

Strategic Plan

Department of Mathematical Sciences

April 2010

The Department of Mathematical Sciences has recently completed two significant strategic planning activities: a comprehensive curriculum review, and the creation of an updated faculty hiring plan. The following narrative describes recent decisions and ongoing actions that will form the basis of our strategic activities for the next few years.

Goal 1: Attract, retain, and support a world-class and diverse faculty, staff, and student population.

Increase the size and quality of the undergraduate and graduate education programs. (Appendices 6 and 7 show the number of majors and degrees awarded in recent years, while Appendix 8 shows the enrollment projection for CS majors.)

Increase the undergraduate enrollment to approximately 135;

Hold stable the number of MS students enrolled at approximately 10;

Hold stable the number of doctoral students enrolled at approximately 32.

Faculty

Due mainly to retirements, the department has filled many positions during the last five years, and is continuing to advertise. As a result, a number of teaching-oriented faculty have been replaced with dynamic faculty who are pursuing excellence in both teaching and research, including the pursuit of external funding. A significant part of the strategic plan of the department is to nurture these junior faculty and help them to be successful. The department has recently instituted a formal faculty mentoring program to assist junior faculty to establish themselves in both teaching and research. (Appendix 5 includes the department's mentoring plan.)

In addition to tenure-track hiring, the department made a strategic decision in Fall 2009 to reserve three positions for visiting assistant professors, who will join the department for up to three years to teach and conduct research. In filling these positions, preference will be given to candidates who have recently earned their PhD and who can collaborate with existing faculty. The chair has also made a commitment to facilitate visits by more senior faculty who wish to spend all or part of a sabbatical collaborating with departmental faculty. By these means, we hope to increase the research activity, ensure the constant influx of ideas, and generally create a more vibrant department.

The department has hired nine faculty in the last five years, plus one faculty member with a joint appointment (one-third in Mathematical Sciences, two-thirds in Cognitive and Learning Sciences). Of these ten new faculty, six are women, which represents a significant increase in the diversity of the department. (Appendix 1 shows the faculty demographics, while Appendix 2 summarizes the results for recent searches.)

During 2009-10, the department advertised two tenure-track positions and one visiting position. In future years, in addition hiring tenure-track faculty in response to retirements, we expect to be hiring one or more visitors each year. Regular hiring will provide opportunities to bring in a more diverse group of faculty.

Staff

The department has an outstanding staff consisting of Jeanne Meyers (budget coordinator and department manager), Margaret Perander (administrative aide), and Tori Connors (office assistant). The chair's strategic plans for the staff focus on professional development, encouragement of initiative, and retention.

Students

Over the past two years, the department has implemented a multi-faceted plan for recruiting undergraduate majors, which includes targeted mailings to prospective students and collaboration with local and regional high school teachers. In addition, the department now provides regular career-oriented events (for example, visitors who speak about mathematics and statistics in industry) and is working to increase internship opportunities for mathematics majors.

The graduate committee is working to recruit better graduate students by focusing attention on those whose interests are most aligned with departmental faculty.

1.2 Maintain a diverse student body and faculty.

Background

Currently, 33% of undergraduate majors, 40% of graduate students, and 30% of faculty are female. Departmental faculty represent thirteen different countries, with 52.5% from the USA and 20% from China. Appendices 1 and 3 provide data on faculty and student demographics, while Appendix 2 shows the results of recent faculty searches. Appendix 4 contains the department's plans for diversifying the faculty and student populations. Key activities include:

- Anticipated hiring, for both tenure-track and visiting positions, will allow the department to increase its diversity.
- The department chairs in the College of Sciences and Arts are discussing the possibility of sending representatives each year to the annual SACNAS conference and other meetings that attract minority students to recruit underrepresented minorities for graduate programs in the college.
- The chair has identified one project with the potential to significantly address the diversity of the university and/or of the department. An **“Emerging Scholars” program** is a well-established model for improving the performance of minority students in STEM fields. The particular approach envisioned is the workshop model created by Uri Treisman. In such a program, students in mathematics courses (usually calculus) have the option of enrolling in a special section that offers extra class meetings, during which students work on additional (and specially designed) problems in small groups. One of the main intents of an Emerging Scholars program is to create a learning community that becomes a source of assistance, support, and encouragement to underrepresented

minority students (many of whom are first-generation college students). The lack of such a community is one of the main factors identified by Treisman as leading to minority student attrition in STEM programs. An Emerging Scholars program at Michigan Tech could be targeted at first-generation college students, and remaining slots (if any) could be open to all students. To create such a program would probably require a new Lecturer line. The chair will initiate discussions of these possibilities during the 2010-11 academic year.

