New Wine in No Bottles: Immersive, Personalized, Ubiquitous Learning

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Today's children can meet future challenges if their schooling and informal learning activities prepare them for adult roles as citizens, employees, managers, parents, volunteers, and entrepreneurs.
## Dimensions of Advanced Knowledge and Skills

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<tr>
<th>Cognitive Outcomes</th>
<th>Intrapersonal Outcomes</th>
<th>Interpersonal Outcomes</th>
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<td>Cognitive processes and strategies</td>
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3 Contexts for Learning

- Classrooms
  - Presentation and discussion

- Richly Contextualized Real World Learning
  - Internships, apprenticeships

- Learning Communities
  - Interpretation and transfer

  face to face, virtual, blended
Multidimensional Learning
Filming a Play
Advancing to Movies

- Special effects
- Manipulation of space and time
- Shooting on location for contextual richness, authenticity, large-scale
- Close-ups
- Point of View
- Composition and Editing
Next-Generation Learning

Immersive and Richly Contextualized

Ubiquitous

Personalized
Next Generation Interfaces for “Immersive Learning”

- **Multi-User Virtual Environments**
  Immersion in virtual contexts with digital artifacts and avatar-based identities

- **Virtual Reality**
  Full sensory immersion via head-mounted displays or CAVES

- **Ubiquitous Computing:**
  Wearable wireless devices coupled to smart objects for “augmented reality”
Special Effects
Module 1: Pond Ecosystem

Modeled after Black’s Nook Pond in Cambridge, MA

http://ecomuve.gse.harvard.edu
<table>
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<th>Naturalist</th>
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<th>Water Chemist</th>
<th>Private Investigator</th>
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<td>Observe pond for similarities to EcoMUVE</td>
<td>Observe duckweed</td>
<td>Observe pond for similarities to EcoMUVE</td>
<td>Talk to virtual golfer</td>
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<td>Observe virtual fish</td>
<td>View 3D model of duck</td>
<td>Measure dissolved oxygen</td>
<td>Observe storm water pipe overlay</td>
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<td>Calculate fish population size</td>
<td>Video of starch decomposition by bacteria</td>
<td>Video of how oxygen dissolves in water</td>
<td>Find inlet and outlet of pond</td>
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<td>Collect macroinvertebrates</td>
<td>Observe virtual bacteria</td>
<td>Measure water temperature</td>
<td>Talk to young girl about what a watershed is</td>
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<td>ID macroinverts and calculate tolerance index</td>
<td>Measure pH</td>
<td>Measure phosphates</td>
<td>Measure turbidity</td>
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Work together to create video that summarizes the health of the pond based on whole team’s observations
Manipulation of Space
Manipulation of Time
Next-Generation Learning

Immersive and Richly Contextualized

Ubiquitous

Personalized
Shooting on Location
Augmenting Real World Ecosystems

http://ecomobile.gse.harvard.edu
IN THE FUTURE YOUR MOBILE PHONE WILL ACT AS YOUR DIGITAL “6TH SENSE”
Next-Generation Learning

Immersive and Richly Contextualized

Ubiquitous

Personalized
Personalized Learning

...ensuring that a student’s educational path, curriculum, instruction, and schedule be personalized to meet her unique needs, inside and outside of school... through a wide range of resources and strategies appropriate for her learning style, abilities, and interests, as well as social, emotional, and physical situation.
Point of View
Actions as Basis for Assessments

Logfiles Indicate with Timestamps

- Where students went
- With whom they communicated and what they said
- What artifacts they activated
- What databases they viewed
- What data they gathered using virtual scientific instruments
- What screenshots and notations they placed in team-based virtual notebooks
- What hints they accessed
- What mathematical representations they created
## Logfiles: Events, Chats, Notebooks

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GoPro Cameras Capture EcoMOBILE Experience
What Can We Inculcate and Assess?

- Inquiry skills?
- Collaboration?
- Leadership?
- Self-efficacy?
- Metacognition?
Close-ups
Path Analysis for Defined Tasks

Individual and Group Paths

Heat Maps
Usage of Individualized Guidance

Bug Catcher: Bog Hints

Click on one of the message tabs above to view hints about this area, object, or River City citizen.

Mosquito Catcher- Next to the Bog:

The current site is Bog

Number Observed

Reset Counter

Number Of Samples

New Sample

Sample Number
Interacting with Animated Pedagogical Agents

Ask Dr. C. Your Personal Mars Expert

Brian N
Diane K
Jody C

Why is Mars called the Red Planet?

Dr. C: Busy day today! But I still have time to answer any of your questions about Mars, space, or science.

Diane K: Why is Mars called the Red Planet?

