



COLUMBIA UNIVERSITY  
IN THE CITY OF NEW YORK

TEAGLE COLLEGIUM  
ON PSYCHOLOGICAL SCIENCE AND STUDENT LEARNING  
2009-2010

**Columbia University's Teagle Collegium**—which includes faculty, post-doctoral fellows, and doctoral students from Columbia University's Morningside Campus, Medical Center, and Teachers College—explores two fundamental questions:

- *What has recent psychological research in neuroscience, cognitive and developmental psychology, and assessment taught us about student learning?*
- *How can we apply these findings to improve teaching and enhance student learning?*

**2009-2010 Teagle Fellows**

**Poonam Nina Banerjee** (Mailman School of Public Health)

**Patrick Kennedy** (Department of Psychology)

**Molly Martin** (New York University)

**David Miele** (Post-Doctoral Fellow, Department of Psychology)

**Steen Sehnert** (Department of Psychology)

**2009-2010 Teagle Scholars**

**Jeff Crow** (Department of Psychology)

**Ariel Duncan** (Department of History)

**Annegret Falkner** (Department of Neurobiology & Behavior)

**Andrew Guess** (Department of Political Science)

**Douglas Huang** (Teachers College)

**Elina Kanellopoulou** (Department of Psychology)

**Ming-Tsan Pierre Lu** (Teachers College)

**Tamara Mann** (Department of History)

**David Mason** (Teachers College)

**Lydia Ogden** (School of Social Work)

**Michael Preston** (Teachers College)

**Christina Priest** (Department of Biological Sciences)

**Michael Siegfried** (Department of Philosophy)

Parita Suaphan (Teachers College)

Simon Taylor (Department of History)

Katherine Thompson (Department of Psychology)

Alysa Turkowitz (Mailman School of Public Health)

Victoria Tzotskova (Department of Music)

Jonathan Vitale (Teachers College)

Gary Yu (Mailman School of Public Health)

## First Annual Report June 2009

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### 1. Findings

During the first year of Columbia University's Teagle Collegium, faculty, post-doctoral fellows, and doctoral students from Columbia University's Morningside Campus and Medical Center and Teachers College focused their energies on the following questions: What has recent psychological research taught us about learning and how can we best apply these findings to improve teaching and enhance student learning?

Formal presentations by three leading professors of neuroscience, cognitive psychology, and neurobiology and behavior identified several key factors validated by empirical research.

#### Engagement

What are the factors that enhance or inhibit involvement in learning? Engagement tends to decline if an activity is motivated by the promise of a reward (as opposed to an intrinsic motivation, such as a desire to increase one's competence). Motivation is also reduced if individuals engage in more than one activity at a time, or if they attribute their failure to a lack of ability (rather than a lack of effort).

#### Emotional Factors Affecting Cognition

Learners have distinct styles that influence learning. Especially important is whether a student has a prevention and promotion focus. A student with a prevention focus is especially sensitive to negative outcomes, seeks to avoid errors, and is driven by security concerns, while a student with a promotion focus is more sensitive to positive outcomes. Learning is enhanced when there is regulatory fit, when fit when the manner of in which a student engages in an activity sustains their goal orientation or interests regarding that activity.

### **Grounded Cognition**

Learning, memory, and reasoning are enhanced when students have the opportunity to perceive and interact with real-world examples. Thus, simulations and problem solving activities can play a valuable role in promoting understanding and recall.

### **Mental Modeling**

A mental model is a representation or a conceptualization of a larger reality which allows an individual to readily acquire, code, store, recall, and decode information. By allowing an individual to structure knowledge, mental models play a crucial role in cognition, recall, learning, and decisionmaking.

### **The Zone of Proximal Development**

The early 20<sup>th</sup> century developmental psychologist Lev Vygotsky wrote about “the zone of proximal development,” a phrase that refers to the level of understanding that a student can reach with a teacher’s help. Thus, an instructor seeks to stretch and broaden a student’s understanding (i.e. scaffold) by identifying those areas that are within a student’s grasp: not too easy, but also not too difficult.

