

Mathematics Program Action Update 2006

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August 2006 Update on Mathematics Program Goals 2004-2009 and External Program Review Recommendations of Spring 2003

The following is a cumulative list of the goals proposed for the mathematics program for the five year period 2004-2009, ranked by general priority, followed by specific recommendations from an external review team that visited the mathematics program in spring of 2003. Goals over the five year period are assigned on a on a cyclic basis, meaning that if a goal is not accomplished in one year, it cycles forward to the next year, until it gets done. Items are ranked into high-intermediate-low priority listings, and while the high priority items are also ranked in more or less prioritized order, the items rated intermediate or low are not prioritized in this fashion. A rough estimate of resources is given in (parentheses) after each item. In most cases, the primary resource needed is simply time for the faculty members to be able to carry out these tasks, time which could be made available through release time and even simply through increased salaries which would reduce the need for overload courses to be taught. This is an update on all these goals as of August 24, 2006, with current responses indicated by the ► symbol. **Green** indicates no further action is necessary, or perhaps even possible, and that item may be removed in the next update of program goals. **Red** indicates that action is still desired and should take place in the current 2006-2007 year or as soon as possible. **Orange** indicates that action has been initiated and is ongoing, and needs to be monitored and followed through on. **Blue** indicates that some action is still desired, although not as urgently as red items, or in some cases means that the action is out of the control of the department, although desired.

Mathematics Program Goals 2004-2009

High Priority (prioritized)

1. An additional full time mathematics faculty member is needed. Currently, the mathematics program employs five part-time instructors to teach approximately 28 classes per year, and it is always a major task to staff those positions with high quality instructors. This position should ideally be advertised in late fall, 2004, and hired for the 2005-06 academic year. (\$50,000?)
 - A budget request for a new full-time position in mathematics has been submitted to the administration every year since 2003, but *rejected* due to an insufficient number of majors to justify it. It is the view of the department that a full-time faculty member would have a tremendously positive impact on the non-mathematics major population, and that the administration is being extremely short-sighted in adopting this stance.
2. A final decision needs to be made within a few months about whether or not the mathematics program will submit a document to the state to apply for subject matter approval in mathematics, and if affirmative, the document needs to be written and submitted by March 1, 2005. (One course paid release time - \$2500)

- ▶ The decision of the department was that the number of students who benefited from the subject matter program in the past 12 years (2) did not warrant the expenditure of time and resources necessary to submit and get state approval for a new subject matter proposal in mathematics. The decision was made to counsel students to study for and pass the CSET exams instead, and that this was a perfectly good alternative that many other ULV mathematics graduates have adopted successfully.
3. A new introductory statistics course which would meet the mathematics general education graduation requirement should be developed, and other possible courses possibly involving art, music, computer graphics, or any of a myriad of other topics should also be considered. (Time)
 - ▶ This new course has been in the planning stages for several years, but the problem of time to do it has been the primary sticking point. It was the thought of the department chair that he would do it on while sabbatical in spring 2006, but he decided to put it on hold until the new developing requirements for general education courses were revealed in final form in the fall of 2006, and then hopefully have a new course ready for the schedule in either spring or fall of 2007.
 4. Strategies for maximizing the benefit from the current NSF CSEMS grant money in terms of increasing the number of mathematics majors need to be explored. (Time and unknown \$ for support)
 - ▶ A meeting of the CSEMS Board was held in September, 2005 to discuss strategies to increase the number of students applying for and accepting CSEM Scholarships in both mathematics and computer science. A number of ideas were discussed which are in the planning and implementation stages.
 5. A handbook for mathematics majors needs to be developed, along the lines of the handbook for biology majors. This should include a set of guidelines for senior projects. (Time and \$1000 in printing costs)
 - ▶ This is still an idea that all want to be done, it is just a question of the chair either writing the handbook, or assigning other faculty members to help him write it and just get it done. Time is the biggest impediment.
 6. A Mathematics Club existed at one time, and its revival should be considered now to generate more interest in mathematics. (Time and unknown \$ for support of activities)
 - ▶ A student in the fall of 2005 indicated that she would be interested in and willing to help start a new MATHEMATICS Club, but she "got busy" and did not follow through on it. Having some key students around for a few years to get it going and stabilized is crucial, and we probably need to increase our core number of majors to come up with such a critical mass.
 7. All mathematics faculty need to maintain web pages with current and relevant information about themselves and the courses they teach. In addition, a web pages should be set up within the department pages to explain how the mathematics subject matter program works at ULV (if renewed), and to provide information on suggested course schedules for majors and minors, as well as senior comprehensive and senior project information, and current events and news in the mathematics program. A web "problem of the week" (or month) type of page would also be nice.

