Department of Mathematics
California State University, Fullerton

Program Performance Review
Self-Study

2010-2011

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EXECUTIVE SUMMARY

This PPR Self-Study identified four Goal Clusters that the Department of Mathematics views as being of critical importance to its work over the next PPR cycle. They are:

- Developing new instructional modalities, including online and hybrid courses;
- Institutionalizing the supplemental instruction program which has measurably increased the success rates of students in key gateway mathematics course;
- Strengthening undergraduate programs in all sectors, including mathematics major courses, developmental courses, GE courses, and service courses for majors in the College of Natural Sciences and Mathematics, College of Engineering and Computer Science, and the Mihaylo College of Business and Economics; and
- Strengthening graduate and professional programs, including the M.A. in Mathematics Applied Option, the M.A. in Mathematics Teaching Option, the M.S. in Statistics, and the Single Subject Teaching Credential in Mathematics.

Curriculum maps were developed for each of the four undergraduate concentrations within the Mathematics major: Applied Mathematics, Pure Mathematics, Probability and Statistics, and Teaching Mathematics. While the curriculum maps showed strengths in each of the four curricular areas, the maps helped to uncover specific areas that should be addressed during the next PPR cycle. These curriculum maps were based on seven specific Student Learning Outcomes previously developed by the Department.

Data on course enrollment showed that enrollments increased steadily from 2003-2008, with a decline in 2009, all of which paralleled overall university trends. All sectors of the mathematics program showed student success rates significantly above the national average, particularly since the implementation of the Supplemental Instruction (SI) program two years ago. In addition, there have been increased Departmental efforts to support and monitor Part-time Lecturers and Teaching Associates, who are responsible for teaching 60% of the courses in the Department. These include the creation of Math Ed 480, a teaching development course for Teaching Associates, as well as faculty observation of courses taught by each Part-time Lecturer and Teaching Associate.

The Department has remained extremely active in its scholarly and creative activities, including federal and state grants, with well over twelve million dollars in external funding awarded during this PPR cycle. Monies generated from indirect cost funds, as well as faculty and facilities support provided directly from the grant, may become increasingly important for the Department and the College if current budget trends continue. Department faculty members have been highly productive in their research programs and have disseminated their results in numerous journal articles and professional conference presentations. Much of this activity has included student collaborators. This productivity remains an ongoing goal of the Department.

Specific goals for the next PPR cycle include launching the M.S. in Statistics, an online/hybrid program; exploring the development of more online/hybrid courses across all sectors of the Department; and institutionalizing the SI program.

Introduction

This review describes the activities of the Department of Mathematics during the PPR period 2003-2010 (please note that the 2009-10 PPR cycle was postponed to 2010-11 due to furloughs). The review includes both a description of work completed and in progress as well as a critical assessment of areas of strength and weakness. The review concludes with departmental priorities for the future. The format for this review follows the PPR Self-Study Outline.

We acknowledge here the invaluable assistance of and support from the offices of Dr. Gerald Patton, Dr. Chris Renne, and Mr. Ed Sullivan in shaping and completing this review.

I. Department Mission, Goals and Environment

A. Mission and Goals Since Previous PPR

Mission

The Department of Mathematics at California State University, Fullerton continues to strive for excellence in the execution of its responsibilities in three areas:

1. Undergraduate and graduate degree programs for mathematics majors.
2. Courses for science majors, majors within other Colleges that require a mathematical component for their degree and General Education requirements in mathematics.
3. Creative, professional and consulting activities performed by members of the Department for the mathematical, University, local, and global communities.

Goals

1. To maintain a commitment to excellence in the teaching and learning of mathematics.
2. To provide undergraduate and graduate programs in mathematics, which prepare students for careers in education, business, industry or government, and for graduate studies.
3. To cooperate with other departments in providing students with the concepts and skills in mathematics needed for success in their field of study.
4. To promote research and scholarship by the faculty in pure and applied mathematics, mathematics education, statistics, and other areas of mathematics.
5. To provide exemplary professional service to the University and to the community.

Relation to University Mission, Goals and Strategies

http://www.fullerton.edu/strategicplanning/index.htm

The Department of Mathematics' Mission and Goals are intertwined with those of the University. A principal University focus is the preeminence of learning, which the Department also embraces as seen in our emphasis on the effective delivery of high quality mathematics programs to effect student involvement and student learning (MG I). These programs include not only our own undergraduate and graduate degree programs but also our service courses, which are part of the University's General Education Program (II), as well as degree programs in other units. The Department's foremost tool for program delivery is its faculty, whose members are both scholars and teachers (I), with dual interests in the creation and dissemination of knowledge and in the teaching and learning of our students (I, III)). The Department of Mathematics also has a demonstrated interest in and record of obtaining significant external funding (VI). Our Department members are also committed to providing the highest level of University, community and professional service (VIII).

B. *Changes in Discipline and Department Response*

The field of mathematics has retained a remarkable stability as well as a vibrant dynamism over time. It is stable in that its structure, theory and tools have remained valid through the inquiry of generations of mathematicians. It is dynamic because there has been a steady advance in the theory and results in mathematics. As recent examples, in the 1990's the long-standing problem Fermat's Theorem was proved, and in 2002 the Poincaré Conjecture was established. Both of these problems have had a rich history and were the source of and inspiration for the development of other important mathematics.

In the recent past, the field of mathematics has become much more an applied science. This is in large part due to the introduction and use of computer technology by mathematicians, statisticians and mathematics educators. With computing available, previously unapproachable and computationally complex problems are necessarily outside the realm of the solvable. The size and scope of many of these problems render the traditional analytic solutions impossible to obtain or, perhaps, not even useful. Computer generated numerical solutions become the end product. In the context of considering these large problems, the theoretical mathematical foundations become even more important as researchers seek to find efficient shortcuts to make these problems manageable. With computing available to mathematical scientists, applications have been made in many and varied disciplines from cryptography to genetics to finance.

In this context, the Department has evolved to having a more applied orientation in our programs and research, but at the same time, recognizing the absolute importance of a strong theoretical foundation, it has maintained a focus on providing students with a solid mathematical core background in undergraduate concentrations. Each of our students benefits from the Department's increased use of technology. The Department has placed greater emphasis on having majors take Math 320, Mathematical Programming, in which *Matlab* or *Mathematica* are taught, so that students have the ability to program, use symbolic computation and take of advantage of computer generated graphics. Applied mathematics students are well versed in the modern methods of simulation, and probability/statistics students are trained in data analysis, a skill, which starts on the computer for the modern statistician.

The surge of technology (advances in information technology and Internet access) has also affected the teaching of mathematics and mathematics education. The Department has experienced a rapid rise in the use of learning management systems (e.g., Blackboard) and course websites as a means to communicate with students and as instructional tools. Indeed, the use of internet-based technologies (IBTs) has the power to transform how mathematics (as well as most other subjects) can be accessed and learned. However, the implementation of IBT has lagged far behind its availability. It is estimated that while almost every US College and University has wireless Internet access available to faculty, staff, and students, fewer than 10% of mathematics Departments are delivering or even offering a meaningful number of courses in a way that is essentially different than the traditional lecture approach. That observation applies to the CSUF Department of Mathematics.