### **Repeated Testing**

Testing can be a valuable learning tool. It can focus on evaluation, or it can be used in other ways: to motivate study, consolidate learning, combat overconfidence, and assist students in monitoring their own understanding. Testing enhances long-term memory and helps students retrieve and apply knowledge.

### **Spacing**

Recent research has demonstrated that a student’s ability to remember, retrieve, and utilize information is greater when an instructor’s presentations of difficult material are spread out over time rather than concentrated intensively.

### **Generation Effect**

Studies have shown that when students generate their own answers to a problem, their mastery of a topic is greater than when an instructor shows them how to solve a problem.

### **Metacognition**

Metacognition refers to one’s self-awareness of one’s own thought processes. It also involves the ability to monitor comprehension and accurately evaluate one’s learning. Metacognition helps students avoid distractions, sustain effort, and modify their learning strategies based on their awareness of the strategies’ effectiveness. Strategies for encouraging metacognition include having students:

- Ask reflective questions;
- Recount their thought processes as they attempt to solve a problem; and
- Make graphic representations of their thoughts and knowledge (e.g. concept maps, flow charts, semantic webs).

We also explore recent findings on the psychological dynamics of the classroom.

### **The Social Psychology of the Classroom**

That students fall into certain stereotypes—jocks, grinds, party animals—is part of the conventional wisdom. Among the roles students commonly adopt are the compliant, the annoyingly argumentative, the habitual rebels, and the discouraged and fatalistic. Other student types include careerists, intellectuals, strivers, and the disconnected. It is sometimes postulated that first and second generation immigrant students often fall into certain categories: assimilators, accommodators, and resisters.

### **Student Learning Styles**

We frequently hear that students have disparate learning styles: That some are auditory learners, while others are visual or tactile or kinesthetic learners (who learn by manipulating objects or engaging in projects) or analytical learners (or prefer information presented in sequential steps), or global learners (who do not like to be bored and prefer various kinds of stimulation). Then there are other learning styles: competitive, collaborative, independent, dependent, participatory, resistant, and avoidant. Rather than placing students in rigid categories, it appears that most students learn in multiple ways and that it is best, therefore, to present information in multiple ways.

### **Learning and Students' Psychosocial Development**

Students' psychological development does not end at adolescence. Indeed, it is clear that the college years are just as important in students' cognitive, emotional, moral, and social development. How does college affect students? It influences their verbal, quantitative, and subject matter competence, their cognitive skills, their identity, self-concept, and self-esteem, and values and attitudes.

- The peer group is the single most important source of influence on students' development: on personality development, attitudes and values, behavior patterns, career development, and satisfaction with college.
- The extent of peer interaction is strongly connected to overall satisfaction with college.
- Women's attendance at women's colleges and African American students attendance at predominantly black colleges is positively related to success and achievement in later life.
- The degree to which faculty are student oriented is second only to the influence of the peer group on students' growth. Measures include interactions outside of class, student engagement in research under a faculty members' supervision, and feedback on papers.
- Active learning—including class presentations, group projects, and discussion—and substantive projects also have positive effects on students' growth.

In preparation for Year 2, we began to explore applications of the psychology of learning to classroom teaching. Successful teaching, we concluded, involves much more than the transmission of skills and content. Our ultimate goal is to nurture independent, self-directed, self-motivated learners who are capable of directing and critiquing their own work, who are open to

alternate viewpoints, and who have highly developed higher-order skills in interpretation, analysis, and communication.

As an instructor, one of our most important tasks is to guide, motivate, and assist students through this maturational process. Students must recognize the limits of their current skills, knowledge, and perspectives. They must realize that approaches rewarded in high school—such as rote memorization, the mechanical use of formulas, or the parroting back of ideas from a textbook—are no longer sufficient in college, where a premium is placed on originality, high-level analytical skills, and facility in writing.