(Time)

- ▶ The full time faculty all maintain personal web pages, but only one of them has links to current specific course information. All faculty will have the opportunity to utilize pre-set course shells in Blackboard for disseminating information and email to their students, automatically set-up through the course registration process, as of September, 2006. It is recommended that all faculty, full time and part time, take advantage of this, although the administration is not requiring it.

Intermediate Priority (not prioritized)

1. The compensation for part-time mathematics instructors needs to be increased to around \$3500 to be competitive with other schools that draw from the same hiring pool. (Considerable \$ annually!)
 - ▶ As of Fall 2006, the base salary rate for all undergraduate categories has increased by \$145 per four unit course, and further annual increases are expected for the next several years, until the pay rate is equivalent to the average rate for a similarly-sized online class.
2. The mathematics major should be examined in light of recent recommendations by the MAA and revisions in state requirements for subject matter programs, with an eye toward possibly reducing the number of upper division courses offered, reducing the number of directed studies taken by students, and building consistent enrollments in the remaining courses. Every directed study course should count for as some type of overload for faculty, in contrast with the current policy, which mandates up to 10 directed studies per year as a normal part of the load. The questions of whether or not a distinction between the B.A. and B.S. degrees should be maintained, and whether or not different tracks (teaching, industry, graduate school) should be developed for majors, should also be examined. (Time)
 - ▶ All directed studies are now compensated at the rate of \$75 per semester unit, or \$300 for a typical 4-unit course. The number of upper division courses has been reduced in the sense that Computer Science has now assumed responsibility for the MATH 327 Discrete Mathematics course, and courses like differential equations, vector calculus, and number theory are only offered if enrollments permit it, even though they are already cut to an every other year offering scheme.
 - ▶ The department has not yet taken a serious look at the B.A. / B.S. / track issue, and should.
3. A Senior Project course needs to be developed which all graduating seniors can enroll in during the spring semester, to provide a context in which to develop and work on the senior project. (Time)
 - ▶ No serious work has been done on this yet, mostly because the course would only have about two students in it, although we would expect that to grow to 5 or 6 by 2007 or 2008. The need still exists.
4. The College Algebra course should be revised to integrate more real world modeling and problem solving into it, and web-based tutoring for College Algebra and Intermediate Algebra should be investigated to assist students with skills development and concept mastery. With less class time needed for fundamentals, more emphasis could be placed on the higher-order thinking skills the revised course would demand. (Time and unknown \$ for online tutoring software licenses)

