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

Designing Socio-Technical Environments in Support of Meta-Design and Social Creativity

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Overview

- Basic Message

- The Larger Context

- Lifelong Learning

- Design and Meta-Design

- Social Creativity

- Examples of Socio-Technical Environment: **E**nvisionment and **D**iscovery **C**ollaboratory

- Conclusions

Basic Message

- **CSCL is too timid and not thinking radically enough**
  - by accepting too many established approaches and organizations (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 for the CSCL community:**
  - provide elements of a transformational conceptual framework for CSCL by focusing on how learning takes place when the answer is not known (→beyond schools)

  - act as the engine of innovation and radical transformation and contribute to changing the public understanding of learning, collaboration, expertise, attention, control, freedom, and creativity in the digital age

A Transformational Conceptual Framework

- school learning   →   **lifelong learning**

- unaided individual human mind   →   **distributed intelligence**

- reflective practitioner   →   **reflective community**

- community of practice   →   **community of interest**

- "gift-wrapping" and   →   **socio-technical environments**
    techno-determinism

- consumers   →   **active contributors (meta-design)**

- learning when the answer   →   **learning when no one knows**
    is known   **the answer (social creativity)**

Beyond the Unaided, Individual Human Mind
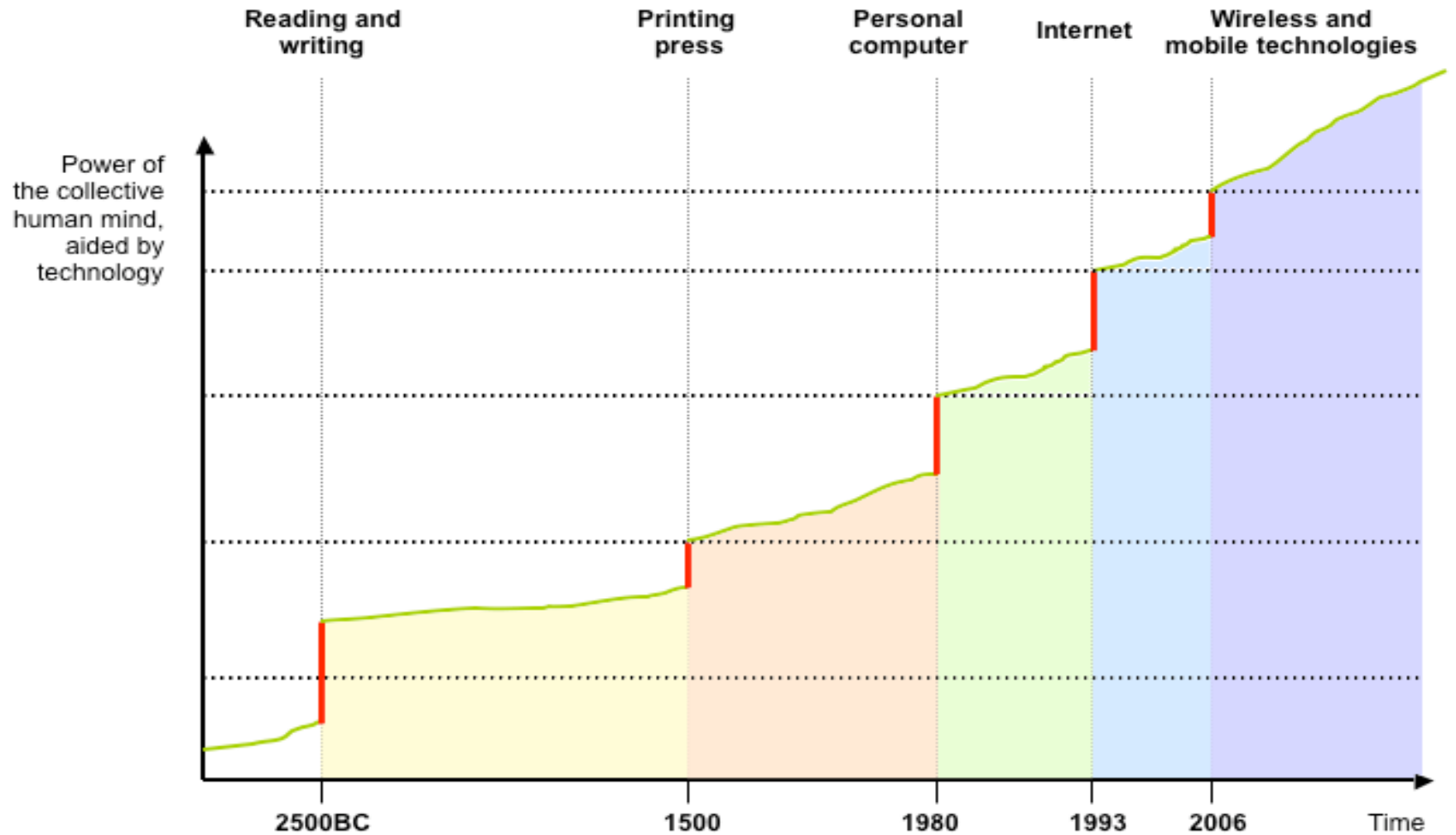
History

- Ivan Illich: *Deschooling Society* (1971) + Tools for Conviviality (1973) →
  Learning Webs

