

External Review Report

**Mathematics Program
Department of Mathematics and Computer Science
Western Carolina University**

March 3, 2015

External Reviewers

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Department of Mathematical Sciences
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1. Introduction

a. **Visit by Review Team**

The external members of the review team arrived on Sunday afternoon March 1, 2015 and departed at 2:00 PM on Tuesday, March 3, 2015.

b. **Meetings conducted by the review team**

Monday

- Breakfast with Carol Burton, Associate Provost for Undergraduate Education, and Allison Morrison-Shetlar, Provost.
- Meeting and tour of Math Department and Facilities, Jeff Lawson, Department Head.
- Meeting with Richard Starnes, Dean of College of Arts and Sciences.
- Working Meeting of Review Team
- Meeting with students Tyler Allen, Anthony Benavente, Aidan Grennell, Andrew Latham, Aaron Moose, and Margaret Pearce.
- Meeting with Department faculty Risto Atanasov, Mark Budden, Sloan Despeaux, Axelle Faughn, Cory Howk, Kathy Jaqua, Erin McNelis, and John Wagaman.
- Meeting with Computer Science faculty Scott Barlowe, Mark Holliday, and William Krehling.
- Break for Pi Month Opening Celebration
- Meeting with Nory Prochaska, Director, Math Tutoring Center.
- Meeting with Mathematics faculty Julia Barnes, Geoff Goehle, and Nathan Borchelt.

Tuesday

- Meeting with STEM faculty Brian Dinkelmeyer, Organic Chemistry; Enrique Gomez, Physics; and Peter Tay, Engineering and Technology.
- Working meeting of Review Team
- Exit Meeting with Jeff Lawson, Richard Starnes, Allison Morrison Shetlar, Carol Burton, and David Onder.

II. Analysis of Program

a. Undergraduate Program

The review team was very impressed with the three options (Traditional, Applied, and Mathematics Education) for undergraduate curriculum. All of the curricula are a nice blend of many traditional mathematics courses with some more modern courses (such as the required MATH 340 Introduction to Scientific Computing class). The curricula have obviously been closely aligned with the 2004 Mathematical Association of America Committee of Undergraduate Programs (CUPM) Curriculum Guide and seem to meet all six of the recommendations outlined in the report.

While the number of majors as a percentage of the student body is above national averages (the NSF found in 2004 that 0.7% of college students major in mathematical sciences) the department seems concerned about increasing the number of majors. This is particularly true since two of the main programs for recruiting high achieving students, Teaching Fellows and the 4+1 program, are no longer options. The review team felt that the department should consider bringing back the actuarial option in an attempt to recruit more students. This option would not require the addition of any new classes and has the potential of attracting high achieving students with a strong mathematical background. In our experience some of these students change out of this option to other math majors but the option is still a good recruiting tool. Another suggestion to attract more students might be to incorporate data analytics into some of the course offerings. Again this may not be as much of a change in offerings as a change in the description of what is covered. The department had also mentioned that they were considering adding a senior thesis option as an elective for students interested in expanding on the capstone project they begin in the Senior Capstone class. This seems like it would further build on the strength that seems to be developing in undergraduate research and generate more credit hours from undergraduate research work that is going on. This could also turn into a recruiting tool for stronger students as they may be looking for a school where you can do research with a faculty member as an undergraduate.

The review team was highly impressed with the student-centered focus that the department demonstrated. We heard about numerous activities for students to be involved with faculty in both formal and informal situations and were very impressed with the faculty's work to get students involved in undergraduate research both on campus and through REUs. We also got to see some of the informal activities as the department kicked off "Pi Month" while we were there.

If there was a problem in the undergraduate program, we felt it was in the initial placement of students into their initial math classes. Currently the placement is done completely on the basis of SAT scores with a new system based on SAT scores and high school unweighted GPA is being developed. In today's environment with the strong emphasis on "Finish in Four," freshman retention rates, and persistence to degree, getting students placed into courses where they can succeed but also not delaying their time to graduate is more important than ever and can have pretty major financial implications for the university. We recommend at least exploring some sort of

placement testing like Aleks PPL or some others to see if you can improve student success in these entry level courses.

Another challenge that the department will be facing in the near future is dealing with the math courses that will be required of the engineering students at Biltmore Park site. Maintaining the quality of educational experience provided on campus in a daytime program at a remote site can be difficult.

b. Graduate program

While the graduate programs in the department were cut during the recent program prioritization and the last one is being sunsetted this semester, there seems to be interest in some of the client disciplines, definitely engineering and possible chemistry, of having their graduate students take graduate courses in the mathematics department. If interested the department should explore these options with these departments.

