

Cyberlearning and Future Learning
Technologies
Prospective PI Webinar
Integration Projects (INTs)

Spring 2014



Outline of presentation

- Cyberlearning & Future Learning Technologies (CFLT) Description
- Key Components of a Cyberlearning and Future Learning Technologies Proposal
- Examples
- Preparing Cyberlearning Proposals
- Other Related Programs



Cyberlearning and Future Learning Technologies Description

WHAT IS THE CYBERLEARNING PROGRAM?



Vision of the Cyberlearning Program

- New and emerging technologies will expand and transform learning—opportunities, interests, and outcomes—cradle to grave.
- 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

By integrating opportunities offered by emerging technologies with advances in what is known about how people learn



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 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
 - Should be literature that focuses on processes, representations, conditions, and influences associated with learning
 - Can focus on any combination of perspectives:
 - Cognitive, neurobiological, behavioral, cultural, social, volitional, epistemological, developmental, affective, and other kinds of processes and influences
 - Individual and/or collective learning

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



Cyberlearning Proposal Types

Proposal Type	Award Limit and Duration
<p>EXP: Exploration</p> <ul style="list-style-type: none"> -- due March 19 in FY14 -- due in December in FY15 and beyond 	<p>\$550,000* and 2-3 years</p> <p>New innovations with properties that are not well understood, risky</p>
<p>DIP: Development and Implementation</p> <ul style="list-style-type: none"> -- due March 26 in FY14 -- due in January in FY15 and beyond 	<p>\$1,350,000 and 3-4 years</p> <p>Evidence of viability exists, as does understanding of what research needs to be carried out</p>
<p>INT: Integration</p> <ul style="list-style-type: none"> -- due mid-July (July 14th in FY 14) -- require a letter of intent, due mid-May (May 12 in FY14) 	<p>\$2.5m and 4-5 years</p> <p>The innovation(s) being built on have shown promise, research on their individual use has been carried out; the focus now is on integration and research that can only be done in integrative contexts</p>
<p>CAP: Capacity Building</p>	<p>\$50k and 1 year for partnerships, \$100k and 2 years for conferences, workshops, short courses</p>



Deciding which type of Cyberlearning proposal to submit

- EXPs are appropriate when the innovation is new and its properties aren't well understood
- DIPs are appropriate when the innovation has some proven track record and warrants further development and study
- INTs integrate and involve studying innovations embedded in larger, complex, realistic environments
 - Integrate several emerging and/or developed technologies that have shown promise
 - Incorporate promising technologies and technology-enabled practices into the lives of learners or organizations
 - Extend a promising innovation in ways that would allow it to be used by a larger population or variety of learners
 - Combination of the above
- **IMPORTANT:** INTs are NOT efficacy, effectiveness, or scale-up research.



Selected Cyberlearning alternatives

Sample Programs	Key differences
DRK12: Discovery Research K-12	Learning domain is STEM discipline Context is K-12 Potential applicability today or on a short horizon
 AISL: Advancing Informal STEM Learning	Learning domain is STEM discipline Context is informal learning environments Potential applicability today or on a short horizon
 ITEST: Innovative Technology Experiences for Students and Teachers	Learning aims towards technology-literate STEM workforce Audience is 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 REAL: Research on Education and Learning	Foundational research on learning (Not design/development focused), research aimed at understanding, building theory to explain, and suggesting interventions and innovations to address persistent challenges in STEM learning (not design/development focused)
 SBIR: Small Business Initiation Research (and STTR)	Exploration or development associated with putting a technology on the market



QUESTIONS?



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 should have

- A technological innovation: a new (or emerging) genre or model for technology design or use, that is informed by what is known about how people learn AND pushes beyond state-of-the-art
- Research advancing understanding of how people learn
- Research uncovering principles for design and/or use of the new genre (was called “broad use and transferability” in the solicitation)

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



EXAMPLES

(WE HAVE AWARDED FUNDS TO ONLY 3 INTEGRATIVE PROJECTS IN 3 YEARS)