- Donald Schön: *The Reflective Practitioner: How Professionals Think in Action*.
  (1983)

- Herbert Simon: *The Sciences of the Artificial,* 3rd ed (1996) → Design

- Seymour Papert: *Mindstorms: Children, Computers and Powerful Ideas* (1980)
  → constructionism, LOGO

- Alan Kay: Dynabook → computers of today

- John Seeley Brown: Learning in the 21st Century

Why Now ("Punctuated Equilibrium")

National Science Foundation

- ***5 year strategic plan: terms and concepts***
    - collaboration   17
    - creativity   6
    - innovation   26
    - exploration   11
    - discovery   27

- ***new programs:***
    - Science of Design (started in 2005)
    - CreativeIT   (started in 2007)

The CSCL Community

- **my question:** what do your consider the **MOST CHALLENGING AND MOST IMPORTANT ISSUE** for the CSCL community in 2007

- **selected answers:**
  - the problem that computers and schools are basically incompatible
  - CSCL is at the moment reinvented by the rapidly growing web 2.0 community. The interchange between these two communities should be fostered as intensively as possible
  - to use CSCL to "teach" - or to enhance students' capability for – creativity
  - CSCL has failed to settle on an agreed upon research question and has similarly failed to develop a distinctive research methodology
  - we need to develop new methodologies for CSCL

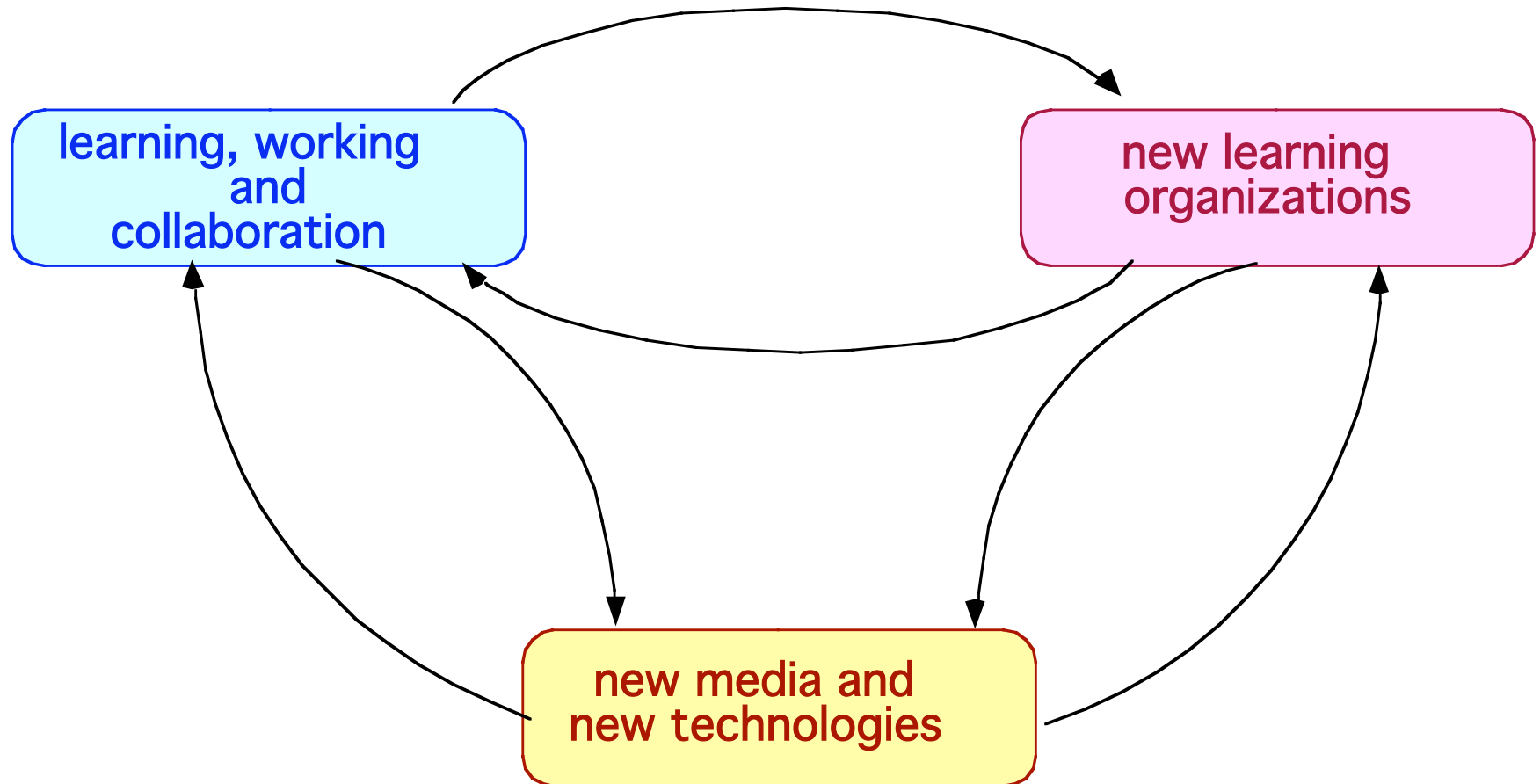# CSCL

- **CS: computer supported**
  - clickers in classroom
  - multi-media for presentation and instruction
  - $100 computer
  - Web 2.0 technologies

