



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**

## **Doctoral Level Independent Study**

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### **CSCI 7900-903**

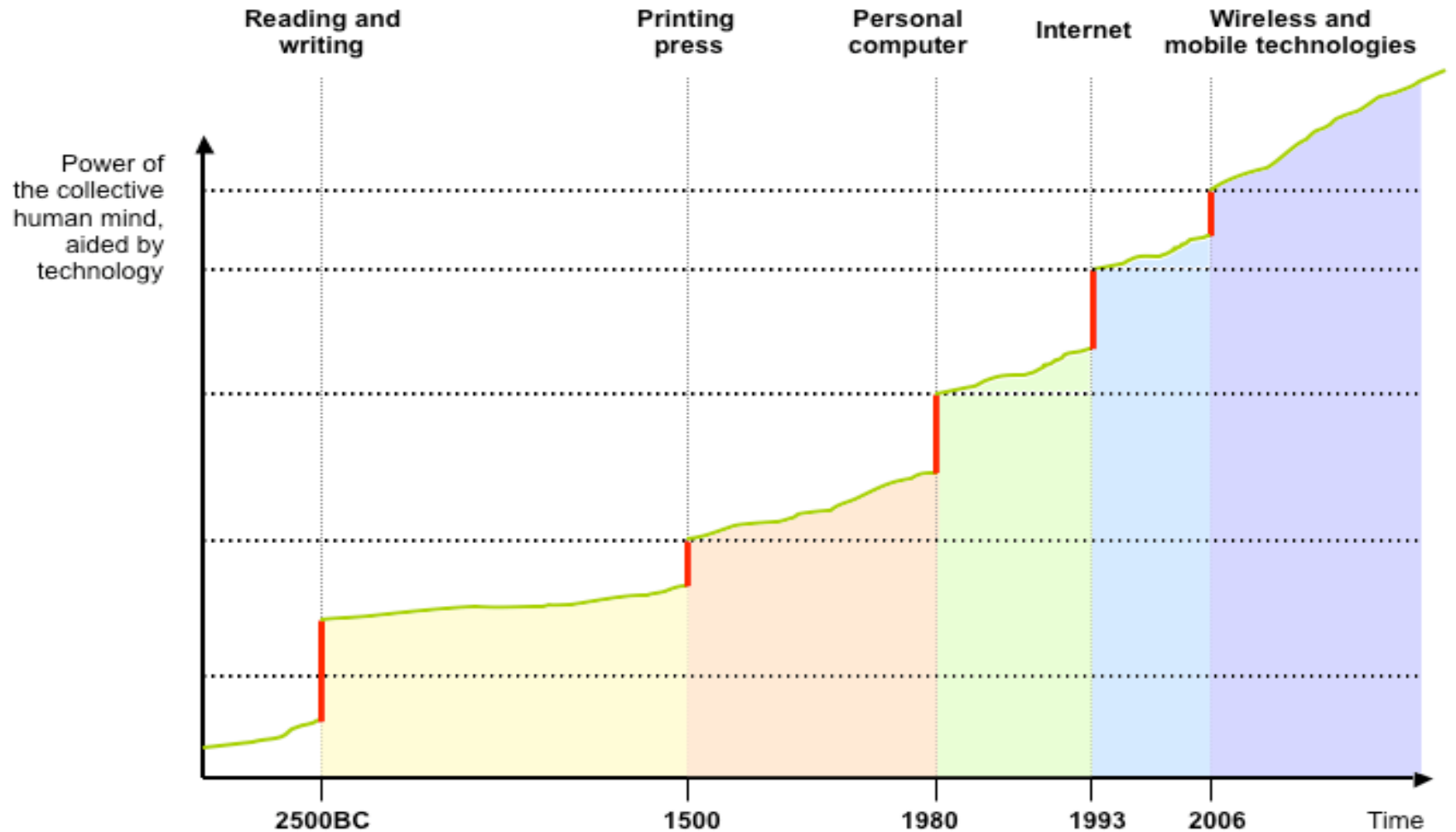
**Gerhard Fischer and Hal Eden  
Fall Semester 2006**

