Neuroscience Research in Education Summit: The Promise of Interdisciplinary Partnerships Between Brain Sciences and Education

June 22-24, 2009
University of California, Irvine

October 12, 2009

Colleagues:

It is my pleasure to share with you the report release for SfN's Neuroscience Research in Education Summit, held June 22-24 at the University of California Irvine. SfN hosted the event to catalyze continuing dialogue among scientists, educators, and policy-makers about how brain science can contribute to the field of education.

The report, *The Promise of Interdisciplinary Partnerships Between Brain Sciences and Education*, summarizes the discussions that centered around several key questions:

- How can results in neuroscience laboratories translate to classrooms, curricula and educational policy?

- What do we already know about learning and the brain? What do we need to better understand? How can we communicate this knowledge effectively to multiple constituencies including educators, parents, researchers, and other critical stakeholders?

Given the crucial role that education plays in shaping our future as well as increasing public interest in neuroscience research, this is an important area for continued dialogue. Many leaders and organizations are already engaged in this enterprise and SfN hopes the summit was catalytic in both continuing and deepening these activities and in developing new partnerships all of us can strengthen over time.

On behalf of the summit steering committee, we encourage you to review the report and hope it serves as a foundation for continued progress in forging stronger links between education and neuroscience.

Sincerely,

Thomas J. Carew
President
Society for Neuroscience

Neuroscience Research in EDUCATION SUMMIT

THE PROMISE OF INTERDISCIPLINARY PARTNERSHIPS BETWEEN BRAIN SCIENCES AND EDUCATION

Executive Summary

One might ask, "What does brain science research have to contribute to the field of education? How can what happens in the laboratory translate to classrooms, curricula, and educational policy?" These are the questions Society for Neuroscience (SfN) President Tom Carew posed to an interdisciplinary group of researchers, educators, and policy-makers at the Neuroscience Research in Education Summit, hosted by SfN, June 22-24, 2009, at the University of California at Irvine. Their responses, discussions, and questions contribute to expanding an important conversation that has been building momentum for several years.

Breakthroughs in educational research and practice and new knowledge in the brain sciences are being shared and communicated in ways that have begun to result in improved outcomes for students. The National Science Foundation's Science of Learning Centers, The International Mind Brain and Education Society (IMBES), National Institutes of Health's Blueprint for Neuroscience Research K–12 Education Workshop, and the Dana Foundation have already made significant progress in linking the brain sciences to learning. In addition, individual researchers working through programs like the Institute for Education Sciences of the U.S. Department of Education are contributing to the ground swell of new information.

The summit focused on several key aspects of this conversation: What do we already know about learning and the brain, what do we need to better understand, and how can we communicate this knowledge effectively to multiple constituencies including educators, parents, researchers, and other critical stakeholders?

Why this summit and why now?

The impetus for the summit came in response to an increased public interest in neuroscience research and how it might inform the teaching/learning process. Brain science is a key element in the rich milieu of knowledge contributing to the science of learning. Future research and efforts to translate it and communicate findings for use in practical settings by the education community and others must occur as a multidisciplinary effort.

Successful translation and application of brain science research for use in practical settings has inspired new areas of focus such as neuroethics and neuroeconomics. Like other professionals, educators are eager to harness and decipher findings in neuroscience and related disciplines to inform the design of instructional strategies and learning environments whether it be a school classroom or informal educational setting. With research advances in areas such as memory, attention, and stress, information about how people learn is becoming readily available and educators are eager to translate it for their use.

Throughout the event, candid conversations took place and clear themes and next steps emerged. "We got very messy here and messy's good," concluded Carew. "We cannot oversimplify the complexities and challenges we face. But we must remain committed to the common goal of understanding the developing brain, and how it acquires, stores, and retrieves information at different stages of maturation. We can do that best if many disciplines come together and tease apart the specific and most relevant applications to education. Our work must continue — the stakes are very high."