- **CL: collaborative learning**
  - giving all stakeholders a voice
  - teacher, learner = f{person} $\rightarrow$ f {context}
  - learning from each other
  - distributed intelligence
  - reflective communities

- **misunderstanding** between necessary and sufficient

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

Lego-Mindstorms and Agentsheets
─
An Example of a CSCL Environment

<show Agentsheets movie clip>

- computational media support a design environments providing rich opportunities for learning

- collaborative learning takes place (among children, between students and mentors, between students and parents)

- strength: a socio-technical environment

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 cultures, disciplines, and tools

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

Lifelong Learning

- is more than adult education: learning is a new form of work → CSCW = CSCL

- rethink the role of learning institutions from the objective of "making learning a part of life"

- emphasis: self-directed learning, learning on demand, collaborative learning, informal learning,

- 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)

Design and Collaborative Design

- **design versus natural science** (Herbert Simon "Sciences of the Artificial")
  - **natural science**: how things are
  - **design**: how things ought to be

- the need for **collaborative design** because design problems are
  - **complex** → requiring **social creativity** in which stakeholders from different disciplines have to **collaborate**
  - **ill-defined** → requiring the **integration of problem framing and problem solving**
  - **have no (single) answer** → **argumentation support, consideration of trade-offs**
  - **unique ("a universe of one")** → requiring **learning when no one knows the answer**

Design and (Natural) Science

- **AERA Symposium 2007:** *"Balancing the Tensions between Science and Design in Design-Based Science Curricula"* (chaired by Sharon Derry)
  - Design serves Science, e.g.: building a car powered by a balloon (grounded in STEM philosophies)
  - alternative: Science serves Design

- Bereiter and Scardamalia: *"Design mode activity does go on in schools of course — in practical and fine art course, and in extracurricular activities such as drama and fund-raising — but it is alien to the academic curriculum. This marks a deep divide between knowledge as it is treated in schools and knowledge as it is treated in Knowledge Age organizations"* — Bereiter, C., & Scardamalia, M. (2006) "Education for the Knowledge Age: Design-Centered Models of Teaching and Instruction."

Meta-Design = Design for designers

- **meta-design explores:**
    - the invention and design of a culture in which participants can express themselves and engage in personally meaningful activities
   - **underdesign:** the creation of context rather than content

- **meta-design requires**
    - designers giving up some **control** at design time
    - **active contributors** (and not just passive consumers) at use time

- **meta-design raises research problems of fundamental importance** including
    - new **design methodologies**
    - a new understanding of **cognition, collaboration, motivation, innovation and creativity**
    - the design of innovative **socio-technical environments**

Design Time and Use Time

key

system developer   user (representative)   end user

design
time

use
time

time
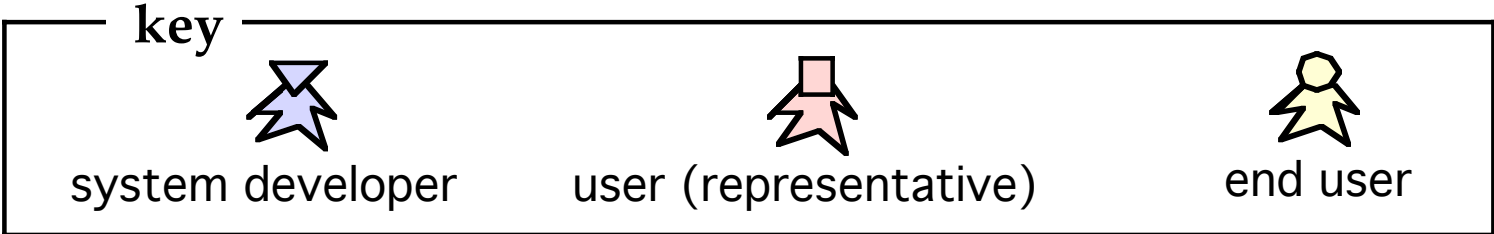
world-as-imagined
prediction
planning

world-as-experienced
reality
situated action

What Do Meta-Designers Do?

- they use their own creativity to create socio-technical environments in which **other people can be creative**

- they create **technical** and **social** conditions for broad participation in design activities which are as important as creating the artifact itself

- **examples for meta-design:** Web 2.0 Technologies
    - SketchUp + 3D Warehouse + Goggle Earth
    - Second Life
    - Open source

