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

What's on the Horizon?

Lifelong Learning: New Mindsets and New Media

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Presentation, Teachers as Scholars, Feb 26, 2002, Boulder
# Learning in Different Worlds

<table>
<thead>
<tr>
<th>dimension</th>
<th>old paradigm</th>
<th>new paradigm</th>
</tr>
</thead>
<tbody>
<tr>
<td>information</td>
<td>scarce</td>
<td>plentiful</td>
</tr>
<tr>
<td>reproduction of documents</td>
<td>expensive and restricted</td>
<td>cheap</td>
</tr>
<tr>
<td>specialization</td>
<td>low</td>
<td>high</td>
</tr>
<tr>
<td>change within a human life time</td>
<td>slow</td>
<td>fast</td>
</tr>
<tr>
<td>interaction / collaboration</td>
<td>physical proximity</td>
<td>shared professional interests</td>
</tr>
<tr>
<td>economy</td>
<td>rigid, hierarchical organizations, long-term personal identity</td>
<td>dynamic economy, flexibility, networking, eroding the sense of sustained purpose, no long-term</td>
</tr>
</tbody>
</table>
L³D’s Research Focus

• Artificial Intelligence (AI) → Intelligence Augmentation (IA)
  - replacement → empowerment
  - emulate → complement (exploit unique properties of new media)

• instructionist learning → constructionist learning
  - learning about → learning to be
  - when the answer is known → when the answer is not known (collaborative knowledge construction)

• individual → social
  - knowledge in the head → creating shared understanding, distributed cognition
  - access → informed participation

• things that think → things that make us smart
  - what computers can do → what people and computers can do together
  - computational → computational and physical

• “gift-wrapping” with new media → tradition and transcendence
  - technology → co-evolution of media and new theories about thinking / working / learning / collaborating
LifeLong Learning

- more than “adult education” → it tries to cover and unify all phases: intuitive learner (home), scholastic learner (school and university), skilled domain worker (workplace)

- learning is a new form of labor → integration of learning, working (teaching) and collaborating

- changes:
  - from means → ends
  - from medium → content
  - from computers → tasks, services
  - from specialist → every-day life
  - from “learning about computers” → “learning with computers”
## School Learning and Lifelong Learning

<table>
<thead>
<tr>
<th></th>
<th>School Learning</th>
<th>Lifelong Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>emphasis</strong></td>
<td>“basic” skills</td>
<td>education embedded in ongoing work activities</td>
</tr>
<tr>
<td>**potential</td>
<td>decontextualized, not situated</td>
<td>important concepts are not encountered</td>
</tr>
<tr>
<td><strong>drawbacks</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>problems</strong></td>
<td>given</td>
<td>constructed</td>
</tr>
<tr>
<td><strong>new topics</strong></td>
<td>defined by curricula</td>
<td>arise incidentally from work situations</td>
</tr>
<tr>
<td><strong>structure</strong></td>
<td>pedagogic or “logical” structure</td>
<td>work activity</td>
</tr>
<tr>
<td><strong>roles</strong></td>
<td>expert-novice model</td>
<td>reciprocal learning</td>
</tr>
<tr>
<td><strong>teachers</strong></td>
<td>expound subject matter</td>
<td>engage in work practice</td>
</tr>
<tr>
<td><strong>mode</strong></td>
<td>instructionism (knowledge absorption)</td>
<td>constructionism (knowledge construction)</td>
</tr>
</tbody>
</table>
Co-Evolution: Beyond “Technology-Driven Developments” and “Gift-Wrapping”

- learning, working and collaboration
- new learning organizations
- new media and new technologies
“Technology-Driven Developments”

Education = f{Media, Technology} ↔ Media, Technology = f{Education}
“Gift-Wrapping” and Beyond

• Peter Drucker: “There is nothing so useless as doing efficiently that which should not be done at all.”
  - example: “webify your courses’

• claim:
  - “old” frameworks such as instructionism, fixed curriculum, memorization, decontextualized learning, ..... do not get changed by technology itself (e.g., intelligent tutoring systems, expert systems, multimedia, networks)

  - “new” frameworks: lifelong learning, integration of working and learning, learning on demand, problem-based learning, authentic problems, self-directed learning, (intrinsic) motivation, collaborative learning, organizational learning, “open systems” approaches, ......