Goal 2: Deliver a distinctive and rigorous discovery-based learning experience grounded in science, engineering, technology, sustainability, the business of innovation, and an understanding of the social and cultural contexts of our contemporary world.

In response to feedback from majors obtained at exit interviews, we have put a high priority on providing students with **information about careers in mathematics and statistics**. Specifically, we are instituting the following regular activities:

- Regular visits by mathematicians and statisticians working outside of academia. The first visitors have been from Boeing, the National Security Agency, and Lawrence Livermore National Laboratory.
- Bringing companies to campus to recruit students for both jobs and internships. In Fall 2009, three actuarial firms sent representatives to campus to meet with students. In addition, the Michigan Tech Research Institute visited the department to recruit interns for Summer 2010. We plan to continue to develop these relationships, and to work to establish relationships with companies that hire statisticians and other mathematicians as well.
- Regular promotion of research opportunities for undergraduate majors, both on and off campus.

The department completed a **comprehensive review of course offerings** in Fall 2009. The most significant outcome is the creation of a number of advanced PhD-level course that will significantly strengthen our graduate program. A significant change at the undergraduate level is a new course on statistical programming that should make our graduate students more competitive for both internships and entry-level jobs. We also took this opportunity to eliminate some low-enrollment courses.

We continue to discuss how to address the **need for scientific programming of our majors**, and hope to work with the Computer Science Department to address this issue in the near future. We believe that better programming skills will make our students more competitive for internships and better prepared for graduate school and entry-level jobs. To address the perceived need for more programming skills, we introduced a course Statistical programming and analysis (MA3740). We also discussed a programming/scientific computing course to act as a second programming course for our undergraduates (to be taken after CS1121), but did not come to a final conclusion about the advisability of offering such a course. We continue to study this issue.

Goal 3: Establish world-class research, scholarship, innovation, and creative work that promotes sustainable economic and social development in Michigan, the nation, and the world.

3.1 Improve our stature as a research university and Ph.D. granting institution.

In recent years, the department has hired new faculty in computational mathematics, algebra, number theory, and statistics. Searches were conducted in 2009-10 to fill positions in mathematics education and statistics. These faculty bring additional research expertise to the department, both strengthening existing areas and opening up new areas of investigation.

Updated promotion and tenure guidelines put more emphasis on external funding and mentoring of PhD students.

Positions for regular visitors (see Goal 1) will ensure a regular influx of new ideas and creativity, increasing research productivity.

The department's graduate program is about the right size for the current number of faculty, given their extensive teaching responsibility in fundamental course for other majors. But the department, in concert with all units in the college, will place greater emphasis upon seeking external support for research programs. Department faculty already contribute to a number of research programs, especially in the form of expert statistical analysis. And the research program in statistical genetics is a leading program in terms of securing support from the National Institutes of Health. A college-wide emphasis will be given to securing additional external support for graduate education and research through appropriate funding agencies. Appendix 9 shows the current pattern of external funding received by the department.

Action items related to specific Strategic Plan goals:

Goal 1

- Fill open and anticipated positions with faculty who excel in both research and teaching.
- Continue and improve mentoring program for junior faculty.
- Provide staff with opportunities for professional development, including the acquisition of web design skills for at least one staff member.
- Continue efforts to recruit students at both undergraduate and graduate level.
- Use Noyce Teacher Scholarship program and other means to recruit students into the Secondary Education concentration within the mathematics major.
- Continue regular contact with high school mathematics teachers in the Upper Peninsula (including regular mailings and annual dinner with teachers).
- Take advantage of ongoing hiring (for both tenure-track and visiting positions) to bring a diverse group of scholars to the department, increasing the research activity and vibrancy of the department.

Goal 2

- Continue to make connections with industries, labs, and government agencies that can offer our students internships and regular employment. Bring speakers and recruiters to campus when possible.
- Seek external funding for summer research opportunities that can be offered by the department.
- Work with the Computer Science Department to address the need for better programming skills in our undergraduate majors.
- Introduce more innovative teaching methods to some of our coursework (blended [online/classroom] learning, the Moore method, etc.) to encourage more intellectual engagement.

Goal 3

- Continue to emphasize the importance of external funding.
- Positions for visiting faculty were created both to increase research productivity and to promote the visibility of our department (visiting assistant professors should go on to tenure-track positions at other universities).