- ▶ A new textbook was selected that it is hoped will enable the students to perform and pass at higher levels, but the content has not yet shifted in any serious way as described above. Web- based tutoring programs are much more prevalent now, and need to be seriously investigated by the department.
5. Each faculty member in the department should visit the classroom of at least one other faculty member in the department for a collegial review sometime during the year. The division chair has even provided an incentive in the form of a free lunch afterward to discuss the classroom visit. (Time and minor \$ incentives)
 - ▶ This has not happened. The chair needs to get behind this and make it happen.
 6. The student area for math, physics and chemistry students needs to be expanded to at least twice the present size (front half of MA54), to accommodate more majors wishing to utilize the space, more computers (from the current 4 up to 8), and bookshelves for display of relevant journals and books. (Unknown \$)
 - ▶ No progress has been made on this in terms of space, because there simply is not any more space.
 - ▶ The 4 computers need to be upgraded as well.
 7. *All* classrooms in which math courses are taught need to be smart classrooms so that a laptop or other portable computer could be plugged in and used with a projection device and the internet. (Budget from ITC)
 - ▶ Most of the classrooms in which mathematics classes are taught are now smart classrooms, and those that are not can make use of a portable smart cart within the Natural Science Division, or reserve a smart cart from OIT, for those days it is needed in a traditional classroom.
 8. The math placement system needs to be thoroughly investigated to see why each semester there still seem to be students that are admitted to math classes without the appropriate prerequisites of math placement scores. An obstacle to being fully aware of the depth of the problem is the difficulty in getting data as to which students have what placement scores or grades in previous classes. (Time and unknown \$ for Banner query coding)
 - ▶ Nothing has been done on this due to limitations on the chair's time.
 9. A system of web-based or online mathematics placement testing should be investigated. (Time and possibly a considerable amount of \$)
 - ▶ The chair participated in a webinar in spring 2006 which demonstrated a web testing system from Maple which could be used with the MAA placement tests. This needs to be further considered by the department and discussed with the placement testing administrators (Bailey Smith and Steve Kinzie).
 10. Although class sizes in MATH 170 Mathematics in Society are improving, work still needs to continue to educate advisors as to the appropriateness of that course meeting the math G.E.

requirements for most students, and to increase enrollments in the MATH 170 course. (Time)

- ▶ Enrollments seem to be dropping even further for MATH 170. It will probably be more fruitful at this point to devote more energy to developing and marketing and teaching a new introductory statistics course to meet a mathematics general education requirement.
11. An in-house database of mathematics graduates should be developed, and letters and a survey instrument should be sent out on an annual basis, in order to create an initial database of graduate feedback. (Time and unknown \$)
 - ▶ The chair has a fairly accurate database of graduates, but it needs to be updated with current address and email information, and letters and surveys have not been sent out annual to connect to the graduates. This needs to happen.
 12. The senior comprehensive exams need to be looked at by the mathematics faculty for possible revision or alternate exam selection. (Time and unknown \$ if another standardized is adopted for in-house use)
 - ▶ The department still needs to consider this and make a decision on it. The chair examined a mathematics field test from ETS in 2005 and invited the other faculty members to look at it, but they declined. It was the opinion of the chair that that exam was not appropriate for the program of courses that we offer.
 13. The calculus curriculum should be looked at and possibly revised to try to get it more in synch with three and five hour programs at other schools. (Time)
 - ▶ There is still a need for this to take place. It will probably require the chair assuming responsibility, making a proposal, and having the other two mathematics faculty modify it and finally approve it.

Low Priority

1. Consideration needs to be given to deciding which math courses are suited to and can benefit from adaptation to web versions. (Time; unknown \$ for actual conversions)
 - ▶ At present, no mathematics courses are being offered on the web. There may be a market for online statistics or college algebra or intermediate algebra courses, but the mathematics faculty have little time for web course development, and little confidence in the ability of ULV students to be able to pass online courses when they have so much difficulty in passing them in face to face classes.

