

## **Science of Learning Centers Program Update on Actions Taken in Response to 2009 COV Report**

The COV review for the Science of Learning Centers Program was carried out March 9-11, 2009. The nine-person committee was chaired by Dr. John Leslie King, a member of the SBE Advisory Committee.

### **I. COV Recommendations (quoted from the Cover Letter to the COV Report)**

1. Continue and expand the program.
2. Do not hold another competition until the results of the current efforts have been more fully assimilated.
3. Do not merge the SLC Program with other center programs.
4. Rethink the nature of “evaluation” as applied to SLC Program participants.

### **II. Program Staff Responses to the Recommendations**

#### **Responses to Recommendation 1: *Continue and expand the program.***

The SLC Program staff continues to be encouraged by the Committee’s recognition of the vital role the SLC program is playing to foster an emerging new field of an interdisciplinary Science of Learning. SLC Program staff shares the committee’s appreciation of NSF’s long term vision of investing in fundamental knowledge about learning as key to innovations in education, in science and technology, and in workforce preparation.

However, due to funding constraints in FY 2011, the SLC program needed to reduce funding for all but one of the six centers. Expansion of the Program is no longer a reasonable expectation. Under these circumstances, *maintaining high quality performance* of the program has been the primary activity and challenge. This includes ensuring program responsiveness to escalating urgency of issues that have now come to the fore as the centers mature and evolve, and as Cohort #1 centers prepare for sustainability beyond NSF funding. The Program’s ability to address these and other issues will determine the extent to which the Program can successfully achieve its goals of: advancing integrative, multidisciplinary knowledge about learning, and connecting that knowledge to address other scientific, educational, technological, and workforce challenges.

#### *Activities for FY 2011 included:*

- All six centers in the SLC portfolio underwent critical site visit reviews in FY2010 to determine whether they would be renewed for the additional five-years allowable in the original program solicitations. In FY11, following the site visit reviews, the Program recommended funding for four centers at levels requiring DRB/NSB approval (LIFE, CELEST, TDLC, SILC) – all four were successfully approved. One center had received prior NSB approval of renewal funding in 2010, and the 6<sup>th</sup> center was funded at a

reduced level that did not require DRB/NSB approval. With these actions, all centers in the SLC portfolio are operating with renewal funding. Cohort #1 centers are in Year 7 of operations, and Cohort #2 centers are in Year 5. The maximum duration of funding for all centers is 10 years, with the exception of VL2 which was renewed for an additional 4 years only (for a total of nine years of NSF funding).

- In FY2011, annual site visits for the six centers were conducted using an “assistive” format as recommended by the COV (see Response to Recommendation #4)
- Funding of EAGER, RAPID, workshops and supplement awards: In FY 2011, the program was able to support one RAPID, two small supplements, and one workshop.

*Activities planned for FY 2012 include:*

- Annual PI meeting, scheduled for December 4-6, 2011 – this meeting will include sessions on brain plasticity and learning, social factors in learning, translational research for education, museum engagement and informal learning, educational games and learning tools, computational modeling and data sharing, and international collaboration. In addition, there will be a luncheon meeting to discuss the development of a centralized evaluation plan for the six centers, which until recently were evaluated by each center’s selection of an external evaluator. Students attending the PI meeting will present their plans for the next i-SLC student conference, to be held at UCSD on April 21-23. In addition to NSF staff, attendees at this meeting will also include representatives from other funding agencies (NIH, ED, NEA, ONR and other DoD agencies), as well as educational practitioners from schools and museums/science centers.
- Annual Inter-SLC (iSLC) student conference in spring of 2012 – this will be held at the University of California-San Diego, with the Temporal Dynamics of Learning Center (TDLC) as host. The theme this year is “Time, Mind, and Education Intertwined” which reflects TDLC’s focus, but will be construed broadly to include a substantial portion of research at other SLCs. These thematic emphases at the iSLC have been effective in helping the students/postdocs identify cross-center training opportunities and collaborations.
- The SLC Program holds an annual meeting with the external evaluators of the individual centers. This year, the Evaluation meeting will be held on October 24-25, 2011, and will include not only the external evaluators, but also the center directors. The purpose of this meeting is to receive input from the center directors and evaluators with regard to what was useful (or not) in center evaluation to date, what they learned from their experiences, and what should be essential elements of a centralized evaluation plan.

**Accomplishments:**

In FY 2011, progress was made in the following areas:

***International Cooperation and cross-center collaborations:*** All SLCs have significant international collaborations embedded in the centers’ original operating plans. These are too

numerous to include here. Examples listed below are activities either initiated by the Program, or by the centers through leveraging of the SLC funds to create new opportunities. These activities serve to:

- strengthen existing collaborations;
- create new international experiences for research and student training;
- disseminate SLC research to new audiences, including practitioners and policy makers
- enhance cross-center synergies in the process of expanding the SLC International Network; and
- mobilize and globalize the establishment of a integrative, interdisciplinary, science of learning.

