# Cyberlearning and Future Learning Technologies Prospective PI Webinar

May 2015

Cyberlearning and Future Learning Technologies Description

# WHAT IS THE CYBERLEARNING PROGRAM?

# Vision of the Cyberlearning Program

- New technologies change what and how people learn
- The best of these will be informed by research on how people learn, how to foster learning, how to assess learning, and how to design environments for learning.
- New technologies give us new opportunities to learn more about learning

# Cyberlearning Program Purpose and Goals

The purpose of the Cyberlearning program is to

1. advance design and effective use of the next generation of learning technologies, especially to address pressing learning goals, and
2. increase understanding of how people learn and how to better foster and assess learning, especially in technology-rich environments

# A Cross-Directorate Effort

- CISE – Computer and Information Science and Engineering
- EHR – Education and Human Resources
- ENG – Engineering
- SBE – Social, Behavioral, and Economic Sciences

# Cyberlearning & Future Learning Technologies project "recipe"

| | |
|---|---|
| Need | • Pressing societal need or technological opportunity<br>• *Any domain of learning* (not just STEM) |
| Innovation | • Design and iteration of new cyberlearning system that could spawn a new genre of learning environments<br>• Imagining/inventing the future of learning |
| Learning | • Builds on what we know about how people learn<br>• Contributes back to the learning sciences |
| Genre | • Advances design knowledge for a whole category of learning environments<br>• Research to inform development of the genre |

# Cyberlearning Program Scope

- Populations, disciplines, and contexts for learning
  - any (not just STEM, not just formal)
- Technologies and interactions with them
  - any – hardware, software, combo, interactions with them, their integration into environments, must aim beyond state of the art
- Scholarly literature on learning and how people learn
  - Processes, representations, conditions, and influences associated with learning
  - Cognitive, neurobiological, behavioral, cultural, social, volitional, epistemological, developmental, affective, and other perspectives
  - Individual and collective learning
- Cyber-learning R&D, not cyber-enabled research on learning or cyber-enabled teaching

But remember: What you are doing must advance imagination about what is possible and have potential to really make a difference

# Cyberlearning program facts

- Must integrate design & research on learning
- Must be grounded in state of the art
- Interdisciplinary teams strongly recommended
- Not implementation or scaling driven—imagining the future!

| Track | Due | Amount |
|---|---|---|
| EXP Exploration | Dec. | $550k/$750k<br>2-3 years |
| DIP Dev't & Implementation | Jan. | $1.35m<br>3-5 years |
| INT Integration | (LOI May)<br>July | $2.5m<br>4-5 years |
| CAP Capacity Building | Rolling | $50/100k<br>1-2 years |

http://go.usa.gov/N5T5

# Entry criteria for each tier

- EXPs are appropriate when the innovation is new and its properties aren't well understood
- DIPs are appropriate when innovation has some track record and has solid integrated learning sciences research (1 EXP prior)
- INTs involve studying innovations embedded in larger, complex, realistic environments (2 or more DIPs prior)
- **IMPORTANT:** INTs are NOT efficacy, effectiveness, or scale-up research.
- CAPs require consultation with program officer

Cyberlearning and Future Learning Technologies (CFLT)

# KEY COMPONENTS OF A CYBERLEARNING PROPOSAL

# Key Components of a Cyberlearning Project

Addressing a pressing learning issue and/or technological opportunity, each project has:

