Results of Undergraduate Mathematics Degree Study

In November 2006, I performed a three-part study on the undergraduate degree requirements of the Department of Mathematical Sciences, focusing on the Maths-Application degrees (excluding the Single Subject BA, and Statistics BS). The goal was to assess these requirements, and motivate possible reform. The three components consisted of:

1. Surveying people on their perceptions of our current requirements.
2. Comparing our current requirements with those of peer institutions.
3. Comparing our current requirements with those of other departments in the SDSU College of Sciences.

This report will briefly summarize the findings of this study, and suggest some possible further directions.

Perception Survey

An online survey was run, to determine satisfaction with our current requirements. There were 44 respondents; these were divided among faculty, undergraduate students, and graduate students. A copy of the survey questions, as well as more detailed results and analysis, are available online, at:

http://www-rohan.sdsu.edu/~vadim/survey.html

As illustrated below, there is widespread dissatisfaction among the faculty respondents with our current requirements\(^1\). Of particular note are the various BS emphases; between 80% and 100% of faculty respondents recommended change.

![DMIS Major Requirements Survey (Faculty Only)](image)

Although the call for change was strong, unfortunately the respondents were inconsistent about what precisely needed to be changed. The only change frequently recommended is the removal of 534B (Advanced Calculus II) from the list of required courses in the Applied Mathematics and Science emphases.

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\(^1\) A similar pattern was observed in non-faculty respondents.
Peer Institution Comparison
In an attempt to satisfy the faculty call for change, I executed a detailed comparison between our undergraduate requirements and those at peer institutions. 25 peer institutions were involved in this study; 19 were chosen by the California Postsecondary Education Commission as peer to the CSU system, and the remaining six were the six largest other CSU branches. 57 degree programs were identified as being similar to one of the degrees we offer.

The key finding is illustrated below. Our department requires a very large number of units of mathematics/statistics courses (both specific requirements and electives) for a degree, by comparison with our peer institutions.

![Degree Requirements, Math/Stat courses only (25 peer institutions)](image)

Elementary economics suggests that if we reduce the cost of a major (in units/courses) then the sales (number of students declaring our majors) will increase. This has the potential of increasing our FTE’s; although each individual student may take fewer courses, this can be more than compensated for by a larger number of students. Lacking concrete data, this argument is speculative. However, the data do clearly show that any student comparing our major program to one at a peer institution will be pressured away from ours, based on our relatively high costs.

A substantial impediment to reducing the number of units required for our degrees are (rather high) SDSU-wide requirements of 24 upper-division units for a BA degree, and 36 upper-division units for a BS degree. However, these units need not be within the department in question. Therefore, we can reduce the cost of our degrees by permitting more flexibility in our elective requirements. We can reduce the BA requirements from 27 to 24 upper-division units. Finally, we can reduce the lower-division requirements.

College of Sciences Comparison
The final component of this requirement study was to compare our lower-division requirements with those of other degrees within the SDSU College of Sciences. The focus was entirely on number of lower-division units required from within the department (or a closely related department, such as astronomy/physics or mathematics/statistics). Fourteen other degree programs were identified for comparison (several interdisciplinary programs were excluded).

The key finding was that our department has very high requirements, as the following graphic illustrates. This serves to discourage undecided students from selecting one of our degree programs. If the Department of Mathematics and Statistics were impacted (as are several other degree programs in the College of Sciences), this would be a desirable consequence. Instead, it not only hurts us but also hurts our fellow, impacted, departments by sending our potential students to them.
While this problem admits no complete solution (e.g. calculus will always be 3 semesters of required lower-division courses), it can be ameliorated somewhat by reconsidering the lower-division mathematics requirements. They can be promoted to upper-division required courses (concurrent with a reduction in the number of required electives), or they can be combined with other mathematics courses (e.g. 245 OR 254), they can be combined with courses from another department, or they can be removed entirely from the list of requirements.

Further Directions

The following list of suggestions are the most clear-cut outcomes of the study. Please note: I am not advocating making these, or any, changes. They are merely suggested by the study; any changes would require careful consideration of consequences and effects on other interested parties.

1. Remove 534B from the list of required courses in the BS-Applied Math, BS-Science emphases.

2. Reduce the number of electives required for the BA by one.

3. Increase flexibility in upper-division courses to permit more courses outside of the department. For example, permit upper-division courses in the BS-Applied Math Auxiliary Area to be part of the 36 upper-division units for the major.

4. Reduce the number of lower-division requirements. This can be done in several ways; the courses may remain required but become upper-division, or may be eliminated or given as an option, perhaps with a course outside the department. For example, permitting PSY 270 / BIO 215 / ECON 201 / etc. instead of STAT 250.

The only outcome that I am prepared to advocate is the creation of a curricular assessment task force (distinct from the assessment committee and the curriculum committee) to study these and similar issues. The online survey has revealed that our faculty senses the need for such assessment and reform; anecdotally, this has not been done in many years.