Mathematics Department
Program Planning Report
Fall 2004

I. Background and Analysis

Program Description and Goals

The Math Department is the largest component of the Natural and Applied Sciences Division at Cabrillo College, offering a full spectrum of basic skills, high school equivalent courses, and transfer mathematics courses including courses comprising the first two years of university level mathematics for Engineering, Science and Mathematics majors. The Math Department has 19 full-time and approximately 20 adjunct math faculty. The Math Learning Center has one 10-month 100% contract LIA, one 9-month 80% contract LIA, two 9-month 50% LIAs, and an average of 27 student tutors. In Every semester 3,500 students are enrolled in mathematics. The twenty-seven courses described in the 2004-2005 catalog range from Essential Mathematics (Arithmetic) through Differential Equations and Linear Algebra. Nearly all of the classes are offered in the traditional classroom-based lecture/discussion mode, with one course delivered using computer-mediated instruction in a lab setting and four others delivered through the Internet in hybrid distance learning format.

Relationships

The Math curriculum supports AA and AS degrees, a number of Cabrillo's certificate and vocational programs, and university transfer and graduation mathematics requirements for students in many majors. The Mathematics department provides strong, broad-based support for the students and faculty in science and engineering programs.

The Math program is continuing efforts to articulate with the local high schools, and articulation agreements for the Cabrillo College AA degree in Mathematics are in place with UC Santa Cruz, UC Berkeley, CSU San José and CSU San Francisco. A complete program content review was completed by the department in Spring, 2003.

Costs

The statistics on productivity of the mathematics program reproduced below are taken from the 2003-2004 Cabrillo College Fact Book. The program data is shown in bold type and the College data in plain type. The math program's productivity is consistently well above the college average.

PRODUCTIVITY: WSCH/FTEF										
Term	FA99	SP00	FA00	SP01	FA01	SP02	FA02	SP03	FA03	SP04
Math	**593.74**	**544.07**	**599.73**	**543.74**	**662.94**	**576.09**	**593.03**	**588.76**	**588.56**	**561.43**
College	504.20	496.80	511.66	505.57	529.88	497.52	533.73	543.93	571.71	529.79

The table below details the productivity rate of the mathematics program compared to the College at large shown as a percentage found by dividing the WSCH/FTEF for Math by that for the College at large.

MATH PRODUCTIVITY RATE: MATH/COLLEGE PRODUCTIVITY										
Term	FA99	SP00	FA00	SP01	FA01	SP02	FA02	SP03	FA03	SP04
Math Rate	**118%**	**110%**	**117%**	**108%**	**125%**	**116%**	**111%**	**108%**	**103%**	**106%**

The FTES revenue generated by the mathematics class offerings as a percentage of the College FTES is shown below along with the cost of the program as a percentage of the budget for instruction.

FTES REVENUE v. COST OF PROGRAM										
Term	FA99	SP00	FA00	SP01	FA01	SP02	FA02	SP03	FA03	SP04
Revenue	**12.0%**	**11.1%**	**12.2%**	**10.6%**	**12.0%**	**10.7%**	**11.1%**	**10.4%**	**11.2%**	**11.0%**
Cost	8.8%		8.9%		9.0%		8.9%		9.2%	

This demonstrates that mathematics is now and will continue to be one of the most profitable and efficient programs at Cabrillo College. Our classes are large, numerous and run with a very low overhead. The performance of the department and program is stable from year to year.

Student Success

Data on student success and retention for the mathematics program and the College at large have been provided below, courtesy of the college research office.

SUCCESS AND RETENTION RATES										
Term	FA99	SP00	FA00	SP01	FA01	SP02	FA02	SP03	FA03	SP04
Success (Math)	**57.0%**	**54.9%**	**53.5%**	**56.9%**	**57.7%**	**56.2%**	**57.4%**	**55.7%**	**55.5%**	**53.9%**
Success (College)	67.2%	68.4%	65.2%	67.9%	67.7%	67.8%	68.0%	68.2%	68.8%	68.4%
Retention (Math)	**74.8%**	**71.6%**	**71.0%**	**73.1%**	**75.4%**	**72.0%**	**73.6%**	**72.9%**	**74.0%**	**71.7%**
Retention (College)	81.5%	81.5%	79.5%	81.7%	81.1%	80.4%	80.2%	81.1%	81.8%	81.3%

While student success and retention in math fall below the college averages, the numbers are consistent with or even higher than other community colleges around the state. Poor performance in mathematics is not a local phenomenon nor is it a reflection on the Cabrillo Mathematics program or faculty. It may be argued that statewide (and nationwide) entering students typically assess substantially lower in math skills than is consistent with their educational background, indicating a problem much larger than, and beginning prior to entry into, the Cabrillo Mathematics program. No mathematics program regardless of its quality can undo damage that has been done to students years prior to their entry; nevertheless, efforts are being made to ameliorate the effects for at-risk students. Students are urged to take Math Study Skills courses offered by the Learning Skills faculty. In some classes, group work is required, and study groups are encouraged. The emphasis in classes is on understanding the ideas and uses for the techniques rather than on memorization of facts, rules, and theory. Success and retention rates rise steadily as students progress through the curriculum. This provides strong evidence that the program itself is not at fault.