While it may appear that overall mathematics Departments are lagging behind in using cutting course delivery methods, there are reasons to move cautiously. Despite the growth of and access to IBTs, there has been a paucity of research on the efficacy of IBT-based mathematics courses at the post-secondary level. The research work in this area is lacking in both depth and credibility, and so the Department has been slow to embrace this potential change in course delivery. In light of this, the Department has been cautious in developing the use of IBTs in its courses. We discuss in section I.C. below and in section VII.A our plans for developing new modalities of instruction incorporating IBTs.

Finally, a major change in mathematics education is the shift in emphasis from teaching to learning, that is, evidence-based outcomes of student learning. The Department has been proactive in addressing this area, including the creation of MathEd 480, a teaching, training and support class for our graduate teaching associates, and the development and expansion of the Supplemental Instruction (SI) program in key gateway courses. These are also discussed in detail later in this document.

C. *Priorities for the Future: Long Term Plan Summary*

The Department's priorities and long-term plans are based on both ongoing as well as more recently added goals. These were outlined in our 2009-10 Annual Report (Appendix VI). Six main areas were outlined in this document, including (1) Effectiveness of Student Learning; (2) Graduate Program Development; (3) Departmental Priorities; (4) Curricular Review; (5) Faculty Scholarly and Creative Activities; and (6) Maintaining Service to the Campus and Community. In this section we describe what we believe will be the most critical areas, or Goal Clusters (GC), for development over the next seven years.

GC 1: Developing New Instructional Modalities
The Department continues to strive to find the optimal balance between on-line and face-to-face instruction. These curricular and instructional decisions need to be informed by the specific goals and outcomes for the course, as well as the availability and accessibility of hardware and software necessary for instruction and learning. We will continue to monitor Math 45 as well as the MS in Statistics program. We plan to develop these courses according to University, College, and Departmental needs, in conjunction with faculty interest and expertise, with special consideration given to our primary service Departments and Colleges.

GC 2: Institutionalizing the Supplemental Instruction Program
The SI program in mathematics has shown strong evidence of impacting student achievement in key gateway mathematics courses that traditionally have had non-success rates of 40% or more. Data from the first two years of the program showed that SI participation significantly reduced the need to repeat courses and therefore helped students move through their mathematics or mathematics-based major in a timely way. This should not only shorten the time to graduation for these students but reduces the need to run additional sections for course repeaters. Funding for this program has, to date, come from a variety of external and internal grant sources. Given the impact of this program, not only academically but financially, as well as the constraints of seeking "soft" funding every semester to keep the SI program going, we strongly recommend that SI in mathematics be institutionalized at CSUF.

GC 3: Strengthening Undergraduate Programs
Enrollment in the undergraduate mathematics programs has been steadily on the rise for the past seven years. While this may be a direct reflection of campus-wide enrollment increases as well as the quality of the Department, employment opportunities for mathematics majors continue to rise as well, which also increases the attractiveness of the major. In January 2011, the *Wall Street Journal* cited a study naming mathematician, actuary scientist, and statistician as the three best jobs in America (*http://online.wsj.com/article/SB123119236117055127.html*). The Department aims to harness this momentum to continue to increase its student numbers. At the same time, we will provide high quality mathematics programs in which students meet our learning outcomes and are prepared for mathematics-based careers or graduate study in mathematics or mathematics related disciplines. Please note that in this Goal Cluster we include our service courses as well. We also include here an expansion of student advising services such as NSO and NTO.

GC 4: Strengthening Graduate and Professional Programs
Both options within the master's degree program have experienced enrollment fluctuation over time. Several years ago the Applied Mathematics option program was low enrolled; however, enrollment has increased over the past two years. The Teaching option program has retained high enrollments for the last seven years, but experienced lower enrollment in the 1990s. To a certain extent, these enrollments are market driven. Both programs meet a specific need in the private and public sectors, respectively, and it is important that both programs continue to evolve, improve and thrive. Faculty in the Applied Mathematics option work closely with local business and industry firms to identify and have graduate students solve major problems of interest and use to the firms. The Teaching option prepares students for both high school and, increasingly, community college mathematics teaching careers. Faculty members in this program work closely with local community colleges and school districts to help facilitate these students' professional

trajectories. The proposed M.S. in Statistics program may help inform both programs, especially as regards to using on-line teaching modalities as appropriate. The Department will continue to aggressively advertise and recruit students for all three programs. Please note that in this Goal Cluster we also include our service graduate courses, such as Math Ed 532, and professional programs, such as the Single Subject Credential in Mathematics.

D. Self-Support Programs

The Department has continued to offer a robust summer program, including courses in remedial math, GE, LD and UD, and graduate courses. Over the last eight summers the Department have offered a decreasing number of sections ranging from 44 down to 32.

II. DEPARTMENT DESCRIPTION AND ANALYSIS

A. *Structure of Degree Programs*

Undergraduate Program

The undergraduate major program is designed to give sufficient breadth and depth in the study of mathematics to prepare students either for a career requiring a strong mathematics background or for subsequent graduate study in mathematics or related areas. The Bachelor of Arts Degree in Mathematics is built around a set of core requirements, consisting of 25 units, including three semesters of calculus, a sophomore-level course in differential equations and linear algebra, and upper-division courses in linear algebra and advanced calculus. The set of core requirements also includes a sophomore-level course designed to help students transition from their procedurally oriented lower-division courses to the more theoretical and conceptual demands of upper-division course work. In addition to meeting the core requirements, students choose one of four concentrations, each consisting of between 21 and 23 units of coursework.

In addition to the core and concentration requirements, each mathematics major must also complete a set of courses in one of seven outside cognate areas with substantial applications of mathematics (actuarial science, computer science, economics, information systems and decision science, physics, chemistry, or civil engineering), or from a selection of upper-division mathematics courses in a concentration different from the one the student has chosen. For students interested in participating in a research project, the Department also offers a research cognate, where students satisfy the cognate requirements by participating in a research seminar and writing a thesis paper.

Finally, each undergraduate major is required to satisfy an elementary computer programming requirement, which can be met with either a course in the Computer Science Department or in the Mathematics Department, and to satisfy the University's writing requirement, which most of our majors achieve by completing our writing-oriented course, Math 380, History of Mathematics.

Table 1 **Student Learning Outcomes for Mathematics Undergraduates**
1. To achieve mastery of basic mathematical ideas and techniques ranging across different fields. 2. To think analytically and critically to formulate problems, solve them, and interpret their solutions. 3. To develop a sophisticated understanding of the nature of proof. 4. To use technology as a meaningful tool in formulating and solving problems. 5. To apply knowledge from one branch of mathematics to another and from mathematics to other disciplines. 6. To communicate mathematics effectively both orally and in writing. 7. To develop essential information skills, including determining, accessing, and using electronic and printed information appropriately and professionally.

Seven student learning outcomes (SLOs) have been identified as being essential for all majors in mathematics (Table 1).