Teaching can be didactic, emphasizing the transfer of information. It can be philetic, in which the teacher serves as role model and mentor. It can be evocative, assisting students in discovering the personal meaning of a topic or text, rather than seeking some larger truth. Then there is heuristic teaching, which engages students in a process of inquiry and discovery to help them develop the habits of a particular discipline.

### **From Transactional to Transformational Teaching**

Transactional teaching involves the transmission of knowledge from teacher to students. Students are expected to assimilate and synthesize the new knowledge on their own. Transformational teaching, in contrast, is much more self-conscious about its objectives and methods. It adopts a learner-centered rather than an instructor-centered approach. It makes students privy to the instructor's larger goals and expectations. It prepares students to understand that they will receive challenging feedback. It cultivates reflective learning by giving students opportunities to reflect on the learning process. It gives students assignments that they find meaningful, involving case studies, real-world data and problems, research and inquiry, and the public display of their findings.

### **Teaching as a Developmental Process**

Learning involves a process of personal transformation. It requires students to develop a capacity for self-direction, self-monitoring, and self-generation of ideas. In order to mature as a learner, a student must shed earlier ways of thinking and earlier forms of self-expression. Because the process of intellectual maturation involves fundamental transformations in a student's self-perception and thinking, it is often emotionally wrenching.

### **Conceptual Learning**

We typically think of learning as the acquisition and application of knowledge. Even when we think of higher-order thinking skills—analysis, synthesis, and evaluation—we cling to a functionalist view of learning. But advanced learning requires more: That students construct a conceptual framework that allows them to integrate and organize new knowledge into a coherent structure.

To foster deep learning, instructors need to nurture creative and unconventional thinkers who are skeptical about the received wisdom and capable of challenging existing assumptions and paradigms. This involves cultivating:

- intellectual curiosity (or what is often called “intrinsic motivation”)
- intellectual independence (an unwillingness to accept any idea or conclusion on faith), and

- an interest in grappling with the aesthetic, ethical, political, and social implications of ideas.

Deep learning entails examining facts and ideas critically, relating new and older knowledge, linking ideas together, and constructing novel conceptual structures. It involves the ability to place isolated, unlinked facts into larger conceptual structures.

Conceptual thinking means something quite different than the learning of skills or the mastery of content and concepts. It involves the discovery of meaningful patterns, the formulation of generations, and constructing arguments that are located in a larger disciplinary conversation.

### **The Classroom as a Site of Interpersonal Interaction**

Learning generally does not take place in isolation. Rather, learning involves interpersonal interactions in a social setting. Therefore we need to pay close attention to the psycho-social and emotional dimensions of learning. The psycho-social aspects of learning have been a particular concern among feminist pedagogues, who argue that learning is context sensitive. Proponents of feminist pedagogies view the classroom as a site of power, privilege, and hierarchy, and regard teaching as an inherently political act. Yet the politics of the classroom, these scholars maintain, remain obfuscated.

Within the traditional classroom, these scholars argue, certain ideas, perspectives, and forms of behavior, discourse, and argumentation are favored. The conceptual design of a course tends to remain hidden and unexamined, while the selection of topics and readings reflects unspoken ideological presumptions. Meanwhile the approach to teaching in the traditional classroom, whether involving lecture or discussion, takes the significance of a particular text or topic for granted and fails to model the range of alternate interpretive or analytical approaches. All of these factors lead some, if not many, students to feel marginalized, discouraging deep learning.

### **Teaching for Inclusion**

Today's college classrooms are more diverse than ever. Only 16 percent of college students can be described as "traditional": entering college right out of high school, attending full-time, and living on campus. A fifth of college students are immigrants or the children of immigrants, a third are students of color, and a tenth have a diagnosed disability.

Student learning can be enhanced or hindered by the classroom environment. A safe, inclusive, and stimulating environment encourages students to actively participate. Fostering such an environment requires an instructor to be acutely sensitive to individual differences and make sure that students understand the instructor's expectations and goals, as well as the steps the student must take to meet these objectives. In addition to promoting sensitivity, an inclusive classroom encourages dialogue, a process that might include collaborative inquiry, peer criticism, and intellectual give-and-take.

