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

Learning and Education in the 21st Century

Gerhard Fischer
Center for LifeLong Learning & Design (L^3D)
Department of Computer Science and Institute of Cognitive Science,
University of Colorado, Boulder

University of Milan, February 2012

Overview

- Basic Message
- The Larger Context
- Lifelong Learning
- Courses-as-Seeds / Teacher as Meta-Designer
- Challenges
  - reflective communities
  - long tail opportunities
- Conclusion

Basic Message

- **many technology enhance learning (TEL) approaches are too timid and not thinking radically enough**
  - by accepting **too many established approaches** (e.g.: a theory of human learning based solely on school learning is too limited);
  - by **not embracing new learning opportunities** (e.g.: exploiting the unique opportunities of social production in which all learners can act as active contributors in personally meaningful problems);
  - by **not moving beyond "gift-wrapping" and "techno-determinism"** to co-evolution of learning, new media, and new learning organizations

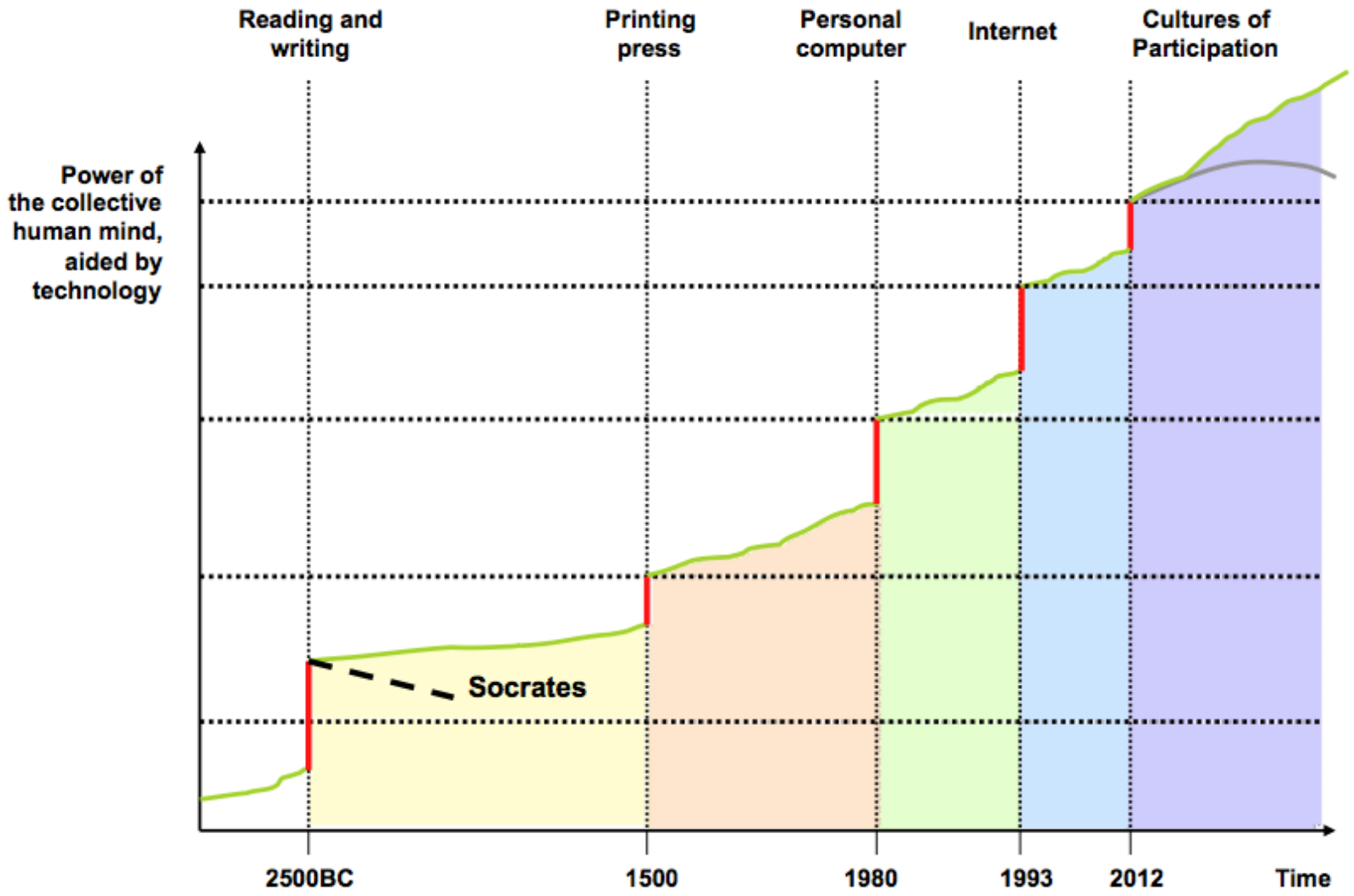
- **challenges:** create a **transformational conceptual framework**
  - for lifelong-learning by focusing on how learning takes place when the answer is not known
  - supporting people in taking control of their own learning
  - for cultures of participation

A Transformational Conceptual Framework

▪ school learning	→	**lifelong learning**
▪ unaided individual human mind	→	**distributed cognition**
▪ reflective practitioner	→	**reflective community (cultures of participation)**
▪ "gift-wrapping" and "techno-determinism"	→	**socio-technical environments**
▪ consumers	→	**active contributors (meta-design)**
▪ learning when the answer is known	→	**learning when no one knows the answer (social creativity)**

The Larger Context

Beyond the Unaided, Individual Human Mind



Major Eras of Education

- **apprenticeship era:** personal, resource intensive, and engaging
- **schooling era:** mass oriented, efficient, and bureaucratic
- **lifelong learning era:** powerful new digital tools (distributed cognition), interactive, customized, self-directed, collaboration (face-to-face and virtual)