Curriculum Maps

A curriculum map (CM) was developed for each of the four undergraduate concentrations assessing the extent to which each of these learning outcomes is introduced (I), developed (D), or mastered (M) in the degree program. Please note that courses are listed in the order in which they are typically taken including the core courses. We conclude this section with a critical discussion of how the curriculum map may help inform the Department's programs for the next evaluation cycle.

The Pure Mathematics Concentration is designed primarily for students interested in pursuing a graduate degree in some area of pure mathematics. The curriculum map for this concentration shows that the concentration emphasizes fundamental components for theoretical mathematicians, including analytical thinking and proof construction (Table 2).

Table 2
Department of Mathematics Curriculum Map of Outcomes:
The Pure Concentration

Course	1 Basic Ideas	2 Analytical Thinking	3 Proof	4 Tech Tools	5 Application	6 Communication	7 Info Skills
150A	I	I	I	I	I	I	I
150B	I	I	I		I		
250A	I	I	I	I	I		
250B	I	D	I		I		
Cognate	I	D			D		I
280	D	D	D	I, D		I	
307	D, M	D	D			D	
320	D	D		D	D		D
380	D	D	D	D	D	D, M	D, M
302	D	D	D			D	
350	M	D	M			D	
407, 471*	M	M	M			M	
430*	M	M	M				
412*	M	M	M		M		
425*	M	M	M			M	M

*Note: Four of Math 407, 471, 430, 412, and 425 are taken.

The Pure Concentration CM shows strength at the mastery level in SLO 1, 2, and especially 3 regarding the emphasis on mathematical proof. This outcome is perhaps the most critical area for the student intent on pursuing graduate school in pure mathematics. The CM also shows mastery level in SLO 5, 6, and 7. The CM identified relative weakness in SLO 4, the use of Technological Tools. This is an emerging area in pure mathematics, with computer applications being very topic-specific, such as applications to number theory, combinatorics, or coding theory. This is an area that will be reviewed for strengthening in our program for pure mathematics majors, including the increased use of mathematical writing software such as *LaTeX*.

The Applied Mathematics Concentration is designed for students planning to use mathematics in a career in business, industry, or government, or to pursue graduate studies in applied mathematics. Since this area substantially diverges in its theoretical and applied underpinnings, the Department offers two separate tracks in the Applied Concentration: (I) the Modeling and Computing Track and (II) the Classical Track. A separate CM is given for each track (Tables 3 and 4).

Table 3
Department of Mathematics Curriculum Map of Outcomes:
The Applied Concentration I: Modeling and Computing Track

Courses	1 Basic Ideas	2 Analytical Thinking	3 Proof	4 Tech Tools	5 Application	6 Communications	7 Info Skills
150A	I	I	I	I	I	I	I
150B	I	I	I		I		
250A	I	I	I	I	I		
250B	I	D	I		I		
Cognate	I	D			D		I
280	D	D	D	I, D		I	
307	D, M	D	D			D	
335	I, D	D	I, D		I, D		
306	D	D	I, D	I, D	D		
310	D	D	I, D	D	D		
320	D	D		D	D		D
380	D	D	D	D	D	D, M	D, M
340	D	D		D	D		
370	D	D		D	D	D	D
350	M	D	M			D	
406*	D, M	M		D	D		
440*	M	M		M	M	M	M
470*	M	M		M	M	M	M

*Note: Two of Math 406, 440, and 470 are taken.

The CM shows strength in SLO 1, 2, and 4, with mastery level in each of the other areas. Math 440 and/or 470 serve essentially as capstone courses in this concentration and aim to ensure mastery level in most of the outcomes.

Table 4 **Department of Mathematics Curriculum Map of Outcomes:** **The Applied Concentration II: Classical Track**							
Courses	1 Basic Ideas	2 Analytical Thinking	3 Proof	4 Tech Tools	5 Application	6 Communications	7 Info Skills
150A	I	I	I	I	I	I	I
150B	I	I	I		I		
250A	I	I	I	I	I		
250B	I	D	I		I		
Cognate	I	D			D		I
280	D	D	D	I, D		I	
307	D, M	D	D			D	
306	D	D	I, D	I, D	D		
310	D	D	I, D	D	D		
320	D	D		D	D		D
380	D	D	D	D	D	D, M	D, M
302	D	D	D			D	
350	M	D	M			D	
406	D, M	M		D	D		
425	M	M	M			M	M
412, 414 450*	M	M	M				

*Note: Two of Math 412, 414, and 450 are taken.

The CM shows strength in SLO 1, 2, and 3, with mastery level in SLO 6 and 7 achieved as well. The CM identified relative weakness in SLO 4 and 5, the use of Technological Tools and the generation of Applications. As with the Pure Concentration, the Classical Track emphasizes the theoretical aspect of applied mathematics. This is an area that will be reviewed for strengthening, including the increased use of mathematical software such as *Mathematica*.

Table 5
Department of Mathematics Curriculum Map of Outcomes:
The Teaching Mathematics Concentration

Courses	1 Basic Ideas	2 Analytical Thinking	3 Proof	4 Tech Tools	5 Application	6 Communication	7 Info Skills
150A	I	I	I	I	I	I	I
150B	I	I	I		I		
250A	I	I	I	I	I		
250B	I	D	I		I		
Cognate	I	D			D		I
280	D	D	D	I, D		I	
335	I, D	D	I, D		I, D		
338	I, D	D		D	D	D	D
307	D, M	D	D			D	
320	D	D		D	D		D
380	D	D	D	D	D	D, M	D, M
302	D	D	D			D	
350	M	D	M			D	
407,414, 417*	M	M	M			M	
430, 471*	M	M	M				
401	M	M	M		M	M	M
402	M	M	M	M	M	M	M

*Note: Two of Math 407, 414, 417, 430, and 471 are taken.

The Teaching Mathematics Concentration is intended for the student planning to teach mathematics at the secondary or community College level (Table 5).

The CM shows mastery in each of the seven outcomes. This concentration requires four 400-level courses, including Math 401 and Math 402. Math 401 and 402 serve as capstone courses and together address all of the learning outcomes in depth.

Table 6 Department of Mathematics Curriculum Map of Outcomes: The Probability and Statistics Concentration							
Courses	1 Basic Ideas	2 Analyt Thinking	3 Proof	4 Tech Tools	5 Application	6 Communication	7 Info Skills
150A	I	I	I	I	I	I	I
150B	I	I	I		I		
250A	I	I	I	I	I		
250B	I	D	I		I		
Cognate	I	D			D		I
280	D	D	D	I, D		I	
307	D, M	D	D			D	
335	I, D	D	I, D		I, D		
390*	D	I, D		I, D	D		
338	I, D	D		D	D	D	D
340*	D	D		D	D		
370*	D	D		D	D	D	D
380	D	D	D	D	D	D, M	D, M
350	M	D	M			D	
439	M	M	D	D, M	M	D, M	D, M
436	M	M		M	M	M	M
435	M	M	M		M		
438	M	M	M		M		

*Note: One of Math 340, 370, and 390 is taken.

The Probability and Statistics Concentration is designed to give students a sound preparation for graduate study in statistics or a career in statistics, actuarial science, or other statistics-based fields (Table 6).

The CM shows mastery in each of the seven outcomes. This concentration requires four 400-level courses, which, collectively, address each of the learning outcomes in depth.