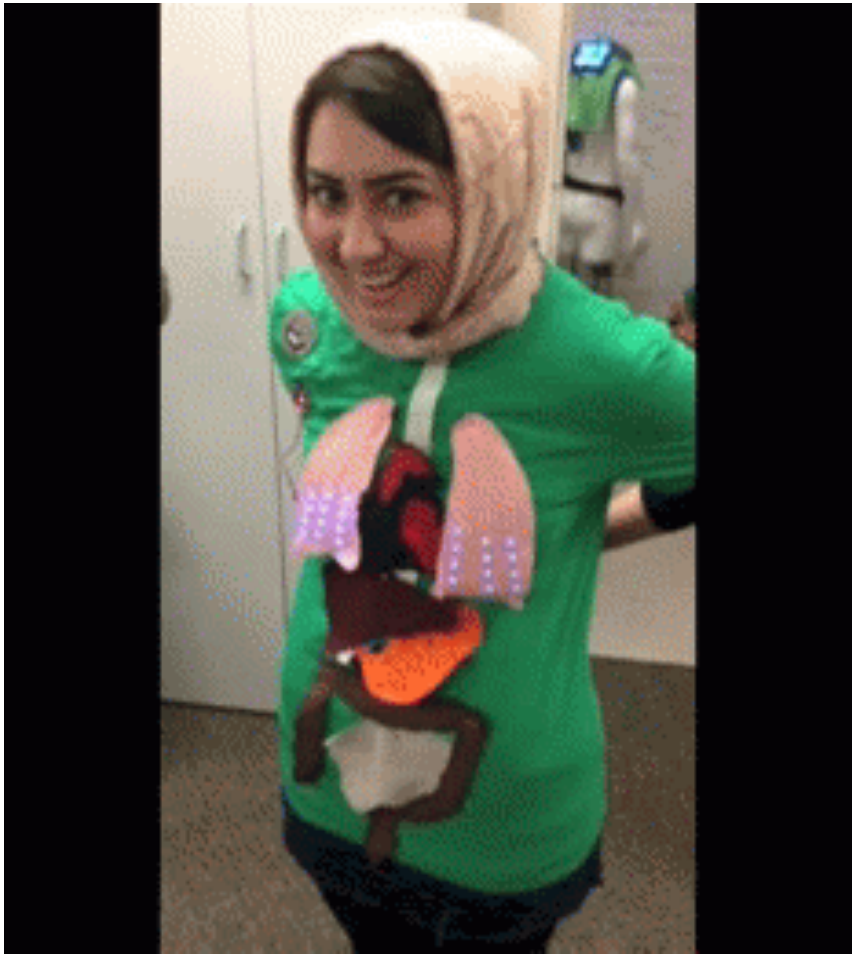
- A technological innovation: a new genre or model for technology design or use, that is informed by, but pushes beyond, state-of-the-art
- Research advancing understanding of how people learn
- Research pointing towards broad use or transferability of the new genre

The two kinds of research are done in the context of iterative refinement of the innovation

# EXAMPLES

# Example EXP: BodyVis

- Wearable computing shows body processes
- Research on early biology learning including embodied cognition
- CS + Learning Sci + Developmental Psych

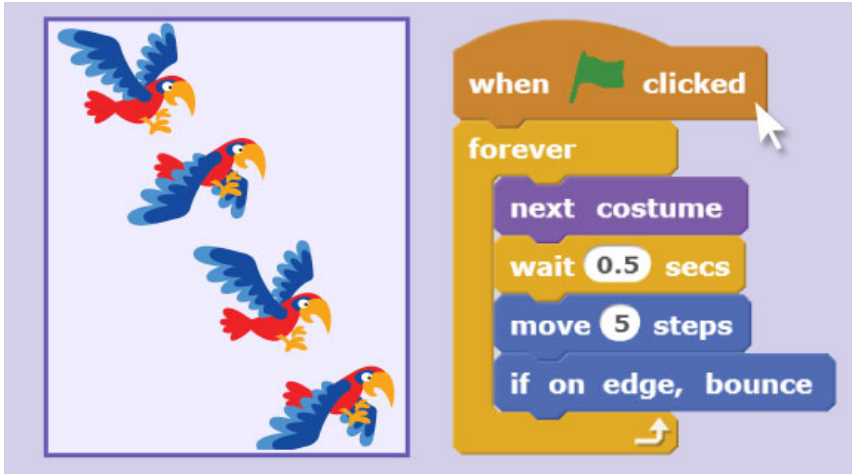


# Example DIP: Simulation and Embodied Learning

- ‘Simulation theatres’ use computer vision to automatically classify improvised gestures
- Research on how embodied cognition occurs across domains
- Tools for future research on gesture and for gesture-based instruction
- CS + Sociolinguistics + Learning Sciences