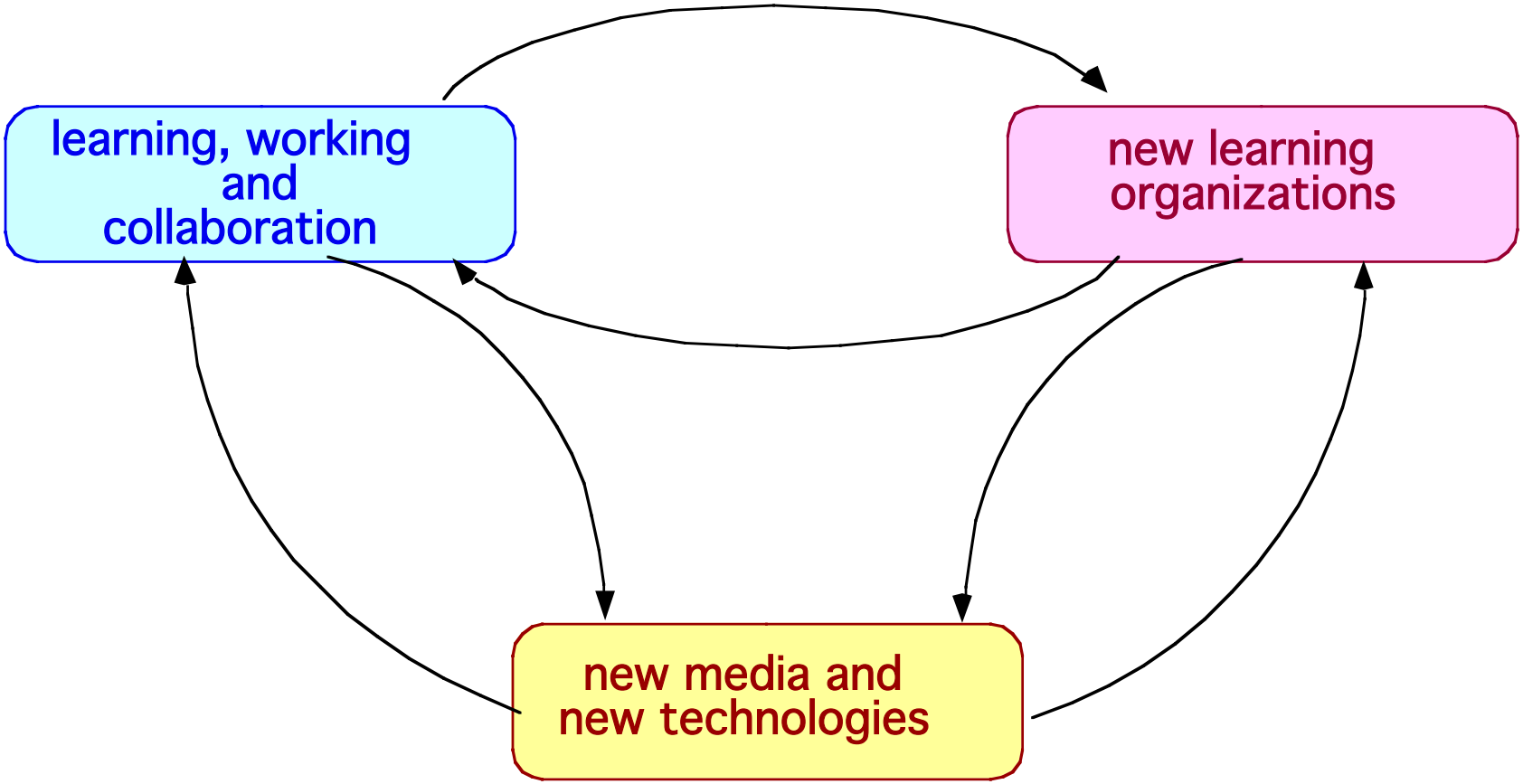
How the World Has Changed

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

What's Wrong with the Universities of Today

- **lecture dominated** — emphasizing passive knowledge absorption instead of active knowledge construction
- **curriculum dominated** — little room for authentic, self-directed learning activities
- students solve **given problems** — they do not learn to frame problems
- problems in school have **right or wrong answers** — problem in the real world are wicked, ill-defined, ill-structured
- **closed book exams** — ignoring distributed cognition
- little emphasis on **collaborative learning and communication skills —** working together is regarded as “cheating”

Co-Evolution: Beyond "Technology-Driven Developments" and "Gift-Wrapping"



Stuck in "Giftwrapping" or "Technology-Driven Developments"

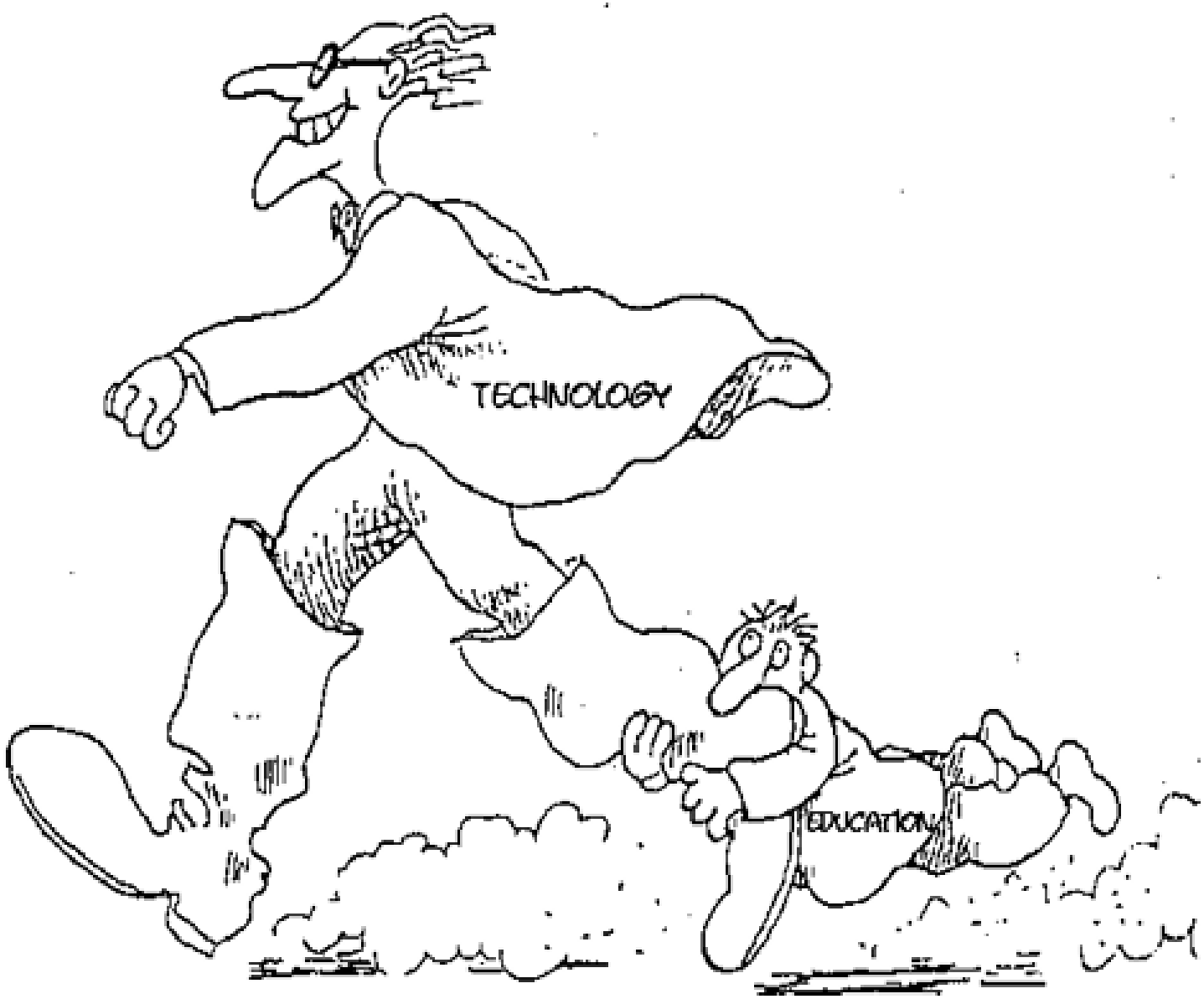
"There is nothing so useless as doing efficiently that which should not be done at all." — **Peter Drucker**

- **"Giftwrapping"**
  - using technology as an **add-on to existing practices** → instead of fundamentally rethinking what education should and could be about in the future
  - *"distance learning is different from classroom learning at a distance"*
  - Classroom Response Systems **(→ "Clickers")**

- **Technology-Driven Developments**
  - "all schools on the Internet" → necessary, but **not sufficient**

– the Clicker –

a simple technology that works


TECHNOLOGY
EDUCATION

Innovations

- **digital divide:** OLPC (=one laptop per child) = $100 computer

- **OpenCourseware (OCW),** Massachusetts Institute of Technology (MIT)
  - MIT will put all its course content, undergraduate and graduate, into Web-based format
  - the OCW website will be open and freely available to the world
  - MIT will commit to OCW as a permanent, sustainable activity

Challenges Created by MIT's OpenCourseware

- commoditizing the 'content' sharpens the focus on the substantive values of residential education: **personal attention** from faculty and **participation** in learning and research communities

- move away from large passive lectures towards **active learning environments**

- look beyond the simplicities of information to the **complexities of learning, knowledge, judgment, communities, and organizations**

- emphasize **"learning to be"** in addition to **"learning about"**

Lifelong Learning

Our Credo of Lifelong Learning

- **assumption**: If the world of working and living relies on *collaboration, creativity, definition and framing of problems* and if it requires dealing with *uncertainty, change, and intelligence that is distributed* across minds, cultures, disciplines, and tools

- **consequence:** then education should foster on competencies that prepare students for having meaningful and productive lives in such a world

