2015 Call for Research Proposals

The mission of the Johns Hopkins Science of Learning Institute (SLI) is to understand the nature of learning at all levels of scientific inquiry, from changes at the level of synapses to the nature of cognitive change over the lifespan and the implications of these for education and learning in formal and informal settings. The SLI seeks to create an integrated understanding of the cellular and molecular mechanisms of learning, how learning varies as a function of basic learner characteristics (e.g. over the life span, among the typically developing child, the challenged learner, the gifted student), how these characteristics interact with different environments and learning settings to produce variation in learning outcomes, and how interactions with intelligent artificial learning systems can enhance and optimize human learning. The Institute's grant portfolio will focus broadly on these four areas, and will consider questions such as:

- How does language learning occur in typically developing children and in challenged populations, such as people with genetic deficits and/or damage to the brain?
- What are the biological bases for learning and memory (including cellular, molecular and systems approaches) and how can we use our understanding to improve these?
- How does genetic variation interact with the environment to change development?
- What is the range of individual differences in spatial understanding, and are there interventions that can improve these capacities?
- What are the basic characteristics of gifted learning in key domains?
- What kinds of educational practices are most effective in facilitating conceptual learning and academic achievement? Do these vary over different ages or populations?
- How do basic mechanisms of attention interact with learning in childhood, in adolescence, in the aging; and over different contexts of learning?
- What scientific principles of learning can be moved into practice, including contexts of formal and informal learning? How will these scale up in educational settings?
- How can we use intelligent learning systems to maximize learning across different types of learners? Examples include: development of novel machine learning theories and algorithms for understanding patterns emerging from large data sets including those coming from multiple modalities; developing optimal training modules and/or robotic and machine feedback regimes to enhance individual learning functions in content areas such as spoken and written language, mathematics, spatial cognition.
- How can computational learning models employed by intelligent machines either benefit from or lead to advances in our understanding of human learning mechanisms?

Such questions can be explored using a wide range of approaches including, but not limited to, inquiry about the basic mechanisms of learning, understanding individual differences in learning, considering how insights on learning can be embodied in an applied science of learning, and improving learning by creating effective human-machine interactions. Insights can be gained using traditional techniques of neuroscience, cognitive science, computer science, robotics, and educational intervention. However, the larger goal is to create new insights for the science of learning by cross-pollinating among these techniques and approaches.
I. ELIGIBILITY AND AWARD INFORMATION

We invite proposals on the science of learning for funding of up to $200K over 2 years. Principal Investigators (PIs) and Co-PIs must be full-time faculty members at JHU who are eligible to serve as PIs/Co-PIs in their division. The PIs and Co-PIs must be from (a) at least two different disciplines and (b) two departments or divisions from Johns Hopkins University. We especially welcome proposals that include PIs and Co-PIs who are in the early stages of their careers. PIs who were funded in the first two rounds (2013, 2014) are not eligible to apply.

Please note that applications will be returned without review if:

1. The applicants do not meet the stated eligibility requirements above.
2. The research project does not align with the mission of the Science of Learning Institute.
3. The application does not adhere to the formatting guidelines or include all relevant application materials.

II. APPLICATION REVIEW CRITERIA

Priority will be given to proposals that are strongest in meeting the following criteria, which will be explicitly evaluated in the review process:

1. Innovation: The project seeks to discover principles about learning that break traditional barriers and generate truly new insights.
2. Interdisciplinarity: The project uses multiple theoretical and empirical approaches to the same learning problem, and draw on expertise spanning more than one JHU school, division, or department in the university.
3. Breadth of Reach: The project’s approaches and domains of inquiry push traditional boundaries on the dimension that ranges over levels of understanding, from cellular/molecular through cognition and educational application. Projects that include innovative dissemination plans designed to enhance scientific, technical, and/or practical understanding are encouraged.
4. Sustainability: The project is likely to generate preliminary data that could be used to generate continuing support for the research, including grant proposals to federal institutions, private foundations, and/or industrial partners when the grant period is complete.
5. Approach: The project’s design, methods, and analytic plan are well-developed, integrated, and appropriate to the aims of the proposed project and the research environment.
6. Strength of PI and Research Team: The PI has a demonstrated ability to carry out and publish high quality research, and team members are uniquely qualified to create new synergies across traditional disciplines with appropriate content knowledge and methodological expertise to carry out all elements of the proposed project, including dissemination of research to appropriate target audiences.

III. APPLICATION PREPARATION AND SUBMISSION

A. Formatting Requirements

All application materials must be formatted to fit on 8.5 x 11” paper with 1-inch margins, single line spacing, 12-point Times New Roman font, and consistent with the professional style guidelines of the applicant’s field. Please adhere to the specified page limit for each section (listed in parentheses below).

B. Proposal Materials

Proposals should include the following items:

1. Project Abstract: A short description of the project in 300 words or less.
2. **Project Description (8 pages maximum):** This document must contain the following sections:
   a. **Specific Aims (1 page):** This section should clearly describe the background, the goals or objectives of the project, the hypotheses or questions addressed, and the anticipated outcomes.
   b. **Significance (1 page):** This section should include 4 clearly-labeled subsections that briefly describe how the project addresses the innovation, interdisciplinarity, breadth of research, and sustainability evaluation criteria listed above. This section should clearly demonstrate the importance of the project or describe the critical barrier to progress in the science of learning domain and how the project will improve scientific knowledge, technical capability, and/or practice if the aims are achieved.
   c. **Approach (3 pages):** This section should clearly describe the research design, measures, data analysis plan, and any preliminary data.
   d. **Project Timeline for Years 1 and 2 (1 page):** This section should include a brief project timeline (table format preferred) that identifies major project activities and their projected completion dates (e.g., experiment development, research trials, data analysis, manuscript submission).
   e. **References (2 pages)**

3. **Brief Biographical Sketch of PI, Co-PI(s), and other Key Personnel:** Include a brief, 2-page statement summarizing each individual’s qualifications for the proposed project as well as a list of their existing funding for research related to the project. Please download the [biographical sketch template](#) and instructions.

4. **Budget and Budget Justification for Years 1 and 2:** This should include personnel effort (PI, Co-PI, other key personnel), salary, equipment/materials/supplies, travel expenses, and other categories, as needed. Faculty salary can be included but funding for this will not exceed 15% effort for each PI/Co-PI. Indirect costs are not covered by SLI grants (1-2 pages).

**C. Application Deadline and Timeline for Review**

Applications are due March 16, 2015, and should be submitted via the Science of Learning Institute’s grant application and review website: [https://jhupiter.fluidreview.com](https://jhupiter.fluidreview.com), which will open for submissions starting February 9, 2015. Evaluation of proposals will be carried out by a team of internal evaluators who are experts in the science of learning. Funding is expected to start on July 1, 2015. Funding after Year 1 will be contingent on acceptable progress as described in a progress report due two months prior to the start of Year 2.

**D. Fast Facts: Science of Learning Institute Grant Funding in 2013 and 2014**

- 53 research proposals were submitted and 16 were awarded grants.
- Average grantee award for 2-year projects was $138,750.
- View round 1 and 2 funded project summaries on our website.

**IV. QUESTIONS**

Applicants who wish to discuss their project before applying are encouraged to contact Barbara Landau, Kelly Fisher, or members of the [steering committee](#) with the most relevant expertise.

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