

*A Focus on Academic and Career Advising
Department of Mathematics and Statistics
Spring 2016*

I. Current practices

Overview. As of 4/18/16, according to data collected from SPIRE and the Student Success Collaborative (SSC), there are **698 active Mathematics Majors**, of which 525 are BS-Math, 1 is BA-Math, and 172 are SM-Math. In April 2014, the number of Mathematics Majors was 475, so the current count reflects a **growth of 47% in a two-year time span** in the number of majors. We have added 40 students in the month of April alone. Of the SM-Math students, 58 are primary Computer Science, 25 are in Engineering or pre-Engineering, 20 are in School of Management (SOM) or pre-SOM, 18 are in Physics or Astronomy, 20 are in Chemistry or Biochemistry, 9 are from the College of Humanities and Fine Arts (HFA), and the rest are mostly in Biology, Economics, Public Health, and Resource Economics.¹

In earlier stages of Strategic Planning, we have previously written at length about the intellectual and societal forces that are driving more and more students at all levels to study Mathematics & Statistics. Briefly, for quite a few years running, according to any number of high profile reports and surveys, the top 3 occupations in the nation are Mathematician, Statistician, and Actuary. Reports from the US Department of Labor on expected vacancies in these fields corroborate the need for a workforce with strong training in the mathematical sciences. At a recent national meeting of Chairs/Heads of Mathematics and Statistics Departments at Research Universities, an unofficial survey revealed universal growth in the number of math majors, but none that quite matched the rate of growth we are experiencing in our department. Some local conditions are therefore contributing to the particularly rapid growth of math majors at UMass Amherst. We list here some factors that we believe are the primary drivers of growth in the number of math majors:

- Majoring in Math prepare students for a wide variety of career opportunities.
- The Actuarial program in the department is a particular draw.
- The Mathematics Computing and Applied Mathematics concentrations attract a large number of primary majors from Computer Science, Engineering, and other technical disciplines.
- In contrast to Computer Science, Engineering, and the Isenberg School of Management, admission to the Mathematics major is open to all students.
- Based on anecdotal evidence, an increasing number of guidance counselors in local high schools encourage students to choose math as a major in college.

¹ We note that most of our secondary majors with a primary major in SOM are in our Actuarial Concentration; these students are required to choose SOM as their primary major so the secondary designation may not be an authentic measure of students' interests. The fact that it is otherwise difficult for our actuarial students to register for SOM courses is a continuing challenge.

The Mathematics Major is subdivided into 7 concentrations: Actuarial Mathematics, Applied Mathematics, Mathematical Computing, Pure Mathematics, Statistics, Mathematics Teaching, and the Individually Designed Concentration. The latter allows for a student to create an individualized academic plan, which requires the approval of the students' Academic Advisor and the Chief Undergraduate Advisor. By far the largest growth has occurred in the Actuarial Concentration, which is also now the largest of the seven.

The Senior Survey clearly indicates broad student dissatisfaction in the category of advising in Mathematics & Statistics. The sharp rise in the number of majors, concurrent with a dramatic drop in the number of tenure track faculty members (due to an unrecovered retirement wave in 2002) has made what has been a difficult task into a much more difficult one. The story can be briefly told thus:

- In 1995-1996, 53 tenure track faculty members advised 148 majors
- In 2005-2006, 40 tenure track faculty members advised 305 majors
- In 2015-2016, 38 tenure track faculty members advised 698 majors.

Nearly all tenure stream faculty members currently participate in undergraduate advising. We have written elsewhere about the dire need for growth in the number of tenure stream faculty members in the department – this is the single most important action for improving the experience of mathematics majors, not just in terms of teaching and learning but also in the important category of advising. However, in the meanwhile, we have taken a number of smaller but important steps during the current academic year to revamp many of our advising practices, and will detail those below.

The biggest structural change made in the past year has been to switch to group advising for first-year students so that we may focus a better effort in advising the upper division students who require more specialized advising. Currently, the number of advisees per faculty member varies from 5 to 17, as determined by the Department Head in light of the overall service load, and seniority, of each faculty member. (In particular, junior faculty are assigned a smaller number of students). Other changes include:

- All tenure-track faculty members are now trained to use SPIRE and record summaries of their meetings in *SPIRE advising notes*
- An advisors lunch is held every semester before advising week begins to bring advisors up to date on the course offerings and latest news/directives.
- All sophomore, junior, and senior primary majors are assigned a tenure track faculty advisor in SPIRE.
- All freshmen and secondary majors are advised through two advising nights per semester, as well as during drop-in hours held by the CUA and other designated faculty. Some Lecturers help in freshman advising as well.