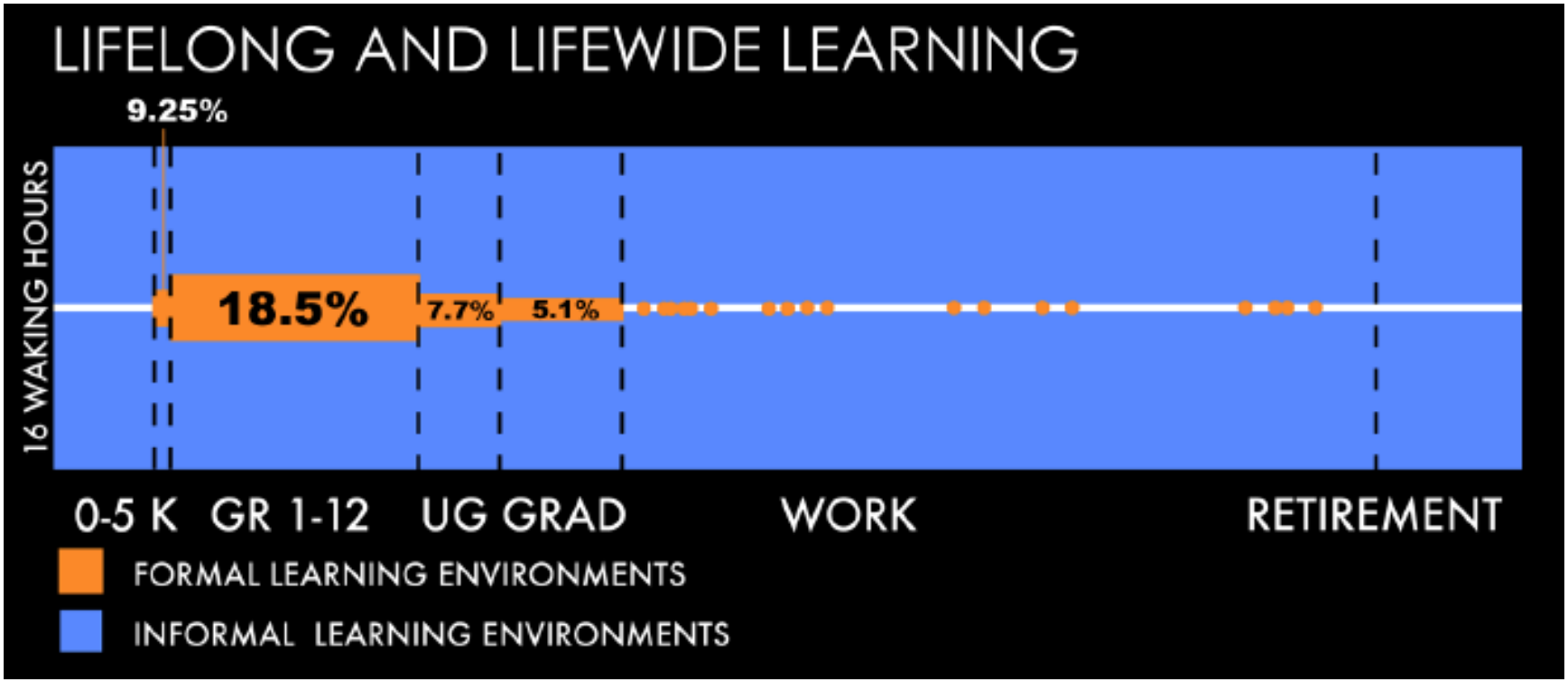
Science of Learning

- *"A decade of interdisciplinary research on everyday cognition demonstrates that school-based learning, and learning in practical settings, have significant discontinuities.* ***We can no longer assume that what we discover about learning in schools is sufficient for a theory of human learning****."* — Scribner and Sachs

- *"In important transformations of our personal lives and organizational practices, we must learn new forms of activity which are not there yet. They are literally learned as they are being created.* ***There is no competent teacher****. Standard learning theories have little to offer if one wants to understand these processes."* — Yrjö Engeström

Formal and Informal Learning?

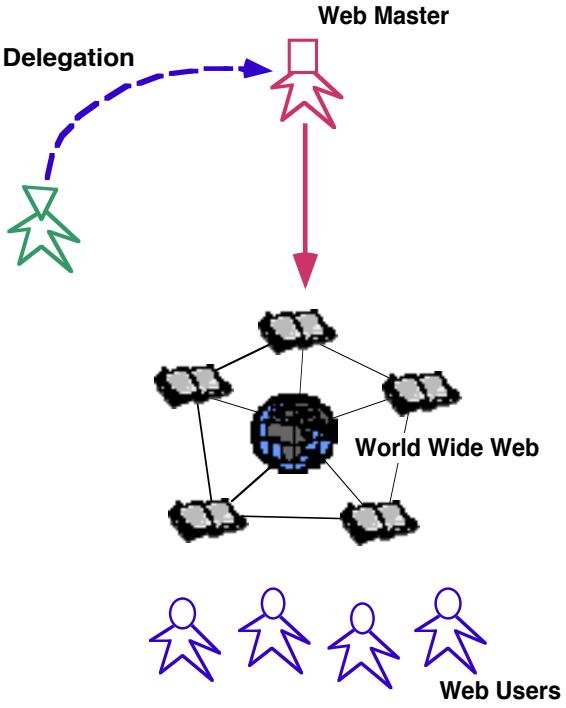
<source: LIFE Center, University of Wash + Stanford>



Facilitating Cultures of Participation

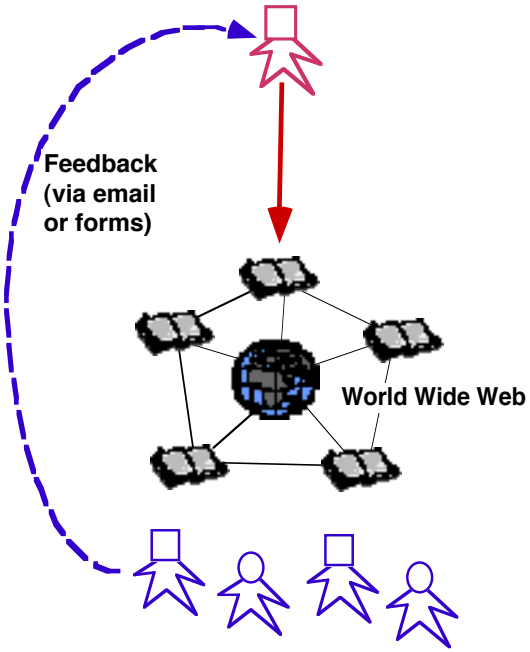
From Broadcast to Collaboration Medium

(1996: Fischer, Ambach, Ostwald, Repenning)



M1

The Web as Broadcast Medium



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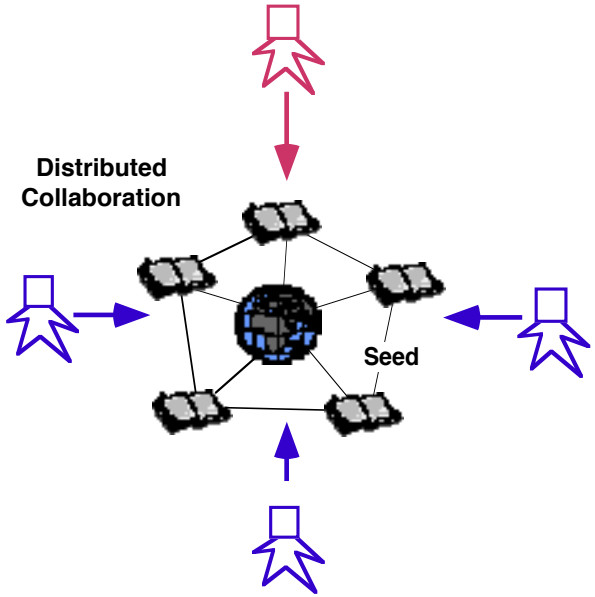
Broadcast with Feedback



M3

Evolutionary and Collaborative Design

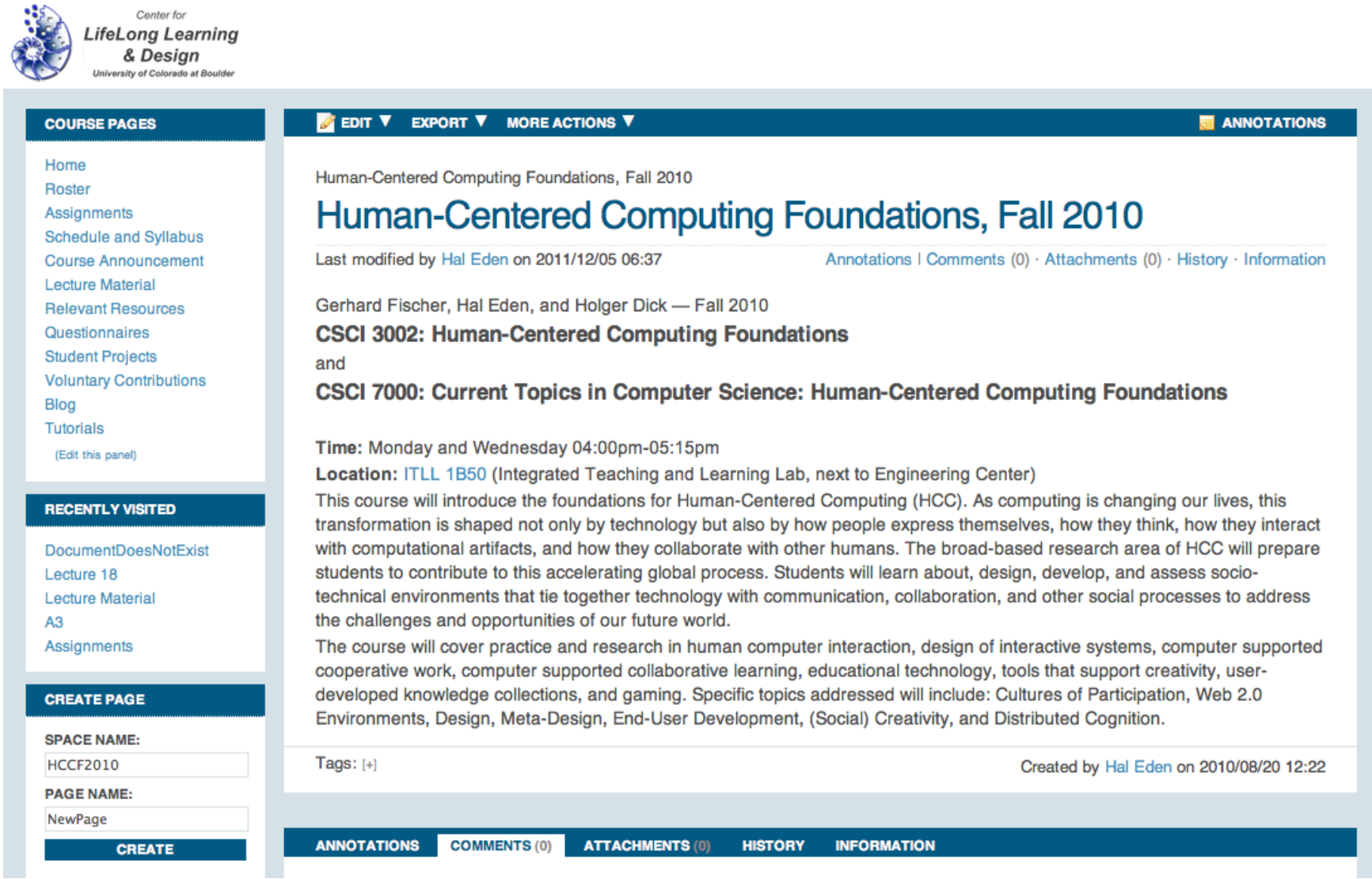
Courses-as-Seeds: Teacher as Meta-Designer