Setting the Stage

Many important findings about the way the brain works have emerged in recent decades, but rigorous application research of these scientific findings to the practice of education has been slow to emerge. Within the fields of neuroscience and cognitive science, a growing body of research aims at understanding the neural basis for learning, mental functioning, memory, attention, and more. There is also significant research being conducted on stress, sleep, anxiety, depression, learning differences, and the arts that could have major implications on how learning can be enhanced. At the same time, the education community is turning eagerly to researchers for information that will not only guide the use of best practices in formal and informal educational settings, but also frame questions for the future and identify research areas relevant to teaching and learning.

"The interdisciplinary and inter-institutional nature of this work is both exciting and essential for developing real solutions to educational issues," said Tom Carew in his opening remarks at the summit. "My professional and personal interest in the intersection of neuroscience and education led me to choose this topic as my signature initiative as SfN president."

The Society for Neuroscience is a nonprofit membership organization of nearly 40,000 scientists and clinicians in 81 countries who study the brain and nervous system. Since its inception in 1969, the Society has grown from 500 members to become the world's largest organization of scientists and physicians devoted to advancing the understanding of the brain and nervous system. The Society's primary goal is to promote the exchange of information among researchers. To meet this goal, SfN publishes the scholarly journal, *The Journal of Neuroscience*, and holds an annual meeting each fall attracting tens of thousands of attendees from around the globe.

Throughout its history, the Society has been devoted to promoting public information and education about the nature of scientific discovery and results of the latest advances in brain research, as well as their implications for public policy, societal benefit, and scientific progress. SfN's mission includes "encouraging translational research" and in the spirit of a significant event such as the summit, SfN recognizes the opportunity for its members to play a leading role in contributing neuroscience research to inform educational practice. The summit capitalized on SfN's unique position to bring together leading scientists and enrich the conversation between the research community and educators to include a broader, more informed subset of neuroscientists.

A Single Goal

"The time is now to forge strong alliances between the brain sciences and education to work to inform best practices at school, home, and in the community," said Guy McKhann, senior advisor to the Dana Foundation and Professor, Johns Hopkins University. "Innovations in technology, imaging and other brain science research tools enable us to bring additional information to share with social science and behavioral science to create a fuller picture."

Planning for the summit began in May 2008. A steering committee provided expertise in neuroscience and education and offered guidance on the proposed model and outcomes. The goal of the summit was to stimulate dialogue between neuroscientists and educators in a focused structure in order to capture opportunities for collaboration and next steps that could inform future directions.

The summit structure not only prompted exploration of new translational research opportunities but was successful in capturing two key elements: (1) overarching themes that recur and have traction, and (2) a vision for strategic opportunities in the evolving area of neuro-education.

Carew and members of the summit steering committee organized the summit by instructing participants to come prepared to address two specific questions:

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— Thomas J. Carew, SfN President

1) How can neuroscience research inform education strategies?

2) What do teachers want and need to know about how students think and learn and how can teachers' questions drive neuroscience research?

Background information to stimulate discussion on these questions was sent to all participants prior to the summit. Introductory remarks by Carew and Kenneth Kosik from the University of California, Santa Barbara, set the stage for focused discussions around each question. In his introductory remarks, Kosik observed that in the recent decade, educators and brain scientists have been coming together to discuss learning and the brain. "Educators have an enormous interest in and appetite for neuroscience … and neuroscientists love to talk about their science — even if they are uncertain about how it can be applied. Our goal is to work collectively to align these interests in an effort to enhance the growth and success of children," noted Kosik.

Emerging Summit Themes

1. Closing the Gap

The urgent need to close the gap between laboratory neuroscience research and teachers' practice in their classrooms was a dominant theme. Despite the decade of the brain in the 1990s, and years of educators striving to adopt evidence-based practice, it is clear that brain science is not the driving force behind improving education practices. The era of brain-based pedagogy should be supplanted by a richer, interdisciplinary dialogue aimed at understanding and reshaping the study of learning. Scientists may continue to dazzle teachers with images of brain activation, but more often than not, educators, as astute consumers of that information will ask, "How does this affect what I do in the classroom?"

2. Neuromyths Still Persist

For the most part, the neuroscience community has not intervened to help educators de-bunk the myths of brain-based pedagogy. The summit shed light on the pervasiveness of what many call "neuromyths" in learning, such as brain laterality — that children are either "right-brain or left-brain" learners. Misguided notions such as this, in some instances, have actually shaped the way curriculum is developed and taught. Neuroscientists at the summit learned of these and other misinformed "brain-based" theories. Unaware of their popularity and proliferation among educators, the group swiftly embraced the opportunity to clarify what is, and is not, accurate information.