• beyond a consumer mindset ➔ new civic discourses are required, because one of the major roles for new media and new technologies is not to deliver predigested information to individuals, but to provide the opportunity and resources for social debate and discussion
# New Forms of Learning of Importance to Lifelong Learning

<table>
<thead>
<tr>
<th>Form</th>
<th>Complementing Form</th>
<th>Contribution toward Mindset</th>
<th>Major Challenges</th>
<th>Media Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>learning to be</td>
<td>learning about</td>
<td>becoming a member of a community</td>
<td>scaling up (a Ph.D. experience for undergraduates)</td>
<td>social creativity, meta-design, boundary objects</td>
</tr>
<tr>
<td>self-directed learning</td>
<td>prescribed learning</td>
<td>authentic problems culture of inquiry</td>
<td>problem framing purposive activities</td>
<td>understanding evolving tasks</td>
</tr>
<tr>
<td>learning on demand</td>
<td>learning in advance</td>
<td>coverage is impossible obsolescence is guaranteed</td>
<td>identifying breakdowns integration of working and learning</td>
<td>critics support for reflection-in-action</td>
</tr>
<tr>
<td>informal learning</td>
<td>formal learning</td>
<td>learning by being in the world</td>
<td>larger, purposive activities provide learning opportunities</td>
<td>end-user modifiability</td>
</tr>
<tr>
<td>collaborative learning</td>
<td>individual learning</td>
<td>community social capital</td>
<td>shared understanding informed participation</td>
<td>boundary objects group memories</td>
</tr>
</tbody>
</table>
Examples from L³D’s Work

• **theories**
  - lifelong learning ➔ making learning a part of life
  - beyond access ➔ informed participation
  - breakdowns and critiquing as a source for individual learning
  - symmetry of ignorance as a source for collaborative learning

• **systems**
  - Dynasites [http://Seed.cs.colorado.edu/dynasites.documentation.fcgi](http://Seed.cs.colorado.edu/dynasites.documentation.fcgi)
  - Envisionment and Discovery Collaboratory (EDC) [http://www-l3d.cs.colorado.edu/~l3d/systems/EDC/](http://www-l3d.cs.colorado.edu/~l3d/systems/EDC/)
  - PiTaBoard "Participate in the Action"

• **practice**
  - classrooms as design studios ➔ **examples:**
    - [http://webguide.cs.colorado.edu:3232/atlas](http://webguide.cs.colorado.edu:3232/atlas) (Swiki)
  - teachers as lifelong learners ➔ working shops, virtual libraries

• **assessment**
  - “understanding” mindsets
  - new assessment approaches for design-based education: motivation, interest, participation in communities of learners, long-term longitudinal assessment
• dynamic, extensible and integrated web-based information spaces

• supports the collaborative creation and evolution of artifacts through which communication can take place

• examples:
  1. **Dynagloss** — a decentralized, dynamically evolved space of concepts
  2. **Living Book** — an information space evolving as a side effect of interaction between readers
  3. **DynaClass** — a DynaSites document type developed for class discussions and workshops
  4. **Virtual Library** — used extensively at New Vista High School

The Envisionment and Discovery Collaboratory (EDC)

http://www.cs.colorado.edu/~l3d/systems/EDC

• creating shared understanding through collaborative design
  - symmetry of ignorance, mutual competence, and breakdowns as sources of opportunity

• integration of physical and computational environments
  - support and exploit face-to-face collaboration
  - hardware: touch-sensitive electronic whiteboards, crickets
  - software: AgentSheets, DynaSites
  - beyond the screen: immersive environments

• support for reflection-in-action
  - action space: AgentSheets, Visual AgenTalk
  - reflection space: DynaSites, WWW

• open system — seeding, evolutionary growth, reseeding process model
The Envisionment and Discovery Collaboratory (EDC)
The Envisionment and Discovery Collaboratory
Boundary Objects and the EDC

- **physical and computational languages to “think-with” and to “act-with”** — a common language meaningful to all stakeholders

- **simulations** — dynamic feedback meaningful to all stakeholders

- **reflection spaces** — explicit information helping stakeholders remember what they have learned and to consider other perspectives

