

(CISE EXCLUSIVE CONTENT)

EDUCATION

Preparing Graduate Students for Interdisciplinary Careers

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Students preparing for careers in technical fields face a job market that continues to expect an ever-widening range of skills to complement subject-matter competencies. Such skills include being adept in communication, from traditional report writing and oral presentation to informal interpersonal communication and networking—the so-called "soft skills." It takes more than coursework to master these skills; rather, it takes an environment in which the student can practice the art of being a professional. It was with this in mind that the Department of Mathematics and Statistics at the University of Maryland, Baltimore County (UMBC), created its Center for Interdisciplinary Research and Consulting (CIRC). In this installment of Education, we'll take a closer look.



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The Center

CIRC is staffed by two faculty acting as directors (an applied mathematician and a statistician, the authors) and two lead graduate research assistants (GRAs) as lead consultants, who are responsible for business development, organizing workshops, and routine administration. Any graduate student can become involved with CIRC by signing up for an independent study course, which might either focus on working on one long-term project that involves an outside client and a departmental faculty mentor, or participating as a general consultant working on a collection of projects during the semester. All CIRC-affiliated students participate in weekly consultant meetings by providing updates on projects and discussing proposed methodologies, which gives them ample opportunities to practice the art of identifying and succinctly communicating the key aspects of scientific projects. The meetings also let other consultants contribute ideas and learn from all ongoing projects and the methodologies used to tackle them.

CIRC helps our mathematics and statistics graduate students apply their technical training to application problems and gives them the chance to develop interpersonal and communication skills. UMBC's mathematics and statistics department has two graduate programs in applied mathematics and in statistics, both offering MS and PhD degrees. Enrollment in both programs is typically 40 to 60 students, equally split between degrees. Because getting a job in any field—from educational institutions to industry to government agencies—requires soft skills, involvement with CIRC is profitable for students in either program and at all levels.

CIRC's outward format borrows from the idea of consulting centers run by statistics departments at several other universities. Large pharmaceutical companies and some government agencies have similar statistics and mathematics offices as the "go to" place for help on quantitative aspects of projects. In this spirit, CIRC offers services in its areas of expertise to both on- and off-campus clients. But on the inside, CIRC focuses on training graduate students affiliated with CIRC, by expanding their technical skills to interdisciplinary areas and by developing many of the skills vital for interacting successfully with professionals from other areas.

CIRC takes special advantage of the unique synergy available in a joint department of mathematics and statistics, such as an ability to tackle projects at its intersection by drawing on students and faculty in both areas. In turn, having CIRC in the department creates energy and improves the collaboration between the two programs. For the students involved, benefits include gaining experience and confidence in dealing with people and projects from outside their own area of specialization—as well as a powerful, tangible resume entry. The clients also become references that students can draw on as they begin their job search.

Consulting

A client typically initiates a consulting project by submitting a consulting request form via the CIRC Web site (www.umbc.edu/circ). We ask all clients to submit this form, even if the original contact is in a different form. Besides helping to track requests in one centralized channel, the key advantage is that the consultants get to experience the

thrill of the first contact from a client. Then, based on the nature of the work and current workload, one CIRC consultant is assigned to the project, who then contacts the client and sets up a meeting, at which the client delivers the problem statement. Some projects are small and consist only of giving the client quick advice. For larger projects, the student develops a statement of work and a project plan that includes estimated hours and then obtains client approval. It's important to be accessible to clients; thus, we offer the initial consultation for free. The work on these projects typically requires learning additional skills in mathematics or statistics, in addition to getting up to speed in the client's application area.

On-campus clients have included faculty from other departments and staff from administrative departments. All on-campus services have proven to be valuable and popular at UMBC, which has many departments with a science and technology focus and additional departments in social and decision sciences that need statistical consulting. CIRC offers a special service to the campus that includes helping PhD candidates from other programs with free consulting meetings of up to two hours. Additionally, it has attracted the attention of staff in administrative departments on campus, for whom it has provided help with data analysis projects. Thus, CIRC bridges the traditional gap between the academic and administrative personnel on campus in a mutually beneficial way.

As a mathematics and statistics department at a public research university (UMBC is located in the Baltimore-Washington corridor with government agencies and high-tech companies), we receive contacts from the local community with a frequency that indicates a need for service to a larger field. As such, our off-campus clients have ranged from faculty at other local institutions to individual residents from the Baltimore metropolitan region to local business, industry, and government agencies.

The major financial investments of CIRC are the two GRAs acting as lead research assistants for mathematics and statistics projects, respectively. To offset these investments by the department, CIRC partners with other units on campus. For instance, UMBC's Office of Information Technology (OIT) supports the cost of a partial GRA in its effort to provide content expertise of campus-supported software to the community. In this spirit, we're working with other units to invest in CIRC to support research infrastructure and education at UMBC. Additionally, off-campus projects generate a modest revenue stream, although by its nature, this source of support fluctuates widely; luckily, CIRC isn't expected to be entirely self-sustaining financially. The faculty involved in CIRC are compensated by accounting for their workload appropriately. This level of departmental support is justified because of the tangible and intangible benefits to the department and its students.

Workshops

CIRC pursues several strategies for presenting itself to the community. Our Web page is our main presence. It lists examples of projects, client feedback, and the consulting request form (usually the first contact with CIRC). One service to the campus is our hands-on workshops on mathematical and statistical software packages such as Matlab, Mathematica, Maple, SAS, S-Plus, SPSS, and more. The workshops are held in an instructional computer lab and financed in cooperation with OIT. For OIT, these workshops are a place to which they can point their customers for basic introductions on packages the campus maintains, but for which no user expertise exists within OIT.

For students affiliated with CIRC, preparing the written software tutorials and facilitating the workshops are great opportunities to expand their experience with important software packages. The students typically have had initial exposure to some of the packages as part of their coursework, but preparing for the workshops deepens their knowledge and almost invariably requires learning more about their features. Naturally, the skills CIRC students acquire are also invaluable for the students' own research and constitute a marketable skill backed up by a tangible resume entry.

Student Benefits

The benefits of involvement with CIRC are usually tailored to a student's career goals. Projects from off-campus clients are a chance for the student to get in contact with a potential employer—for example, one student who earned an internship with a local corporation via CIRC was eventually offered a full-time job. Another student who worked on a client project in 2003 was hired the next spring as a research assistant, and finished his PhD in applied mathematics working on that project. Significant recognition for CIRC during the past year also came from projects from outside clients.

Through its various activities, CIRC has had a significant impact on the department's academic atmosphere. CIRC holds a social hour every Friday during regular semesters, designed originally as an opportunity for graduate students to learn how to network. It has since become a focal point for the energy of all students and faculty in the department. For instance, the graduate program director often uses it as a starting point for the department tours of prospective students. Other VIPs visiting the social hour include colloquium speakers in mathematics and in statistics and various administrators from across the campus. Students don't usually have such easy availability to professionals; this face-to-face time thus leads to vital contacts for future job searches and as references.

CIRC has enabled us to improve and showcase the vibrancy of our department. Both the application of mathematical and statistical technical skills to application problems and the experience gained with the soft skills involved in the interaction with professionals from all fields vitally improves our students' skills for entering the job market and being successful in their careers.

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