

# Cyberlearning: Transforming Education

Janet Kolodner

The National Science Foundation

# What is Cyberlearning?

- Using technology to amplify, expand, and provide learning opportunities not otherwise available.
  - Directly (by interacting directly with a learner)
    - Providing ways to construct, run, visualize, sense, and examine objects, processes, and phenomena that are too hard to explore otherwise
    - Providing means of connecting to, communicating with, and communicating better with a broader array of potential learning partners
    - Providing scaffolding and other assistance (for reasoning, reflection, ...)
    - Providing assessment feedback
    - Providing workbenches, resources, etc.
    - Personalizing an experience
    - ...
  - Indirectly (by assisting a teacher, facilitator, tutor)
    - Providing assessments of learner understanding and capabilities
    - Providing assessments of cohort understanding and capabilities

# Cyberlearning: Transforming Education

- An NSF program shared by CISE (Computing), EHR (Education), SBE (social and behavioral sciences), and OCI (CyberInfrastructure)
- Focuses on a particular role for interactive media and experience design: promoting learning

# Vision/Mission

- Using technology to amplify, expand, and transform opportunities people have for learning, and better draw in, motivate, and engage learners
- By integrating advances in technology with advances in what is known about how people learn to help us
  - Better understand how people learn with technology and how technology can help people learn
  - Better use technology for collecting, analyzing, sharing, and managing data for assessment purposes and to shed light on learning
  - Design new technologies for these purposes, and advance understanding of how to use these technologies and integrate them into learning environments
- To cultivate a citizenry that
  - engages productively in learning and
  - has knowledge and capabilities that allow informed decision making and judgment about problems ranging from those affecting our immediate lives to global challenges such as war and peace, economics, health and wellbeing, and the environment.

# Aims

- Envisioning the next generation of learning technologies
- Learning how to design them and use them effectively
- Advancing the science of learning with technology
- Essentially, learn more about how to design effective technology-mediated learning experiences and expand foundational understandings of learning and design needed for that

# Using technology to promote, for example:

- Interdisciplinary computational thinking
- Mindfully seeing the world and the differences one might make in that world
- Thinking like an engineer
- Making sense through narrative and story telling
- Complex thinking
- Becoming a transdisciplinary designer and/or evaluator

# Requirements

- Designs based on and supported by what is known about how people learn
- Projects must make three important types of contributions:
  - A model technology product that others might emulate
  - Identifying affordances of, challenges to effective use of, design characteristics of, ways of effectively using, and/or ways of effectively integrating some target technology or set of technologies
  - Add to the literature on how people learn (with technology)
- Vision must be potentially transformative, and project must support that vision (as Janet said: ask long-term questions and model lasting solutions)
- Research must be done in the real-world contexts the technology is designed for and in which it will be used
- Three types of data collection: for assessing learning, to inform refinement of the innovation, for answering research questions
- Teams (including PIs, senior personnel, and advisors) must have the variety of skills and expertise needed to address issues -- so that engagement, learning, human interaction, technology integration, and other goals can be achieved.

# Types of Projects

- Exploratory (EXP), 2-3 yrs, up to \$550,000 –due in December; affordances of a technology, extending those affordances, challenges to effective use; shed light on answers to questions about how people learn
- Development and Implementation (DIP), 3-5 yrs, up to \$1,350,000 –due in January; pilot projects; answer questions about how people learn
- Integration and Deployment (INDP); 5 yrs, up to \$2,500,000 – due in July; integrative projects; answer learning questions that can only be addressed in an integrative approach
- Capacity-Building (CAP); building capacity of a team (up to \$50,000) or building capacity of the community
- EAGERS, RAPIDs
- Cyberlearning Resource Center (CRC) – to be funded shortly; will support matchmaking, capacity building, and integration; help PIs identify lessons that can be learned across projects; aid with bringing research to practice

# Advice

- Think transformatively; what can make a real difference in what and how and where people learn?
  - An invitation to reconfigure the way educating is done and the venues in which learning happens
- Put together the right team; remember to include learning scientists from the beginning (and not just as assessment people)
- Think in terms of model building (not enough money to build complete products), iteratively refining your model, and extracting lessons from your model
- Begin with a transformative goal in mind; propose a socio-technical solution around that; design research inquiry around a set of questions essential to achieving that transformative goal
- Research must focus on advancing what is known about processes involved in learning, specifically when technology allows new kinds of experiences
- Separate out formative evaluation of your innovation and answering research questions
- Don't jump to summative evaluation before it is time
- The solicitation tells you to state your vision and why it is important, then which part of it you are working on and why that is the right way to get started (or continue), how you'll go about it and why, separating out your technological innovation and evaluation of its effectiveness from the research on learning and how you are addressing research questions

# Other NSF Programs

- Human-Centered Computing (HCC)
  - Designing new ways of interacting with technology
  - Designing new kinds of interactive experiences and new ways of using technology
- DRK-12
  - Resources, tools, and models for formal STEM education
- AISL (formerly ISE)
  - Resources, tools, and models for informal STEM education
- Look out for Expeditions in Education