- A portion of seats in courses are held for majors to ensure majors can graduate on time, while keeping some seats open for minors and students from other majors. This approach goes “against the grain” of our overall philosophy but has been forced on us by the funding made available to us. We would like to work with the administration to reverse this trend.
- Career opportunities and other experiential activities are disseminated in a timely manner to students via email and a departmental career webpage.
- The Department has invested (with support from CNS) in upgrading the position of Assistant to the Undergraduate Program to Academic Advisor. Mr. Jacob Lagerstrom serves very ably in this position, and has modernized many of the department’s record-keeping procedures. He is an invaluable resource for Mathematics majors as well as indispensable assistant to the Chief Undergraduate Advisor.

Career Advising. The department hosts several events during the year related to helping students decide on careers and prepare for job searches. In 2015-6 the department hosted a resume preparation event, the Actuarial Career Fair with 11 companies in attendance, and a campus visit and undergraduate talk by an alumnus who has worked in the financial and actuarial fields. The department has also assisted the Actuarial Club in hosting visits by companies and an interview and networking event.

The department sends periodic emails to students about important career events on campus. These include resume writing events, networking events, and the major career fairs on campus. The CUA forwards to all majors, in a timely fashion, job and internship postings that are sent personally to the department. This has led to numerous students getting jobs and internships. Students are also encouraged to join Career Connect. Faculty advisors are encouraged to engage with students in a conversation about jobs, internships, and graduate school opportunities.

Experiential Opportunities.

- **Overview.** The department maintains a designated link on its website for secondary majors and minors. The department encourages all majors, especially those in the Applied Math and Statistics concentrations, to take courses outside of the department as part of their upper level electives. The department encourages its majors to seek out minors, especially in Computer Science and Economics.
- **Department events.** In the past year the department has hosted two presentations on study abroad geared toward Math/Stat majors (one run by IPO and one run by the program Budapest Semesters in Mathematics Education). The department hosted a resume preparation event in September run by Career Services. The department funds and runs its own Actuarial Career Fair each fall.
- **Clubs.** In Spring 2016, the department initiated a chapter of the Association for Women in Mathematics (AWM). The Actuarial Club has, as of March

2016, become a chapter of a national organization, Gamma Iota Sigma, focused on risk, insurance, and actuarial science. These organizations, together with the Math Club, provide opportunities for students to learn beyond the classroom. Examples include a case study event run by Aetna (Actuarial Club), a 'how to apply to graduate school' event (Math Club), and a brown bag lunch with a senior faculty member (AWM). The Department provides funding for all three of these clubs.

- **Research Opportunities.** The department hosts its own REU program each summer using alumni donations and faculty grants. The department maintains a link on undergraduate opportunities, with links to the national REU programs in mathematics and statistics.
- **Career Opportunities:** The CUA forwards relevant job and internship opportunities to students, as well as campus events related to careers; many of these extra efforts have led to successes by students who are grateful for this effort (and have told the CUA about this). The department maintains a link on career opportunities.
- **Professional Development.** The department does about 3-4 weeks of professional development in the junior year writing course (resume, cover letter, interview skills, graduate school statement of purpose). All students are encouraged to join Career Connect through their faculty advisors and emails from the CUA.

Division of Labor/Usage of Personnel: Advising for class registration is done through a variety of mechanisms depending on the student's status. This new structure was put in place as of Fall 2015 to provide better advising to the students and to handle the increase in the number of majors.

- A primary major, holding sophomore standing or higher, is assigned a faculty advisor on Spire who the student meets during an appointment during advising week (the week before registration).
- Freshmen and secondary majors are invited to advising nights where there is a presentation, followed by several advising stations where students can discuss their individual situations with a faculty or staff advisor.
- Several faculty members assist the CUA in holding drop-in hours throughout the academic year.
- One faculty member is designated as the freshmen advisor and this is notated in Spire.
- The department experimented with three peer advisors in Fall 2015. Each peer advisor held two hours of advising hours per week. These hours were not well utilized and the department is looking at ways to make this program have more impact.
- Two professional staff members, Ilona Trousdale (Director of Administration and Staff) and Jacob Lagerstrom (Advising Program Assistant) play key roles in the advising process. Lagerstrom handles all the paperwork and logistics, while doing a good deal of initial advising for new majors, as well as advising

freshmen students. Trousdale manages the courses and ensures that we have enough seats in courses for our majors, among many other tasks.