Sketchup — a 3D Modeling Environment
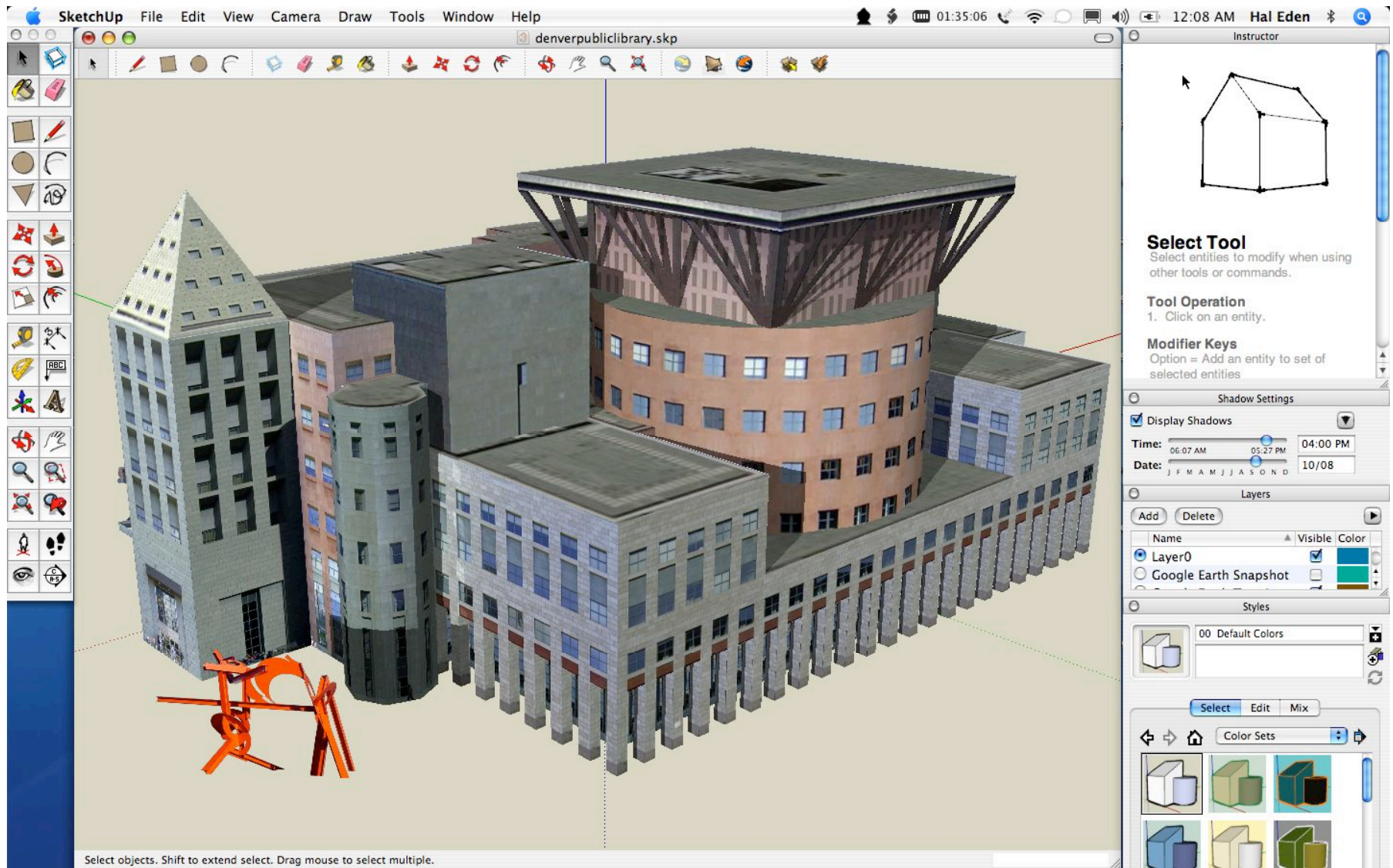
3D Warehouse

- a feature of Google SketchUp → search, share, and store 3D models

- models in the 3D Warehouse include: buildings, houses, bridges, statues, sculptures, couches, cars, people, pets, …

- download the 3D models to use in SketchUp models

- if the model has a location on earth→ download it and view it in Google Earth

- share 3D models by uploading them from Google SketchUp into the 3D Warehouse.

CU Boulder in 3D

Downtown Denver in 3D

Learning When No One Knows the Answer: Social Creativity

- Beyond the Individual Human Mind: Fish-Scale Model → the key to address complex problems is

  - **not** in *"Leonardos who are competent in all sciences"* or in "educating the *intellectual superhuman"* who knows everything

  - but to achieve *"**collective comprehensiveness through overlapping patterns of unique narrowness**"*

  - Campbell, D. T. (2005) In S. J. Derry, C. D. Schunn, & M. A. Gernsbacher (Eds.), "Interdisciplinary Collaboration"

- exploit:

  - conceptual collisions (LIFE Center)