3. New Research Agenda Needed

Efforts such as this summit can catalyze new approaches to the study of learning. Scientists, engineers, psychologists, and experts from many disciplines must bring their knowledge and insight into a meaningful dialogue with educational practitioners and policy-makers. Structured

collaboration and interdisciplinary dialogue are seldom present in current research models for neuroscience. But, the anticipated result from these new interactions will be creative research designs that can have great potential to inform teaching practice and the ways in which content is presented in multiple learning environments.

4. Communication is Key

All stakeholders must listen to and embrace different perspectives, disciplines, and experiences and engage in an informed dialogue. Those gathered at the summit acknowledged a basic lack of understanding and even the use of a "different vocabulary" by neuroscientists and educators. The view was expressed that the two groups need to learn each other's language. Further, researchers and educators need to spend more time immersed in shared interests as a step in developing an appropriate research agenda. Examples were discussed where research in schools resulted in effective strategies resulting from the integration of specific brain research findings. Moreover, the importance of communicating scientific advances to key audiences like school leaders, parents, policy-makers, and media was underscored.

What do pre-K–12 educators want to know?

- What strategies best promote long-term retention?
- Is exposure to gaming and "texting" affecting the way students learn?
- Are there critical periods for brain systems to regulate emotions?
- Do boys really need to move around more than girls?
- What is the effect of sleep-deprivation on my students?
- How can I help students at varying ages learn to self-regulate?

5. Contributions from Many Disciplines Are Needed

Research findings in many disciplines — psychology, cognitive science, engineering, genetics, education, and neuroscience are converging to inform a new understanding of what we know about how the human brain learns and functions. This convergence, and the complexity of it, presents one of the greatest challenges to understanding and translating what we know about how we learn. Attendees at the summit agreed that the task of exploring, analyzing, and improving education rests with a collaborative, interdisciplinary approach. In addition, educators have a vital role to play in informing the research community about what is needed. What will result is the design of new experimental work that will inform how teaching and learning environments should be structured.

6. New Careers Opportunities in Neuroscience Are Emerging

Summit discussions touched upon the need for innovative career paths, marked by offering interdisciplinary graduate degrees. Carew pointed to recent results of a survey of SfN members. Of the respondents, nearly one-third are new PhDs or are student members at some level. In addition, thousands of members expressed interest in education. Given the current public interest in the brain, and brain-related news and issues, summit participants explored opportunities to broaden career paths in neuroscience, tapping education-related research needs as well as feeding the public's growing excitement about brain science. As more graduate students engage in innovative career paths, organizations such as SfN and others can help to develop and launch new programs and courses of study.

7. Innovative Training Models in Teacher Preparation Are Needed

Much is known about the brain and neuroscience that should be central to teacher preparation programs. The importance of teachers being informed, critical consumers of science — all science, particularly pertaining to student learning

— is paramount. Neuroscientists and education leaders at the summit agreed that inclusion of basic science content is needed by all educators, both those in training and those already in service as practicing educators. Numerous strategies outlining opportunities for teachers to gain lab experience, access to scientist mentors or communities of practice were cited as successful models.

8. Institutions of Higher Education Must Bring Education and Neuroscience Together
Collaborative initiatives involving neuroscience departments and schools of education at universities are essential. Models involving interdisciplinary teams were discussed along with ways that such teams might launch initiatives or projects involving existing faculty as well as new researchers. The design and implementation of programs and research projects that model effective collaboration and intersection between disciplines was viewed as a crucial initial step.

Where Do We Go From Here? Strategic Opportunities

Summit discussions ranged from dispelling "neuromyths" to identifying best instructional practices in classroom settings to establishing new career paths in neuroscience. Researchers described how new advances in imaging techniques and other technologies are enabling studies to be created that directly involve children. Participants heard examples of classrooms that are becoming living laboratories and interdisciplinary studies that are informing the design of curriculum and educational environments.