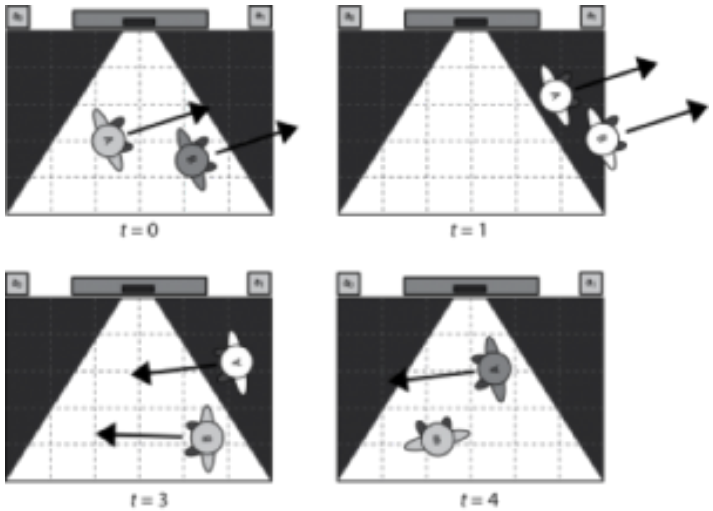
# Example INT: Studying the scratch programming ecosystem

- Studying the programming environment, professional development, and community tools as change agents
- How does/doesn't scratch enable interest driven learning?
- Ethnographers, social informatics/law/policy, learning sciences




# Example CAP: Technology measuring learners in museums

- Technology-based learning in museums lacks good assessments
- Workshop to build consensus on how to do this well with tech
- Edited volume as outcome
- Learning sciences, computer science, museum studies, psychometrics, data science, policy/ethics




Preparing Cyberlearning and Future Learning Technologies Proposals

# HOW DO YOU DEVELOP A COMPETITIVE PROPOSAL?

# Every project needs 4 integrated parts*

1. An important learning need
2. A proposed innovation that is iteratively refined during the project
3. Research advancing understanding of how people learn (that requires the technology innovation)
4. Research promoting broad use and transferability of the genre

**except CAPs*

# What is an appropriate purpose?

- A pressing learning need, e.g.,
  - Drawing in underserved learners
  - Helping learners deepen understanding of particular difficult content or phenomena
  - Helping learners gain skills that are difficult
  - Helping learners develop interests
  - Helping teachers or other mentors provide excellent facilitation
- Combined with an opportunity to use technology to address the need

Achieving the purpose should have potential to make a real difference.

# What will reviewers will look for in your purpose?

- How important is it?
- How well have you justified its importance?
- How clear are you about what it will take to get there?
- How well do your innovation and research address it? How well-poised is your approach for eventually achieving that purpose?

# What is an ‘innovation’?

A new or emerging learning environment enabled by technology

- Must aim beyond state-of-the-art and be informed by
  - Best available research on how people learn
  - Best available technology design
- Should have potential to transform learning
- Can be quite futuristic, but doesn’t need to be high tech—just a significant advance in learning design enabled by technology
- Should have the potential to spawn a new genre of learning environments

# What counts as a “new genre”?

Software itself has a short shelf life; <u>think about your innovation as representative of or a model for some new category of learning environments</u>

- Might be novel technology
- Might be novel application of existing technology
- Might be a new sociotechnical system
- Must suggest a brand new model of technology-enhanced learning

# What counts as ‘iterative refinement’?

- The innovation should be
  - Imagined and laid out in the proposal
  - Tried out in appropriate situations
  - With data collected about both its effectiveness and its way of being used
    - To allow understanding of what is working and not working and why
  - And results of analyzing that data used to make it better
    - by refining the technology or
    - by refining its use or the pedagogy around it
  - Then it is tried out again
- Formative evaluation is done in the context of iterative refinement

Design-based research is one way to do this by combining your iterative refinement with your research. Or you might have separate formative evaluation and research data.

