

INTERDEPARTMENTAL

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To: Dave Eaton, Dean of the Graduate School
From: Ron Irving, Chair, Department of Mathematics
Subject: Response to the Report of the Ten-Year Review Committee

We are grateful for the thoughtful work done by the ten-year review committee, and for their praise of our work. We learned a lot in preparing the self-study, still more during the site visit, and more yet again from their report. We respond below to the committee recommendations in sequence.

Overarching Recommendation: *Reconsider undergraduate course section sizes and how the human instructional resources of the Department are deployed in the undergraduate program.*

Response: A major focus of the undergraduate program committee will be to take a careful look at all our 300- and 400-level courses. Let us outline our plans, which align well with several of the review committee recommendations.

We are exploring the possibility of expanding the section sizes of our 300-level service courses—Math 307, 308, 309, 324—from 50 to somewhere between 120 and 150 over the next few years. These classes are currently taught by a combination of professors, lecturers, postdoctoral acting assistant professors, TAs, and part-time lecturers. The new larger classes would be taught by professors and lecturers with assistance from TAs, similarly to how we teach calculus. Each course would be divided into three TA sections, with each student attending three lecture sessions and one TA session per week. We will experiment in this format with expanded sections of Math 308 next winter and spring. Faculty teaching the new larger classes will receive more teaching credit. We foresee several advantages to this change:

1. Fewer but larger sections of these service classes will allow us to ensure uniformity across all sections of a course and provide more control over the quality of instruction.
2. With larger classes, all taught by faculty, we will reduce the number of graduate students teaching their own classes.
3. The larger teaching credit for these large classes will provide an incentive for faculty to teach them.
4. Under the current system, students in these courses have only their instructor to turn to for help. With the addition of TAs, students can turn to both the professor and the TA, aiding them in their transition from 100-level to 300-level courses.

Recommendation #1: *Reconsider the decision to focus tenure stream faculty at the 100-level that has resulted in graduate teaching assistants dominating instruction at the 300-level. This may require a rebalancing, redesign, or even abandonment of the “point system” which drives tenure stream faculty teaching preferences.*

Response: The new model just described of large 300-level service classes with increased teaching credit would naturally attract faculty to these courses, simultaneously decreasing the number of graduate students serving as instructors for their own classes. The point system has become entrenched in our culture, but the process of preparing the self study did bring to light some of the ways in which it straitjackets us. We will look into revisions, if not abandonment.

Recommendation #2: *Consider expanding the maximum class size in all service courses, and adopting a more traditional TA-led quiz section model.*

Response: As noted, we have begun moving in this direction.

Recommendation #3: *Consider limiting the number of times a graduate student is assigned as a course instructor, to retain the benefits to the graduate student of the instructional experience, but also to protect the graduate student’s time for research.*

Response: This issue has come up in conversation frequently since the site visit. The plan to implement larger 300-level service classes would of course limit opportunities for graduate students to serve as course instructors. Progress may be slow, but we aim to move in this direction. A potential countervailing force would be further reduction by the College in the size of our tenure-stream faculty in response to budget pressures.

Recommendation #4: *Take steps to ensure that department-determined quality standards are both set and met by all service course instructors, particularly courses not taught by the continuing lecturers and tenure stream faculty.*

Response: This is an important point, one that we anticipate addressing in part through the planned revisions of the 300-level service classes. We expect to set detailed syllabi, in contrast to the current syllabi, which are more like outlines, and develop teaching materials such as homework sets to help uniformize the content. Such a system has been in place in calculus for years and has been very successful. It is much needed in the 300-level classes to ensure that students obtain sufficient background for their higher-level classes.