#### *The US-Australia Collaborative Workshop*

This SLC workshop (July 2011) was co-funded with the Computer and Information Sciences (CISE) Directorate. It is a collaboration between the six centers in the NSF's Network of Science of Learning Centers and the newly established Queensland Science of Learning Center (QSOL) at the state-of-the art Queensland Brain Institute (University of Queensland). This workshop was very successful, adding important international perspectives and momentum to the scientific movement spear-headed by the six Science of Learning Centers to establish a rigorous, interdisciplinary and integrative science of learning.

The workshop is the culmination of discussions stemming from 2009 when University of Queensland researchers contacted the SLC Program regarding their interests in establishing a Science of Learning Center. QSOL is interested in tapping into the Science of Learning community and associated infrastructure in the SLCs. From the US standpoint, a particularly attractive feature of the QSOL is the center's focus on an interdisciplinary study of attention, a topic that is complementary to the efforts of all six centers in the SLC portfolio, but one that is not the primary focus of any SLC. This collaboration is exceptionally promising, as student and faculty exchanges have resulted in firm research plans and a broadening of expertise base for the SLCs. The Australian researchers are seeking funds from their agencies to scale up their participation in research at SLC laboratories.

#### *Partnerships in International Science and Engineering (PIRE) award to Pennsylvania State University (PI – Judith Kroll), with members of the Visual Language and Learning (VL2) Center as partners.*

This PIRE award (“Bilingualism, mind, and brain: An interdisciplinary program in cognitive psychology, linguistics, and cognitive neuroscience”) is well aligned with VL2's research focus, which includes collaborative studies of American Sign Language-English bilingualism. VL2's participation in this PIRE will advance cognitive underpinnings of bilingualism in unique ways, where the bilingual's native language is a visual language (ASL) and the second language is a print language. Research on bilingualism holds the potential to reveal aspects of brain plasticity and learning that may be otherwise obscured in studies of individuals who speak only a single language.

#### *Joint NSF- OECD/CERI conference*

This conference will be held at the OECD Headquarters in Paris on January 23-24, 2012. The goals of the workshop are to: Disseminate recent research about how people learn, by promoting dialogue among researchers, practitioners and policy makers that constitute the 33-country membership of the OECD; foster the development of an international network on the broad theme of learning, so as to continue the dialogue among researchers, policy and practice communities on overcoming key challenges; globalize and mobilize the field of an integrative, multidisciplinary Science of Learning by strengthening and exploring new collaboration among US researchers and their international counterparts.

***Enhancement of Cross-disciplinary Activities for students and postdocs:***

***REU-SITE award to the Temporal Dynamics of Learning Center (TDLC)***

This builds on the infrastructure of cross-disciplinary training at the center to create new opportunities for undergraduates.

***Telluride Neuromorphic Cognition Workshop***

This highly successful hands-on, 3-week workshop has been very effective for student training and for spawning new collaborations among neuroscientists, cognitive scientists, mathematical modelers, engineers, and roboticists from academia and industry. Students and faculty from at least three of the SLCs also participate in this workshop, leading cross-center synergies on related research. The organization and staging of this annual workshop is carried out through the auspices of the Institute of Neuromorphic Engineering (INE), an “institute without walls” that consolidates and unifies neuromorphic cognition engineers around the world. Through this strategic connection with INE, the Telluride workshop has an international reach that is very impressive, as shown in image below. The map shows location of INE members, including the applicants, participants, invited speakers and organizers of the workshop.



### ***Connecting basic research with practice:***

#### *SLC Annual Meeting for awardees:*

As the centers mature, issues of how to make research at the centers accessible to educational practitioners and policy makers have increased in priority and urgency. Over the last three years, the Program has been addressing some of these concerns through the annual PI meeting. Sessions on how to connect basic research about learning to educational practice have generated much exchange of information and collaboration, and the upcoming PI meeting will also feature at least 3 sessions on this topic.

#### *2011 AAAS Meeting*

SLC Program staff (Soo-Siang Lim) in collaboration with E&HR staff (Janice Earle) co-organized a session on “Learning Research and Educational Practice: How can we make better connections?” at the 2011 AAAS meeting. Presentations by SLC researchers from TDLC, LIFE, and PSLC generated animated discussions. It underscored how new and evolving pathways of innovation in the science of learning and education call for deep, persistent (iterative) and strategic connections between the learning and education communities. It underscored the value and importance of center-mode funding in providing the stability and infrastructure needed for meaningful and sustainable relationships between researchers and educational practitioners. The SLCs are playing an important role in bridging the research-education divide that currently exists.