# What will reviewers look for in your innovation?

- What is the new genre or configuration of technology proposed? How well is it laid out in the proposal? How novel is it? How well does it advance state of the art?
- How well is it informed by research -- on technology, learning processes, targeted population, and so on?
- How well will your innovation address your purpose? What will learners' experience be like? What do you expect to happen as a result of that experience? How do you expect learner experiences to affect learning? How well-justified are your claims?
- How well will what you aim to build serve as a model or representative of the new genre?
- How will you build and refine it? What is your starting point? What is your process?

# What is ‘advancing understanding of how people learn’?

- Proposals should present clear research questions and appropriate methods to address them
- Research should inform theory
  - About learning processes, fostering learning, assessing learning, and/or designing for learners
  - Advance understanding of processes involved in learning, representations those processes use, what happens through those processes, influences on those processes, and/or how to influence those processes
- In general, the answers to your questions should require the experience of using your technology innovation or collecting data in the context of its use

Your questions may be based on the learning theory and rationale behind your innovation, or they might be different, but your studies should contribute significantly to some branch of learning research.

# What will reviewers look for in your learning research?

- What are the research questions? How well formed are they and how well are they informed by prior work? How important are they?
- What literature(s) will they contribute to?
- What are your research methods, study design, and study context? How appropriate are your methods to answering the questions? How appropriate are your questions and methods to the stage of the innovation's development?
- How will your research add to theory? What new conceptual understandings will we learn from your research? Does it go beyond mere evaluation?

# What is ‘research promoting broad use and transferability’?

- This research should extract guidelines for designing and using the new genre
  - For EXPs: basic affordances, challenges to effective use, and properties of use-in-context
  - For DIPs: design and use rules of thumb that others may use in developing applications and enactments
  - For INTs: clear research questions should be posed and answered about the new genre and its ecosystem

Note: broad use and transferability are NOT about effectiveness, efficacy, scale-up, or broad dissemination (even in INTs)

# Research on broad use or transferability – what will reviewers be looking for?

- What are the goals for understanding the potential for broad use or transferability? How  appropriate are they to the stage of the innnovation's development?
- How will the proposed work yield progress on these goals?
- What will we know at the end of this project about how to promote or assess learning better that we did not know before?
- To what kinds of other innovations and applications will this new knowledge apply? Will others designing new instances of the genre benefit from the work?

# Team requirements

- Teams should include all of the expertise you need to achieve both your technical and research goals
  - spread across your researchers and your (required) advisory board
  - including expertise on learning processes and the targeted content, technology, learners, and practices of educating in the targeted environment.
  - must include expertise in design of learning experiences
- Advisory boards should include both
  - members who complement the expertise of researchers and
  - members who can contribute to critical review of the project.

# Your team – what will reviewers be looking for?

- To what extent does your team have the expertise to carry out the project?
- To what extent has that expertise clearly been used in putting the proposal together?
- What is your plan for using that expertise well while carrying out the project?
- How well have you articulated team member expertise, roles, collaboration, and coordination in your Collaboration and Management Plan?

# IRB Approval

- We are not allowed to recommend a proposal for funding until we have your IRB approval.
- Time your IRB request appropriately.

# Allowable documentation

- Required
  - List of PIs, co-PIs, senior investigators, and other participants – put in ‘supplementary documents’
  - Collaboration and management plan (up to 3pg) – put in ‘supplementary documents’
  - Letters of commitment from project partners – put in ‘supplemental documents’
  - Postdoc mentoring plan (if applicable)
  - Data management plan – not just data, but software
  - Reports of current and pending support and facilities
  - 2-page bios with a maximum of 10 citations
- Strongly suggested
  - Up to 5 screen shots – put in ‘supplemental documents’

***Nothing else is allowed!***

# Special constraints by track

**CAPs**

- CAPs need to be workshop/ course, partnership, or "other"
- Partnerships $50k max, workshops $100k max
- CAPs require prior consultation with a program officer
- Workshop CAPs require 2 year duration and a 1-year-later evaluation
- CAPs alone have target dates, not deadlines