- **open, evolvable tools** — capturing important information not anticipated at system design time by encouraging a culture of participation, that addresses the open-ended nature of problems
The Participate-In-The-Action (PITA) Board
based on: DGT electronic chessboard, NL; http://www.dgtprojects.com/

• supporting alternative **processes** (in addition to the EDC) to create **content**
Cognitive Levers (CLever): Helping People Help Themselves

A L3D Project funded by the Coleman Family Foundation / Institute
Assessment: Understanding the Mindsets of Students — Feedback from Students Taking one of Our Courses

a negative comment: “I will not ever take a course of this nature again in my undergraduate career, and I hope to find a more structured graduate program with an adviser that is more forthcoming. I will reinforce my strengths by continuing to study in the method that I have developed over the past 15 years. I will redirect my weaknesses by avoiding unstructured class environments.”

a positive comment: “When I signed up for this class I had no idea what it was going to be about. Once I started understanding the material, however, I was extremely thrilled and interested to be a part of one of the most progressive courses on campus. I'm not sure what specifically to say except that I rank this class in the top three that I've taken at CU. The self-directed nature of the work ensured that I wouldn't be bored or unchallenged, and the interplay between all of us was a lot of fun. After four and a half years in college, I can honestly say that this is one of the first courses where I was treated as an adult, a fact which means more to me than I can describe.”
## Mismatches

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Student</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>authority (“sage on the stage”)</td>
<td>dependent, passive</td>
<td>lecture without questions, drill</td>
</tr>
<tr>
<td>motivator and facilitator</td>
<td>interested</td>
<td>lecture with questions, guided discussion</td>
</tr>
<tr>
<td>delegator</td>
<td>involved</td>
<td>group projects, seminar</td>
</tr>
<tr>
<td>coach/critic (“guide on the side”)</td>
<td>self-directed, discovery-oriented</td>
<td>self-directed study group, apprenticeship, dissertation</td>
</tr>
</tbody>
</table>
What Are Students Used To?

• consumers of education

• teacher, learner = f{ person} (instead of: teacher, learner = f{context})

• students believe that problems have an answer and that the teacher has to know the answer

• unwilling to engage in peer-to-peer learning (no surprise in a culture in which collaboration is mostly treated as “cheating”)

• learn to get good grades (instead of: learning based on interest, passion, enjoyment, intrinsic motivation)

• sole assessment by teachers (instead of: self-assessment)
Open Systems
—
A “New” Learning Paradigm for the 21st Century?

- an intellectual paradigm requiring a new mindset
  - objective: leverage is gained by engaging the whole world as a talent pool
  - from users/consumers → co-designers/active contributors

- some examples of decentralized, evolvable open systems
  - open source: collaborative development of software
  - open systems: the scientific method/enterprise
  - insight: “software and knowledge is not a commodity to be consumed but is a collaboratively designed and constructed artifact”

- some characteristics:
  - evolutionary design of complex systems
  - success stories so far: technically sophisticated developers — not end-users
  - relies on social capital (in gift cultures, social status is determined not by what you control but by what you give away)
Challenges

• **costs versus quality**: role and value of “residential, research-based universities” in the global, educational market of the future → “If you think education is expensive, try ignorance!”
  - creating new mindsets → from consumers to designers
  - Illich (in *Deschooling Society*): “schools and universities = reproductive organ of a consumer society”
  - technical challenges (open systems, end-user computing) and social challenge (change mindsets and cultures)

• **learning on demand and “basic” skills**: if most job-relevant knowledge must be learned on demand
  - what is the role of “basic” skills?
  - what is the critical background knowledge which makes learning on demand feasible?

• **“school-to-work” transition**:
  - if the world of working and living relies on collaboration, creativity, definition and framing of problems, dealing with uncertainty, change, distributed cognition, symmetry of ignorance, ......
  → then the world of schools and universities need to prepare students to be able to have a meaningful life in this world
Conclusions

• the future is not out there to be “discovered” — it has to be invented and designed not only
  - by Hollywood
  
  - by info-enthusiasts
  
  - based on technological determinism

• it has to be invented and designed by:
  - exploring the fundamentally new possibilities and limitations of computational media on how we think, create, work, learn, collaborate,
  
  - moving beyond “technology-driven development” and “gift-wrapping” to co-evolution
  
  - changing of mindsets (of learners, teachers, researchers, administrators, institutions, and cultures)