

Program Review  
Mathematics  
Institutional Response (draft)  
June, 1996

The Department of Mathematics is a vigorous unit that seems to apply careful thought to the discharge of its many missions. A number of wise decisions and consequent successes are visible in this self-study report.

The Department has a huge service teaching load in that nearly half of Colorado State students require math instruction up to the level of calculus. In addition, it has a large number of majors at both the undergraduate and graduate levels.

In response to these demanding conditions, the department has become extremely efficient in the production of educational services. Commendably, the Department has compared itself systematically with other quality mathematics departments around the country. Our faculty have higher teaching loads than their counterparts elsewhere. Thus, Colorado State spends less in faculty salary dollar per math course registration than any other peer institution. Relatedly, more math degrees are awarded per department faculty member than all but two of this group of schools. In short, the level of efficiency is dramatic.

This result is not regarded as altogether desirable, however, as it is thought to have been purchased at the price of instructional quality.

Perhaps also in the interest of efficiency (certainly it is likely to produce more bang for the buck) the Department has determined to concentrate research efforts in only two substantive areas. The general thrust of the Department in "Computational Mathematics" gives it a very distinctive character and a focus of excellence.

The department seems to favor innovative instruction. It has experimented with "student-active" teaching formats and it is presently engaged in reform of its undergraduate courses in light of best national practice. The Individualized Mathematics Program is of long standing, but it has undergone continual updating and revision. The basic system recently underwent external review and received enthusiastic validation from education professionals.

As part of a program to evaluate instructional quality, the department asked a sample of students to prepare portfolios of materials relevant to their profession as mathematicians. This interesting procedure yielded information not normally available--most importantly, deficient writing experience was revealed. This in turn led to some curricular revisions.

The Department also seems sensitive to broader management issues. For example, the self-study notes that half of the department is nearing retirement age. A long term, broad gauge staffing plan is contemplated along with all the problems and opportunities that presents.

Goal 1: Teaching and Advising--The self-study seeks to demonstrate quality undergraduate outcomes through fairly standard means. ASCSU course evaluations show very strong

satisfaction on the part of students. An interesting feature of this result is that courses taught by GTAs are nearly as well received as those taught by faculty. This the department attributes to careful selection and training of the graduate students. Data from a specific Math Department survey confirms these results and shows that satisfaction extends across several dimensions of the educational experience.

Little additional evidence is presented. Placement data are incomplete though there are some anecdotal reports that professionally placed students rapidly advance to leadership positions. Since math students enter with rather high admissions index scores, one would expect that they would earn special recognitions of various kinds during and after their college careers. We have no indication of outstanding professional accomplishments nor do we know whether any of the 15% who attend graduate school won prestigious fellowships or were admitted to the very top programs. The self-study would be stronger for the inclusion of such information.

Among applicants to this department, average GRE scores have been rising over time. Moreover, Math graduate students at Colorado State have higher GRE scores than the national average. The Department draws from a reasonably high level in the nationally available applicant pool and this is highly commendable. These students appear quite satisfied with their educational experiences as revealed by the ASCSU standard course evaluations and by a specific Math Department survey.

On the output side, we are informed that all of the PhD graduates of the Department are appropriately employed and that two of them have prestigious post-docs--one at MIT and the other at Michigan. This is indeed impressive and the department should be very proud. However, it is unfortunate that we have no placement data on the MS graduates nor do we know what professional or academic distinctions they may have achieved.

Goal 2: Research--The faculty are very active in research. In an impressive piece of comparative analysis, the department has compared its grant and contract income with ten extremely credible peer departments around the country. The per-faculty member annual grant dollar figure, \$25,370, is third on the list. The professional accomplishments of which this figure is presumably a manifestation are shown in other ways. Faculty have been invited to give some 68 invited lectures at other universities during the review period.

Further, during a recent Program of Research and Scholarly Excellence nomination exercise, external assessments of the research program in Applied/Computational Math were solicited. The experts who provided the reviews were top-ranked mathematicians from around the nation and their comments were universally laudatory. This is a significant component in the external validation of this department's claims.

The recent NRC ranking of doctoral programs did not place the department highly. This may be disturbing, but it may also be explained by the fact that the expertise of our department is not in the conventional theoretical mainline.

Interestingly, the self-study makes no mention whatsoever of the faculty's publication record. In an archival discipline, this is difficult to understand. The self-study is greatly weakened by this lack.

Goal 3: Outreach--The Department has a large and appropriate outreach mission. Most importantly, perhaps, there is extensive participation in the training of secondary school math teachers. There are a number of projects and many are externally funded. They include pre-service training, workshops, and curriculum revision work. The volume of these projects, the demand for them among the secondary education community, and the funding they have attracted all testify to a quality operation.

Goal 4: Community--Departmental programming for faculty or student development is not addressed in this self-study. One wonders whether there is any systematic attention to the mentoring of younger faculty members. Especially as retirements and consequent new hires are on the near-term horizon, it might behoove the department to begin serious planning on this dimension.

Student enhancements are also not discussed. Are there undergraduate math clubs? Most importantly, perhaps, are graduate students given appropriate professional socialization? There is no indication, for example, that they are routinely involved in the research program of the faculty.

The department's diversity effort has apparently been confined to gender. Appropriately, women have recently been hired as faculty and the number of women in the graduate student population is robust. While the Department should be pleased by these results, it cannot really use them to justify inattention to ethnic diversity. Plans on this latter dimension should be developed soon.

Goal 5: Resources--While the department's budget has recently stabilized, there is concern over the additional staff perceived as necessary to address quality issues. Considerable sums would be necessary to do what the department desires. It is a bit difficult to guess how these concerns will be resolved as the Dean of the College has declined to participate in this program review exercise.

Conclusion--The Math Department is energetic and thoughtful; it has come a long way during this review period and has a number of successes to show. The future, especially with estimates of large enrollment increases, seems clouded. Given the thoughtful approach exhibited in the past, however, one might expect a continuing record of success.