<u>Summary</u>
The development of the CMs has helped to identify both strengths and weaknesses in each of the four concentrations. The Teaching Concentration, Probability and Statistics Concentration, and Applied Mathematics Concentration: Modeling and Computing Track show evidence of mastery level in each of the Department's seven student learning outcomes. The Applied Mathematics Concentration: Classical Track and the Pure Concentration show relative weaknesses in SL0 4, the use of Technological Tools, and SLO 5, Applications Within and Across Disciplines. The curriculum for these two concentrations will be reviewed by the Department during the next PPR cycle.

<u>Graduate Program</u>
At the graduate level we offer two options, one in Applied Mathematics and the other in the Teaching of Mathematics. There is also a Special Topics Program to meet individual student needs.

Applied Program
The Applied Program has been in place since 1985 although the coursework itself was initiated in 1981. This program was designed for those who are seeking or currently hold positions in industry involving mathematical or quantitative applications. The subject matter emphasizes modern practical applied mathematics, modeling, problem solving and computation. The culminating experience is a project in which students have the opportunity of working in teams on a current problem or issue, contracted and paid for by a local industrial firm. Enrollments in this program have declined over the past decade but have increased during the past two years.

Teaching Program
The Teaching Program is designed for secondary and community College teachers, as well as for students interested in a doctoral program in mathematics education. The program was originally started in the late 1960s with an NSF grant and has undergone continuous evolution in coursework and philosophy since that time. Graduates from this program occupy many positions of leadership in area middle schools and high schools. Some have gone on to further graduate work in mathematics education. Indeed, nearly every community College in southern California employs graduates from this program as full time or part time faculty. The program has maintained very healthy enrollments during the period under review.

Special Topics Program
Under certain circumstances, a plan of study leading to a Master of Arts in Mathematics may be designed to provide advanced work in mathematics. A personalized study plan to meet the objectives of each student may be developed within the general framework of the degree requirements. The program is used very rarely.

B. Curricular Changes in Existing Programs

The undergraduate major has been significantly revised and updated over the past several years, primarily in the four concentrations—Pure Mathematics, Applied Mathematics, Teaching Mathematics, and Probability and Statistics—that comprise the major. Faculty members in each of these concentrations have reexamined each of the concentration courses with the goal to make the concentrations more relevant to our current students and to better prepare them for either employment or graduate school. The result has been substantial changes to the pure mathematics, probability and statistics, and applied mathematics concentrations:

1. The Pure Mathematics Concentration was essentially completely redesigned a few years ago, with several courses removed from the concentration requirements and other courses added. This was done to better prepare our students to meet graduate school requirements, while still allowing them flexibility to pursue their own interests in mathematics. As mentioned above, the curriculum to support SLO 5 needs further development.

2. Changes to the Probability and Statistics Concentration include the addition of three new courses in actuarial science, advanced applied statistics, and data analysis. These changes have given this concentration a more applied orientation while also better preparing our students for graduate studies in statistics.

3. Over two iterations the Applied Mathematics Concentration was streamlined to reduce the number of optional courses for our students and to focus our students toward study in either classical applied mathematics or modern applied mathematics. As mentioned above, the curriculum to support SLOs 4 and 5 needs further development.

4. The Teaching Mathematics Concentration has experienced less substantial changes since there is ongoing evidence, based on enrollment and student and faculty feedback, that it is more than meeting our students' needs.

As mentioned earlier, in addition to their mathematics course requirements, undergraduate majors also complete a sequence of cognate courses either in an area with significant applications of mathematics (computer science, economics, information systems and decision science, physics, chemistry, or civil engineering) or from a selection of upper-division mathematics courses in a concentration different from the one the student has chosen. Since the last program review, the Department has added a cognate in actuarial science consisting of courses in the Finance and Information Systems and Decision Science Departments. This is designed to prepare our students interested in pursuing a career as an actuary.

Finally, since the past PPR cycle the Department has seen an increasing number of undergraduate students participating in research projects. To help provide a structure and additional support to these students' efforts, a Research Cognate has been added to the degree. As part of this cognate, students participate in a research seminar and complete a thesis under the supervision of their faculty mentor.

C. Student Demand and Enrollment Patterns/Trends

The Office of Analytical Studies and Institution Research has provided historical data on student demand, enrollment, graduation rates, faculty allocation and student-faculty ratios. This information has been summarized in tables, which can be found in Appendix I. This section gives a discussion and summary of this information.

Focusing first on student admissions into the mathematics major, the admission rate for the first-time freshmen applicants in the Mathematics Department has been around 70%, for the academic years spanning 2004-2009 (Appendix I Table 1-A). This rate decreased to 62% in the 2009-2010 academic year, which coincides with the budget reversal and the mandatory furlough program in the CSU system. However, the number of admitted students for that year, 237, was the third highest in the six-year period under review. The Department has been successful in maintaining a steady 25% enrollment rate among the admitted first-time freshmen group. This index may be taken as a sign of interest in pursuing mathematical sciences at CSUF among the recent high school graduates. The enrollment rates are understandably higher for the upper division transfers (Appendix I Table 1-B). These rates fluctuate around 60% for the latter group, reflecting the determination of a more seasoned group of students interested in majoring in mathematics. There has been a gradual decrease in the sheer number of upper division transfer applicants, which may be due to seasonal patterns of socio-economic factors.

The lower division enrollment in FTES in the Mathematics Department had been on a gradual incline for the period of 2003-2009 (Appendix I Tables 2-A). This incline tracks the increase in campus-wide enrollments, as each student is minimally required to meet the General Education mathematics requirement. A substantial number of students also enrolled in pre-baccalaureate mathematics courses in order to meet their ELM requirement. The 2009-2010 academic year witnessed a decline in the lower division FTES, mainly as a consequence of University budget limitations in admitting the freshmen cohort. The enrollment in the upper division has remained around 200 FTES with small inter-annual variations. When combined, the total lower and upper division FTES have been on a steady increase in the 2003-2009 periods, with the exception of the 2009-2010 academic year. It should be noted that the FTES per headcount has remained at 0.80 for the entire 6 years of this study (Appendix I Table 2-B), a sign that mathematics majors at CSUF have a tendency to maintain their full time status. This has undoubtedly contributed to a more positive academic experience for our majors, resulting in graduating more skilled mathematicians in the various concentrations within the program.

In the period of 1998-2003, the campus annually admitted from 21 to 26 first-time freshmen mathematics majors during the six years of study, while the associated counts vary from 21 to 33 for the transfer students (Appendix I Tables 3-A and 3-B). In the freshmen category, there was a surge in the four-year graduation rate among those freshmen admitted in 2003 (30.7%). In this cohort, 11.5% finished their undergraduate work in the major, whereas 19.2% graduated outside the major. The fraction of four and five year graduation rates in the major was somewhat the same over the six years, whereas a significantly lower percentage of students who graduated in the major took more than five years to graduate. Expectedly, a higher proportion of students graduating outside the major demonstrated longer graduation times (five years or more). This may be taken as a sign that to many students the challenges of completing a major in mathematics only settles in after a preliminary phase of being exposed to foundational math ideas (such as calculus). The degree is structured so that it is only after taking a series of calculus courses that students in the four mathematics concentrations are able to experience more specialized and complex upper division mathematical courses. Quite interestingly, a larger percentage of transfer students happen to graduate in three or four years. Typically, this group consists of community College transfers who have already satisfied calculus and linear algebra requirements, and at times, a large number of General Education units. This background clearly facilitates their eligibility to decide on a concentration in the major and hence, taking the required upper division courses.