C. Dorsey, U. Wilensky, R. Tinker, W. Finzer: InquirySpace: Technologies in Support of Student Experimentation

- **Issue and Opportunity:** Supporting extended and authentic scientific investigation in middle and high school to promote deep science learning, scientific reasoning capabilities, and an accurate understanding of the practices of science. Well-understood tools and resources exist for supporting different aspects of scientific inquiry (e.g., Probeware, NetLogo, Fathom, Tinkerplots), but they are not linked. New browser capabilities make it possible to deeply link such tools and resources in a single platform.
- **Innovation:** A collaborative web-based platform that (1) deeply integrates several well-developed tools and resources in support of inquiry and (2) scaffolds their integrated use.
- **Technology explorations:** Integration and trial and iterative refinement of the technological means of effecting the desired deep integration and the design of representations, scaffolding, and pedagogical practices that will allow students to have the experiences of scientists without being overwhelmed by the proliferation of tools and representations; in the context of 3 project-based science units and used over at least 3 2-week periods spread throughout the school year.
- **Research advancing understanding of how people learn:** focuses on development of scientific capabilities and understanding when students have the tools of scientists available, are using them as scientists would, and are well scaffolded in that use.
- **Research promoting broad use and transferability:** focuses on extracting out design and use principles for designing such integrated platforms and scaffolding



M. Resnick, N. Russ, M. Ito, U. Gasser: Coding for All: Interest-Driven Trajectories to Computational Fluency

- **Issue:** Middle-class kids have access to tools and experiences for computational fluency (e.g., SCRATCH); but for many populations, these tools, resources, and experiences are not easily available. These children will find it hard to enter a workforce in which computational fluency is important.
- **Innovation:** Interest-based microworlds – introductory programming environments that are customized to particular interests of youngsters in these populations – to provide easier and inviting entry points for getting started AND their integration into the life of communities through public libraries in ways that will woo youth into activities that will result in technological fluency.
- **Technology development:** Develop, trial, and refine a variety of interest-based SCRATCH microworlds; integrate them into the lives of public libraries and refine that integration.
- **Research advancing understanding of how people learn:** Map out development of skills, understanding, and interests in computation and technology, along with the influences on that development, so as to contribute to deeper understanding of needed supports, pathways, and outcomes related to computational fluency.
- **Research promoting broad use and transferability:** Focuses on the ins and outs of designing microworlds that are easily accessible and at the same time technologically sophisticated enough to be inviting; also on the socio-technical infrastructure that invites and sustains participation.



Preparing Cyberlearning and Future Learning Technologies
Proposals

HOW DO YOU DEVELOP A COMPETITIVE PROPOSAL?



Developing a competitive proposal

- Content
- Mechanics



Every project needs 3 integrated parts

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

All focused by an important purpose and to be carried out by a team with appropriate expertise



What is an appropriate purpose?

- A pressing need (usually, that transcends disciplines), e.g.,
 - Drawing in learners who are not easily reached
 - Helping learners deepen understanding of difficult content or phenomena
 - Helping learners gain skills that are difficult
 - Helping learners develop interests
 - Helping teachers or other mentors provide excellent advice or 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 technology; a new or emerging learning technology; a new or emerging configuration of learning technologies or sociotechnical systems

- Should be high impact, learner-oriented
- Must aim beyond state-of-the-art and be informed by scholarly research on how people learn
- Should have potential to transform
- For INTs, should integrate other beyond-state-of-the-art learning technologies or integrate such technologies into the lives of learners or organizations.
- Software itself has a short shelf life; think about your innovation as representative of or a model for some new genre



What counts as a “genre”?

- A new type or category of learning technology
 - E.g., support for synthesis and argumentation
 - E.g., crowd-sourced citizen science games that promote learning
- A new way to integrate or configure learning technologies
 - E.g., a workbench for student scientists that promotes learning as a computational scientist would
 - E.g., configuration for a next-generation textbook
- A new technology-rich learning environment
 - E.g., sensor and other technologies that bring the field into the classroom
- A new way to configure a socio-technical system to foster learning
 - E.g., turning maker spaces into learning environments
 - E.g., turning public libraries into spaces for encouraging computational fluency

For INTs, the genre may not be new, but its integration into the life of learners, organizations, or communities might.



What counts as 'iterative refinement'?

- The innovation should be
 - Imagined, laid out, and its design justified 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 (and again)
- Formative evaluation is done in the context of iterative refinement

The literature on design-based research discusses how this is done; for INTs, your team should be expert at DBR.



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?



QUESTIONS?



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
- Research in EXPs will shed light on answers and tell how to focus later research
- Research in DIPs will answer questions
- Research in INTs will answer questions that can only be answered when the proposed integration is in place.



Research advancing understanding of how people learn – what will reviewers be looking for?

- 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?



What is 'research promoting broad use and transferability'?

