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

Is Google Making Us Stupid?

Gerhard Fischer

L3D Meeting, January 21, 2009

Background

- **source**: Carr, N. (2008) Is Google Making Us Stupid?, available at http://www.theatlantic.com/doc/200807/google

- **short introductory remarks:**
  - Gerhard Fischer: Insights and Disagreement from **L3D**
  - Mark Dubin: Insights and Disagreement from **Neuroscience**
  - Walter Kintsch: Insights and Disagreement from **Psychology**
  - Google colleagues: Insights and Disagreement from **Google**
  - from all participants: Insights and Disagreement from **all participants**

Interesting Quotes from the Paper

- the Net is becoming a universal medium, the conduit for most of the information that flows through my eyes and ears and into my mind. The **advantages of having immediate access** to such an incredibly rich store of information are many,

- The more people use the Web, the more they have **to fight to stay focused** on long pieces of writing.

- It is clear that users are not reading online in the traditional sense; indeed there are signs that **new forms of "reading"** are emerging as users "power browse" horizontally through titles, contents pages and abstracts going for quick wins.

- The Net's influence doesn't end at the edges of a computer screen, either. As people's minds become attuned to the crazy quilt of Internet media, **traditional media have to adapt to the audience's new expectations**.

What the Internet is doing to our brains (and minds)?
—
Some Claims

- it is not Google — but the way **how we use Google**
- we program the Net and **the Net programs us** (= it shapes the process of our thoughts)
- **'pancake people'**—spread wide and thin as we connect with that vast network of information accessed by the mere touch of a button
- how does it compare to **cognitive enhancement drugs** (= brain doping)?
- the story of the human race is one of ever-increasing intellectual capability. Since our early cave-dwelling ancestors, **our brains have gotten no bigger**, but there has been a steady accretion of new tools for intellectual work

Theories

- anecdotes alone don't prove much → we still await the long-term **neurological** and **psychological** experiments that will provide a definitive picture of how Internet use affects cognition

- understanding new media and trying to answer the question: in terms of efficiency, economics, reliability, and human gratification and enjoyment → **what tasks (or part of tasks)** are really better reserved for
  - an **educated human mind**, and
  - which should be taken over by or aided by what kind of **cognitive artifacts?**

- **over-reliance on tools:** under which conditions lead tools for living to learned helplessness and deskilling, ruining the users native abilities by making them dependent on the tool?

