

Review Report of the Undergraduate Program in Mathematics at CSU Channel Islands

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December 11, 2008

A review of the Undergraduate Program in Mathematics at California State University Channel Islands (*the program*) was conducted over a 2-day visit of the campus on November 4-5, 2008, by the authors of this report. The present report is based primarily upon 1) careful consideration of the Mathematics Program Review prepared by Program Chair Ivona Grzegorzcyk and others, and 2) the site visit, which included discussions with mathematics faculty members Geoffrey Buhl, Jesse Elliott, Jorge Garcia, Ivona Grzegorzcyk, Kathryn Leonard, Cindy Wyels, Roger Roybal (lecturer), and James Sayre (visiting A.P.), as well as Provost Dawn Neuman, Dean Ashish Vaidya, Stephen Lefevre (AVP for Academic Affairs), and Math Club President Jaime Morrison (and other Math Club members). Our review is also informed by classroom visits to a number of ongoing mathematics classes; by a visit to the Mathematics Club and attendance at the weekly undergraduate and graduate mathematics seminars; by our experiences at our own institutions (a large urban public state university, and a medium size private comprehensive university with a liberal arts emphasis; and by our participation in discussions of undergraduate mathematics education at regional and national conferences and in professional publications.

During the visit, many strongly positive and valuable aspects of the program were observed and identified. A summary of these points follows:

1. Visits to five mathematics classes while in session provided strong evidence of a high degree of dynamic faculty-student interaction in the classroom. All faculty observed were adept at engaging their students actively in the learning process
2. Judging from the material presented in the program report and from our conversations with faculty members, it is apparent that all are actively engaged in research. Although the size of the full-time mathematics faculty is relatively small, research engagement at the 100% level is unusual in a CSU system school, and is to be applauded.
3. The program has a very active group of mathematics students. Even though those that we interviewed are from a self-selected group—the Math Club—we learned that their activities are well-received and strongly supported by the faculty. The existence of and strong participation in the undergraduate seminar also supports this observation. The commitment of the students and faculty to participate in the Putnam Exam is to be commended and supported, and if the students do not already participate in the Mathematical Contest in Modeling (MCM), they should be encouraged to do so. The role that the Math Club plays in encouraging and preparing students to apply successfully to graduate schools is also to be commended and supported.
4. The students are well-supported financially by the university. For example, their trips to present work at various conferences, both locally and across the country, were supported to a

large degree by the university. We believe this kind of support should be continued and even strengthened whenever possible.

5. The faculty members are also well-supported by the university, enjoying a salary structure at a considerably higher level than their sister campuses. Most if not all faculty seem to have an effective teaching load of 6 units per semester, with re-assigned time stipulated by the Program Chair in conjunction with the administration. While this is to be envied by faculty at other CSU campuses, the reviewers believe that this kind of support is absolutely crucial for faculty to maintain the level of research that they do. It certainly seems to be the case that the time that Chair has reassigned from teaching duties is being used wisely in the area of research. In addition, the support of the part-time faculty is equally impressive, both in terms of their advanced pay rate, and because of the benefits that accrue with a minimum of six units taught per year.
6. The web pages for the program are up to date, and very thorough and complete. The persons responsible for the content are to be commended. In particular, the easy access to the learning outcomes and the comprehensive nature of the textual and visual information available from the home page are exemplary, and will serve as a model for at least one reviewer in future updates on his home institution's departmental web pages

In addition to these positive aspects of the program, there were also a number of issues that were areas of concern, which are identified below (not prioritized), along with recommendations for addressing these concerns:

1. The program self-study report indicates that 79% of the courses in the program are taught by non-tenure track faculty, the highest percentage among all programs at CSUCI. While employment of a large number of part-time and non-tenure track faculty provides a clear and direct economic advantage for the university, the reviewers feel that in the long term, such a policy has detrimental effects for the education of the students. Ultimately, the passion for the subject area and engagement in all modes with the students are optimized through full-time tenured faculty. *Given the relative size of the FTE count in the mathematics program as compared to other programs in the university*, there seems to be every justification for addressing this issue quickly, even as it is understood that this is a complex issue, due to the presence of distinct unions for both full-time and part-time faculty.

Recommendation: Reduce the percentage of mathematics classes taught by part-time and non-tenure track faculty significantly in the very near future.

2. The hiring process at CSUCI is rather unique in the CSU system. The reviewers understand that its roots are in the vision of promoting interdisciplinary collaboration, and also understand that commenting on the hiring process may seem to be out of the scope of the current review. However, both reviewers worry that the hiring procedure is likely to put certain branches of mathematics, if not the entire discipline, in a disadvantaged position when it comes to faculty hiring, as well as demoralize all faculty involved in the hiring process across the university. Competition among candidates for a single mathematics position is expected and healthy. Competition for one position among many disciplines is potentially divisive and demoralizing. Transparency in the dean's and provost's office with respect to hiring procedures and current progress information throughout the hiring process is vital, although not necessarily a feature of past searches.

Recommendation: Revisit the hiring process with a view toward more of a process whereby new positions are granted to programs and competition is limited to within a single discipline. By all means retain the participation of other faculty outside the hiring program in order to achieve the goals of the interdisciplinary vision.

