The Future of Cyberlearning: A vision of the year 2015…

- Virtual Laboratory Simulations
- School: Visualizations of real-time data from remote sensors
- Home: Mobile technology access to school materials and assignments
- Students: Virtual interaction with classmates
- Teachers: Supplemental content
- Parents: Lifelong “Digital Portfolio”
What Is Cyberlearning?

• The use of *networked* computing and communications technologies to support learning

• Interactions among communities of learners across space and time

• Customized interaction with diverse materials, on any topic, at any age
A Brief History of Technological Advances Making Cyberlearning Possible
Why Is Cyberlearning Important?

• Leverages learning through
  – Communication technologies
  – Students’ technology skills

• Extends capacity of educational institutions into life-long learning opportunities
  – Increases public understanding of science
  – Prepares citizens for complex, evolving, global challenges
Why Cyberlearning Now?

- Powerful new technologies
- Understanding of how people learn
- New, more responsive methods of development and testing
- Demand for solutions to educational problems

NSF funding for interdisciplinary programs in cyberlearning

Credit: John Sondek, University of North Carolina, Chapel Hill

Using data to teach geoscience thinking
Credit: Tracy Gregg, State University of New York, Buffalo
Task Force Charge

Advisory Committees
- Directorate for Education and Human Resources
- Office of Cyberinfrastructure

Task Force
- Opportunities
- Research questions
- Partners
- Strategies
- Existing resources

NSF’s US-based Charter
- STEM
  - Science
  - Technology
  - Engineering
  - Mathematics
- SBE
  - Social Science
  - Behavioral Science
  - Economics

Arts

Humanities
Task Force Members

- **Christine L. Borgman (Chair):** Professor of Information Studies, UCLA
- **Hal Abelson:** Professor of Computer Science and Engineering, MIT
- **Lee Dirks:** Director of Scholarly Communication, Microsoft
- **Roberta Johnson:** Director of Education and Outreach, UCAR
- **Kenneth R. Koedinger:** Professor of Human Computer Interaction / Psychology, Carnegie Mellon University
- **Marcia C. Linn:** Professor of Development and Cognition, UC Berkeley
- **Clifford A. Lynch:** Executive Director, Coalition for Networked Information
- **Diana G. Oblinger:** President, EDUCAUSE
- **Roy D. Pea:** Professor of Education and the Learning Sciences, Stanford University
- **Katie Salen:** Executive Director, Institute of Play
- **Marshall S. Smith:** Director of Education, Hewlett Foundation
- **Alex Szalay:** Professor of Astronomy, Johns Hopkins University
Key Strategies and Opportunities for NSF

• **Strategies:** To promote the growth of a cyberlearning infrastructure

• **Opportunities for Action:** Greatest short-term payoff and long-term promise

• **Themes**
  – Develop and advance technologies
  – Enable students to use data
  – Harness learning data
  – Support broader audiences
  – Sustain cyberlearning materials
Develop and Advance Technologies

• **Strategy:** Promoting new talent and new technology

• **Opportunity:** Using technologies to
  – Coordinate learning across contexts
  – Connect students with remote and virtual laboratories
  – Access interactive virtual or “mixed reality” environments

Ann Myers Medical Clinic in Second Life
Image credit: Scienceroll blog

World of Warcraft
Enable Students to Use Data

- **Strategy:** Transforming STEM disciplines and K–12 education
  - New ways of looking at and understanding content
  - Preparing students for “computational thinking”

- **Opportunity:** Teaching students and teachers how to harness large amounts of data
  - Scientific research
  - Responsible use of data
Harness Learning Data

• **Strategy:** Leveraging the data produced by cyberlearning systems
  – Teachers interacting with students and their school assignments
  – Students’ educational histories

• **Opportunity:** Encouraging shared systems that allow large-scale deployment, feedback, and improvement

Pittsburgh Science of Learning Center’s DataShop: learnlab.web.cmu.edu/datashop
Support Broader Audiences

• **Strategy:** Addressing problems and opportunities with
  – Reapplication of tools and resources
  – Scaling of technology for larger communities

• **Opportunity:** Funding development of resources usable for both research and education
Sustain Cyberlearning Materials

- **Strategy:** Sustaining cyberlearning innovations beyond their initial funding
- **Opportunity:** Guaranteeing future availability of Open Education Resources

SimCalc Project
http://www.kaputcenter.umassd.edu/downloads/products/technical_reports/tr1_1.pdf

iLab Inverted Pendulum:
Mark Schulz, iLab
Task Force Recommendations

1. Build a vibrant cyberlearning field
2. Instill a “platform perspective”
3. Emphasize the transformative power of technology
4. Promote open educational resources
5. Sustain NSF-sponsored projects
1. Build a vibrant cyberlearning field

- Promote cross-disciplinary communities of cyberlearning researchers and practitioners including
  - Technologists
  - Educators
  - Domain scientists
  - Social scientists

- Publish best practices
- Recruit diverse talents

*Relationships Among Scientific Paradigms*

(Credit: Research & Node Layout: Kevin Boyack and Dick Klavans (mapofscience.com); Data: Thompson ISI; Graphics & Typography: W. Bradford Paley (didi.com/brad); Commissioned Katy Börner (scimaps.org))
2. Instill a “platform perspective”

- Platform = shared, interoperable designs of hardware, software, and services
- Incorporate and support
  - New technological innovations
  - Fully tested modules for classroom use
- Widely usable now and in the future
- Guidance from expert panel
Current NSF “platforms” to review

- National Science Digital Library (NSDL)
- Innovative Technology Experiences for Students and Teachers (ITEST)
3. Emphasize the transformative power of technology

- Potential for learning, from “K to grey”
- Information and communication technologies that
  - Allow interaction with data, visualizations, remote and virtual laboratories, and experts
  - Bridge multiple learning environments and technologies
- Support teachers’ professional development through
  - Training programs
  - Professional societies
  - Collaborating to create new teaching materials
4. Promote open educational resources

- Make materials available on the web with permission for unrestricted reuse and recombination
- New proposals should plan to make their materials available and sustainable
5. Sustain NSF-sponsored projects

- Maintain cyberlearning innovations beyond the funding of a grant
- Extend initiatives across NSF divisions and create external partnerships
The Cyberlearning Challenge: Transition from Network to Cyberinfrastructure
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Report and followup

(link is in your CNI program)

Further questions / followup:

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