Data Analytics/Tracking: In the past two semesters, the department has experimented with a few modest campaigns. The audiences for these campaigns are identified using Queries in Spire and/or SSC searches.

- One campaign targets students with any kind of university hold in the weeks before registration and helps students find the correct office to resolve the hold. The university could do more to make holds more transparent—even a RAC hold as written in Spire may leave students confused about what to do next.
- Another campaign targeted majors without a concentration (the math major has seven concentrations). Generally students who have not selected a concentration within the major by sophomore year are going to be students in need of more advising. The department works with freshmen at our advising events to help them select a concentration. Upperclassmen must now choose a concentration when entering the major.
- One campaign reached out to students who did not completed the IE requirement by fall of senior year to ensure they enrolled in an IE course in the spring.
- Another campaign identified students with a low grade in Math 132. A grade of C or better in Math 132 (Calculus II) is needed for some upper level major requirements. This requirement is important because it ensures students can handle the work of a math major before embarking on the most difficult coursework. We expect this requirement will lead to better completion rates for our majors.
- Through a poll of faculty advisors, less than 50% of majors with assigned advisors came to see their advisors for Fall 2016 registration.

II. Goals for Academic and Career Advising and the Student Experience

- Become a leading department on campus in both academic and career advising.
- Ensure that all primary majors with assigned advisors attend an advising appointment before registration.
- Improve advising for our secondary majors.
- Improve advising for freshmen majors and help them choose a successful academic pathway.
- Offer a sufficient selection of courses and enough seats in those courses to accommodate both our own majors and other students who want to take those courses.
- Offer a greater variety of advanced undergraduate coursework.
- Continue building on the success of our actuarial program.

- Ensure all juniors are able to complete the Junior Year Writing class so that they gain the needed tools to locate and receive internships after junior year.
- Work toward a goal of securing an internship or REU after junior year for 90% of our majors who have a 3.0 or higher GPA and who are eligible to work in the U.S. (about 15% of our majors are international students).

III. Academic and Career Advising Action Plan

Using existing resources to improve our departmental advising:

- Require faculty to attend the faculty advisors lunch
- Make advising a more central component of the annual faculty review process.
- Make sure that all primary majors meet with their faculty advisor by placing RAC holds.
- Hold monthly career events, where alumni come to speak about their careers. We held one such event this year.
- Renew the peer-advising program for Fall 2016 and do a better job of advertising it and integrating it into other advising components.
- Achieve the Junior Year Writing goal by offering 90 seats in Spring 2016, 60 seats in both Fall 2016 and Spring 2017.
- Organize at least one Undergraduate Colloquium per semester focused on Careers in the Mathematical Sciences (modeled on the inaugural one this Spring on the theme of Careers in Mathematical Finance).
- Assign an additional faculty member to handle freshmen advising.

With additional resources:

- Assign faculty advisors to secondary majors who are sophomores and higher.
- Offer a 1-credit freshman seminar with a focus on career opportunities, professional development, and an overview of the major.
- Offer more advanced coursework in actuarial science and statistics to make these concentrations competitive with other schools such as WPI and UConn.
- Offer more opportunities for advanced coursework (and smaller class sizes) in all concentrations.

College/University actions that could facilitate successful advising in our department:

- Create a minor in business and allocate resources so students in any major can take some courses in SOM. Our students' success, especially in actuarial science, relies on complementary coursework in SOM.
- A certain number of students who declare the Mathematics major do so with the hope of eventually switching to CICS, ENG, or SOM. For those students, requiring departments to advise students on contract (PRE-SOM, PRE-ENG, etc), rather than have the student advised by unrestricted but perhaps undesired major, could relieve some of the stress we are experiencing.

- Some ideas for robust and consistent university handling of weak students.
 - Limit the overall number of repeated courses to in the student's university career;
 - Flag students for probation or dismissal based upon poor performance in any single semester, rather than using overall GPA;
 - Allow departments to request students making poor progress be removed from the major as evidenced by a universal standard, while at the same time preventing departments from creating 'students without a home', i.e., students who are blocked from enrolling in courses in their major, but who remain a major;
 - Notify departments when their majors are re-instated to the university.