Math and Biology Students Work with Veterinary Surgeons on Statistical Analysis of a New Procedure for ACL Repair

One of the most common orthopedic problems affecting dogs is the rupture of the ACL, a ligament tear, which can lead to progressive and debilitating osteoarthritis. Recently, a new technique addressing ACL injuries was developed but not studied for its efficacy or complication rate with significant sample sizes. For the past several years, Monmouth University students from math and biology have teamed up with veterinary surgeons from Garden State Veterinary Specialists in Tinton Falls to analyze data about this new surgical procedure. As a result of this collaboration, MU students have built a statistical model to predict the odds of success and surgical complications.

Garden State Veterinary Specialists is a multi-disciplinary referral-only practice that provides state-of-the-art veterinary care in the fields of surgery, internal medicine, cardiology, and other areas. An important focus of Garden State Veterinary Specialists is the training of veterinary surgeons. According to Math professor, Dr. Richard Bastian, residency requirements for veterinary surgeons include performing research and having that research published. Garden State Veterinary Specialists contacted Dr. Bastian to help with the analysis of data and the design of the study. Ex Ed students are assisting with the data and are currently working on the third project with each project taking a year to complete.

There have been several surgical options for the repair of ACL injuries that are especially common among larger dogs. This study examines the new technique relative to the other procedures and includes data from over 800 surgical procedures performed since 2006 by five surgeons. Until now, no data have been published on the success of the surgery. Students have helped to prepare the first large-scale paper on complication rates. Results are showing that while the procedure is safe for all dogs, larger dogs have significantly higher complication rates. Results of the study will be published in a veterinary journal and will impact decisions about ACL repair around the world.

Ex Ed students majoring in mathematics, Emily Pumphrey, William Scott, Brittni Fink and Eric Thorn, worked on the study along with Kyle Gavin who majors in biology. William described the experience, “Participating in the Ex Ed program has been a very rewarding experience. Not only did I get to utilize the techniques I’ve learned from my math courses, but I observed how influential they really are outside of the classroom. The results of our handiwork are going to have an effect on decisions made by veterinarians to care for real injuries suffered by people’s dogs. It’s very gratifying to know how significant our work really is.”

Brittni Fink and Emily Pumphrey examine data on ACL injuries.

Clockwise from top: Kyle Gavin, Eric Thorn, Brittni Fink, Emily Pumphrey, and Joe Skolnik collaborate on the project.

William Scott and Eric Thorn organize research files.

http://monmouth.edu/academics/css/exed.asp
Practical experience and confidence are the two primary benefits of fulfilling an Ex Ed experience in a biology laboratory at Monmouth University. I have had the privilege of guiding several students in cell biology research in my laboratory, through funding of my research by an AREA (Academic Research Enhancement Award) grant from the National Institutes of Health (NIH). The AREA program serves to provide funding for primarily undergraduate institutions, so that students can be given experience working on cutting-edge research projects early in their career. Such grants are highly competitive so, at Monmouth, we are proud to have two laboratories in the Biology Department that have secured funding through this program. Since I joined Monmouth University in 2002, the Biology Department has strongly promoted student involvement on-campus research projects. The research in my laboratory involves studying proteins called mitogen-activated protein (MAP) kinases and the regulation of these proteins during cell proliferation. This work will lead to new insight on the regulation of proteins during cancer, but may also have implications for chronic inflammatory diseases, cardiovascular disease, and aging. The NIH funding gives us the means to keep a variety of human cell lines growing in culture in the laboratory, provides us with equipment and supplies, and enables us to employ students as research assistants during the academic year and summer.

To perform this research, students need to become proficient in a variety of cellular and molecular techniques, including tissue culture, western blotting, and transfection. The basic protocols and theories behind these techniques are introduced in the classroom at Monmouth University, but having the opportunity to perform them independently, often on a daily basis, in a research laboratory helps the students to become extremely proficient at research. Usually, it takes a semester for new researchers to feel comfortable with all of the techniques. Then, they are “off and running” – performing experiments independently with confidence. Not only do they tend to become “perfectionists” – wanting publishable-quality results with each experiment, but they also become efficient troubleshooters as they learn first-hand how to put the “theory” of the procedure in practice. Therefore, the undergraduates in the laboratory tend to work as if they are graduate students – executing experiments and analyzing the results independently. Many of the students have commented about how much their research projects have helped them in achieving. Two articles from my laboratory have appeared in *Molecular and Cellular Biochemistry*, and more should be forthcoming.