- **examples: http://l3d.cs.colorado.edu/~gerhard/courses/index.html**

- **teachers creates seeds:**
  - lecture notes
  - readings
  - assignments
  - questionnaires
  - project proposals

- **students are active contributors → evolutionary growth**
  - answers to assignments and questionnaires: contributors and summarizers
  - project ideas, initial proposal, progress report, final report

Home Page of one Of Our Courses

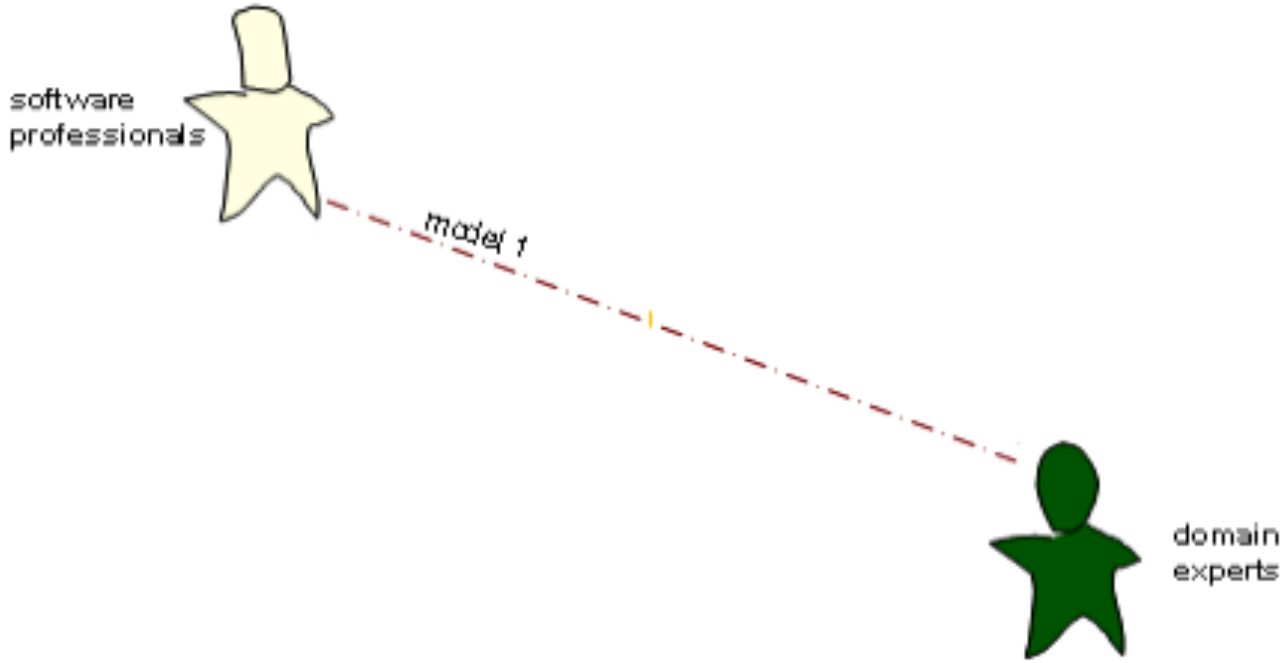


Challenges

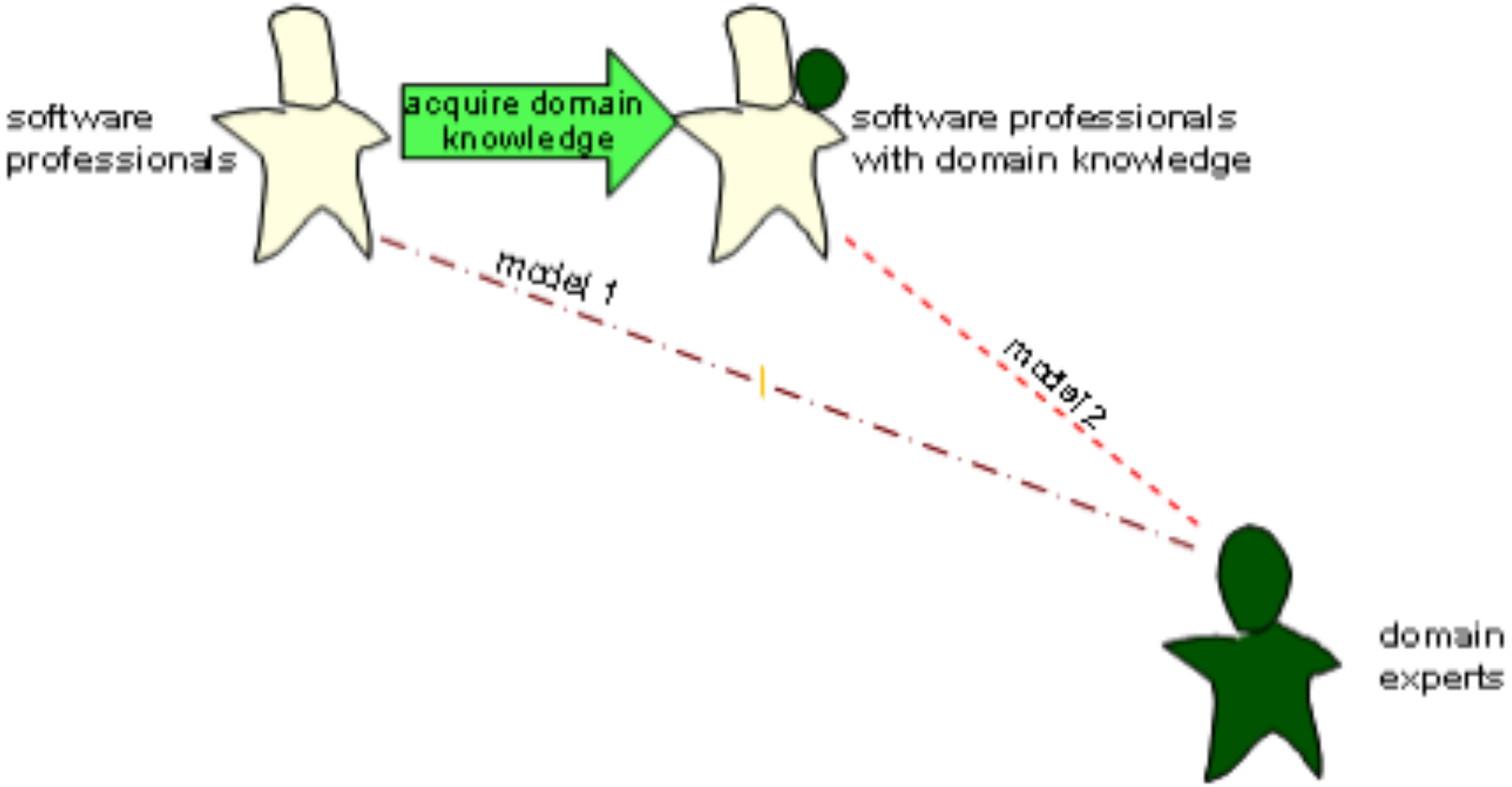
- **reflective communities**
- **"long tail" opportunities**