Despite the excitement about the future possibilities for meaningful discovery and solutions, there were several cautionary thoughts expressed. First, there is never going to be a magic bullet to solve educational issues, but rather we need to look at many topics through a multiple disciplinary lens. Second, this work must be topic-focused and research-driven in collaboration with all stakeholders to ensure we are asking the right questions. Third, substantive work has been done and it is essential to build on this existing knowledge. And fourth, the stakes are high

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and a strategic plan is needed to systematically build this new field called neuro-education and coordinate efforts for maximum impact.

While there is much to be accomplished, three major strategic initiatives emerged at the close of the summit. The participants endorsed these as critical next steps to providing structure, a framework, and consistent and credible communications.

1. Identify Core Translational Research Priorities
Work has begun in this area. Ongoing efforts to map opportunities and their potential for impact on education, teaching, and learning are essential. This work could create a master research agenda for the field of neuro-education.

- Identify and prioritize a defined set of core translational issues and research strategies that have the potential for high impact on education and learning. Topics discussed for

consideration include neuroplasticity, play, attention, behavior, stress, sleep, the arts, gender, executive function, social networks, self-regulation, and technology.

- Invite all relevant disciplines and constituents to define priorities and identify research hypotheses.
- Expand laboratory schools and educational interactions to co-develop and implement research studies collaboratively with groups of teachers, researchers, and parents.
- Engage public and private funding institutions to make investments in research-to-practice approaches.

2. Create and Implement a Coordinated Communication and Outreach Program for all Stakeholders

Without credible, consistent, and relevant communications, the field of neuro-education and its stakeholders are at the mercy of misinformation, missed opportunities, and misunderstandings. It is essential that not only information gets properly and accurately shared but also key conversations between educators, researchers, policy-makers, and parents are established and expanded.

- Develop foundational neuro-education messages for all constituencies. These messages need to provide clear explanations about what neuro-education is and is not. Further content should be integrated with context and include not only research but also application and practical uses.
- Create a shared vocabulary that can be consistently presented for use and understanding by all constituencies.
- Develop communications tools to share topics, research, and practices that are timely, accurate, and relevant. The creation of a comprehensive Web site was identified as an effective initiative for reaching educators, parents, and researchers.
- Create opportunities for communication between professional associations to foster interaction between education and research groups.
- Develop targeted communications initiatives including ongoing conversations with science, lifestyle, and education journalists to keep the general public fully informed.
- Nurture and encourage spokesmanship on the part of educators and researchers doing this work.

3. Cultivate a Leadership Core from Public and Private Institutions to Spearhead the Neuro-Education Initiative

Good intentions alone will not move this important work forward. Many leaders in all fields have already self-identified their willingness to participate in this initiative. With a team of dedicated institutions and individuals to drive this field, much is possible.

- Identify and invite individuals to form a Scientific and Educational Neuro-Education Advisory Board.
- Develop a neuro-education 3 to 5 year strategic plan including research, communications, and outreach.

Steering committee members

Mary Brabeck, New York University
Roberta Diaz Brinton, University of Southern California
Kyle Frantz, Georgia State University
Mariale Hardiman, Johns Hopkins University
Susan Magsamen, Johns Hopkins University
Nick Spitzer, University of California, San Diego

- Develop timelines and framework for achieving goals.

- Convene the Advisory Board and key stakeholders through annual and informal gatherings for targeted purposes.

What Now?

The most critical issues that will determine our success are our ability to:

- accurately translate brain science research to inform education practice and policy, and to

- develop effective communication vehicles for a shared conversation.

No one institution or individual can solve the complex issues we face in education or their impact on the community and society. By harnessing the enormous resources across many institutions, and through the creation of interdisciplinary teams addressing specific targets, we can positively affect outcomes for children.

The Society for Neuroscience is proud to have facilitated a discussion on the role that brain sciences can play in informing educational practice and sparking collaboration across disciplines and key stakeholders. "The challenges and opportunities are clear. We know what must be accomplished to build and grow the important emerging field of neuro-education. We applaud those who have already made significant progress in linking the brain sciences to learning, and invite others to join us all in crafting the next chapter," said Tom Carew. "Our collective work must continue — the stakes are very high, for us certainly, but especially for our children."

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