For the graduates of my laboratory, their success upon leaving Monmouth speaks volumes about the benefits of performing independent research as undergraduates. Graduates are now in medical school, dental school, physician assistant programs, Ph.D. programs in biology, or are employed in technical positions in industry. If I could give advice to incoming students about Ex Ed, I would recommend seeking an experience early in your college years. In the case of laboratory research, students benefit the most when they begin as freshmen or sophomores, and make a long-term commitment to the project. Students considering laboratory research should be willing and able to dedicate time to do extensive background reading on their project, be self-motivated, be willing to learn and to take direction, be able to work in a team environment, and also should have a lot of stamina to troubleshoot difficulties in the lab. The effort in undertaking such a research project is well worth the rewards. Of his experience, current student Vincent Marchese states, “My experience in the lab was very beneficial to my advancement in science. I learned how to carry out detailed biological experiments. I learned important microbiology lab techniques. Reading journals and background information helped my critical thinking and reading skills. I not only carried out experiments, but also analyzed and composed data that I later presented to a group of science colleagues. Overall I gained a lot of hands-on experience, critical reasoning skills, and confidence in my abilities as a scientist, that set me apart from other students who have not had the time in a biology lab that I have had.”
“The people I have met, the adventures I have experienced, the things I have learned, the breathtaking sights I have seen, have all contributed to my growth as a young woman. I could not emphasize enough how much I recommend that every single individual study abroad.” Karen Schwartz/England Spring 2009

“Studying abroad will give you an opportunity to expand who you are as a person and help you to grow into someone who becomes a citizen of the world. It is a life-changing experience to do something different and travel the globe.” Jordanna Spaulding/Australia Fall 2009

“Studying abroad should be mandatory in order to graduate college. This is honestly the best thing that I have done for myself; it’s the best decision I could have made here at Monmouth. Being immersed in the Italian culture forces you to cope with a new lifestyle and thrusts you into unexpected situations that have been extremely rewarding. Brandon Karkovice/Italy Fall 2009

What It Takes to Be a Surgeon
By: Michael Barbera, Chemistry Major

I am currently a senior Chemistry major and I plan to attend medical school in an effort to achieve a lifelong dream of becoming a medical doctor and surgeon. Along with continuing my education here at Monmouth University, I have been shadowing a general, laparoscopic, and breast surgeon. Since September 2008, I have had the opportunity to attend patient visits on a weekly basis and through these visits I have learned about pre-operative and post-operative consultations and proper management of medical staff. While completing my Experiential Education requirement, I have kept a journal describing what I have learned. Entries include details from physician interaction with patients and staff to different methods of treatment. I was also given the opportunity to attend surgeries at a hospital and surgical center. Through these experiences I have learned a great deal about several surgical procedures, including laparoscopic cholecystectomies, removal of lipomas, and repair of hernias.

Not only was my Ex Ed placement fun and exciting but this is one that I will never forget. As of spring 2010, I have obtained approximately 600 hours of shadowing experience. I have learned a great deal about medicine and about being a surgeon. The Ex Ed requirement should be utilized to its full advantage by all students. I will always remember this opportunity as a highlight of my undergraduate career.

Engineering the Future
By: Jessica Pino, Software Engineering Major

My name is Jessica Pino and this past summer I had the opportunity to intern in the FAA with my company, Enroute Computer Solutions (ECS). My job while working with ECS was to develop, code, and test various pieces of software as well as maintain documentation and perform various defect and project management activities. Having the opportunity to use the skills that I learned in college was a gratifying experience. Gaining experience in a real business setting helped me to learn how the software that I made was going to be used within the FAA. This is a big difference as compared to classes, where I would write software and, once it was graded, never look at it again. The work I produced is going to be used within the business itself and will be deployed out for workers to use.