**Introduction, August 30, 2006**

# Computer Science – A “Design” Discipline?

- **natural science: “how things are”**
  - knowledge about natural objects and phenomena
  - primary interest: analysis
  - examples: physics, chemistry
  
- **sciences of the artificial: “how things might be”** (and ought to be in order to attain goals and to function)
  - knowledge about artificial objects and phenomena
  - primary interest: synthesis
  - examples: engineering, medicine, business, architecture, painting, universities, cognitive artifacts, notations
  
- **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, a household appliance, a housing development, a software system, .....

# Beyond the Unaided, Individual Human Mind



# **The Motto of the Integrated Teaching and Learning Laboratory (ITLL)**

<from Confucius, 500 BC>

**I hear and I forget**

**I see and I remember**

**I do and I understand**

# Learning and Teaching

- *"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 and
  - much teaching takes place without learning

# Passion for Learning – Beyond Tests

COMMENTARY • OPEN FORUM

Tuesday, May 2, 2000



# More is Less

- **Blaise Pascal:** *“I have made this letter longer than usual, because I lack the time to make it shorter.”* — Provincial Letters XVI
- **Antoine deSaint-Exupéry** (aviator, aircraft designer, author of classic children’s books): *“Perfection (in design) is achieved not when there is nothing more to add, but rather when there is nothing more to take away.”*

# What is the Scarce Resource: — Information or Human Attention

- *“What information consumes is rather obvious: it consumes the attention of its recipients. Hence a wealth of information creates a poverty of attention,, and a need to allocate efficiently among the overabundance of information sources that might consume it.” — Herbert Simon*
- From *“Anywhere, Anytime, Anyone”* → *“The Right Information at the Right Time, the Right Place, in the Right Way to the Right Person”*



# CS Formalisms – General or Specific

- question: why is one programming language not good enough?
- **Turing Tar Pit:** *“Beware of the Turing Tar Pit, in which everything is possible, but nothing of interest is easy.”*
- **The Inverse of the Turing Tar Pit:** *“Beware of the over-specialized systems, where operations are easy, but little of interest is possible.”*
- observation: “The smartest people in the world do not generally look very intelligent when you give them a problem that is outside the domain of their vast experience.”

# The Role of Mathematics in Software Design

*“I am skeptical that classical mathematics is an appropriate tool for our purposes: witness the fact that most formal specifications are as large, as buggy as, and usually more difficult to understand than the programs they purport to specify.*

*I don't think the problem is to make programming `more like mathematics'; it's quite the other way around.” — W. Wulf*

# Ease of Use – The Ultimate Goal?

- “If ease of use was the only valid criterion, people would stick to tricycles and never try bicycles.” — Doug Engelbart
- ease of use (usable) → useful, engaging
- ease of use → low threshold, high ceiling

# Course Information Environment

- a Swiki at: <http://l3dswiki.cs.colorado.edu:3232/phd-intro>
- all course work (lecture notes, assignments, questionnaire) will be distributed, documented, and shared via the Swiki

## 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{person} → **teacher, learner = f{context}**
- the knowledge for (re)solving complex, real-world problems does not exist *a priori*, but is generated through collaboration among stakeholders

# Preview of the Course

- locating relevant information
- writing papers
- giving a presentation
- defining a area of research
- writing a dissertation
- interviewing faculty members and experienced PhD students
- creating a community
- getting a job
- guest lectures

## Some Relevant Websites

- the PhD program at CU Boulder  
<http://www.cs.colorado.edu/grad/phd/>
- why computer science:  
<http://www.cs.colorado.edu/why/>

# What does a Ph.D. require?

- intrinsic motivation
- dedication
- sometimes: hard work
- getting through days in which one thinks:
  - “I will never get done with this!”
  - “why do I waste years of my life doing this!”



## What is a Ph.D. all about?

- it qualifies you for the rest of your life
- it opens you doors which may provide unique opportunities for you
- it should motivate you *“to work hard not because you have to – but because you want to!”*