboration

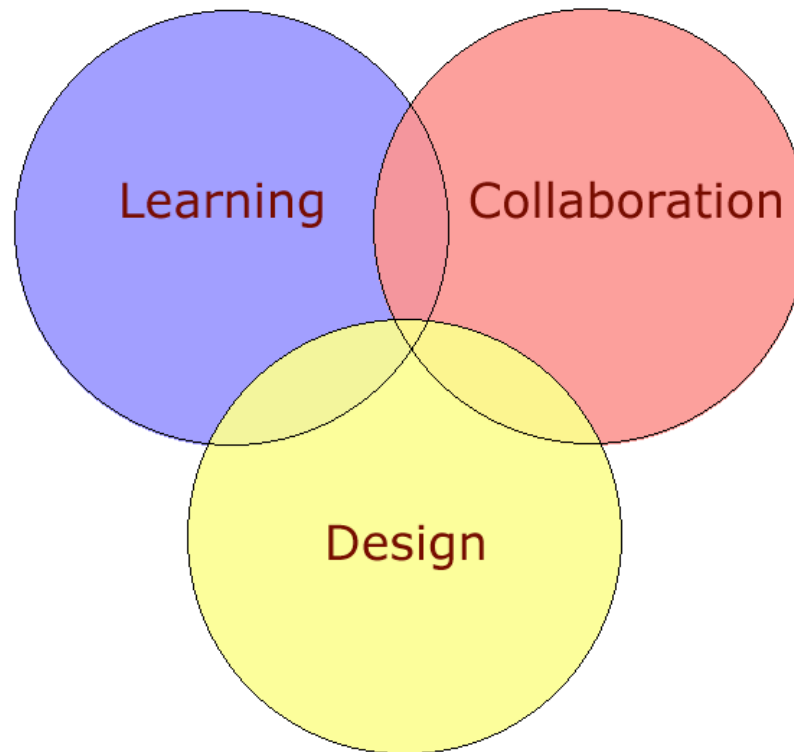
Gerhard Fischer  
Spring Semester 2002

Introduction and Overview of Course, Jan 14, 2002

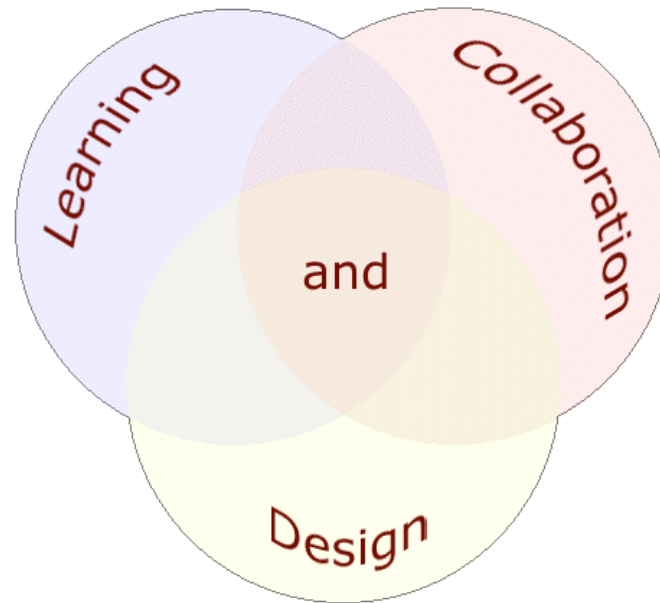
# Intersection of Design, Learning and Collaboration and their Changing Nature through New Media



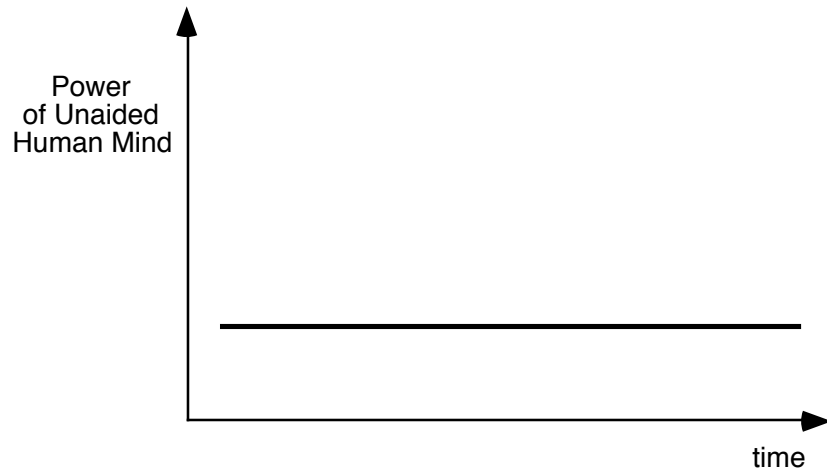
# Design, Learning and Collaboration – the “Old” View