3. It is the understanding of the reviewers that regular faculty meetings of the mathematics faculty are not scheduled, other than an initial meeting at the beginning of each school year which is mostly for disseminating information. Decisions are made mainly via email exchange and informal discussion between faculty members. Although this approach may itself to efficiency, as the program grows, consensus-building on various issues will become much more important, and the current approach will no longer be adequate. It seems to be the case that some faculty would much prefer the opportunity to sit down and discuss issues face to face with the larger group, but for whatever reasons, the Chair may not be aware of this.

Recommendation: The Chair should create a regular meeting time for mathematics faculty meetings, on a schedule of at least once per month (perhaps with an alternate second date in the month when necessitated by current business), and should issue an agenda in advance of each meeting, populated by issues both from the Chair and from faculty solicitation.

4. The classroom environment / geometry is an issue ubiquitous throughout the buildings used for teaching mathematics classes. Students need classrooms and labs that are better suited for learning mathematics. The classrooms observed were all rectangular in shape, with the long side disproportionately longer than the short side, making it difficult to see the front whiteboards from the rear of the room, or to see the side boards when not seated perpendicular to that section of board. Most classrooms had walls available where more board space could be utilized, but was not, and some rooms simply did not have adequate

boards or space, and should not be used for teaching mathematics. In addition, pillars in many of the rooms obstruct students' views of the boards. Finally, students complained of intolerably hot temperatures in classes in the Bell Tower in the early part of the academic year, which at some point transitions from a comfort issue to a learning issue.

Recommendation: When buildings on campus are remodeled or built anew, work closely with the architects to provide better aspect ratios for the rectangular classrooms. If possible, remodel existing classrooms by moving non-load bearing walls. Install more whiteboards in all classrooms where space permits, and reschedule mathematics classrooms out of rooms without adequate board space. More than almost any discipline, it is vitally important in mathematics to have as much board space as possible, not just for effective exposition by the faculty, but for active participation by students during classes. Expand computer labs to larger rooms with more workstations, or provide more computer labs. If possible, i.e., if non-load bearing, internal pillars should be removed. If air conditioning is impractical in the older buildings on campus, such as the Bell Tower, at least consider standing fans or other temporary cooling devices for rooms for the last hot days of summer.

5. The computer labs visited seemed to be impacted in terms of space and time usage. The library computers are listed as a computing resource, but the environment there is not conducive to collaborative work, and during the day, the computer labs utilized by the program seemed to be fully engaged throughout the day. It did not appear that it would be an easy task for a couple students to just sit down in front of computers (near the Mathematics Program) and work amongst themselves on problems in a collaborative setting, nor did there seem to be any place devoted specifically to mathematics students "hanging out" to just talk shop and socialize with each other. This is a critical need for mathematics students to strengthen their sense of community within the discipline.

Recommendation: Identify space for another computer lab somewhere near or within the Mathematics Program (without any classes scheduled into it) that could be utilized mostly (but not exclusively) by mathematics students. Also, set aside space for math and science students to discuss problems and socialize, with a few computers as well. The computers in those areas should be equipped with the specialized programs that math and science students need.

6. In reviewing the self-study and talking with faculty, it did not appear that there was any systematic effort to track alumni. The reviewers feel that it is vital to have a database with such information kept locally within the program, for any number of reasons related to recruiting, assessment, grant-writing, external funding, and simple communication.

Recommendation: The program should build, perhaps with the help of admission and records, a database of their alumni.

7. The program offers a large number of concentrations (10), and the rationale behind offering such a selection with such a small program was not clear. The reviewers have some doubts as to the feasibility of providing such a cornucopia of topic areas and their attendant courses with only six full-time faculty, nor is it even clear that enough courses are offered on a regular enough basis that students can actually complete a concentration in any of the 10 areas.

Recommendation: Reconsider the list of concentrations with an eye to deciding which are absolutely essential to the mission of the program and can be offered frequently enough to be practical options, and then reduce the total number of concentrations accordingly.

8. There does not seem to be any course specifically designed to teach students the fundamentals of mathematical proof writing. Such a course will help students through the lower-to-upper level course transition, and is prevalent across undergraduate mathematics programs. Currently, it seems that valuable time is being taken up in several different courses to teach the concepts behind proof devising and writing on a need-to-know basis. In the opinion of the reviewers, this type of treatment is both inadequate and abusive of the time necessary to devote to content in the other upper division courses (which is pretty much all of them) requiring proofs of students. It is a pivotal gateway course required early on for all mathematics students at both home institutions for the reviewers.

Recommendation: Institute a degree requirement of a “bridge” type proofs course, Introduction to Proofs, Introduction to Abstract Mathematics, something of this sort, as soon as possible. It should be required, should be taken after a year of calculus, and should be taught by the best teachers in the program, as it is a make-or-break course for undergraduates desiring to obtain a degree in mathematics. It may be worth considering replacing the MAT 230 Logic course by such a transition course, which would normally include a significant component in logic.