- This research should extract guidelines for designing and using other applications and experiences that fit the new genre
 - For EXPs, 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, design, use, and/or integration rules of thumb or principles for developing applications and carrying out enactments
- 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 is your genre?
- What are the goals for understanding the potential for broad use or transferability? How appropriate are they to the stage of the innovation'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 than we did not know before?
- To what kinds of other innovations and applications will this new knowledge apply?



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 at 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 Collaboration and Management Plan (up to 3 pages to be placed in Supplemental Documents) should detail how you will use your team to its best advantage.



Your team – what will reviewers be looking for?

- To what extent does your team have the expertise to carry out both the technology and research goals of 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?



QUESTIONS?



Integrating the parts -- advice

- Make clear the issue or opportunity,
- Describe your innovation and how you will iteratively create/refine it, and where it will be used/tested (to address the issue or further the opportunity),
- Propose research questions on how people learn that can be answered in the context of your innovation, and propose how you will study them (your questions should be relevant to the issue or opportunity you are addressing)
 - New experiences learners can have suggest new things that can be learned about learning
 - New data that can be collected may allow new things to be learned about learning
- Propose a plan for extracting design and use lessons that will allow others to use your innovation as a model.

The Proposal Preparation Instructions in the solicitation (Section V.A) provides specifics of what to include in each section of the proposal to make the different components and their integration clear. [We encourage you to name and sequence the sections of your Project Description according to those guidelines.](#)



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 and a context for carrying out your two types of research
 - Fully-developed products are not required
- New knowledge about learning
- New understandings about design and use of a new technological or socio-technical genre



Where can you find more guidance?

- The *Common Guidelines for Educational Research* might help you figure out how to integrate the parts of your proposal
 - Cyberlearning proposals typically combine Type 2: Exploratory/Early-Stage or Type 3: Design and Development with Type 1: Foundational
- Literature of Design-Based Research might also help you



Common Guidelines for Educational Research

Type	Description
1. Foundational Research	Basic research, methodology development
2. Early stage/ Exploratory Research	Descriptive/inductive, correlational, looking for connections
3. Design and Development Research	Research oriented towards designing/engineering a learning intervention



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- The solicitation
- NSF's Grant Preparation Guide (GPG)



QUESTIONS?



NSF's criteria

- Intellectual Merit
 - Solidity, rigor, and intellectual interestingness of your proposed work
- Broader Impacts
 - Your proposed work's potential to address some important societal need

Both are equally important in Cyberlearning and Future Learning Technology projects



Mechanics

- Submitting
- Budget
- Required/allowable documentation
- IRB approval
- Critical information about your submission



Submitting

- Submit to fastlane.nsf.gov or grants.gov
- Collaborative proposals must go to fastlane
- All of the rules are in the *Grants Proposal Guide* and the solicitation



Budget

- Scope of work and budget must match; you do not have to request the maximum
- Cap of 2 months salary total across NSF grants for personnel with academic positions, unless justified
- No cost sharing allowed
- No undergraduate tuition; limited equipment
- Indirect costs may be charged at each organization's government-approved rate.



Allowable documentation

- **Required**

- Collaboration and management plan (up to 3pg) – put in 'Supplemental Documents'
- List of PIs, co-PIs, senior investigators, and other participants – put in 'supplemental documents,' and include advisory board members also
- Letters of commitment from project partners – put in 'supplemental documents'
- Postdoc mentoring plan (if applicable)
- Data management plan – sharing and care of data
- Reports of current and pending support and facilities
- 2-page bios with a maximum of 10 citations each

- **Strongly suggested**

- Up to 5 screen shots – put in 'supplemental documents'
- Refer to the screen shots in the Project Description; remember, the reason they are there is to help reviewers grasp the experience of learners

Nothing else is allowed!



IRB Approval

- We are not allowed to recommend a proposal for funding until we have your IRB approval.
- We will hold panels for INTs, probably in October, with negotiations in November.
- We will want to recommend awards in December or January.
- Time your IRB request appropriately.



Critical information about your submission

Your submission will be returned without review if

- It is missing a properly named and properly inserted Collaboration and Management Plan
- It is missing a Data Management Plan
- It is missing a Post-Doc Mentoring Plan (if you have a post-doc in the budget)
- It includes extra documents in supplementary documents section
- Formatting is not done correctly (see Grant Proposal Guide for margins, fonts, etc.)
- “Intellectual Merit” and “Broader Impacts” are not identified as such in the Project Summary



QUESTIONS?



Other Related Programs

OTHER CYBERLEARNING OPTIONS



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