## **2. Expenditures**

Administration	\$7,339
Fringe Benefits	\$2,140

Services & Supplies	\$1,903
Undergraduate stipends	\$1,000
Graduate student stipends	\$29,333
Total Direct Costs	\$42,513 (92 percent of proposed first year expenditures)
Budget Balance Available	\$3,807

### 3. The 2008-2009 Teagle Collegium Sessions

*2009*

- May 29** **Carl Erik Fischer**, Columbia University Medical Center, “Teaching Medicine”; Teagle Collegium Workgroups Meeting
- May 15** **Philip Rubin**, CEO and Senior Scientist, Haskins Laboratories; Research Affiliate, Psychology Department, Yale University, “Yale University’s Teagle Collegium”
- April 10** **Steven Mintz, Director**, Graduate School of Arts & Sciences Teaching Center; History Department, Columbia University, “The Psychology of Learning and the Art of Teaching”
- March 13** **Deborah Mowshowitz**, Director of Undergraduate Programs in the Dept. of Biological Sciences, “Teaching in the Sciences”
- February 27** **Molly Martin**, Post-Doctoral Fellow, Department of Italian, “Teaching in the Humanities”
- January 29** **Teagle Pre-Conference Meeting** featuring Columbia University Provost Alan Brinkley, W. Robert Connor, President, The Teagle Foundation, and Janet Metcalfe, Professor of Psychology and of Neurobiology and Behavior, Columbia University

*2008*

- December 12** **E. Tory Higgins**, Professor of Psychology at Columbia University and Professor of Management at the Columbia Business School, “Beyond Pleasure and Pain: Value from Engagement”

What are the most effective ways to motivate learners? Professor Higgins examined ways that instructors can enhance the learning environment, better engage student learners, and make learning a more active experience. In particular, positive student engagement is viewed as a means towards increasing the value in knowledge and learning.

- November 21** **David Helfand**, Chair of the Department of Astronomy and Co-Director of the Columbia Astrophysics Laboratory, “Rethinking Undergraduate Education: Reinventing the 21<sup>st</sup> Century University”

The driving force behind Columbia’s Core Curriculum “Frontiers of Science” course, Professor Helfand described curricular innovations at Quest University in Squamish, British Columbia, Canada’s first secular liberal arts university.

**November 7 Janet Metcalfe**, Professor of Psychology and of Neurobiology and Behavior, “Learning and Memory Enhancement”

What does recent research tell us about the teaching strategies that work best to help students master new knowledge and skills and remember and apply information? Professor Metcalfe presented research on what we have learned about the spacing of course content, the use of multiple forms of instruction (including verbal and graphical and abstractions and concrete examples), the strategic use of quizzes, students' ability to judge how well they have learned new knowledge and skills, and the use of metacognition as a way to focus student attention on underlying causal and explanatory principles.

**October 24 John Black**, Cleveland E. Dodge Professor of Telecommunications & Education and Chair Department of Human Development Director Institute for Learning Technologies, Teachers College, “Embodied Cognition”

Professor Black discussed the educational merits of creating mental models and perceptual simulations in the area of basic cognitive research and theory. Learning implications of this embodied/grounded cognition trend are explored in its application to such aspects as text/reading comprehension and learning basic science.

**October 10` Introductory Meeting**

#### **4. THE 2008-2009 TEAGLE FELLOWS**

Four Teagle Fellows served as interns in the Graduate School of Arts and Sciences Teaching Center and the Center for Educational Research and Evaluation (CERE) in the Medical Center and were mentored both by the centers' staffs and a faculty sponsor. The Fellows also played a leadership in directing the workgroups that focus on core curriculum classes in the humanities and Natural Sciences.