There are some other issues related to shutting off the supply of graduate students in the department. One of these issues is the staffing of the Math Tutoring Center. This center provides free help to students in introductory math courses and is a key to student success in these courses. Currently each graduate student who is teaching a class spends 3-4 hours per week working in this lab and providing experienced tutoring while beginning graduate students who are not teaching work in the lab for 15 hours per week. In addition to this more experienced graduate students provide TA's in some of these same introductory courses. Finding replacements for them, as well as the graduates who stay and teach part time for a while could be difficult.

III. Analysis of Faculty

The thirteen tenure-line faculty members in mathematics are a productive, dedicated group of teacher-scholars as evidenced by their effective instruction, prolific scholarly output, and strong dedication to the success of their students. The four fixed term faculty members also supply excellent teaching in the lower level service courses.

The review team was very impressed with the diversity of interests, mathematical specialties, and teaching interests of the faculty but the common shared almost fanatical devotion to student education and engagement. Faculty members have a broad range of mathematical specialties, including mathematics education, statistics, graph theory, number theory, group theory, complex analysis, functional analysis, dynamical systems, mathematical biology, mathematical physics, and the

history of mathematics. This is quite an impressive list for only thirteen faculty members. Several faculty members mentioned the respect for a diversity of ideas and teaching methods as a real strength of the department and several students mentioned how committed various faculty members were to their education and success. The faculty also had an impressive record of scholarship including an impressive record of involving students in their research. One area that seemed a bit lacking was the number of proposals for external funding. The review team felt in particular that proposals to fund activities involving students, either scholarship and pipeline projects such as the NSF SSTEM, STEP, or Noyce programs, or programs to encourage undergraduate research such as REU programs might be successful in the department. If the department wished to encourage such activity they may wish to put clear language supporting well reviewed but unfunded proposals in the DCRD.

Staffing levels have to be watched closely as the graduate program is eliminated. Estimates are that there will be a net gain of about three more courses that will need to be covered as there will be no more graduate students to teach some of the lower level courses.

While some of the review team members, namely those from outside of the discipline, felt that the Department Collegial Review Document (DCRD) was vague, the members of the department that we talked to, including several that had been tenured under this document, felt it was sufficient and did a good job of holding faculty to standards while also allowing a wide variety of creative activity. The review team came to the conclusion that it seemed to be doing its job and felt no revision was necessary. In general the whole process of appointment, reappointment, tenure and post tenure review seemed to have clear guidelines and work very well.

IV. Analysis of Operational Facilities and Budget

Faculty salaries seem to be uniformly low. Given the situation in the state over the last several years that is not surprising, however there seems to be a great deal of salary compression and a few inversions that should be addressed. The operating budget of the department seemed to be sufficient to carry out the work expected. Faculty seemed to feel that sufficient travel money was available if one knew where to look and apply for such funding.

The physical facilities the department uses seem to be nice and well utilized. While there is sufficient space now there does not seem to be space for growth which could become a problem. Some of the faculty, in particular some of the math education faculty, mentioned the lack

of properly working classroom technology, in particular malfunctioning Smartboards and a lack of classroom sets of handheld graphing technology. It was also noted that the space for the Math Tutoring Center was nearing its capacity and that with any additional usage from more student growth there would be a need for more space. This will be tricky as the location of the center in close proximity to faculty offices is a great advantage as it allows tutors to get help or clarification from faculty on assignments or concepts very easily.

V. Summary of Program Strengths and Areas for Improvement

- Composition of faculty and their caring for and commitment to the education of their students is exceptional
- Strong programs with good curricular balance of traditional and modern topics.
- Good customer service to all clients, both students and other disciplines.
- Tutoring center and its incorporation into the department.
- Challenges
 - Evolving beyond grad program
 - Biltmore Park programs
 - Growth in client disciplines
 - Placement and remediation
- Opportunities
 - Actuarial Option
 - Analytics

VI. Summary of Recommendations for the Department

- Request a new tenure-line position in mathematics.
- Resurrect the actuarial science option, and consider an analytics/big data option or theme.
- Ensure that mathematics instructors for the Biltmore engineering program are stakeholders in the WCU Mathematics Department.
- Adopt a placement/remediation tool such as ALEKS PPL.
- Advise terminal mathematics students to take something other than MATH 130 (College Algebra). Other more suitable options include MATH 101 (Mathematics Concepts) or MATH 170 (Applied Statistics).
- Apply for grants that aid recruitment, such as NSF SSTEM, STEP, and Noyce grants.
- Add language to DCRD indicating that unfunded grant proposals with good reviews will be valued.
- Add a senior thesis option.

VII. Summary of Challenges for Administration

- Establish a new tenure-track faculty line in mathematics.

- Address salary compression and inversion.
- Supply additional funding for furniture and instructional technology (e.g., smartboards).
- Be cognizant of the fallout from the loss of mathematics graduate programs, such as
 - MTC staffing
 - Loss of 4+1 recruiting tool
 - Loss of local supply of mathematics instructors with ties to WCU