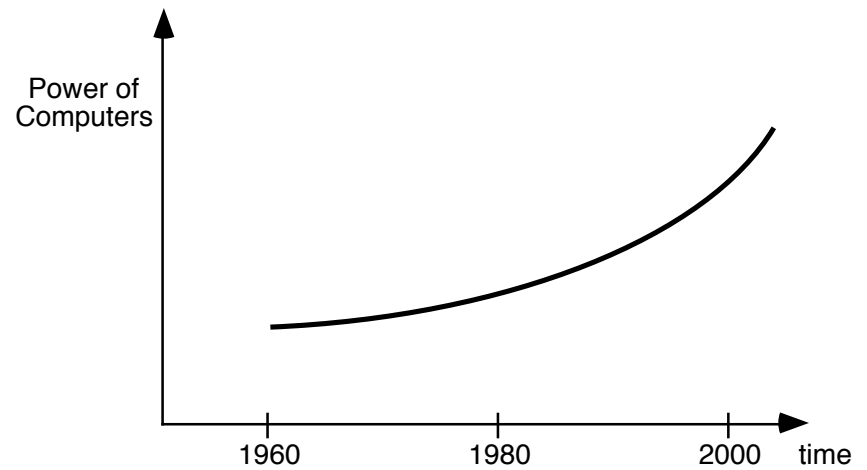
# Design, Learning and Collaboration – the “New” View