Dr. C: Mars probably got the nickname, The Red Planet, due to the rusty color of its soil, which is comprised of iron-rich minerals. The Egyptians called it the red one because it appears more reddish in the night sky. What makes it appear reddish is a combination of the fact that its surface is comprised of iron-rich minerals that essentially rust (or oxidize) and that the dust made of these minerals is kicked up into the atmosphere, giving the atmosphere a reddish hue from far away. The Martian surface is not all...
Documenting Progress and Transfer in Similar Settings

- Student takes on identity of a scientist
- Students complete quests
- 60 minutes
- Four Phases:
  1. Orientation
  2. Problem Identification
  3. Experimentation
  4. Competing Explanations

http://vpa.gse.harvard.edu
Formative and Diagnostic

- Formative, diagnostic assessment provides *more leverage for improvement* than summative measures.
- Formative, diagnostic assessment is *richer and more accurate* than summative measures.
- Potentially, formative, diagnostic assessment *could substitute for* summative measures.
Composition and Editing
The Spectrum of Interactive Media

- **Sharing**
  - Social Bookmarking
  - Photo/Video Sharing
  - Social Networking
  - Writers’ Workshops and Fanfiction

- **Thinking**
  - Blogs
  - Podcasts
  - Online Discussion Forums
  - Twitter

- **Co-Creating**
  - Wikis/Collaborative File Creation
  - Mashups/Collective Media Creation
  - Collaborative Social Change Communities
Jenkins’ Framework for New Literacies

- **Play** — experimenting with one’s surroundings in problem-solving
- **Performance** — adopting alternative identities for improvisation and discovery
- **Simulation** — interpreting and constructing dynamic models of real-world processes
- ** Appropriation** — the ability to meaningfully sample and remix media content
- **Multitasking** — scanning one’s environment and shifting focus to salient details
- **Distributed Cognition** — fluently using tools that expand mental capacities
- **Collective Intelligence** — pooling knowledge with others toward a common goal
- **Judgment** — evaluating the reliability and credibility of different information sources
- **Transmedia Navigation** — the ability to follow the flow of stories and information across multiple modalities
- **Networking** — the ability to search for, synthesize, and disseminate information
- **Negotiation** — the ability to travel across diverse communities, discerning and respecting multiple perspectives, and grasping and following alternative norms
Next-Generation Learning

- Immersive and Richly Contextualized
- Ubiquitous
- Personalized
3 Contexts for Learning

- Classrooms
  - Presentation and discussion

- Richly Contextualized Real World Learning
  - Internships, apprenticeships

- Learning Communities
  - Interpretation and transfer

  face to face, virtual, blended
The Promise of MASSIVE

- Serves a broader range of learners
  - increased human capital
  - greater diversity in co-learners
- Wider opportunities for social capital and for links to workplace and life
- Self-improving via research and continual feedback
- Excellent return on investment by learners and by society

If effective (mastery, full range of skills)
Advances in technology and in knowledge about expertise, learning, and assessment have the potential to reshape the many forms of education and training past matriculation from high school.
A Different Model of Pedagogy

- Experiences central, rather than information as pre-digested experience
- Knowledge is situated in a context and distributed across a community
- Reputation, experiences, and accomplishments as measures of quality
Core Principles of Professional Development

- Teachers teach as they were taught.
- The important issue is not technology usage, but changes in content, pedagogy, assessment, and learning outside of school.
- Continuous peer learning is the best strategy for long-term improvement.
Professional Development: “Unlearning”

- Developing fluency in using the full range of emerging interactive media
- Complementing presentational instruction with situated, collaborative learning
- Unlearning almost unconscious assumptions and beliefs and values about the nature of teaching, learning, and schooling
Transformation of Formal Education
### Rubrics and A/B Experiments

<table>
<thead>
<tr>
<th>Question</th>
<th>Skill</th>
<th>observable variable</th>
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Strategy for Change

- Evolution
- Transformation
- Disruption
New Models for Financing

- Attract 0.5% of the 1B people who are looking for learning experiences over twelve months
- Start a new session of 10,000 people 50 weeks of the year
- $5 a person for a twelve hour experience over six weeks
- $2.5M annual revenue
Rethinking Educational Processes

- Credentialing/certification based on competency rather than time
- Many sources of accredited learning, based on alternative business models and new marketplaces
- Continuous improvement via analytics applied to rich databases and embedded A/B experiments
- Generic tools and media repurposed for learning
Organizational Strategies for Adoption and Scale

- Develop authentic assessments based on outcome objectives
- Select initial innovations carefully so that strong models of learning are implemented
- Emphasize user-friendly interfaces
- Study design strategies for effective media that have scaled
- Accomplish tasks instructors/institutions want to relinquish
- Use organizational development strategies to change culture