Recommendation #5: *Ensure that graduate teaching assistants assigned to teach service courses have access to course materials (lecture notes, sample exams, syllabi, etc.) to reduce duplication of effort, maintain quality of instruction, and protect graduate student time for their independent research.*

Response: We have material available online for graduate students (and all our instructors) thanks to the efforts of Judith Arms and Andy Loveless. Professor Arms supervises graduate students in 300-level courses during the academic year and Dr. Loveless does so in the summer. Both meet with the students before the year or quarter starts. However, beyond

the supervision these two faculty members perform, we have not done enough to ensure quality and uniformity across sections. With the changes and materials described above, we will do a better job of meeting the goals of this recommendation.

Recommendation #6: *Complete the careful comparison of student outcomes in traditional and on-line service courses that is already underway.*

Response: We have recently completed a 78-page review of the first three years of online calculus, based on data provided by UW's Office of Educational Assessment and a survey we did of TAs involved with online courses. We find that a significant number of students benefit from the scheduling flexibility offered by taking one or more calculus classes online. Data suggests that by and large students have adapted to and are satisfied with their experience. The department's ability to ensure that any entering freshman who is ready to begin calculus will be able to complete the sequence in their first year is a major bonus.

Overall, online student performance is comparable to, though a bit lower than, performance of students in regular classes, the results depending on the quarter in which a given Math 124, 125, or 126 course is taken. Online calculus grades appear to be good predictors of subsequent calculus grades; that is, online 12X appears to prepare them for 12(X+1). For both instructors and TAs, the degree of scheduling flexibility made possible by online teaching is unprecedented.

Nonetheless, there are concerns. A majority of students in online classes take them as a last resort option. Only about one-third say that they would take an online class again by choice. Many calculus students, predominantly freshmen, lack the skills to succeed without daily face-to-face reminders from instructors and TAs. The lack of a human connection with students, for both the instructors and the TAs, takes some of the passion and fun out of teaching a subject we all enjoy.

We will make use of the findings of the report, as a second wave of online instructors replaces the creators, to continue improving online instruction.

Recommendation #7: *Work with other participating departments to increase the number of student-slots in the ACMS degree program if this can be done without significantly compromising quality.*

Response: Discussions along these lines have been underway since last autumn, involving the chairs of Mathematics, Applied Mathematics, and Statistics, the ACMS director, and the ACMS steering committee.

Recommendation #8: *Reconsider the deployment of tenure stream faculty so that more are available to participate and provide leadership in instruction of the 300- and 400-level curriculum for undergraduate majors. Here again, the "point system" may need to be reconsidered.*

Response: Our 400-level classes are almost all taught by tenure-stream faculty, with the occasional participation of acting assistant professors. Regarding our 300-level service classes,

our earlier responses address this recommendation. Our 300-level non-service courses are taught by a mix of lecturers, acting assistant professors, and tenure-stream faculty. We believe the distribution of faculty for these non-service classes is healthy. Lecturers highly value the opportunity to teach these classes, complementing their work at the 100-level, and do quite well in them. We envision that the changes to the 300-level service courses will take care of most of the issues raised in this recommendation.

Recommendation #9: *Endeavor to improve the alignment of student interest in and the offerings of upper division courses (size of courses or number of offerings, as well as specific curriculum). At a minimum, the Department should attempt to meet demand by increasing the size of current popular course offerings. The addition of computational-based courses should receive consideration.*

Response: We are working on this. We are now offering more sections of our linear optimization course, Math 407—one of our most high-demand courses—than we did a year or two ago. In the coming year, we will be experimenting with parallel sections and with larger class size in order to better meet demand. We also plan to look carefully at our linear algebra classes that follow the introductory one-quarter course, Math 308. The Undergraduate Program Committee is discussing Math 340, our second course in linear algebra, and Math 464-5-6, our numerical linear algebra sequence. Our probability courses also fall under the umbrella of high-demand courses and are in need of attention.

Recommendation #10: *Attempt to improve the environment for the undergraduate majors, including the addition of mechanisms for student interaction, both academic (group work) and social. If the long-standing goal of providing a student space remains beyond reach, at a minimum some social events (“pizza parties”) should be sponsored.*

Response: We have worked hard on expanding social events for faculty, staff, and graduate students in recent years, but have fallen short in developing events for our majors. It is past time to do something.