### ***Dissemination of SLC objectives and results through public media:***

Work from centers have been picked up by numerous media outlets, including the New York Times (social robots, featuring research at TDLC, and importance of play in learning, led by SILC), the Charlie Rose Show (social influences on learning, featuring research at LIFE), CNN (building robots that learn, featuring work at CELEST), and the Hindu, which has 1.5 times the circulation of New York Times (on LearnLab India, featuring work at PSLC) .

### **Dissemination of SLC Objectives and results through public outreach**

#### *The Ultimate Block Party (October 2010)*

The SLC Program in collaboration with E&HR provided partial support for a highly creative, large-scale outreach effort called the Ultimate Block Party (UBP). The purpose of this activity was to engage the public in the importance of play in learning, and to raise awareness of how everyday activities can contribute to children’s learning. This was a highly successful event followed by media coverage in New York Times, noting the over 50,000 attendees that converged on New York’s Central Park for this event. A SLC-funded workshop following the UBP was important in coordinating outreach efforts amongst the six centers, and have inspired postdoctoral trainees from SILC and CELEST to take the lead in organizing a session at the 2011 iSLC conference to develop a set of learning principles (representative of work at SLCs and elsewhere) that can be used in museum exhibits or other UBP-like events. The coordination with E&HR has also stimulated a lot of interactions between the museum directors (E&HR awardees) and SLC investigators. Follow-up invitations to museum directors to attend the October 2010 SLC PI meeting has now led to an invited pre-meeting workshop at the

Association for Science and Technology Centers annual meeting in October 201, where SLC research and their implications for museums and other informal learning environments will be discussed with museum practitioners. Conversations are underway to strengthen further the interactions between museum professionals and researchers – including creation of internship programs at museums for SLC students.

**Response to Recommendation 2: No new competition in 2010.**

No Centers competition was held in 2010.

**Response to Recommendation 3: No merger with other center programs.**

As planned, and beginning in FY 2010, SLC activities and budget were managed by SBE. In addition, program funds were partially distributed to other relevant directorates to increase visibility and recognition of the program throughout NSF. The SLC Program is not merged with other center programs.

**Responses to Recommendation 4: Rethink evaluation.**

In response to COV recommendations that site visit reviews could be more assistive in nature and be less of an administrative burden for the program as well as the centers, the Program have expended considerable effort to rethinking some evaluation practices:

- A new, more “assistive” format for 2009 annual site visit reviews was planned and implemented as an experiment; the feedback was very positive from the centers and site visitors, and the same format was again implemented in 2011 (the 2010 site visits were necessarily critical and comprehensive reviews – in order to determine whether or not to renew centers for the full 5 years of renewal applications).
- PIs played a more active role in identifying issues to be reviewed and assistance to be sought; site visitors were briefed in advance of the site visit about these issues.

**Summary of New Actions Taken by NSF and the Program**

Reorganization of the management of SLC; beginning October 1, 2009 it is an SBE activity.

New and expanded modes of cooperation with NSF directorates, such as budget distribution, participation in the PI meeting and other jointly organized meetings, and co-funding of centers and supplements.

In addition to NIH, the Program expanded collaboration with E&HR in NSF and with other Federal agencies (NEA, Office of Naval Research and Department of Defense, and Department of Education).

Increased international collaboration by the program and the centers, incorporation of a session on international activities at the annual PI meeting

#### **IV. Actions Remaining to be Taken**

*Planned Future Activities:* Following the FY09 COV, several activities for expansion of the SLC program were planned to include the following:

- Contracts to produce an SLC-wide management database, and a network website for coordination, outreach and dissemination
- New cyberinfrastructure for scientific research and communication, large-scale sharing and data-mining of scientific results
- Infrastructure development and analysis of best practices for transfer of research results to implementation in education and technology
- Dissemination of SLC research objectives and results through public media
- New program partnerships and resources, including planned collaborations with other Federal agencies and other NSF directorates, as well as new center partnerships with universities, school systems and businesses
- Expanded international cooperation by the program and the centers
- Enhanced interdisciplinary training opportunities for undergraduates, graduate students and post-docs through REU, IGERT, and cross-center partnerships and exchanges
- New models of support to prepare centers for post-award sustainability, including planned collaborations by the presidents of center-hosting universities
- Strategic planning for the future by the SLC program

Budget and staffing constraints permit only a subset of these actions to be followed through. Future activities will be based on budget and personnel availability.