# The Tension between Human and Computational Power

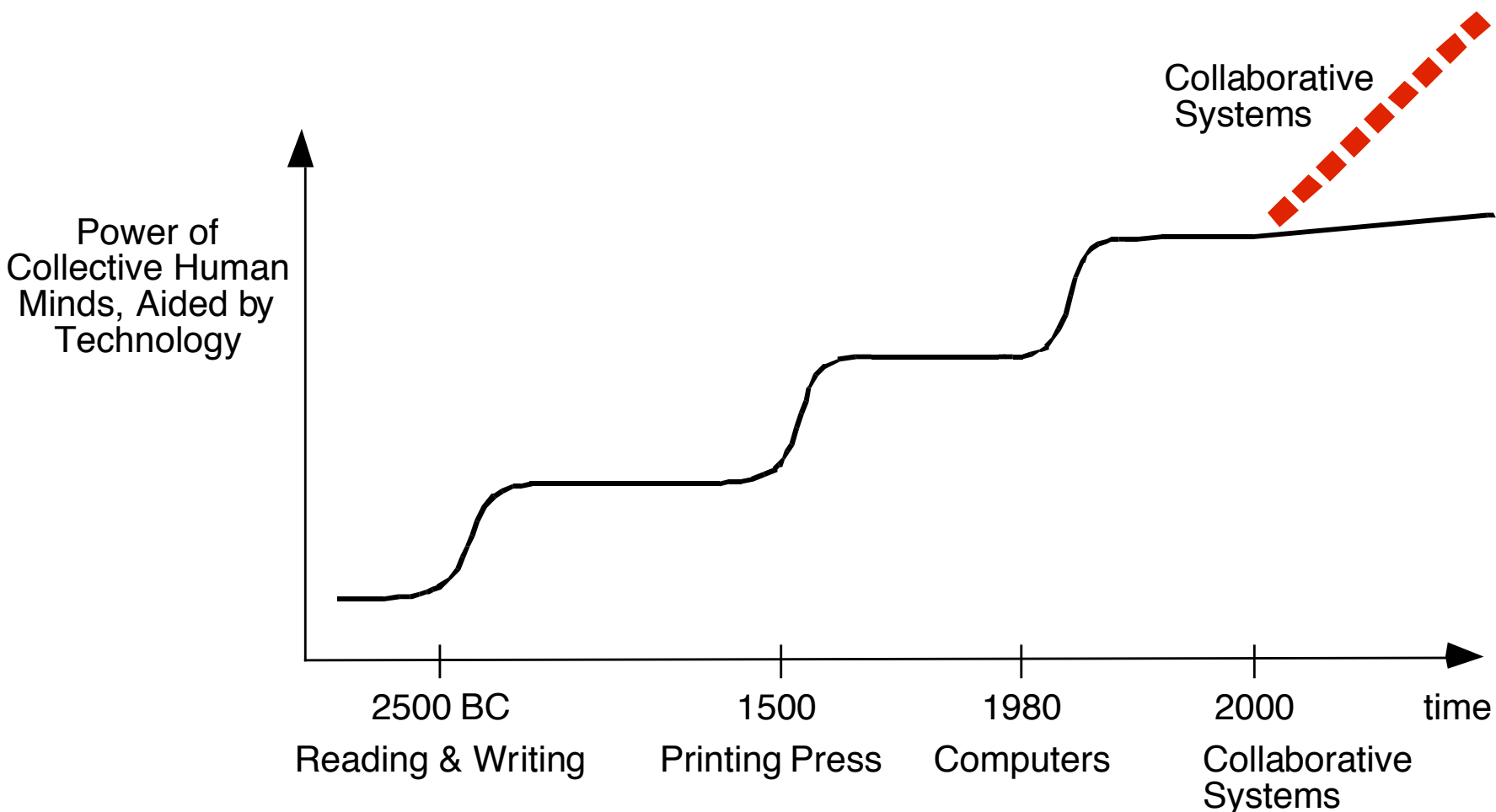


The power of the unaided individual human mind remains constant over time.



Computing power increases at an exponential rate.

# The Aided, Collective Human Mind – Exploiting the Social



# Design

- **design** = although there is a huge diversity among design disciplines, we can find common concerns and principles that are applicable to the design of any object, whether it is a (scientific, mathematical) notation / poster, a household appliance, a housing development, a software system, .....
- **some relevant publications:**
  - Simon, H. A. (1996) *The Sciences of the Artificial*, (Third ed.), The MIT Press, Cambridge, MA.
  - Norman, D. A. (1993) *Things That Make Us Smart*, Addison-Wesley Publishing Company, Reading, MA.
  - Schön, D. A. (1983) *The Reflective Practitioner: How Professionals Think in Action*, Basic Books, New York.
  - Winograd, T. (Ed.) (1996) *Bringing Design to Software*, ACM Press and Addison-Wesley, New York.
  - Fischer, G. (1994) "Domain-Oriented Design Environments," *Automated Software Engineering*, 1(2), pp. 177-203.

# Learning

- **learning** = is a new form of labor and working is often a collaborative effort among colleagues and peers. In the emerging knowledge society, an educated person will be someone who is willing to consider learning as a lifelong process. More and more knowledge, especially advanced knowledge, is acquired well past the age of formal schooling, and in many situations through educational processes that do not center on the traditional school.
- **some relevant publications:**
  - Gardner, H. (1991) *The Unschooled Mind*, Basic Books, Inc, New York.
  - Papert, S. (1980) *Mindstorms: Children, Computers and Powerful Ideas*, Basic Books, New York.
  - Rogoff, B., Matsuov, E., & White, C. (1998) "Models of Teaching and Learning: Participation in a Community of Learners." In D. R. Olsen & N. Torrance (Eds.), *The Handbook of Education and Human Development — New Models of Learning, Teaching and Schooling*, Blackwell, Oxford, pp. 388-414.
  - Fischer, G.: "Lifelong Learning - More Than Training", Special Issue on Intelligent Systems/Tools In Training and Life-Long Learning (eds.: Riichiro Mizoguchi and Piet A.M. Kommers), *Journal of Interactive Learning Research*, Vol. 11, No 3/4, 2000, pp. 265-294. [<http://www.cs.colorado.edu/~gerhard/papers/III99.pdf>]



