

# PKAL FACULTY FOR THE 21ST CENTURY STATEMENT

Undergraduate educators face significant challenges in preparing diverse graduates for a technologically sophisticated and scientifically interdisciplinary twenty-first century community. One of the important recent pedagogical debates has focused on the relative merits of emphasizing process-skill development versus content-based teaching in undergraduate pedagogy. Such discussions have spurred widespread support for innovations in college teaching, providing added impetus for ongoing models of curricular reform:

- ♦ student active teaching
- ♦ cooperative learning
- ♦ collaborative learning
- ♦ experiential learning.

Science curricula that integrate more research and research-like experiences into undergraduate teaching have enjoyed tremendous support from the National Academy of Sciences, National Research Council, National Science Foundation, and Project Kaleidoscope (PKAL). This leads to increased engagement of students in project-based research experiments in lieu of cookbook experiments and mastery of primary literature. In implementing such transformative reform, we have to ask whether work-on-process comes at the expense of time for work-on-content. Can we achieve both goals simultaneously without a trade-off?

Lake Forest College Biology Department is meeting this challenge with inquiry-based pedagogy. This form of teaching helps students develop scientific process and master content by progressing through increasingly sophisticated hypothesis-driven investigations, requiring collaborative research, critical thinking, and diverse forms of communication. I am deeply committed to rigorous and broad scientific training of undergraduates. Small liberal arts colleges like ours offer exceptional environments for carefully mentored faculty/student research and for innovative integration of research into educational practices. Therefore, after graduating in 1991 from Wittenberg University, a liberal arts college in Ohio, my career goal has been to educate and to conduct research at a similar college, because I know the long-term impact this extremely satisfying and challenging career has on strengthening the science infrastructure of our nation.

At Lake Forest College, I am a research advisor and teacher for undergraduates studying molecular genetics, cell biology, and neuroscience. Within our department's innovative biology curriculum, I have received strong support to develop a distinctive and transferable pedagogy that effectively combines scientific process and scientific content. In the lab and the classroom, I combine my

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extensive research background with my love of teaching to create distinctive experiences that help students feel the excitement of scientific research while learning important scientific concepts. In bringing out the best work from each student, I strive to:

- ♦ provide individualized attention
- ♦ motivate students to perform beyond their expectations
- ♦ help them take pride and ownership of their learning
- ♦ share high enthusiasm in their scholarship.

As a member of an ethnic minority in my own country, I am particularly committed to mentoring students of diverse backgrounds, including those from traditionally marginalized gender or ethnicity.

Since I began my faculty career, I have thoroughly enjoyed mentoring a diverse group of sixteen students in my research lab: four men and twelve women, among them five Asian and one Latino, two first generation college-goers, and six scholar athletes. My students possess a range of academic strengths, which is important to my philosophy of training diversely talented individuals.

My student-centered research program has both NSF and NIH support. Additionally, my research students have received research fellowships from the NIH, Michigan Parkinson Foundation, Parkinson Disease Foundation, Council of Undergraduate Research, and postgraduate fellowships from the NIH and U.S. Fulbright Office. My students routinely present our collaborative work

at national meetings, such as Experimental Biology and American Society of Cell Biology. My lab graduates are pursuing PhDs at Stanford, Yale, Rochester, and Michigan State; MDs at Washington University, Wayne State, Michigan State; and a MD/PhD at Loyola Stritch School of Medicine.

Through formal teaching and advising, I have taught over 250 students and placed over 60 of them into summer research fellowships at universities across the United States. I have advised many on pursuing biology PhDs (two received NSF graduate fellowships) and biology MS programs. My other students enjoy research technician positions in academia and industry, and some have chosen diverse careers, including K-12 teaching, health care, law, environmental outreach. I directly supported many successful medical, dental and veterinary applications, served on thesis committees, took students to local or national conferences, and guided several presentations at such meetings.

As a classroom innovator, I am using the NSF-CCLI award to enhance quantitative experimental cell biology within a research-rich curriculum. I am integrating semester-length investigative microscopy and biochemistry projects into four content-rich courses:

- ♦ Medical Mysteries: (general education course) features experiments with neuron-like stem cells and treatment with growth factors to study differentiation and apoptosis.

- ♦ Cell & Molecular Biology: (core course) features cell culture and protein analysis experiments to study membrane transport and enzyme kinetics.
- ♦ Molecular Neuroscience: incorporates cell culturing, microscopy, and protein biochemistry to illustrate neurodegeneration principles.
- ♦ Advanced Cell Biology: (modeled after the Cold Spring Harbor Yeast Genetics course) uses yeast models and semester-length projects that integrate genetics, cell biology, and biochemistry to answer original research questions.

Service and outreach are integral aspects of my professional philosophy. As an officer of the Chicago Chapter Society For Neuroscience since 2002, I founded and continue to organize a Chicago-area Undergraduate Neuroscience Research Symposium as part of the annual Chicago Society for Neuroscience Symposium ([www.chicagosfn.org](http://www.chicagosfn.org)). Eleven institutions were represented in 2003 from four states: Illinois, Indiana, Wisconsin, and Michigan.

My long-term hope is to collaborate with neuroscientists at peer Midwest colleges to expand this local symposium into a comprehensive regional conference that celebrates pedagogical collaboration in undergraduate neuroscience teaching and research, similar to the NEURON (Northeast Undergraduate Research Organization for Neuroscience) and SYNAPSE (Society of Young Neuroscientists and Professionals of the Southeast)



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meetings. Currently, no such dialogue exists for Midwest institutions, even though half of the Great Lakes College Association (GLCA) and Associated Colleges of the Midwest (ACM) boast undergraduate neuroscience programs.

Since my undergraduate days at Wittenberg University where I spent summers as a resident counselor for the Upward Bound Program for accomplished minority high school students who took college courses alongside undergraduates, I have firmly believed that college and K-12 students (especially those from underrepresented backgrounds) and faculty mutually benefit from pedagogical collaborations. Lake Forest College maintains many levels of such interactions with North Chicago and Waukegan public schools (which serve a economically and racially diverse student base in Lake county, Illinois).

I am currently designing curricula wherein the Medical Mysteries and Molecular Neuroscience course students will team with North Chicago middle school students to conduct annual "Brain Awareness" campaigns in the middle school. As warm-up to this future outreach, my Fall 2003 students organized a highly successful "Brain Awareness" week in our college community that features educational exhibits, teach-ins, and a symposium on neurological disorders. ■