  - epistemological pluralism (LOGO Community),

  - distributed intelligence

  - boundary objects

  - symmetry of ignorance (L3D),

Reflective Practitioners → Reflective Communities
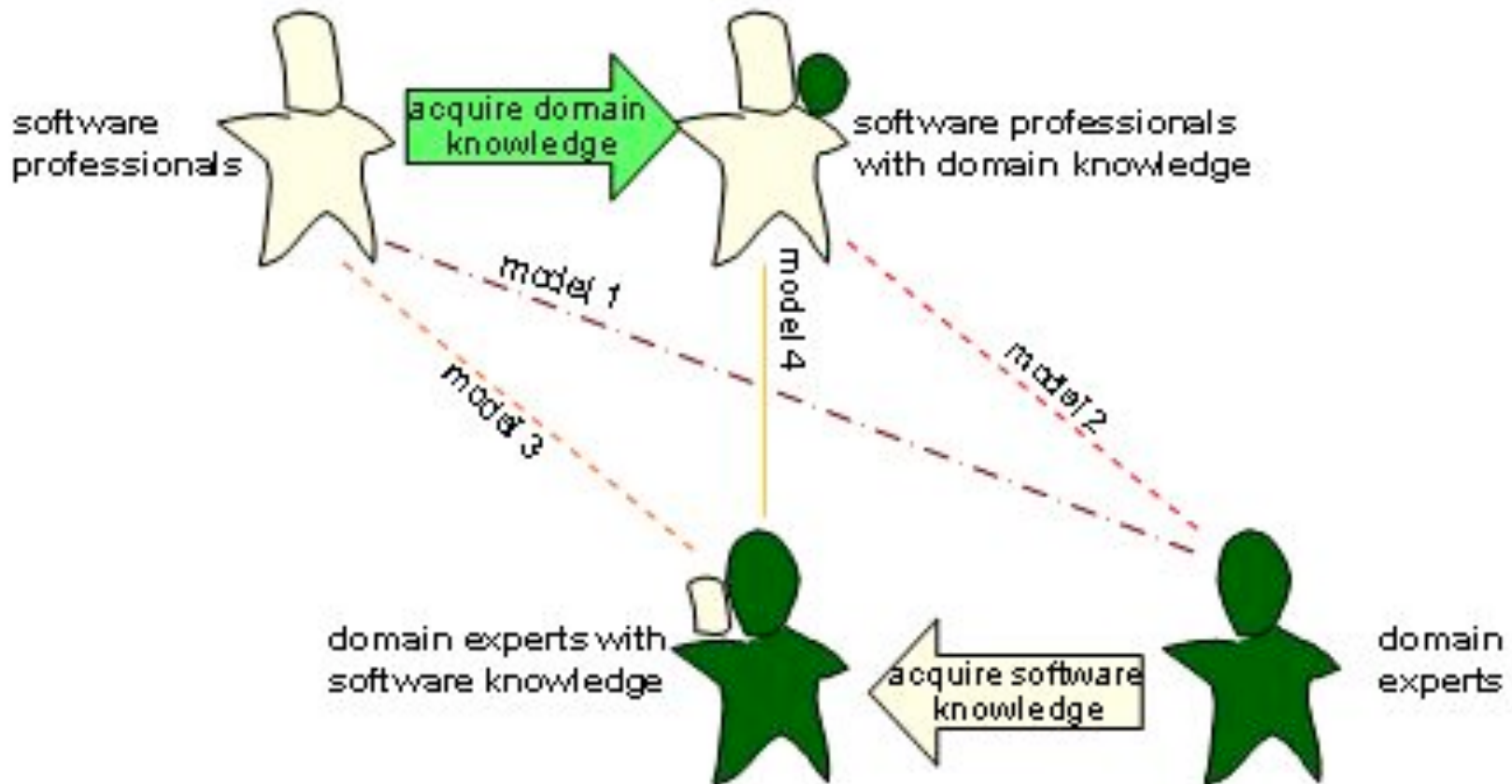
Distances in Social Creativity: Limitations or Opportunities

- **spatial dimension:** shared location → shared concerns; *success model:* open source communities

- **temporal dimension:** learning from the past; *success model:* reuse and redesign

- **conceptual dimension**: exploiting symmetry of ignorance, conceptual collisions, epistemological pluralism and breakdowns as sources for innovation; success models: Communities of Practice (CoPs) and Communities of Interest (CoIs)

- **technological dimension:** a new understanding of ***distributing intelligence*** (tools for living versus tools for learning) and the identification of basic skills in the 21st century

Communities of Practice (CoPs):
Homogenous Design Communities

- **CoPs =** practitioners who work as a community in a certain domain

- **examples:** architects, urban planners, research groups, software developers, software users, kitchen designers, computer network designer,

- **learning:**
  - masters and apprentices
  - legitimate peripheral participation (LPP)

- **problems:** *"group-think"* → when people work together too closely in communities, they sometimes suffer illusions of righteousness and invincibility

- **systems:** domain-oriented design environments (e.g.: kitchen design, computer network design, voice dialogue design, …..)

Communities of Interest (CoIs)
Heterogeneous Design Communities

- **CoIs =** bring different CoPs together to solve a problem

- **membership** in CoIs is defined by a shared interest in the framing and resolution of a design problem

- **diverse cultures:** people from academia and from industry, software designers and software users, students and researchers from different cultures

- **fundamental challenges:**
  - establish common ground by creating boundary objects
  - build a shared understanding of the task at hand
  - learn to communicate with others who have a different perspective
  - primary goal: not "moving toward a center" (CoP) but **"integrating diversity and making all voices heard"**

A Socio-Technical Environment
Envisionment and Discovery Collaboratory (EDC)

- **the EDC supports:**

  - collaborative design (e.g. in: urban planning, emergency management)

  - social creativity → "learning when no one knows the answer"

  - meta-design → an end-user modifiable version of SimCity

- **the EDC and CSCL**

  - **CS:** table-top, computationally enriched physical objects, visualization

  - **CL:** CoIs, emergence, boundary objects, reflection in action, reflective communities