Reflective Practitioners → Reflective Communities

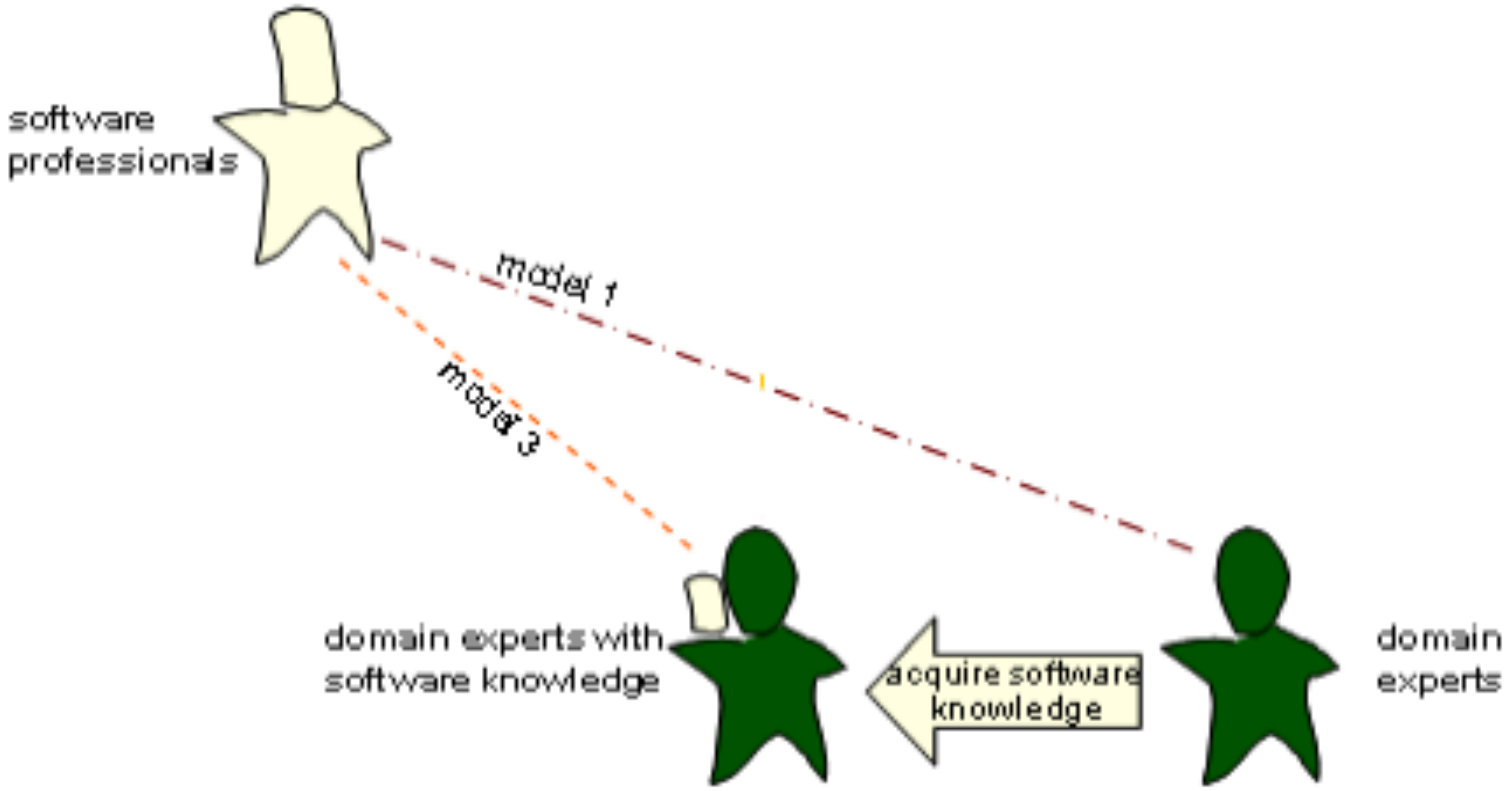
Large Conceptual Distance — Limited Common Ground



Software Professionals Acquiring Domain Knowledge

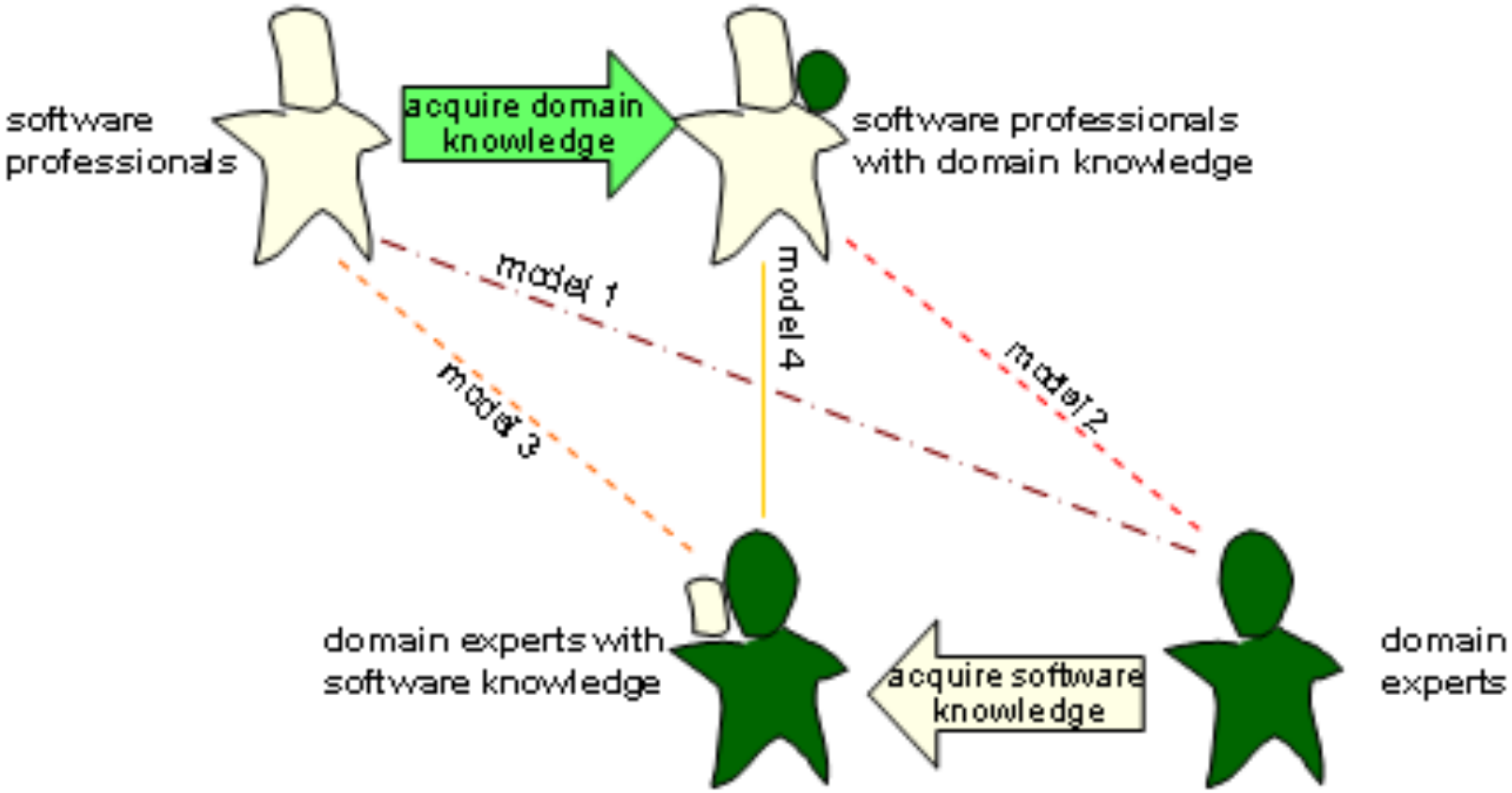


Domain Experts Acquiring Media Knowledge



From Reflective Practitioners to Reflective Communities

(supported by transdisciplinary collaboration)