# Collaboration

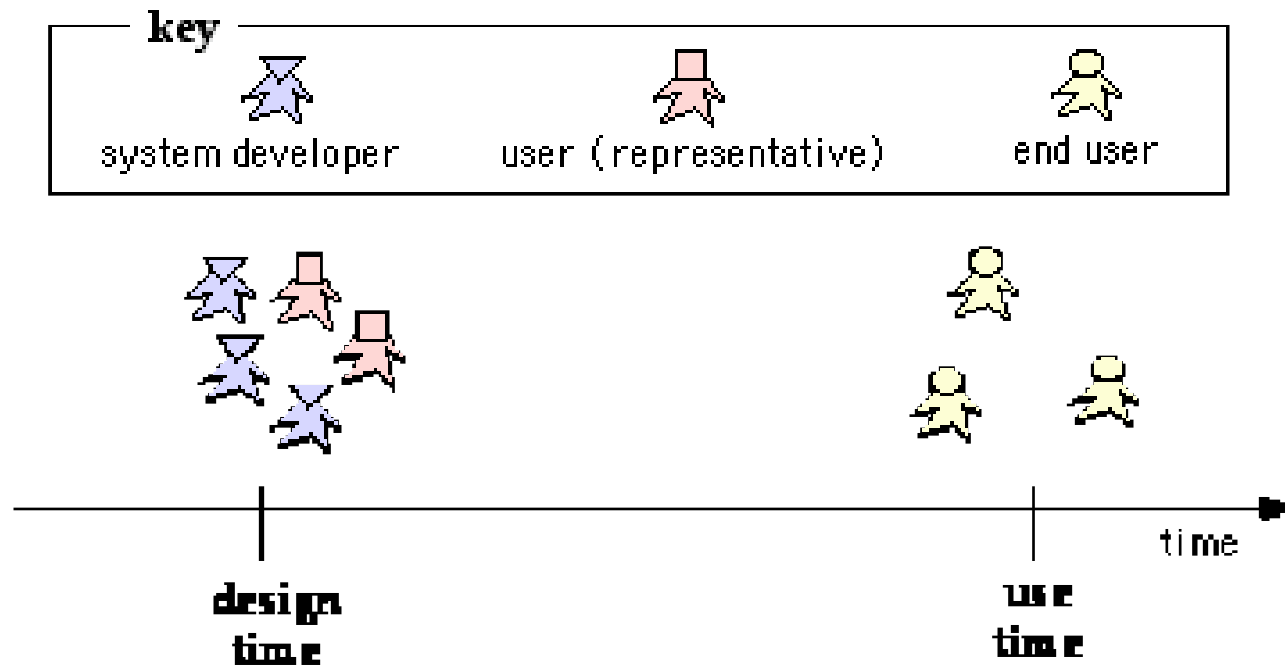
- **collaboration** = the individual, unaided human mind is limited: there is only so much we can remember and there is only so much we can learn.
- **some relevant publications:**
  - Resnick, L. B., Levine, J. M., & Teasley, S. D. (Ed.) (1991) Perspectives on Socially Shared Cognition, American Psychological Association, Washington, D.C.
  - Koschmann, T. (Ed.) (1996) CSCL: Theory and Practice of an Emerging Paradigm, Lawrence Erlbaum Associates, Hillsdale, NJ.
  - Sachs, P. (1995) "Transforming Work: Collaboration, Learning, and Design," Communications of the ACM, 38(9), pp. 36-44.
  - Fischer, G. (2000) "Social Creativity, Symmetry of Ignorance and Meta-Design," Knowledge-Based Systems Journal (Special Issue on Creativity & Cognition), Elsevier Science B.V., Oxford, UK, 13(7-8), pp. 527-537.

# Innovative System Development Efforts In Support of Design, Learning and Collaboration

<http://www.cs.colorado.edu/~l3d/>

Domain-Oriented Design Environments (DODEs)	kitchen design, computer network design, voice dialog design, .....
Dynasite	WWW support for collaborative design, Sources, Dynagloss, ....
Agentsheets,	substrate for DODEs
Visual AgenTalk	simulation, end-user programming
Behavior Exchange	sharing the work
Envisionment and Discovery Laboratory (EDC)	integrated physical and computational environments creating shared understanding, studying authentic problems
PiTABoard	innovative interaction mechanisms in face-to-face-collaboration
CodeBroker	software reuse and information delivery
Swiki / Squeak	organizational memories created by collaborative knowledge construction

# Fundamental Difference between Printed and Computational Media



**print media:** a fixed context is decided at design time

**computational media:** decision at use time can take advantage of contextual factors only known at use time

**challenge:** articulation of contextual factors at use time (about tasks, users, social systems,.....) — end-user programming and modification, customization, specification sheets, usage data, .....

# The Course

- This course will consist of **lectures, guest lectures, independent research activities by students, demonstration of existing major prototype systems, experiments, and a major project by groups of students.**
- **Independent Research Activities by Students**  
This part of the course will provide students with an opportunity to engage in self-directed learning in the context of independent research explorations (this work is more conceptual and *complements* the work in the course project). Students will present their research about these topics in class some ideas. A list of suggested topics will be provided by the instructor.
- **Major Project (by groups of students)**  
purpose: to gain an in-depth understanding of a theme relevant to the course. Projects need to be carried out through a learning-by-doing approach throughout the semester, preferably as a collaborative activity of team(s).  
***Requirements for Projects include:***
  - An Initial Description of your Course Project
  - Project Proposal
  - Progress Report
  - Final Report

# Expectations about Involvement of Students

- active participation → presence in class
- readings and small assignments
- independent research
- projects
- create a community: (peer-to-peer learning, website, take picture)

## Self-Application: A “New Culture” for this Course

- “symmetry of ignorance” — stakeholders are aware that while they each possess relevant knowledge, none of them has all the relevant knowledge
- teacher, learner =  $f\{\text{person}\}$  → teacher, learner =  $f\{\text{context}\}$
- the knowledge for (re)solving complex, real-world problems does not exist *a priori*, but is generated through collaboration among stakeholders

# Passion for Learning – Beyond Tests

COMMENTARY • OPEN FORUM

Tuesday, May 2, 2000