Over the six year period detailed in Appendix I, Tables 3-A and 3-B, the graduation rates of freshmen mathematics majors within the math major were quite low, varying from 15.3% to 23.1%. For transfer students, the three-year graduation rates within the math major were also low and variable ranging from 9.5% to 33.3%. These two pools of students have in total a headcount of around 57, and if the times to graduation were extended, the total number of math graduates from these two pools would still be less than 80. In the time period from 2003 to 2010, the Department has graduated 269 students in the major. Clearly, we are able to conclude that many of our graduates are not starting their CSUF tenures as math majors but are migrating from other majors.

Appendix I Table 4 shows that overall the graduation counts in all for the mathematics major has increased steadily in the aforementioned years. As discussed before, there is a decline in the 2009-2010 academic year. One may speculate that some candidates delayed their graduation hoping for a change in the tide in the declining employment years of the post 2008 economic downturn. It is reasonable to predict a repeat of this pattern for at least the immediate years to follow, as the job market continues to remain stagnant.

Contrary to the variation the Department experienced in undergraduate enrollments, the graduate programs in the Department have benefited from consistently high numbers of applicants, and have consequently secured 31 to 42 new enrollments per year in 2003-2010 (Appendix II Table 5). Typically, two-thirds of the applicants are admitted, roughly half of who officially enroll in one of the two graduate program options offered by the Department. To give an example, in 2009, from 98 applicants, 63 were admitted to the graduate program (64%), out of which, 31 officially entered the program (63%).

The graduate program annual enrollment in terms of FTES ranges between 27 and 31 for 2003-2010 (Appendix II Tables 6-A and 6-B). The FTES peaked somewhat in 2009-2010 at 30.8, a possible reflection of the difficult job market leaving education as an alternative for students who were unemployed or under employed. The FTES per headcount was roughly 0.40, a reflection of the part-time student orientation of our program and the more professional group of graduate students in the Department.

A solid majority of the graduate students finish their program within 3 years after their enrollment (Appendix II Table 7). The percentage of graduate students with a Master's degree in 3 years peaked for those entering the program in 2000, followed by a significant decline entering in 2001 (83% and 41% respectively). This index was at least at the 60% level for the other four years within the 1998-2003 block.

In summary, the Department has been successful in awarding at least 25 Master's degrees per year in the 2005-2010 period, with higher counts of graduation in 2007 and 2008 (33 and 33 awarded degrees, respectively). The stabilized pattern of awarded Master's degrees can mirror not only the success, but also the popularity of our graduate programs, providing a hopeful outlook for our upcoming Master's program in Statistics.

The Department's Single Subject Credential Program has also had steady enrollment. Appendix II Table 6-B shows that between 17 and 31 students have been in this program each year from 2003 to 2010. Each of these students is full-time and takes 15 units each semester. The student success rate in this program is high with over 90% of these students completing their requirements for the credential.

Appendix IV Table 9 shows the seven-year Department enrollment trend, which was positive until the effects of the budget downturn were felt in 2009-2010. The Department enrollment targets are also displayed. In the first two years 2003-2004 and 2004-2005, the Department exceeded its enrollment targets by about 5% to 6%. In the five years from 2005 through 2010, the campus adopted a rolling target determination as enrollment was occurring, so that target and enrollment virtually coincided.

Appendix IV Table 9 also shows the annual faculty position allocations and student-faculty ratios over the previous seven years. With steady enrollment increases and with a new College administration, the Department FTEF allocations increased at somewhat higher rate than enrollment. From 2003 to 2009, enrollment increased by 22.5% while FTEF increased by 28.6%. In 2009-2010, budget constraints forced enrollment cuts with a one-year decrease in FTES from the 2008-2009 level of 1800.1 to 1484.7. About 60% of this drop is explained by the loss of the 200 FTES that was generated by the High School Honors Program (see section II.E below for more details). The remainder was due to budget induced enrollment declines. Department SFR's remained steady in the 23 to 26 range from 2003 to 2009, and then spiked in 2009-2010 to 30.6 with the decrease in the number of sections the Department offered and increases in class size that were implemented due to budget cuts.

D. Plans for Curricular Changes

<u>Master of Science in Statistics</u>

There are two areas of focus for curricular change: the new M.S. program in Statistics and the expansion and, hopefully, institutionalization of the Supplemental Instruction (SI) program.

Master of Science in Statistics

The objective of the proposed Master of Science degree in Statistics is to prepare individuals for successful and productive careers that involve the scientific application of mathematical principles to the collection, analysis, presentation and interpretation of numerical data. A graduate from this program will be qualified to gain employment as a statistician in various fields including private industry, government, research organizations, engineering and consulting firms, health care organizations, or education.

The proposed program will be the first in Orange County (California State University Long Beach is the closest local University having a Master's degree program in statistics). The program at Long Beach substantively follows a classical curriculum in statistics. In contrast, our proposed program will emphasize current and computationally intensive techniques in statistics in response to the rapidly changing approaches to data analysis. Although our program will provide a firm foundation in theoretical statistics, most of the courses will be applied in nature with some leaning toward applications in biological, health, and medical sciences. For the complete program description, please see Appendix VII: MS Statistics.

<u>Expansion of SI Program</u>

The Department initiated a workshop program called the Academic Excellence Program (AEP) over 20 years ago. It was modeled after a similar program started in the late 1970's at U.C. Berkeley under the direction of Uri Treisman. This program was an integral part of the Alliance for Minority Participation (AMP) Program. The AEP operated one section each for Math 125 (Precalculus), Math 150A (Calculus I), Math 150B (Calculus II), and eventually for Math 115 (College Algebra) as part of the AMP Program. In each section students met four hours per week to work on specially prepared worksheets under the direction of student workshop leaders. In 2008 the Department began working on increasing the scope and scale of this workshop program and launched the Supplemental Instruction (SI) program in spring 2009. It has since grown from three sections in spring 2009 to more than twenty sections in spring 2011 (Table 7 and Figure 1). SI data analysis has shown that SI students have performed at a significantly higher level of success than non-SI students. During the four semesters under review (Spring 2009 - Fall 2010):

1. Students participating in SI had a passing rate of approximately 81% vs. 62% for the non-SI group.
2. Students participating in SI outscored non-SI group by more than half a grade point (2.59 vs. 1.97).
3. Students participating in SI had a non-success rate (any grade below C, including WU) less than half that of non-SI group.