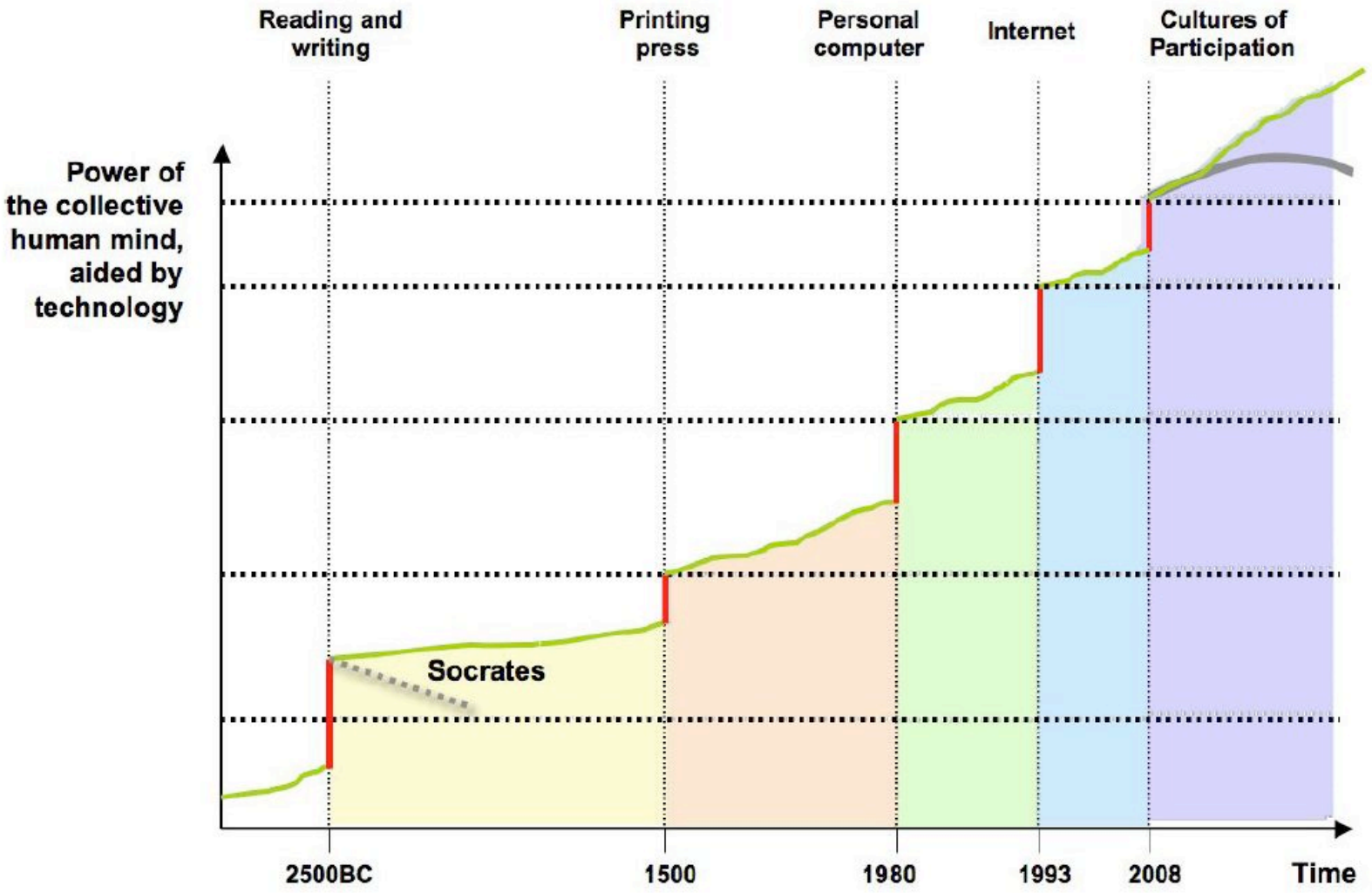
Distributed Intelligence

- ***claims:***
  - *"human cognition has been seen as existing solely **'inside'** a person's head, and studies on cognition have often disregarded the physical and social surroundings in which cognition takes place"*
  - *"people **think in conjunction and partnership** with others and with the help of culturally provided tools and implements"* (Salomon, 1993, p. xiii).

- **distribution:**
  - distributed among people → collaborative learning and working
  - distributed between humans minds and artifacts → intelligence augmentation

- reading, knowing, education, learning, teaching, …… = **f{media}**

Beyond the Unaided, Individual Human Mind



L3D Themes

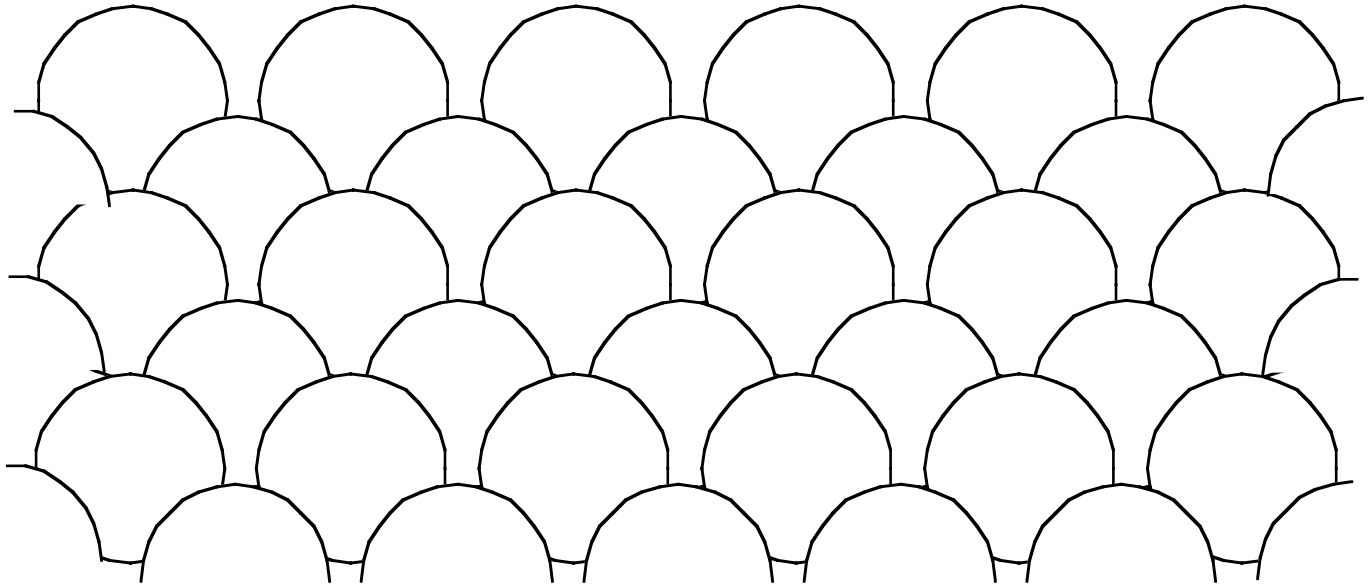
- learning on demand
- tools for living and tools for learning
- over-reliance on tools
- social creativity
- cultures of participation
- long tail learning environments

Thinking, Learning, Creativity, …… —The "Wrong" Image?