Summary of Specific Recommendations from the 2003 External Review, and Responses

1. Pay part-time faculty members at least \$3000 per course, perhaps with a requirement of a minimal number of office hours. They might be contracted for \$2500 per course plus \$500 for a specified number of office hours.
 - ▶ See Intermediate Priority item 1 above.
2. Consider hiring a full-time instructor or lecturer to teach 8 sections of lower level courses per year with a certain number of office hours and possible committee expectations. (Ideally, hire another tenure track member, and even more ideally, both.)
 - ▶ See High Priority item 1 above.
3. The chair should reduce the number of class preparations per faculty member to reduce loads.
 - ▶ The chair has implemented this policy whenever possible within scheduling constraints, and whenever desired by the faculty, and will continue to do so. It is also a high priority with the scheduling of the part time faculty.
4. Faculty should stop taking on overloads, especially those that require extra preparation.
 - ▶ This is a personal choice of faculty, up to a point. A new university policy effective September, 2006 now limits the number of overload classes to a maximum of two per semester. No mathematics faculty member has ever taught more than two overloads in one semester, so there is no issue with the new policy, but it is difficult at times for faculty to avoid teaching any overloads at all simply because of the lower salaries at ULV than at other schools we compare ourselves to.
5. The university should increase faculty pay and program staffing so that faculty do not feel obligated to teach overloads.
 - ▶ No significant progress has been made on this. It is out of the hands of the department, beyond making requests, which is already done.
6. Directed studies should be counted in faculty teaching loads. Two directed studies should count as one course, but, perhaps, as a starting point, six directed studies could count as one course (or one overload).
 - ▶ See Intermediate Priority #2 above.
7. The administration should provide (and that mathematics program faculty members take advantage of) course releases for curriculum development. Participation in curriculum development should be regarded favorably for promotion. In order to give all faculty the opportunity to engage in scholarly activity, the university should take steps to reduce teaching loads in programs with very heavy teaching loads, including mathematics.
 - ▶ The university has now made it possible to apply to obtain a course release in return for a commitment to doing a major piece of research.

8. The university should continue to expand and improve classroom technology by making more classrooms “smart” and by providing adequate computer laboratories. The university should set up one classroom computer laboratory in which mathematics courses could meet regularly.
 - ▶ See Intermediate Priority #7 above.
9. Encourage the faculty to design and offer a “thinking” statistics course featuring collection and interpretation of real-world data sets. This course should be marketed to biology majors as well as to business and social science majors, with the eventual goal of having these programs require the course for their majors.
 - ▶ See High Priority #3 above.
10. If MATH 170 ends up being supplanted by the new statistics course, the business course, the mathematics and the arts courses, and/or an applications-based College Algebra course (see below), then so be it. In order to encourage students to take Mathematics in Society, mathematics program faculty might bar students who have placed solidly into Precalculus or Calculus I (or higher) from College Algebra but not from Mathematics in Society.
 - ▶ See Intermediate Priority #10 above.
11. We recommend following national curriculum recommendations for College Algebra [9] by integrating real world modeling and problem solving into the course. (Also see [13].) We very much like Professor Frantz's suggestion of an approach drawing on environmental problems and modeling. This should appeal to many students, fits in with wider university curricular themes, and may be supported by recent textbook development.
 - ▶ See Intermediate Priority #4 above.
12. We recommend that mathematics faculty investigate ALEKS [1] or another web-based mathematics tutorial system. Such a system may be very helpful in assisting students with skills development and concept mastery in elementary courses such as College Algebra. With less class time needed for fundamentals, more emphasis could be placed on the higher-order thinking skills the revised course would demand. We caution, however, that such tutorial systems are not magic; some students may also need human tutors.
 - ▶ See Intermediate Priority #4 above.
13. Current resources can support only a very focused program. By deciding which courses are most important and focusing on them, the mathematics program should be able to offer fewer upper division courses overall, but offer more upper division courses as classes rather than as directed studies. Since most mathematics majors plan to become high school mathematics teachers, the core of the major should be those courses within the credential program. These courses should be required or at least highly recommended for all majors, not just those intending to teach high school mathematics. The new standards for the single subject credential in mathematics issued by the California Commission on Teacher Credentialing, together with the Commission’s requirement that all colleges and universities re-submit credential program applications within the next two years, give the ULV mathematics faculty an ideal opportunity to redesign major requirements and upper division course offerings around credential program goals. It also is

important that regular course offerings include at least one course that each full-time faculty member would be really and truly excited about teaching, e.g. courses in biological or environmental modeling or in numerical methods. The net result of centering the mathematics major around courses required for the teaching credential should be that the same number of courses are offered as regular courses (we don't see how to reduce this number), but that fewer courses are offered as directed studies. We acknowledge that reducing the number of courses offered does have some disadvantages. It reduces student choices, and the soon-to-be-released recommendations of the Mathematical Association of America advocate wider variety in courses with closer attention to individual student interests. But, again, we believe current faculty and student resources at ULV can support only a very focused program.