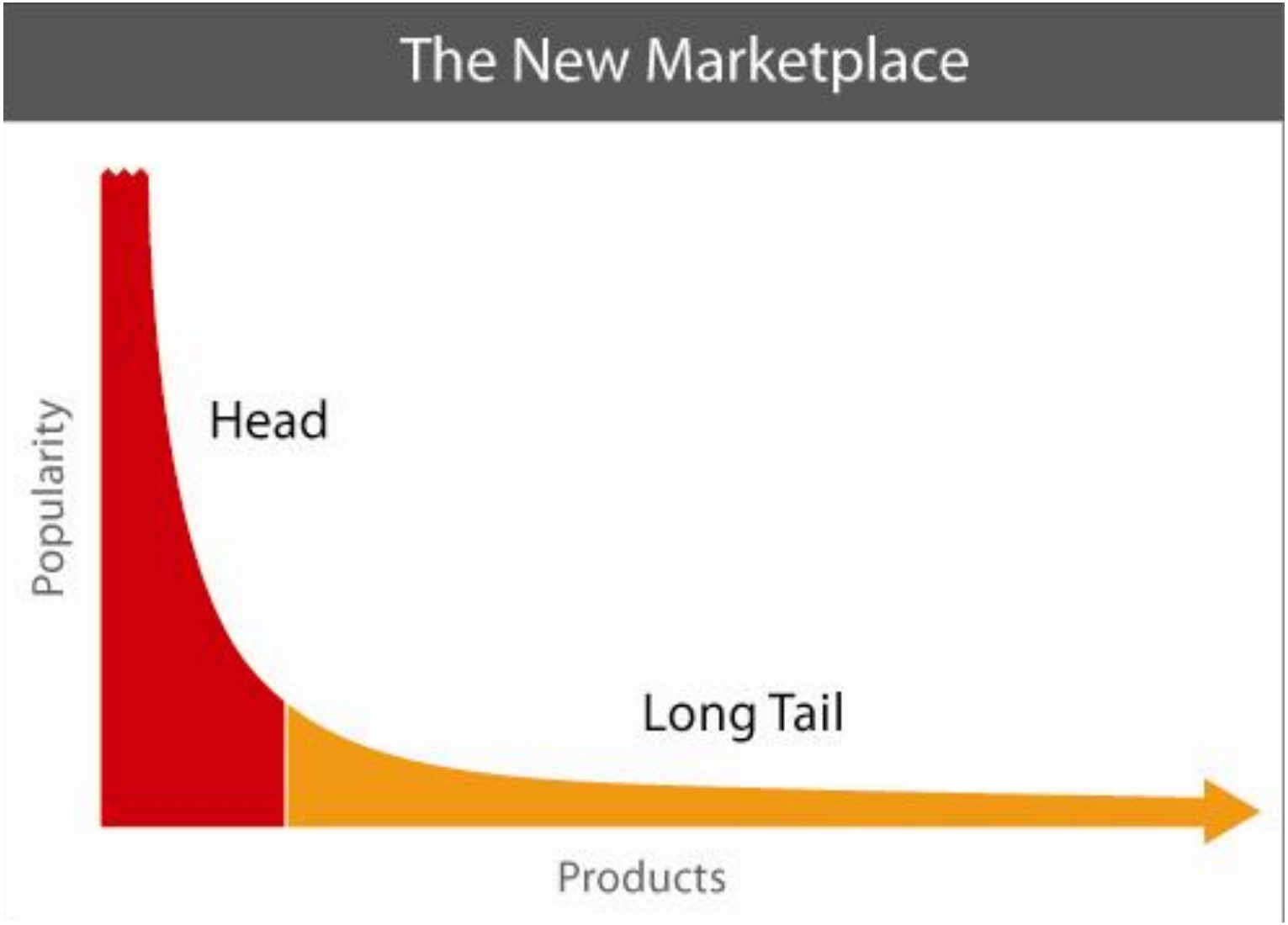
The Long Tail

- **theory of the Long Tail:** our culture and economy is increasingly shifting away from a focus on a relatively small number of "hits" (mainstream products and markets) at the head of the demand curve and toward a huge number of niches in the tail

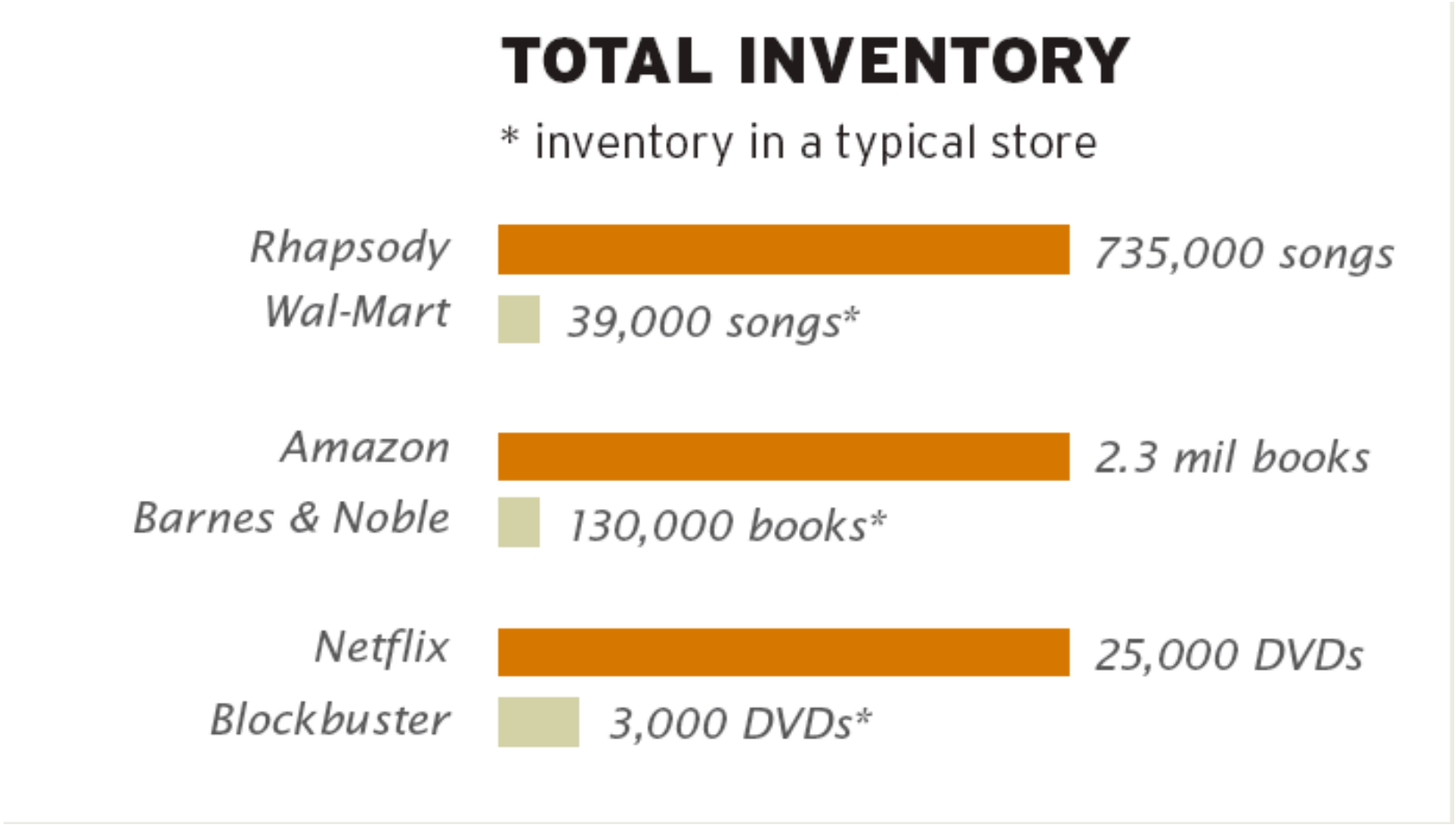
- **main opportunity — digital artifacts:** computer programs, movies, books, 3D models of buildings, …. → as the costs of production and distribution fall, there is less need to lump products and consumers into one-size-fits-all containers

- **hypothesis:** without the constraints of physical shelf space and other bottlenecks of distribution, narrowly-target goods and services can be as economically attractive as mainstream fare.

Exploiting "Long Tail" Opportunities in Business



Specific Examples of the Long Tail



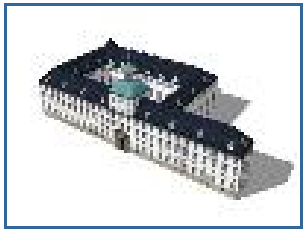
Castles in Northern Germany in the 3D Warehouse

Bergedorfer Castle
by picturemaker
In Hamburg in the middle of a...
History
View in Google Earth

★ ★ ★ ★ ★

Schloss Richmond
by der Uhlenbusch
Schloss Richmond wurde...
View in Google Earth

★ ★ ★ ★ ★



Gottorp Castle - Schleswig - ...
by JWagner
The Gottorp Castle in...
View in Google Earth