**WENDY YIN-KEI CHENG (Epidemiology, Mailman School of Public Health)** A consulting biostatistician at the NYSPI Division of Substance Abuse, she also holds a research position within the College of Physicians and Surgeons Department of Psychiatry.

**PATRICK KENNEDY (Department of Psychology)** A member of Janet Metcalfe's Metacognition Laboratory, his studies focus on motivation, cognition, mind, brain, and behavior.

**MING-TSAN PIERRE LU (Cognitive Studies in Education, Teachers College)** With a strong interest in evaluation and assessment, he holds masters degrees in Applied Statistics and Human Development and Psychology and is currently conducting research on e-learning strategies.

**STEEN SEHNERT (Department of Psychology)** He brings a strong philosophical background to the study of motivation and cognition and to the measurement of engagement and the factors

that facilitate or hinder learning and performance.

## **5. THE 2008 – 2009 TEAGLE SCHOLARS**

Thirteen graduate and post-doctoral students were selected as Teagle Scholars to actively participate in the Teagle Seminars held throughout the year:

**LUCIA ALCÁNTARA** (Organization and Leadership, Teachers College) – Her dissertation research, which has been supported by NASA and the Rockefeller, Ford and Lumina Foundations focuses on the knowledge production process in cooperative inquiry groups.

**POONAM NINA BANERJEE** (Epidemiology, Mailman School of Public Health) – The recipient of a PhD in developmental psychology from NYU, she has conducted research in the Sergievsky Center for Neurological Studies and has published on the influence of maternal teaching on toddlers' cognitive development.

**EMMA BENN** (Department of Biostatistics, Mailman School of Public Health) – Co-founder and co-coordinator of the Biostatistics Enrichment Summer Training Diversity Program to increase the number of disadvantaged students in biostatistics, she co-versed over the Mailman School's Global Health Forum.

**CARL ERIK FISHER** (College of Physicians and Surgeons, Mailman School of Public Health) – The founder and director of the Columbia-Harlem Homeless Medical Partnership, he has conducted significant research on electroconvulsive and magnetic seizure therapy and served in student leadership roles with the National Residency Matching Program, the American Medical Student Association, the Association of American Medical Colleges, and the American Psychiatric Association.

**BROOKE GREENE** (Department of Political Science) – A specialist in International Relations with a strong background in cognition and neuroscience, she is completing a dissertation on state compliance with international humanitarian law.

**TAMARA MANN** (Department of History) – The recipient of an MTS in World Religions, she studies the global migration of cultural artifacts and the legal and political debates surrounding cultural property. She currently assists the American Studies faculty in expanding their civic engagement curriculum.

**MOLLY MARTIN** (Department of Italian) – A specialist in the teaching of Italian language and literature, she is a second-year post-doctoral core curriculum lecturer responsible for multiple sections of Literature Humanities.

**JAMES MCGOWAN** (Clinical Psychology, Teachers College) – The editor of the Graduate Student Journal of Psychology, he focuses on the roles of multiculturalism and gender in the interpersonal, educational, and clinical domains and how best to serve underserved populations.

**DAVID MASON** (Human Development, Cognitive Studies in Education, Teachers College) – A former research assistant in Brigham Young University’s Center for Teaching and Learning, he wrote his Masters thesis on integrating cognitive research into undergraduate psychology curricula.

**DAVID MIELE** (Department of Psychology) – With expertise in new media teaching and learning, he wrote his dissertation on the influence of affective and motivational variables on cognition. He conducts research in the area of self-regulated learning.

**LUCY ROBINSON** (Department of Statistics) – With a strong interest in memory, learning, and brain functioning, her research involves statistical modeling of functional MRI data.

**SARAH WEIL** (Department of Biological Sciences) – Her research in cell biology has important implications for neuronal migration and proliferation which may prove relevant to learning and memory.

**JONATHAN VITALE** (Cognitive Studies in Education, Teachers College) – The holder of a Wood Fellowship, he brings a strong background in cognitive science, neuroscience, computer science, and mathematics to the study of learning.

## **6. Contact Information**

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