"The Thinker" by Auguste Rodin

Fish-Scale Model

- "collective comprehensiveness through overlapping patterns of unique narrowness" → Campbell, D. T. (1969) "Ethnocentrism of Disciplines and the Fish-Scale Model of Omniscience."



Understanding the Role of Basic Skills in the 21st Century

Reference: John Anderson in Eisenberg, M. & Fischer, G. (1993) "Symposium: Learning on Demand." In Proceedings of the 15th Conference of the Cognitive Science Society, Boulder, CO, pp. 180-186.

*"If most job-relevant knowledge must be learned on demand what is the role for **basic education**? In particular, I will consider the role of a traditional high school mathematics education. There is a general perception that American children are poorly prepared in mathematics and that this is part of the reason for our lack of international competitiveness.*

*However, the kind of mathematics that American schools fail at teaching (and which other countries excel at) has increasingly little relationship to work performance. Almost all of the mathematics that students learn in traditional high school mathematics is **job-irrelevant** (e.g., doing proofs in geometry) or now **automated** (e.g., algebraic symbol manipulation).*

John Anderson — Continued!

Most people's on-the-job contact with mathematics (if they have any) will be in using tables and software packages based on mathematics. Perhaps ***we need only teach traditional mathematics to a small minority of the population who will maintain these systems.***

Perhaps the function of a high-school mathematics education is to train students to ***intelligently use these mathematical artifacts****. I will discuss our work at building an algebra tutoring system focused on teaching students to use spreadsheet, graphing, and symbol manipulation facilities to solve "real world" problems. Intelligent use of such artifacts requires that students have some relatively traditional skills in high school mathematics. I will discuss what some of these basic skills are and how they can be tutored."*

Tools for Living = Do Task with Tools

- **"anatomy is not destiny" — a basic belief behind the CLever Project**
  "The invention of eyeglasses in the twelfth century not only made it possible to improve defective vision but suggested the idea that human beings need not accept as final either the endowments of nature nor the ravages of time. Eyeglasses refuted the belief that anatomy is destiny by putting forward the idea that our minds as well as our bodies are improvable!" — Neil Postman

- **examples**:
  - **eye-glasses**: to compensate for poor eyesight (⇒ question: is the correction of eyesight with "lasik surgery" conceptually different?)
  - **pencil and paper** (literacy): to overcome the limitations of short-term memory

- **opportunity**: while some people might have no problems to learn to perform the tasks without the tools (e.g., spelling), they use tools for doing these "low level" tasks and can therefore focus on the more interesting tasks

- **independence**:
  - people will be **dependent** on the tool
  - analyze how **dependence** in one dimension can increase **independence** in another dimension?

Hand-Held Calculators: What Should the Boulder Valley School District Do?

- **position 1:** ignore the existence of the gadget; we are not interested in technology, but in important mathematical skills; **recommendation:** do ***not use*** hand-held calculators in schools

- **position 2:** keep the curriculum the same, make children learn arithmetic, multiplication tables, long division, drawing square root by hands; **recommendation:** ***after*** they have it all mastered, allow the use of hand-held calculators.

- **position 3:** invent/ create new calculators, new curricula, new scaffolding mechanisms that make learning these skills more fun and create a deeper understanding of underlying concepts — **recommendation:** using these hand-held calculators, the learners would acquire the skills and the knowledge and eventually become ***independent*** of the gadget ("scaffolding with fading")

- **position 4:** find new ways to ***distribute responsibilities between humans and machines*** such that humans do the qualitative reasoning, use estimation skills, relate the mathematical result to the real world and machines do the detailed quantitative computations **recommendation:** establish new divisions of labor, rely on distributed intelligence

Over-Reliance on Tools for Living

Over-Reliance on Tools for Living

"Nurse, get on the internet, go to SURGERY.COM, scroll down and click on the 'Are you totally lost?' icon."

A Faustian Bargain — Design Trade-Offs?

Negative?

- "the Net seems to be chipping away my capacity for concentration and contemplation"
- dependency
- over-reliance

Positive?

- research that once required days in the stacks or periodical rooms of libraries can now **be done in minutes**

- **Transcending the Individual Human Mind** → Simon, H. A. (1996) The Sciences of the Artificial, (third ed.), The MIT Press, Cambridge, MA., p 92:

  "When a domain reaches a point where the knowledge for skillful professional practice cannot be acquired in a decade, more or less, then several adaptive developments are likely to occur. Specialization will usually increase (as it has, for example, in medicine), and practitioners will make increasing use of books and other external reference aids in their work."

- **Google — an augmentation system?**
  - *"the components of an augmentation system are the bundle of all things that can be added to what a human is genetically endowed with, the purpose of which is to augment these basic human capabilities in order to solve the problems of human society"* — D. Engelbart