- ▶ See Intermediate Priority #2 above.
- 14. The primary resource allocation goal should be to make sure there almost always are four or more students in each upper division course, and that each student in the course is prepared to take the course. Nevertheless, the administration should support the occasional course with only two or three students in it, recognizing that the mathematics faculty has done everything possible to streamline course offerings while keeping the program attractive to potential majors.
 - ▶ As the numbers of mathematics majors increases, the sizes of core upper division courses have increased to 7 or 8 in some cases, and this trend is expected to continue. One problem arises with the split between the B.A. and B.S. and subsequent reduction in enrollments for courses required by one but not the other.
- 15. Directed study courses should be reserved only for students intending to pursue graduate study in the mathematical sciences. Depending on their intended programs, these students would need from two to six additional courses.
 - ▶ Scheduling has changed so that directed studies are used much less frequently now, in the cases cited above, or when a student fails a class and needs to repeat it before it is offered again.
- 16. The Senior Project should be offered as a yearly spring course, perhaps jointly with physics and/or other programs. It might instead be offered during fall semester or, less ideally, January term if that would help increase the number of students in it and other courses. Another option would be a 1- or 2-unit seminar taken throughout the senior year. Career information could be included in the Senior Project course.
 - ▶ See Intermediate Priority #3 above.
- 17. In redesigning the mathematics curriculum, it may be possible to retain a few choices for majors and to distinguish between the B.A. and the B.S. However, it may not be necessary to offer these two degrees. Redlands offers only the B.S. and Occidental offers only the B.A. We note also that the two main features of the highly successful mathematics program at SUNY-Potsdam are its close faculty attention to individual students and its single-track mathematics degree [5].
 - ▶ See Intermediate Priority #2 above.
- 18. While we appreciate the mathematics faculty's support of the computer science and physics programs through course requirements in these areas for mathematics majors, as well as its

message to mathematics majors that being able to apply their skills in other areas is important, the mathematics faculty may wish to allow students to choose between the two or to design their own “emphasis” or application of mathematics. Perhaps all mathematics majors would complete a computer programming course but only students earning the B.S. degree would complete the physics courses.

- ▶ The department will consider it during meetings in 2006-2007, and in conjunction with any possible revision of the B.A. / B.S. structure.
19. We recommend dropping the GRE as one of the two exit examinations, as we suspect it is demoralizing for weak to average mathematics majors. Other “outside” exams available include those taken by prospective mathematics teachers (currently, the SSAT or Praxis exams) and a more general mathematics assessment exam offered by ETS. (Note: One of the reviewers is an ETS consultant.)
- ▶ See Intermediate Priority #12 above.
20. Opportunities for tutoring and peer mentoring in mathematics [12] should be expanded for qualified students.
- ▶ The CSEMS program is implementing requirements for tutoring and mentoring for its participants
21. Faculty and students must be realistic about prerequisites. For example, students will have a much greater chance of success in the probability and statistics sequence if they take Calculus III first.
- ▶ This can be examined in a department meeting in 2006-2007.
22. In our focus group with students, they expressed a desire for more help with homework. Help in class was preferred, but an outside-of-class homework session with a little more structure than office hours (much like a recitation section at a larger university) also was attractive to them. They also expressed a desire to be able to re-do homework assignments, a request which seems worth accommodating when possible. As for student complaints that mathematics courses are challenging and time-consuming and that taking more than one of them per semester is unrealistic, the faculty should continue to encourage and help students---and to help them plan schedules containing no more than two mathematics courses per semester! Again, students are unanimous in praising the availability of the mathematics faculty for help and guidance.
- ▶ The CSEMS mentoring program should help out student sin lower division courses. The department should explore the idea of encouraging T.A. - like “help sessions” for students in upper division courses. Teaching tips like re-doing of homework are shared at multiple opportunities throughout the year, at department meetings and the annual part time faculty workshop. Students normally are not advised to take more than two mathematics courses in a semester, unless they are exceptional students and in the joint estimation of the faculty member and student, can handle it.