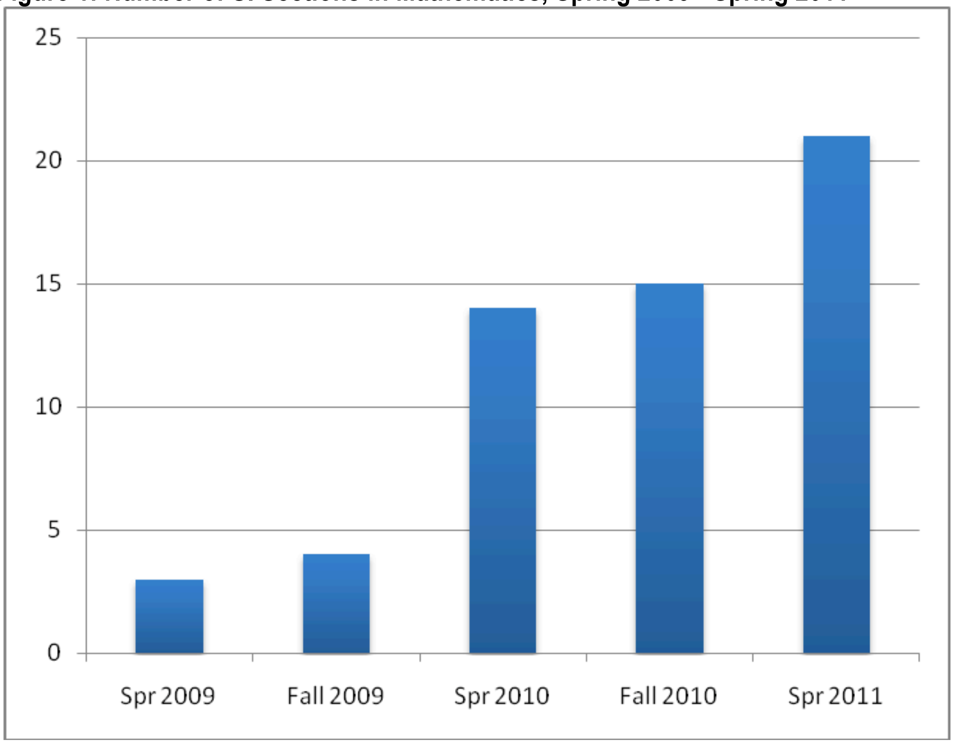
Workshop sections varied from 12 to 28 students, with the average size around 18. SI leaders were paid $1500 per semester and attended all course sessions for their linked SI class in addition to leading the SI three to five hours per week. To date, funding for the SI has come from grant monies, including Title V, GPS-2, and NSF TEST-UP, and a University Mission and Goals Initiative. Minimal support has come from Departmental or College resources.

Result (3) above has significant financial ramifications for the student, Department, College, and University. The fewer students needing to repeat a course, the less cost to all involved both in money and in time to graduation. The CSU does not reimburse student tuition for a repeated course at a different rate than for a non-repeated course. Thus, a student repeating a course costs the state twice as much (or more) as a student who is successful on the first attempt. In the past four semesters (spring 2009 - fall 2009) the SI non-success rate was 21%, compared to an overall non-success rate of 48%, a difference of 27 percentage points. Without the SI program, and assuming that the non-success rate would apply equally to both the SI and non-SI groups, this would result in 27% x 705 = 190 students who would not have been successful on their first attempt in the mathematics class. For a 4-unit class (such as Math 115, 150A, and 150B) the CSU contributes about $520 per student in tuition. Thus, the tuition cost in dollars would be $ 520 x 190 = $ 98,800. The cost to pay the 41 SI leaders over this time was $1500 x 41 = $61,500. While there are administrative costs to run SI which to date have been directly supported by the Mathematics Department and College of NSM, the savings generated from students being successful in their first course attempt may actually be greater than the cost of running the program. Stated differently, initial data show that it may be cheaper (to the state) to have SI than to not have it. It is certainly beneficial to the students in terms of time to degree to be initially successful in these key gateway mathematics courses. Based on this evidence, the Department of Mathematics, with support from the office of the Dean of the CNSM, strongly recommends that the SI program be institutionalized.

Table 7
Growth in Mathematics SI from Spring 2009 to Spring 2011

Semester	Courses (No of Sections)	Total Number of SI Sections	Number of Students Served
Spring 2009	Math 125 (1) Math 150A (2)	3	43
Fall 2009	Math 125 (1) Math 150A (2) Math 150B (1)	4	63
Spring 2010	Math 115 (2) Math 125 (3) Math 150A (5) Math 150B (4)	14	183
Fall 2010	Math 115 (2) Math 125 (4) Math 150A (4) Math 150B (5)	15	220
Spring 2011	Math 115 (2) Math 125 (5) Math 130 (1) Math 135 (2) Math 150A (5) Math 150B (6)	21	325 (estimated)

Figure 1: Number of SI Sections in Mathematics, Spring 2009 - Spring 2011



E. *Special Session Self Support Programs*

Prior to fall 2009, the High School Honors Program provided course credit to local high school students in Calculus and Statistics. As part of the Mentally Gifted Minors Programs it generated around 200 FTES per year without incurring direct cost to the Department. Due to budget concerns, the University moved the program to reside under the auspices of University Extended Education. The cost to students increased from $3.50 per course to $15.00. Although officially a UEE program, the bulk of the staff support (paperwork for approximately 600 student each semester) continues to be handled by the Department.

In this program, mainline Calculus (Math 150A,150B, Math 250A and 250B) and Math 120, Introduction to Probability and Statistics, are offered to 14 area high school campuses. These courses are taught by Department-approved high school instructors who hold, minimally, a Master's Degree in Mathematics. Since the students in this program earn university credit, it is viewed as an attractive alternative to the mathematics component of the Advanced Placement program.

The Department also has operated in a support role for other graduate and post-baccalaureate programs. Students in these programs have been allowed to register in parallel sections of their required mathematics courses and actually participate along with stateside students.

III. DOCUMENTATION OF STUDENT ACADEMIC ACHIEVEMENT AND ASSESSMENT OF STUDENT LEARNING OUTCOMES

A. *Student Learning*

In order to assess student learning in mathematics courses, the Department used enrollment and student performance data for essentially all aspects of the program, including both major and service courses, during the PPR period of review.

Overall Departmental Courses

Table 8 shows that there has been an increase in overall student enrollment in mathematics courses by 29% over the seven-year period from 2003 to 2009, reflecting a campus-wide increase in enrollment. This has been accompanied by a commensurate increase in the number of students successfully completing their math courses (30.3%). The budget-induced drop of 2009 did not impact our success rates. Indeed, overall passing rates during these seven years have remained stable, varying between 72% and 76%. These consistent student success rates suggest that instructional effectiveness has kept pace with and, in some courses, exceeded, the enrollment demands presented to the Department of Mathematics.