**INTs**

- INTs *require* a letter of intent in May (no other tracks require such)
- INTs require summative evaluation component
- INTs have the highest standards for considering growth of the genre
- INTs require the equivalent of 2 or more DIP projects

# In the end, … you should be aiming to produce 3 products

- At least one minimally-viable product that is representative of your new genre, points the way into the future, and addresses your stated purpose
  - To serve as a model of your new genre
  - Full-developed products are not required or requested
- New knowledge about learning
- New understandings about design and use of a new technological or socio-technical genre

Cyberlearning and Future Learning Technologies

# OTHER CYBERLEARNING-RELATED PROGRAMS

# What doesn't belong in the Cyberlearning program?

- Projects primarily about educational impact in the here and now (implementation projects)
- Projects which advance learning sciences but not technology design
- Projects which advance technology design but not learning sciences
- Projects which are primarily cyber-enabled teaching or cyber-enabled research on learning (which do not impact learners)
- Projects in which technology is the object, rather than the scaffold, of learning

# Selected Cyberlearning alternatives

| Sample Programs | Key differences |
|---|---|
| DRK12: Discovery Research K-12<br>IUSE: Improving Undergraduate STEM Education<br>AISL: Advancing Informal STEM Learning | Learning domain is STEM discipline<br>Context is K-12, undergraduate learning, or informal learning<br>Potential applicability today |
| STEM+C: STEM plus Computing Partnerships | Learning domain is STEM discipline as intersecting computer science or computational thinking<br>Context is K-12, potential applicability today |
| ITEST: Innovative Technology Experiences for Students and Teachers | Learning aims towards technology-literate STEM workforce<br>Should have strong impact on K-12 students and teachers |
| CHS: Cyber-human Systems | Research on humans and computing, not necessarily learning focused—contributes to literatures such as human-computer interaction |
| ECR: Education and Human Resources Core Research | Foundational research on STEM or STEM-related learning (Not design/development focused) |
| SBIR: Small Business Initiation Research (and STTR) | Exploration or development associated with putting a technology on the market |
| BIGDATA: Critical Techniques and Technologies for Advancing Foundations and Applications of Big Data Science & Engineering | Education is one possible application area: focus is on new techniques for computational analysis of big data for research |
| SL-CN: Science of Learning: Collaborative Networks | Basic and applied research on learning in all domains<br>Focus on building interdisciplinary collaborations that will yield novel approaches to understanding learning writ large |
| RI, III, and other CISE programs | Focus on computer science research (which includes CS that may have application to education) e.g., AI, NLP, computer vision, etc. |

# Is it right for Cyberlearning?

Alternatives to consider:

- If learning research, but no design: ECR, SL-CN or BCS
- If technology research, but no learning research: CHS or other relevant CISE programs
- If STEM education, but not new genre: DRK12, AISL, or IUSE
- If product development: SBIR/STTR
- If learning *about* technology, not learning *through* technology: STEM+C or ITEST

# Proposal development resources

The Center for Innovative Research in CyberLearning

Projects | Big Ideas | Perspectives | Newsletter | Events

## NSF Cyberlearning Solicitation Webinar

**Tuesday, May 5, 2015 from 1:30 pm – 2:30 pm Eastern Time** (*Note updated time)

An informational webinar on the current solicitation by the NSF Cyberlearning Program.

Register for this Webinar

**Webinar Slides**

- The NSF Cyberlearning Program [PDF]

**Supplemental Materials**

- Cyberlearning Proposal Checklist [PDF]
- Common Reasons Cyberlearning Proposals are Not Recommended for Funding [PDF]
- Cyberlearning INT Special Considerations [PDF]
- Guiding Questions for Cyberlearning Proposal Reviewers [PDF]
- Introduction to NSF for Cyberlearning [PDF] (For webinar to be held Tuesday May 26, 2pm – 3pm ET)

http://circlcenter.org/events/nsf-cyber-solicitation-webinar-2015/