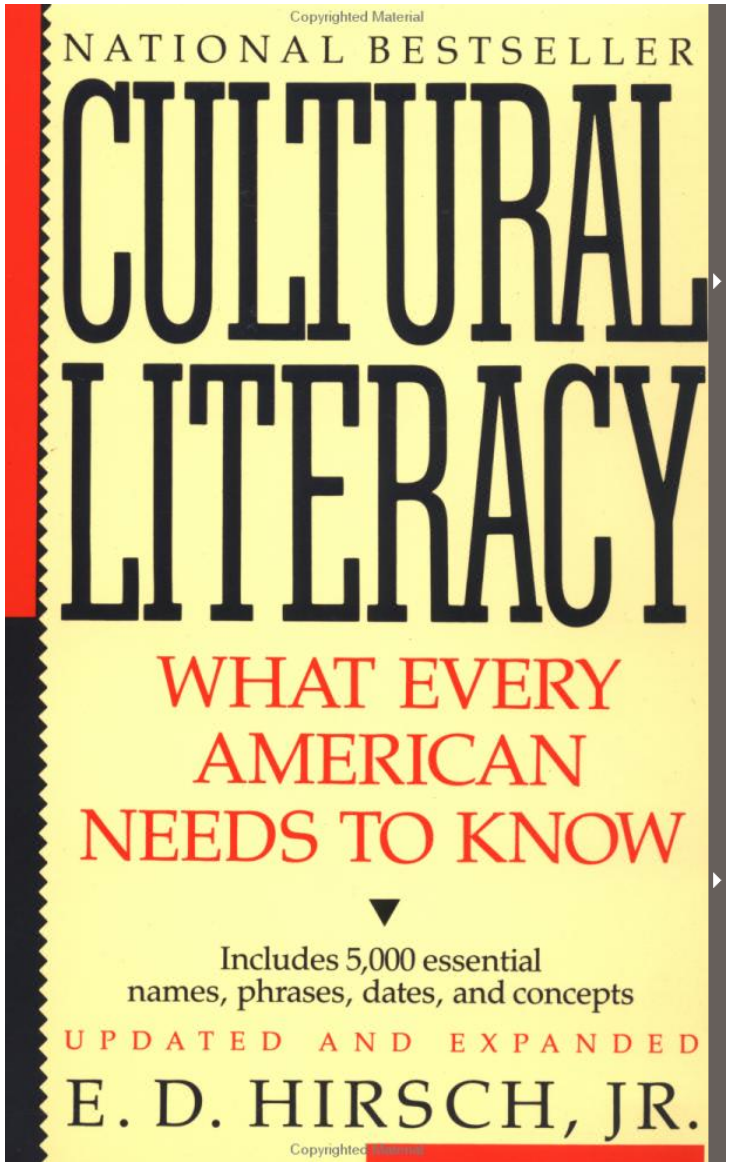
★ ★ ★ ★ ★

Schloss (Schlossmuseum)...
by Projekt-Oldenburg
mehr folgt.....
View in Google Earth

★ ★ ★ ★ ★

- **the current environment:**
  - 14 models (4 of them shown)
  - contributed by: 6 contributors
  - owner of the collection serves as curator

The Other End: Cultural Literacy



A New Synergy: Basic Knowledge/Skills and Long-Tail

- **basic skills:** learning to learn, learning on demand, meta-cognitive skills, soft skills (different from Hirsch "cultural literacy")

- **long-tail:**
  - interest
  - passion
  - self-directed learning
  - intrinsic motivation
  - personally meaningful problems

- **extensive coverage** needed for supporting the infinite numbers of interesting topics — will be facilitated by a "meta-design" culture → examples:
  - Wikipedia
  - 3D objects in Google Earth / 3D Warehouse

Rethinking and Reinventing Learning and Education from a "Long-Tail" Perspective

- **basic beliefs:**
  - all people are interested in something (Viking Ships, Dinosaurs, gambling, Nuremberg trials, White Rose, Castles in Northern Germany, ……)
  - Whatever someone's particular interest is, there is some niche community already formed on the net that the person can join

- a **new synergy and hybrid model**: integrate head and tail of the long-tail) → create richer learning environments
  - **head —** basic knowledge and skills: learning to learn, learning on demand, preparation for future learning, soft skills, digital fluency, …….
  - **tail —** personally meaningful problems: interest and passion, self-directed learning and intrinsic motivation, local knowledge in a globalized world

A Long-Tail Interpretation for Collaborative Learning

- long-tail learning refers at least to two aspects
  - learning about exotic topics outside the mainstream education curriculum
  - the opportunity to communicate with people who share similar interests somewhere in the world on a regular basis

- the participatory Web 2.0 provides *unique possibilities for an educational interpretation of the "Long Tail"* thereby creating new feasibility spaces for collaborative learning

A Reinterpretation of the Long Tail for Collaborative Learning

Web-Based Businesses	Learning and Discovery
unlimited shelf-space	unlimited knowledge
megahits	core curriculum
niche markets	passion for unique topics
hybrid model of distribution	hybrid model of learning and discovery
many interesting books, movies, songs will not enter the traditional marketplace	many interesting topics and ideas will not be taught in schools and universities

Questions to be Explored

- How can we envision a **productive synergy** between the head and the tail and create mechanisms to support and exploit this synergy? How can the passion associated with topics from the tail be integrated with important basic knowledge and skills from the head that they successfully complement each other?
  example: Computer-Generated Poetry (Tail) → Probability Theory (Head)

- Do we want to keep requiring everyone to learn the same thing in school rather than **pursuing their deep interests**? which support can be provided for letting people pursue their deep interest?

- Do we want to keep **extending the years of schooling** to encompass the expanding knowledge base?

A Real Story about Being Passionate about Learning

—

Computer-Generated Poetry (Tail) → Probability Theory (Head)

- course for gifted high-school students → student$_X$: no interest in math

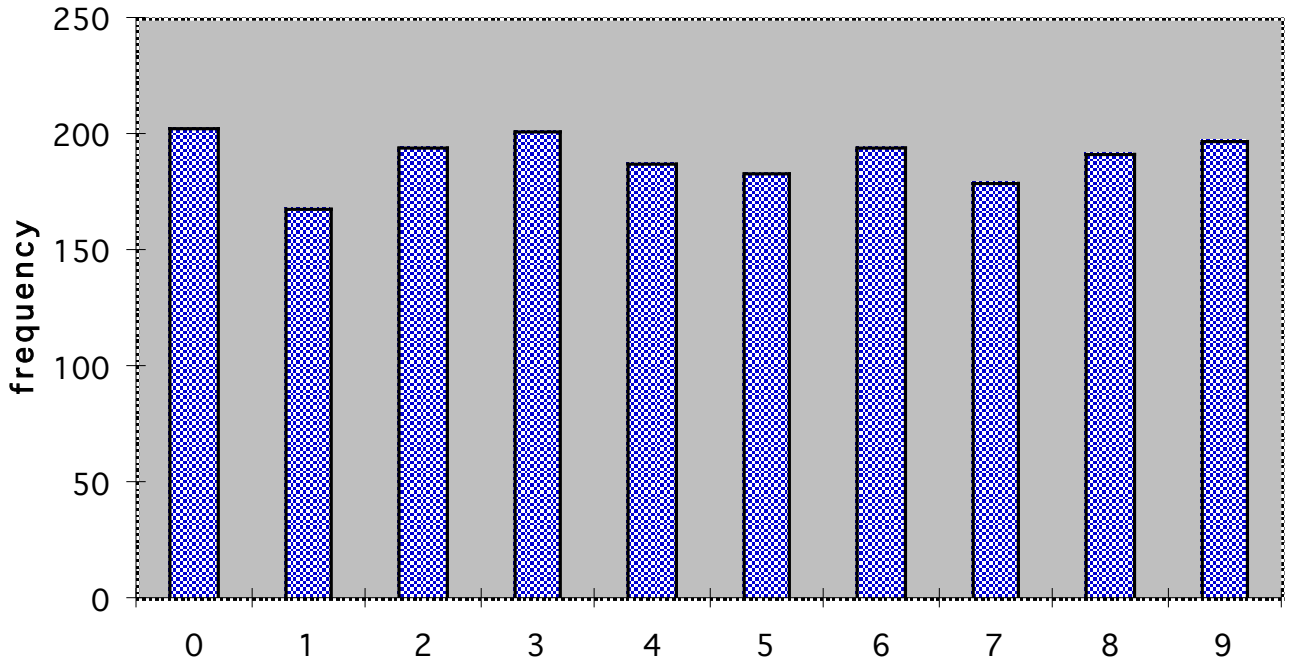
- project: computer-generated poetry
  - sentence structure: <article> <adj> <noun> <verb> <art> <noun>
  - noun: = "house mouse spouse ....."
  - use of a random number generator which returns values between 0 and 9
  - noun list contains 18 objects ----> studentx uses: SUM RANDOM RANDOM