Table 8
Mathematics Enrollment Data and Completion Rates
Fall 2003 to Fall 2009

Term	A+ thru C (incl. CR)	Pct.	C- thru F (incl. WU)	Pct.	Total No. of Students
Fall 2003	4727	73.7%	1685	26.3%	6412
Fall 2004	4870	75.7%	1563	24.3%	5433
Fall 2005	5136	73.5%	1852	26.5%	6988
Fall 2006	5045	72.2%	1936	27.8%	6981
Fall 2007	5510	74.4%	1896	25.6%	7406
Fall 2008	6157	74.5%	2112	25.5%	8269
Fall 2009	4820	75.6%	1556	24.4%	6376

Developmental Math Courses

A review of developmental Mathematics courses, Math 30A, 30B, 40 and 45 shows that the number of students enrolled in these courses from 2003 to 2008 increased over time, with the percentage of those successfully completing their Mathematics remediation requirement hovering around 80% (Table 9). The Department's commitment to smaller class sizes and increased effectiveness in instruction, such as the creation and requirement of MAED 480 for all TAs beginning in fall 2007 may have been a factor in the increased success rates, 83.5% (2007) and 87.4% (2008). This growth pattern changed in fall 2009 with fewer students needing to enroll in developmental math courses, which may be partly explained by the decrease in the size of the freshmen class. In addition, the proportion of first time freshmen still requiring remediation going into the fall semester declined from 30% to about 25%.

Table 9
Mathematics Enrollment Data and Completion Rates in Remedial Math Courses
Fall 2003 – Fall 2009

Term	Credit	Percentage	No Credit (incl. WU)	Percentage	Total Number of Students
Fall 2003	757	79.1%	200	20.9%	957
Fall 2004	850	82.7%	178	17.3%	1028
Fall 2005	870	78.5%	238	21.5%	1108
Fall 2006	804	78.2%	241	21.8%	1105
Fall 2007	1030	83.5%	203	16.5%	1233
Fall 2008	1141	87.4%	165	12.6%	1306
Fall 2009	737	74.5%	252	25.5%	989

Table 10 provides information on how developmental math students who were successful in their developmental Mathematics course performed in their subsequent GE Mathematics course (Math 110, 115, 120 and 125). Rows in Table 10 give the specific course and columns show the results for students who were successful in Math 30B, 40 and 45 as well as, for comparison purposes, students who either passed the Entry Level Mathematics Exam (ELM) or students who were ELM exempt.

Table 10 also shows that successful developmental mathematics students were not as successful in GE mathematics as were students who passed the ELM or were ELM exempt. Math 45 students performed at a higher level than did Math 40 students who in turn outperformed the Math 30B students. Also, ELM-exempt students outperformed ELM non-exempt students.
These data suggest that, while the developmental courses in mathematics have been effective in student remediation, students are better off if they enter CSUF as already GE-ready in mathematics.

Table 10
Developmental Math Students' Performance in GE Math

		30B	40	45	Passed ELM	ELM Exempt
110	**GPA**	1.92	2.11	2.30	2.50	2.68
	% Passed	69.9%	74.9%	80.7%	84.3%	85.9%
115	**GPA**	1.17	1.66	1.92	2.36	2.61
	% Passed	39.2%	58.5%	66.9%	77.1%	81.6%
120	**GPA**	1.21	1.24	1.68	2.05	2.31
	% Passed	36.9%	42.2%	60.0%	72.7%	80.9%
125	**GPA**	0.77	1.00	1.33	1.74	2.11
	% Passed	23.1%	31.5%	44.2%	58.2%	69.4%
Total	**GPA**	1.59	1.83	2.01	2.28	2.51
	% Passed	56.4%	64.5%	70.3%	75.9%	80.2%

<u>General Education Course Success Rates</u>
The number of students successfully completing their GE mathematics courses also rose from 2598 in 2003 to 3622 in 2008, an increase of nearly 40%. Passing rates for GE courses has remained stable at around 70% over the six-year period from 2003 to 2008. In 2009, there was a decline in the number of students enrolled in GE classes but an increase in overall success rates. The increase in student success may be, in part, explained by the quality increase in our 2009 freshmen class, the higher level of motivation of these students as they felt the pressure of budget cuts, larger classes and decreased access to courses. The role that faculty furloughs may have played in student performance is unknown. Even in this difficult context, the 3490 students who were successful in GE mathematics courses in fall 2009 represents a 34.3% increase over this number in fall 2003 (Table 11).

This increase reflects both enrollment increases as well as more effective instructional practices, perhaps explained in part by the teacher training in MAED 480 for our TAs as well as greater attention given to PTL development and accountability.

Table 11
GE Math Courses Fall 2003 – Fall 2009

Term	A+ thru C (incl. CR)	PCT	C- thru F (incl. WU)	PCT	Total No. of Students
Fall 2003	2598	69.6%	1134	30.4%	3732
Fall 2004	2793	72.2%	1073	27.8%	3866
Fall 2005	2845	70.3%	1200	29.7%	4045
Fall 2006	2819	68.0%	1324	32.0%	4143
Fall 2007	3162	71.1%	1284	28.9%	4446
Fall 2008	3622	72.9%	1359	27.1%	4971
Fall 2009	3490	75.2%	1153	24.8%	4643

The Mathematical Association of America has reported that entry-level mathematics courses typically have non-success rates around 40-50%. We believe that the passing rate of 70-80% in these courses reflects a strong departmental focus on teaching effectiveness and support provided for the faculty members and teaching associates who teach these courses.

Post GE Course Performance

The Department is also interested in how successful students in GE mathematics classes perform in their next mathematics course in their major. There are three common transitions: Math 115 to Math 130, Math 115 to Math 135, and Math 125 to Math 150A. Table 8 shows the destination course GPA and passing rates by prerequisite course grade or Mathematics Qualifying Exam (MQE) status (passed or exempt). As expected, higher grades in Math 115 or Math 125 are associated with stronger performances in Math 130/135 or Math 150A, respectively. Students passing the MQE performed in Math 130/135 or 150A at about the same level as students who earned A's in their respective prerequisite courses. Students who were MQE exempt (i.e., students who took calculus in high school) performed in Math 130/135 or 150A better than *B* students but not as well as *A* students in the prerequisite courses.

Table 12
Student Performance in Calculus Post Math 115, 125 or MQE

		Math 115 (or MQE) to Math 130	**Math 115 (or MQE) to Math 135**	**Math 125 (or MQE) to Math 150A**
A	**GPA**	2.98	3.06	2.59
	% Passed	89.7%	92.9%	80.7%
B	**GPA**	1.95	2.03	1.62
	% Passed	70.4%	72.2%	57.9%
C	**GPA**	1.30	1.35	1.02
	% Passed	46.3%	49.2%	34.6%
MQE Passed	**GPA**	2.58	3.11	2.42
	% Passed	82.5%	92.4%	77.3%
MQE Exempt	**GPA**	2.46	2.41	2.11
	% Passed	77.8%	79.3%	64.7%
Total	**GPA**	2.12	2.15	1.72
	% Passed	70.1%	71.8%	57.0%

Math 303A and Math 303B

Math 303A and Math 303B, Fundamental Concepts of Elementary Mathematics, are the only upper-division mathematics courses taken exclusively by non-majors, and are therefore separated out from other upper division courses which are largely taken by mathematics majors.