23. Students were also unanimous in expressing appreciation for their study space in MA 54. Maintaining and improving this space should be of highest priority. Seating might also be provided outside faculty offices so students can wait for faculty there.
- ▶ See Intermediate Priority #6 above.
24. Students' already strong sense of community might be further improved by a Math Club and activities, and by additional program-related employment opportunities for students as tutors, peer-led workshop leaders, graders, or even office assistants. Program alumni should be invited to share career information with current students, by visiting campus or via e-mail.
- ▶ See High Priority #6 above.
25. In addition to the improvements already made in the advising of mathematics majors as a result of better college records, mathematics faculty members might use a little class time each registration period for general advising about upcoming courses and to encourage students to meet with them for further advising, and/or hold general meetings for intended mathematics majors (with food as well as advice as incentive) to dispense information. One-page checklists of mathematics major requirements and recommended course sequencing should be distributed to prospective mathematics majors whenever and wherever possible, including in class. Ideally, ULV students would declare their majors by the end of their sophomore year to help ensure better advising and degree completion.
- ▶ This needs to be discussed and firmed up in a department meeting.
26. The mathematics faculty should pay even more attention to the calculus sequence, especially Calculus I, as the primary place where they will recruit mathematics majors and minors. Calculus courses must be stimulating and rewarding. The faculty might encourage or even require students who place solidly into Precalculus or Calculus I to take that course rather than College Algebra to fulfill general education requirements. Unless articulation really has become a big problem, we encourage the mathematics faculty to continue to design its calculus curriculum based on the needs of various ULV programs rather than on external norms.
- ▶ See Intermediate Priority #13.
27. The faculty also should identify other courses, such as Discrete Mathematics or Bridges Between Art and Mathematics, from which to recruit mathematics majors and minors. Every physics major should have a mathematics minor, if not a second major in mathematics. A mathematics minor should be encouraged for economics and computer science majors.
- ▶ This will be discussed in a department meeting early in Fall, 2006, for possible policy creation.
28. In addition to encouraging the Admissions Office to recruit strong students, capable of and interested in majoring in mathematics, ask Admissions to identify the best incoming students, regardless of intended major. Encourage these students to take Calculus I early in order to keep open their science and mathematics major and career opportunities.
- ▶ This could be implemented, with some participation of and delegation by the chair.

29. Carrying out the curricular changes we recommend will require an even higher level of coordination and mutual inspiration than already exists. We note that the mathematics program is planning a faculty retreat for Summer 2003 to discuss our recommendations. We wish to encourage this kind of activity, which strengthens the faculty's sense of community while also addressing program goals.
- ▶ The retreat never took place. A retreat should take place for perhaps the department as a whole (to achieve a critical mass) sometime during the 2006-2007 year.
30. Consider having adjacent offices. This can improve collegiality within the program, though reducing interaction with other science faculty might be a concern.
- ▶ At the present time, the space configuration will probably remain as it is, due to the desires of the various faculty members. However, the computer science faculty have just moved into the Mainiero Building in late summer 2006, which will facilitate much more interaction among all the department and division faculty.
31. Select one to three goals on which to focus for a given year, using importance and feasibility as criteria. After further discussion, have each faculty member in the program commit to specific tasks needed to achieve these goals. Then meet on a regular basis for the sole purpose of making progress towards these goals, excluding discussions of other program or institutional business from those meetings.
- ▶ This is a priority for the first meeting of the 2006-2007 academic year.
32. Take a look at some of the recent literature on organizational change ([6],[7],[8] in the references for the report) and faculty learning communities ([3],[4]); consider the applicability of this work to your situation.
- ▶ The chair can try to make some of these materials available to the department faculty in 2006-2007.