The Envisionment and Discovery Collaboratory

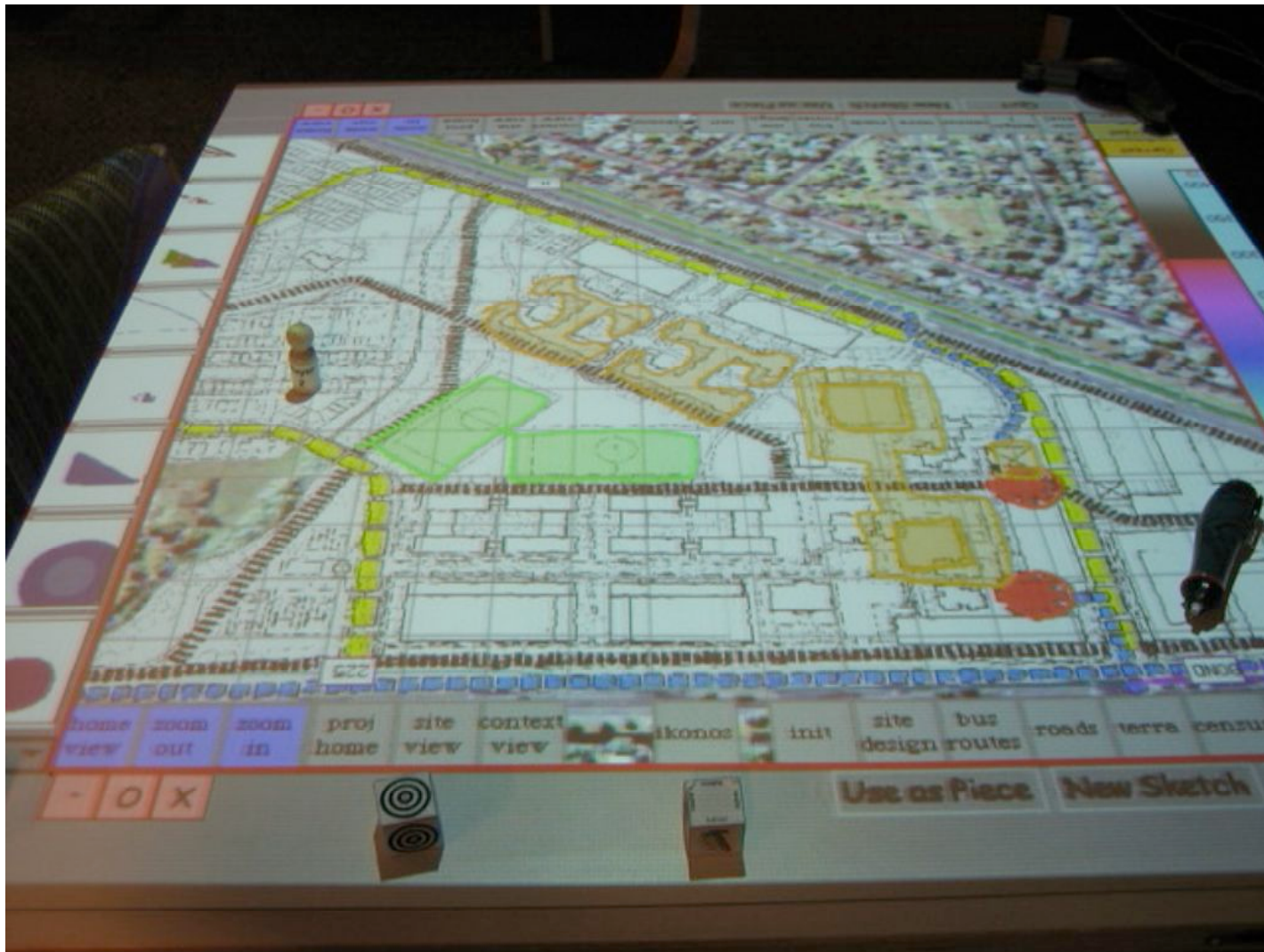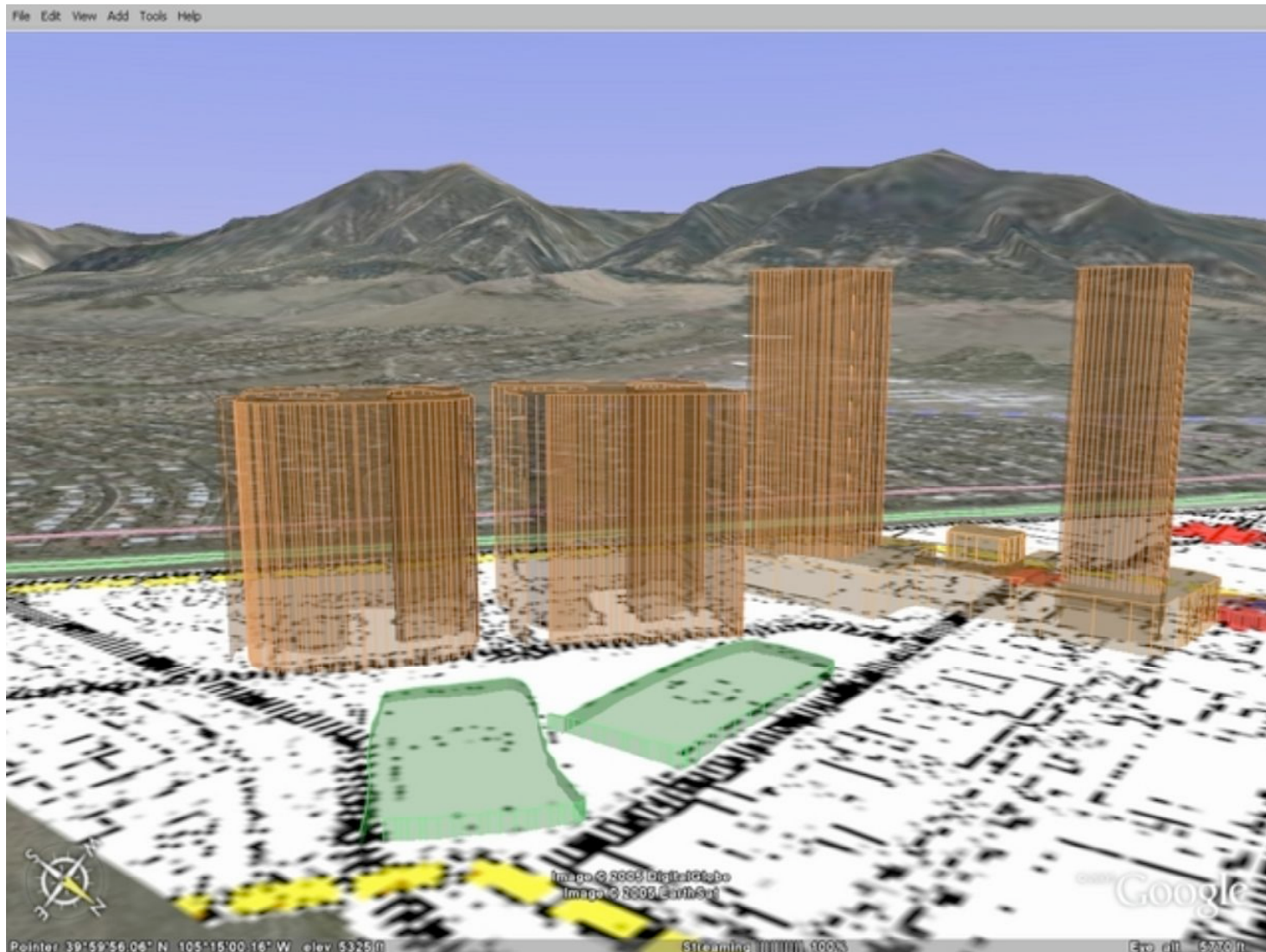# Face-to-Face Collaboration around the EDC Action Space