Working at my internship puts into perspective how the software that I learned how to create in my classes will be built upon to make a real life working product. The experience that I gained was invaluable and it will help me to get a job after I graduate no matter where I decide to go. My advice to other students is to try and find internships because knowledge and experience will make you more attractive to employers than someone who only knows how to work out of a textbook, especially in the current job market. Good luck to everyone in this new school year and to the graduates of 2010!
Experiential Education is a General Education requirement for ALL undergraduate students that seeks to give students practical, “hands-on” experience in a setting outside of the classroom environment. Ex Ed offers students work-related experience and an opportunity to network in their chosen field. 

Career Advisors and Planners (CAPS)
The following is a list of faculty members known as CAPS who are available to assist students with Ex Ed.

Accounting
Douglas Stives, Bey Hall-250, dstives@monmouth.edu, Ext. 5894

Art & Design
Tom Baker, 600 Building-602A, tbaker@monmouth.edu, Ext. 3627
Pat Cresson, 600 Building-AW3, pcrestson@monmouth.edu, Ext. 3626

Biology
Ellen Doss-Pepe, Edison Science Hall-222, edoss@monmouth.edu, Ext. 4433

Chemistry, Medical Technology, & Physics
William Schreiber, Edison Science Hall-243, wschreib@monmouth.edu, Ext. 4443

Communication
Aaron Furgason, Plangere Center-228, afurgaso@monmouth.edu, Ext. 5254
John Morano, Plangere Center-226, morano@monmouth.edu, Ext. 4424

Computer Science/Software Engineering
Allen Milewski, Howard Hall-B18, amilewsk@monmouth.edu, Ext. 7578

Criminal Justice
Michele Grillo, McAllan Hall-22, mgrillo@monmouth.edu, Ext. 5650

Economics/Finance
Robert Scott, Bey Hall-235, rscott@monmouth.edu, Ext. 5532

Education, Curriculum, & Instruction
Laurel Chehayl, McAllan Hall-218, lchehayl@monmouth.edu, Ext. 5191

Educational Leadership, School Counseling and Special Education
Wendy Harriott, McAllan Hall-104, wharriot@monmouth.edu, Ext. 5905

English
Oty Agbajoh-Laoye, Wilson Annex-507, olaoye@monmouth.edu, Ext. 3662

Foreign Language Studies
Priscilla Gac-Artigas, Plangere Center-126, pgacarti@monmouth.edu, Ext. 3406

History/Anthropology
Richard Veit, Howard Hall-548, rveit@monmouth.edu, Ext. 5699

Management/Marketing
Roy Nersesian, Bey Hall-155, rnersesi@monmouth.edu, Ext. 3654

Mathematics
Betty Liu, Howard Hall-B22, bliu@monmouth.edu, Ext. 4455

Music/Theatre Arts
Ron Frangipane, Woods Theatre-215, rfrangip@monmouth.edu, Ext. 3633

Nursing/Heath Studies
Laura Jannone, McAllan Hall-308, ljannone@monmouth.edu, Ext. 5457

Philosophy, Religion, & Interdisciplinary Studies
Pasquale Simonelli, Howard Hall-B11, simonell@monmouth.edu, Ext. 5738

Political Science
Kevin Dooley, Bey Hall-244, kdooley@monmouth.edu, Ext. 4471

Psychology
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Social Work
Rosemary Barbera, McAllan Hall-314, rbarbera@monmouth.edu, Ext. 3606

Ex Ed Leadership Team
Mercy Azeke
Dean, Center for Student Success

Robert Scott
Faculty Director of Ex Ed; Associate Professor, Economics, Finance and Real Estate

Wendy Harriott
Assistant Faculty Director of Ex Ed; Associate Professor, Educational Leadership, School Counseling and Special Education

Jean Judge
Associate Dean for Support Services and Articulation

William Hill
Assistant Dean for Career Services

Kathleen Kennedy
Director of Cooperative Education

Marilyn Ward
Coordinator of Service Learning and Community Programs

Robyn Asaro
Assistant Director of Study Abroad

Looking for an internship, co-op, or service learning? Visit the Ex Ed Database of Opportunities http://www2.monmouth.edu/exed-sequel/gateway.html