A Computer-Generated Poem — Der Dumme Student

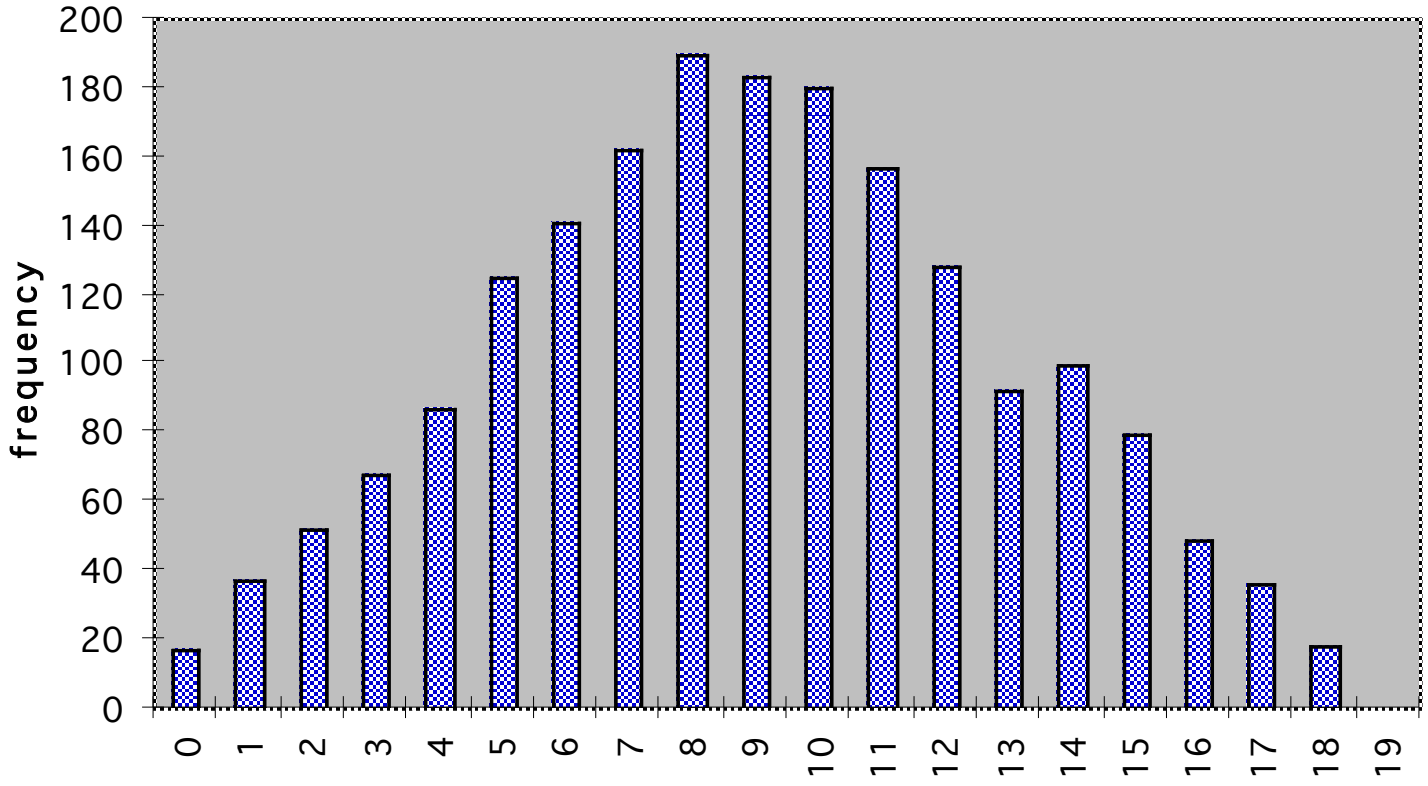
Das dumme Stubenmaedchen verflucht die Schlampe
das lustige Kindermaedchen verbrennt keine Pampe
jedes kluge Maedchen ionisiert den Tresen
ein verschrumpeltes Maedchen verbrennt das Wesen
kein ausgereifter Professor kocht den Wurm
kein aufgespiesster Student besteigt den Turm.

Der kleine Hausmeister elektrisiert einen Ball
jedes schweinslederne Maedchen seziert einen Knall
der gefriergetrocknete Bergsteiger erfreut das Bier
jede erdrosselte Jungfrau untersucht einen Stier
ein kleiner Computer massakriert jede Flasche
jeder erdrosselte Mann bearbeitet die Asche.

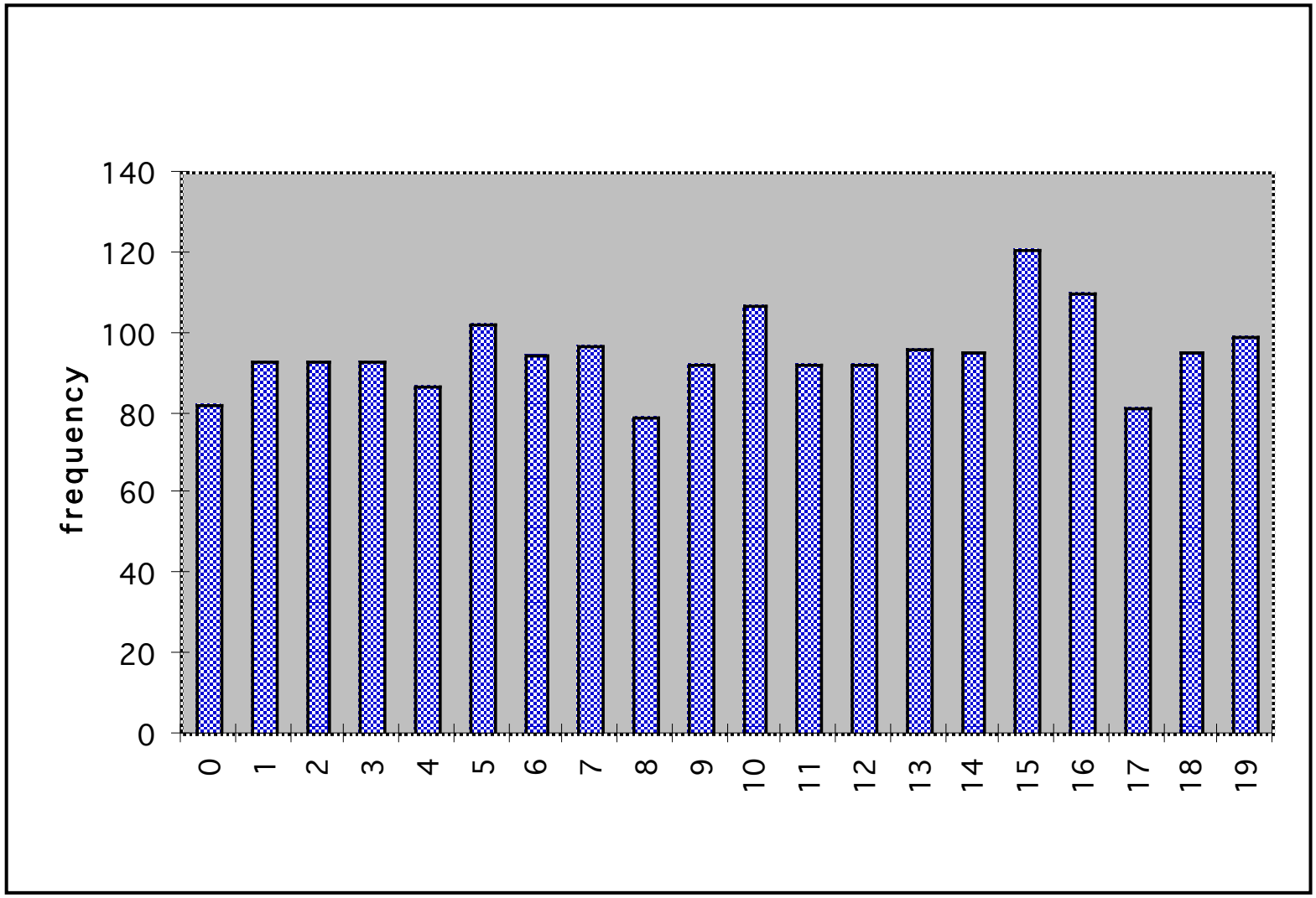
Random 0 to 9



Sum of Random and Random



Word of Random and Random



Lessons to Be Learned from the Story

- student$_x$ learned some aspects of probability theory grounded in a self-directed learning activity

- provide opportunities which change people's lives
  - intrinsic motivation is crucial
  - "falling in love" with something → student$_x$ ended up studying computer science

- "normal" learning experience: learners work hard because they ***have*** to (extrinsic motivation)

- our goal: learners work hard because they ***want*** to(intrinsic motivation)

Conclusion: Technology Enhanced Learning (TEL) Needs to Be Less Timid

- the future is not out there to be discovered — it has to be **invented and designed**

- **Machiavelli:** *"People who want to change institutions, have all those as their enemies who have done well under the old conditions"*

- **Winston Churchill:** *"This is not the end. It is not even the beginning of the end. But it is, perhaps, the end of the beginning."*