Boulder City Council and University of Colorado Regents
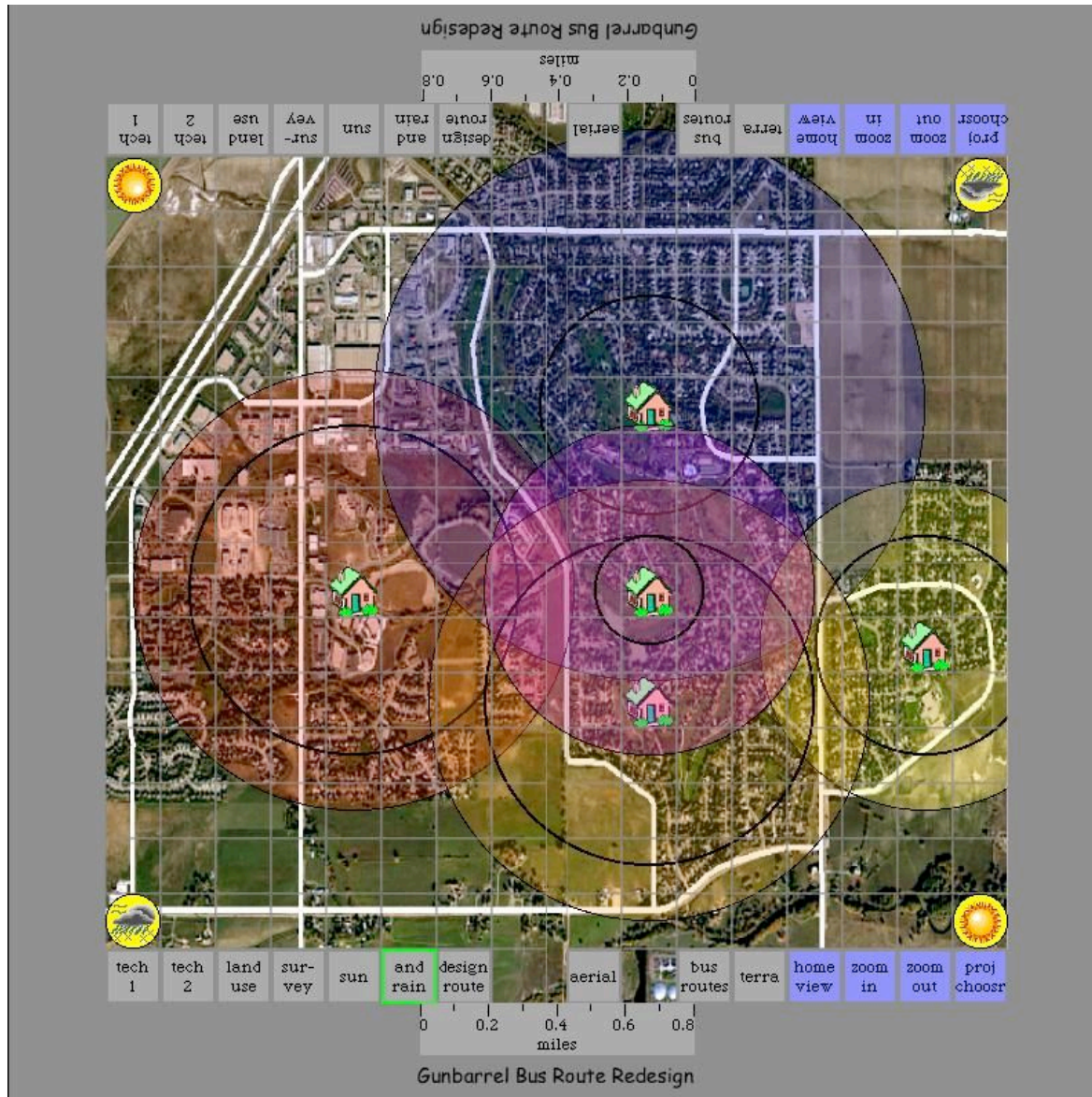
Sketching Support in the EDC
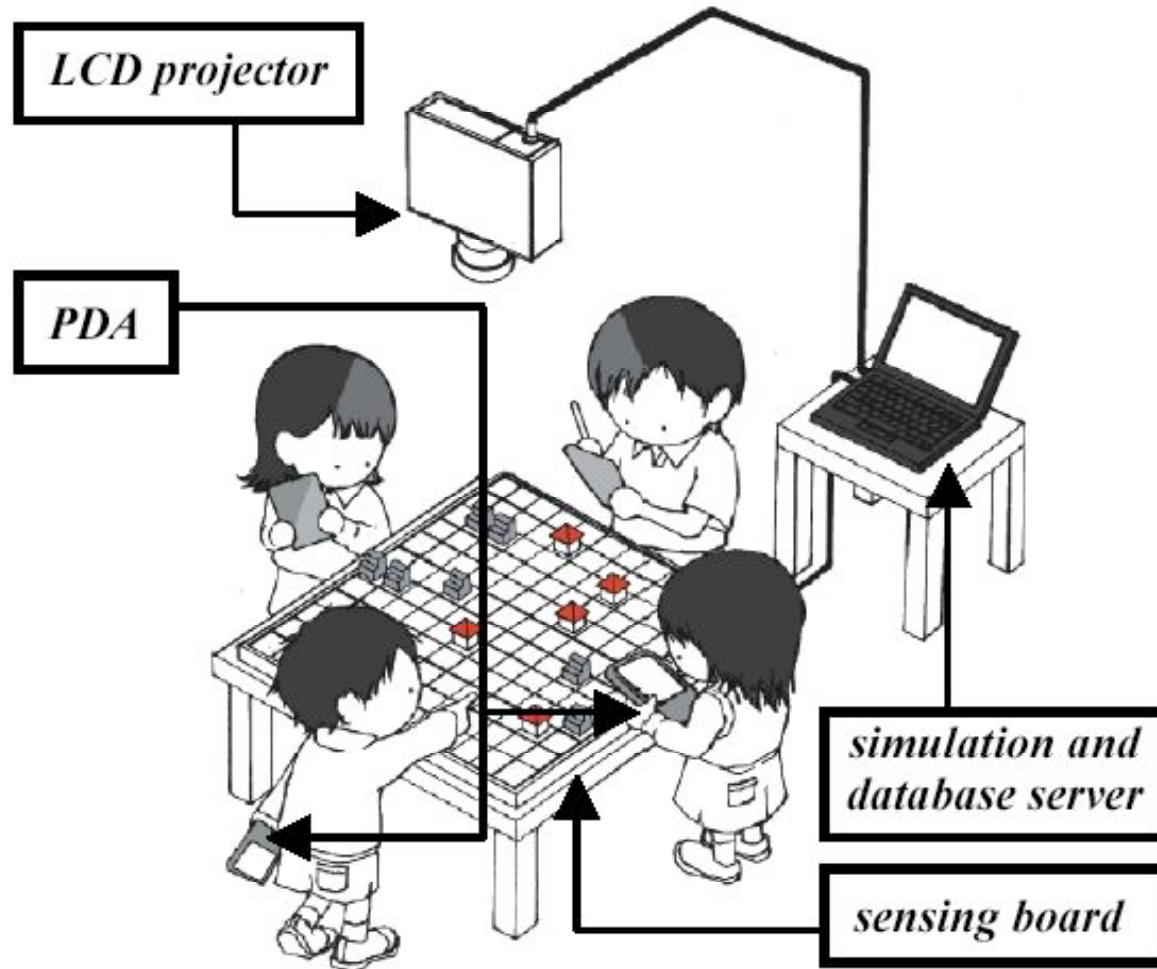
Buildings Sketched into a Google-Earth Client

Emerging Insight: Illustrating Multiple Walking Distances

Integrating Individual and Social Creativity: Caretta
(collaboration with Masanori Sugimoto, University of Tokyo)

Conclusions: "Let Us All Be Less Timid"

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

- **George Bernard Shaw:** *"The reasonable man adapts himself to the world. The unreasonable man persists in trying to adapt the world to himself. Therefore all progress depends on the unreasonable man."*

- **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."* —

Additional Issues — Concepts / Examples

- **Concepts**
  - transdisciplinary education
  - new media are necessary, but not sufficient

- **Examples**
  - courses-as-seeds