The tutoring and instructional support provided by the Math Learning Center and the Transfer Math / MESA Center are extremely beneficial to student success and retention for at-risk students. As financial cut-backs have reduced the ability of MESA to provide tutoring assistance to transfer level students, the MLC has helped take up the slack.

Learner Outcomes

Detailed learner outcomes have been put in place for all math courses up through entry level transfer courses, replacing the detailed topic lists that already existed. These outcomes are made available to all math instructors in order for them to design, implement and assess their curriculum plan for each course. A variety of methods are in place to determine whether students are meeting the requirements including short quizzes, group projects, lab assignments, homework assignments, midterm exams and required final exams.

The mathematics program, as a result of the nature of the discipline, has never suffered from poorly defined goals or from objectives that were less than crystal clear. As a result of the Assessment process the Math department believes that by sharing our grading rubric and explaining how we assign partial credit, students' success on application problems will improve.

During Flex Week of Fall 2004, the Math Department participated in an internal Assessment Analysis Project intended to provide insight into the Department's success in measuring the core competency critical thinking component of learner outcomes. The results of that study are attached as an appendix to this report.

Results of Student Surveys

The survey was given to students in fall of 2002. Out of 196 students, 57% were female and 43% were male. Fifty-four percent were under 21 years, 26% were between 21 and 25, 7% were between 26 and 30, 8% were between 31 and 40, and 5% were over 40. Of these students, only 4% were math majors. Although 85% of students are taking math courses because it is a program requirement and only 9% have career plans in math, still 85% of the students would recommend math courses to other students. Seventy-three percent of the students felt the overall workload assigned was appropriate and 93% thought the course outline provided by the instructor accurately reflected what was actually taught in class. So although most students are taking math courses because it is a requirement or pre-requisite, they are satisfied with their math courses.

Only 39% of the students felt the advice they receive from counselors for math classes was either excellent or satisfactory. At the Math 254 level, there have been meetings between math faculty and counselors to clarify the differences between the computer-mediated course and the traditional lecture course. In response to urging from the State Academic Senate, the Cabrillo math faculty has increased the mathematics graduation requirement for the AA degree to the second year high school algebra level. The students who would be most affected by such a change would be those earning terminal associate degrees, which are only a handful since most AA degree students plan to transfer. The requirement for the AS degree, which is primarily a terminal degree, remains at the first year high school algebra level. It is important that the counselors keep these two different requirements in mind when advising students.

The students reported that the major strength of the math program was the faculty. Students describe them as outstanding, enthusiastic, energetic, knowledgeable, competent, patient, and approachable. The second major strength was the Math Learning Center. The Math Learning Center provides drop-in tutoring services, group study space, group tutoring sessions, exam review sessions, and proctoring for all online math exams and make-up exams in lecture classes. The MLC has provided an average of 235 tutoring sessions per day lasting about 15 minutes per session. About 200 students log in each day, amounting to 18,000 student-hours of free tutoring per semester through the open-entry Math 502 class. The MLC serves between 1400 and 1600 students per semester.

The most common suggestion for improvement was regarding the Math Learning Center. Students want the Math Learning Center open for more hours and with more tutors. The budget of the MLC is not large enough to stay open longer hours to accommodate student's needs since more contract classified staff would be needed.

The second most common improvement students wanted was regarding the facilities. Students wanted tables or bigger desks instead of the small desks that are in some of the classrooms. The small work area of most student desks does not provide enough room for students to have a text, a notebook and a calculator open and available simultaneously. Tables allow students to spread out their resources and to work together easily. Classrooms equipped with movable desks

have been the norm in mathematics, but the number of classrooms with tables is increasing. There are pros and cons to having tables in the classroom. Last year the math department requested new larger desks for two classrooms through instructional equipment funding. Due to cost increases, only 60 desks were purchased. After a year's delay the desks are finally in place.

Students complained the classrooms were at times too hot or too cold. The heating and ventilation retro-fit that was completed in the summer of 2004 should take care of this problem. Another improvement students wanted was regarding the cost of materials. The textbooks are too expensive as are the TI calculators required in some courses. The faculty has no control over the cost of textbooks. There are two math faculty who don't require textbooks for some of the courses they teach and instead have material available online. As for the calculators the math department has discussed having a consistent policy regarding calculators; but there is not agreement among faculty. However, individual calculator policies must be clearly stated in the syllabus so students know what is expected at the beginning of the semester. The math department has two sets of scientific calculators that are available for instructors who do not allow graphing calculators in their course. There is a third set available from MESA. For those students who need a graphing calculator, the MLC has calculators for use while working in the lab. MESA also has calculators students can use while in the MESA center.