9. MAT 399 is operated as a “lab” tag on various courses. Such a format has value in its flexibility, but since students are given university credit for this course, as a matter of principle, students should be required to attend the class, which is currently not the case.

Recommendation: Enforce attendance in MAT 399 courses. Try to find out why students do not attend, and restructure the content of the various sections so that students will have a good reason to attend. If the course is a glorified study hall, do not give graduation credit for it.

10. Faculty members have expressed a concern of other programs offering courses that fulfill various “mathematics requirements” without consulting the mathematics faculty in advance. This is not collegial and can lead to many problems down the road. Dialog between programs is the key regarding this kind of issue.

Recommendation: Work with the university administration and governance bodies to make it clear that decisions involving the use of courses outside of the direct purview of the Mathematics Program must not be made without direct consultation with the mathematics faculty. This principle applies to all programs within the university.

11. Assessment of student learning outcomes is an ongoing program task. Nine goals are set for the program graduates; three of them were assessed in the 2005-06 academic year, and two more in the 2006-07 academic year. The program assessed the goal:

Demonstrate knowledge of some of the current applications of mathematics in the sciences, industry and/or education.

by evaluating students’ performance in MAT 492 (Internship). However, this method did not fully cover the population needing to be assessed, since not all students are required to take MAT 492. Moreover, it seems that this assessment strand was dropped in the 2006-07 academic year. The reviewers also have doubts regarding the completeness of assessing the goal above just by evaluating student presentations in Senior Colloquium (MAT 499), since their projects may in fact involve only pure mathematics, and may not at all demonstrate knowledge of applications of mathematics in other sciences and industry.

Recommendation: Determine an assessment scheme that will effectively evaluate the state of knowledge for this learning outcome for all mathematics majors, even those whose focus is on pure mathematics.

In the 2006-07 academic year, the following goal:

Demonstrate problem solving skills by applying mathematical ideas and methods in various contexts and situations.

was assessed by analyzing students’ answers to a “Math Application Problem” in every math course satisfying a GE requirement. Since GE courses have students in different majors, the results do not indicate whether the goal was achieved or not for mathematics majors. Also, it is puzzling to the reviewers that the very same question was administered to students of various and wide-ranging skill levels.

Recommendation: As has already been hinted at in the program self-study report, more thought should be given over to assessing this goal. A one-size fits all solution is not a solution.

Learning outcome #3, “Demonstrate the ability to understand, evaluate, and create mathematical proofs”, does not seem to be sufficiently evaluated by a checkbox on the assessment form currently used.

Recommendation: Utilize more detailed analysis of performance in a new “proofs” class to evaluate this outcome.

The following are miscellaneous observations which did not necessarily merit the attention of a formal recommendation:

- The lack of a formal title and structure of “Mathematics Department”, while clearly an intended outgrowth of the very nature of the philosophy in the creation of CSUCI, appears to potentially put CSUCI at a disadvantage in applying for external funding, and might well be reconsidered – this applies to other programs as well.
- It seems a bit odd to require a History of Mathematics course of all mathematics majors, which is apparently the case because it meets certain GE requirements, and yet there are very, very few mathematics curricula that would *require* a such a course, and students might be better served mathematically with an elective of their own choosing and closer to their own individual interests.
- There seems to be room for improvement in terms of the mathematical depth of the work done in the MAT 499 (Senior Colloquium) and MAT 492 (Internship) courses.
- The fact that many courses need to be offered both during the day and at night seems to be problematical in terms of their scheduling and being able to offer a sufficient number of them. Would it be possible to offer the night classes less often?
- Syllabi: a few syllabi seemed to be missing the list of learning outcomes, and several of them were skimpy on descriptions of topic lists. Perhaps a departmental review of all syllabi, (particularly) including those of part-time and non-tenure track faculty, is in order?
- There were cases cited of faculty having to wait for months, and in some cases, over a year to have mathematics software installed on their office computers. Apparently every college and university has IT complaints, however, this state of affairs does not rationalize such delays, and the Program Chair should take steps to nudge IT into a more cooperative mode of operation.

- It should always be the case that the Learning Resource Center (Math Tutoring Center?) in the library should always have tutors on duty who are capable in helping students with mathematical difficulties at all levels. It appeared that since recent changes in the operation of the Center, this has not always been the case, to the detriment of students in the Mathematics Program.

In conclusion, the reviewers would like to express their opinion that the Mathematics Program at CSUCI is staffed by a wonderful and extremely capable group of core tenured or tenure-track faculty, enjoys student-faculty relationships that would be the envy of many other schools, enjoys resources (in some specific areas) that outstrip those of their colleagues at other schools, and despite ongoing (and sometimes serious) growing pains arising from the newness and unique character of the school, is privileged to enjoy a tremendous amount of potential for future strengthening and expansion of a high quality program. In addition, the reviewers would like to express their gratitude for the hospitality extended to them by the Mathematics Program and CSUCI, and especially to Kathy Mushashi for handling all the logistical arrangements with a masterful hand. Both reviewers felt that the visit was fruitful, and were very pleased to have the opportunity to meet with colleagues both in work and social settings to help them develop their program, as well as learn many things that may well prove useful within their own home departments.