As we discussed during the site visit, the probability of obtaining space for a dedicated undergraduate lounge is zero. But we will explore alternatives. For example, as also discussed during the visit, perhaps we can reserve a classroom on weekday evenings that majors could use to hang out, study, discuss homework, chat. If so, or even if we could find a suitable space just weekly, we could arrange for pizza to be delivered once a week. We agree that some version of this would be well worth doing. We are also in the early stages of planning an annual event for majors centered on careers in mathematics, and perhaps other events as well.

Recommendation #11: *Revisit the language exam requirement in the graduate program. Despite the recent reduction from two languages to one, this remains an artificial hurdle in the program that as currently administered appears not to be offering benefit to the students.*

Response: This recommendation surprised us, since we thought the steps we took a year ago to reduce the language requirement from two to one served precisely the purpose stated:

to remove an artificial hurdle that appears not to be offering benefit to the students. When we investigated this, we found that most of our peer public institutions (14 out of 19) required one foreign language, so our new requirements were in line with peers. We also allow students to use a computer language instead of a foreign language, which we believe provides flexibility and adds value. In light of this recommendation, the Graduate Program Committee will review the current requirement next year.

Recommendation #12: *The average time to the Ph.D. degree is 6 years. This is in line with comparable institutions but an effort could be made to reduce it to 5–6 years.*

Response: We agree, and we hope that our recent streamlining of the preliminary exam system will serve this very purpose. We will monitor the results and keep on the lookout for other ways to reduce time to degree.

Recommendation #13: *Reduce the teaching load of graduate students. Graduate students leading the teaching of 300- and above level courses should be the exception and not the rule.*

Response: The time required for a graduate student to teach one of these classes is about the same as for other TA jobs, but we have failed to take into account the added responsibility of teaching one's own class. We agree that we should reduce this burden on graduate students, and we anticipate that the planned changes in how we teach our 300-level service classes will help us to achieve this goal. We do believe that teaching one's own class is valuable preparation for an academic career, so we will continue to ensure that some opportunities remain available.

Recommendation #14: *Connect the graduate student cohorts in the Department of Mathematics and the Department of Applied Mathematics.*

Response: We do this to a very limited extent through the hiring of Applied Math graduate students as Math TAs, and through joint courses, but we have not developed any systematic way of connecting the cohorts. This is well worth pursuing. We will discuss possibilities with our Applied Math colleagues.

Recommendation #15: *Skype interviews could be considered when recruiting graduate students.*

Response: This is an excellent idea, albeit daunting, with 350 applicants each year. We may start smaller, for example by conducting Skype interviews with the admitted candidates. This would have the benefit of helping us to decide who should receive our recruitment awards.

Recommendation #16: *Consider launching a professional masters degree program anchored in the Department of Mathematics and possibly bridging with other professional masters programs offered across campus with an optimization flavor.*

Response: Several of our faculty members are strongly interested in this possibility and have begun preliminary discussions about it.

Recommendation #17: *Work with the administration to create a plan for the renewal of the tenure stream faculty, continuing the collegial process of strategic planning in parallel with opportunistic hiring which has served the Department well.*

Response: We fully agree with this recommendation. As documented in our self-study, the age distribution of our tenured faculty is top heavy, and the execution of a realistic renewal plan is crucial for the continued success of our department. We recognize, given the gloomy budget outlook for the College of Arts and Sciences in the upcoming years, that planning along these lines will be difficult. But we are willing partners, and we look forward to discussing this soon with the new natural sciences divisional dean.

Recommendation #18: *Consider offering to the postdoctoral associates a title other than “Acting Assistant Professor”, such as a title including the name of a great mathematician associated with the University.*

Response: We are bound by university code to use “acting assistant professor,” an awkward title at best and one we would happily eliminate. Nonetheless, perhaps there is latitude to attach in a less official way the name of a mathematician associated with our department’s history. We agree that this would be beneficial and will explore the possibility further.