II. Program Recommendations and Directions

1. To continue to provide high quality instruction, replace retiring math faculty positions and expand the number of full-time math faculty.

   As faculty retire, replacement is essential. Contract faculty play a pivotal role in curriculum development and departmental leadership.

   Cost: $35,000/full-time faculty, including benefits, for each replacement position. ($80,000 – 30 units x $1500/unit = $35,000)
   $80,000/full-time faculty, including benefits, for each growth position.

2. To expand the hours of the MLC and better meet the needs of students, add one more full-time LIA position for the MLC.

   As noted earlier the MLC provides invaluable services to students. Yet the lack of tutors and hours limits students' ability to get the needed assistance from the MLC.

   Cost: $41,000/full-time LIA position, including benefits.

3. To better support students and increase student success, increase the number of group study rooms at the MLC.

As noted earlier, the MLC serves between 1400 and 1600 students per semester. The extra rooms are needed to accommodate the large number of students. The rooms would be used for study groups, quiet rooms, tutor training, and proctoring of exams. The Math department strongly urges Cabrillo to keep the MLC's spatial needs in mind when reviewing the secondary effects of the Facilities Master Plan.

Cost: Varies from none to minimal remodel costs, if nearby rooms become available once construction of new facilities is completed.

4. To support students enrolled in distance learning classes, provide a testing facility for the students, especially for those taking online courses.

   Courses offered in self-paced form or delivered in hybrid format on the Internet require that on-campus testing facilities and personnel be available to students on demand. The Math Learning Center is currently trying to meet that need in math, but drop-in tutoring is its primary responsibility. The increasing demand for drop-in testing is stretching the physical resources. The number of courses offered online is increasing, and the hybrid model that combines online instruction and on-campus tutoring and testing is believed to be the most effective method of distance education for math. The College must increase support for on-campus testing on-demand and develop plans for a dedicated, centralized testing facility. This concern applies to all distance education classes so this recommendation could support all departments campus wide.

   Cost: Varies from none to small remodel costs assuming that space is identified and converted once other construction is completed.

5. To improve the quality and consistency of instruction, increase formal mentoring of new faculty.

   New adjunct and full-time faculty would benefit from advice about course pacing, curriculum, and writing exams among other things. If a mentor can help them avoid common pitfalls then the students will benefit. Currently the math department does have course pacings, syllabi, and exams for Math 154 and Math 152 available for faculty but not all new faculty use this information. The math department assigns full-time instructors as mentors for Math 254, Math 254AB, Math 154 and Math 152. It is up to instructors to seek their assistance.

   Cost: Perhaps modest stipend for mentors. Exact cost should be negotiated through CCFT.

6. To increase student retention and success, improve learning and study skills at the remedial math level.

   Students in advanced mathematics classes generally have high success rates while students in basic skills and algebra classes have poor success rates. Linking the Learning Skills program with all courses below transfer level is an effort to address this problem.

Cost: Increased units for Learning Skills to offer more sections of LS 200. $1500/teaching unit

III. Curriculum, Requisite, and Model Program Review

- List of program courses and curriculum changes submitted.

  Math 4 – requirements, objectives, assignments, textbooks

  Math 5A – content, method of evaluation, assignments

  Math 5B – requirements, assignments

  Math 5C – requirements, objectives, content, method of evaluation, assignments, textbooks

  Math 6 – requirements, description, objectives, content, method of evaluation, assignments, textbooks

  Math 7 – requirements, objectives, assignments

  Math 10 – requirements

  Math 12 – requirements, textbooks

  Math 13 – requirements, description, content, assignments, textbooks

  Math 15 – requirements, description, objectives, content, method of evaluation, assignments, textbooks

  Math 18 – requirements, description, content, method of evaluation, assignments, textbooks

  Math 23 – description

  Math 51 – requirements, objectives, method of evaluation, assignments

  Math 152 – requirements, objectives, textbooks

  Math 153 – requirements, textbooks

  Math 154 – requirements, description, objectives

  Math 154A – requirements, description, objectives, assignments, textbooks

  Math 154B – requirements, description, objectives, content, method of evaluation, assignments, textbooks

  Math 158BF – student hours, requirements, description, content, method of evaluation, assignments

  Math 158GC – requirements, description

  Math 158PF – requirements, description, assignments

  Math 158SI – requirements, description

Math 158T – student hours, requirements, description, content

Math 254 – description, assignments, textbooks

Math 254A – description, objectives, content, textbooks

Math 254B – requirements, objectives, textbooks

Math 502 – description, repeatability, objectives

- Outline and Pre/Corequisite Approval Process Form-see attached
- College Catalog pages-see attached
- Articulation Agreements-see attached