In Table 13 below, the data showed a decrease in the number of students enrolled in and successfully completing their Math 303AB courses, from 608 in 2003 to 340 in 2008, a loss of about 43%. There was a small increase in 2009 to 388, which was still a 36% drop from 2003. The decrease in 303AB enrollment was noted particularly in Math 303B between the fall 2003 and fall 2006 semesters in which about 200 fewer students were enrolled in these courses. This notable decrease was almost certainly due to changes in the state credentialing law, which no longer requires this course for the multiple subject credential. The fall 2006 and fall 2007 enrollments were comparable at 512 and 532, but the drops to 462 in fall 2008 and 472 in fall 2009 indicate that the downward trend continues. Passing rates were relatively high (between 75-90%) in all seven years, although there was measurable fluctuation in these rates from a high 89.8% in 2004 to a low in 2008 of 75.3%.

Table 13 Student Performance in Math 303AB Fall 2003 – Fall 2009					
Term	**A+ thru C (incl Cr)**	**Pct**	**C1 thru F (incl WU)**	**Pct**	**Total No of Students**
Fall 2003	608	85.6%	102	14.4%	710
Fall 2004	520	89.8%	59	10.2%	579
Fall 2005	574	84.8%	103	15.2%	677
Fall 2006	410	77.1%	102	22.9%	512
Fall 2007	426	80.1%	106	19.8%	532
Fall 2008	348	75.3%	114	24.7%	462
Fall 2009	388	82.2%	84	17.8%	472

Upper Division Courses In the Major

The enrollments and passing rates for upper division courses in the major (exclusive of Math 303AB) have remained stable for the last seven years, with passing rates at about 80% and enrollments ranging from 446 to 524 (Table 14). The enrollments for 2006, 2007 and 2008 were at the low end of that range while enrollment in 2009 was at the high end. The 2009 success rate represents a seven-year high.

Table 14 Student Performance in Upper Division Math Major Courses Fall 2003 – Fall 2009					
Term	**A+ thru C (incl Cr)**	**Pct**	**C1 thru F (incl WU)**	**Pct**	**Total No of Students**
Fall 2003	414	81.3%	95	18.7%	509
Fall 2004	420	80.2%	104	19.8%	524
Fall 2005	421	81.3%	97	18.7%	518
Fall 2006	366	79.4%	95	20.6%	461
Fall 2007	369	82.6%	78	17.4%	447
Fall 2008	350	78.5%	96	21.5%	446
Fall 2009	439	83.8%	85	16.2%	524

In addition to overall performance in our upper division classes within the mathematics major, the Department is very interested in the progression of our students through their major courses. Table 15 gives a summary of five years of transition data for some of the most important steps through the core requirement courses.

The data indicate that the transitions within the Calculus sequence are among our students' greatest challenges. Many students in that sequence are not our majors but are in programs serviced by our courses. In general students who do well in the prerequisite courses tend to do better in the destination courses. Students who earned a C in a prerequisite course tended to struggle in the corresponding destination course. These patterns are most apparent in Math 350, followed by Math 307 and then Math 302.

Table 15 Student Performance in Key Math Courses by Prerequisite Course Grades								
			150A to 150B	150B to 250A	250A to 250B	280 to 302	280 to 307	280 to 350
Grade in Prereq Course	A	GPA	2.82	2.86	3.22	3.44	3.34	2.79
		% Passing	86.1%	88.1%	90.5%	98.1%	97.1%	83.9%
	B	GPA	1.89	2.27	2.41	2.21	2.08	1.55
		% Passing	64.8%	80.9%	83.4%	75.9%	80.3%	53.4%
	C	GPA	1.09	1.36	1.96	1.60	1.34	1.14
		% Passing	39.3%	47.8%	72.0%	62.2%	46.8%	40.0%
Total		GPA	1.68	1.91	2.29	2.45	2.29	1.95
		% Passing	56.8%	65.2%	78.6%	79.4%	76.0%	62.6%

B. Assessment Strategies

The previous section detailed direct measures of student achievement and learning in mathematics within and between course levels for majors and non-majors. As part of the Department's ongoing assessment strategy, indirect measure such as exit surveys for majors, as well as the use of embedded questions in key courses, tracked over time. This information is presented here together with observations and implications for the future

Exit Surveys

In an attempt to assess student satisfaction with our major program, the Department conducted an exit survey of our January, May and August 2010 bachelor degree graduates. Of the 64 graduates, 29 submitted responses. The responses were quite positive averaging 4.5 on a 5-point scale on a broad range of Departmental issues including quality of teaching, learning, advising and standards. The very last item asked the students to rate their overall experience as a student in the Department of Mathematics; 28 of the 29 students gave a 4 or 5 rating (21 were 5's) with an average of 4.69. We can draw the inference that among students who were successful in our program, the Department is viewed in a very positive light. The specific questionnaire items along with a summary of the results are provided in Appendix XIII Student Exit Survey.

Embedded Questions

During the period 2005-2010 the Department targeted two key mathematics sequences of courses for using embedded assessment questions on final exams: (1) Math 150A, Math 150 B and Math 250A, and (2) Math 303A and Math 303B. These courses include both mathematics majors as well as students serviced by the mathematics Department for both technical and educational careers. The purpose of this embedded assessment was to track student performance and teaching effectiveness in these sequences over time.

As part of the Mathematics Department's self-assessment, students in Math 150A, Math 150B, and Math 250A were given a common question that could be used to provide baseline data for ongoing course assessment. Appendix IX, Calculus Course Assessment, gives the embedded questions used for Math 150A, 150B, and 250A, together with the letter of directions to the course instructors. Scores have been stable over time in Math 150A and 250A. The same is true in Math 150B until this year when scores showed a substantial jump. This may be a result of our use of SI in almost every section of 150B (Table 16).

Table 16 Calculus Assessment Results 2005-2010						
	Math 150A		**Math 150B**		**Math 250A**	
	No. of Responses	**Mean Score (10)**	**No. of Responses**	**Mean Score (10)**	**No. of Responses**	**Mean Score (10)**
2005-06	198	5.6	137	5.6	n/a	n/a
2006-07	270	5.8	134	6.1	72	6.8
2007-08	262	6.2	180	5.5	94	6.4
2008-09	265	6.0	199	6.0	128	6.2
2009-10	373	5.7	351	7.1	203	6.3

In Math 303AB, students were given a common question that could be used to provide baseline data for ongoing course assessment. Appendix X, Math 303 Assessment Questions, gives the question and rubric used for Math 303A. The results for the assessment question are given below (Table 17).

Table 17 Math 303AB Assessment Results 2005-2010				
	Math 303A		**Math 303B**	
	Number of Responses	**Mean Score (5)**	**Number of Responses**	**Mean Score (5)**
2005-06	614	1.91	92*	2.88
2006-07	203*	2.10	116*	3.33
2007-08	524	2.23	246	3.42
2008-09	476	2.56	252	3.64
2009-10	387	2.29	186	2.76

*Data taken from one semester only

The use of common embedded questions in Math 303A and B seems to be a positive vehicle for helping 303 instructors to interact with one another about the course curriculum. During the last five years there has been a sharp decline in the number of students enrolled in Math 303. Major changes in credentialing laws – shifting from coursework to CST testing – have impacted 303 enrollments across the state. The impact at CSUF is evidenced by the decreasing number of students taking Math 303A and (especially) 303B, particularly among students majoring in Child and Adolescent Development.

C. Changes in Assessment Strategies for the Future

In January 2011 the Department chair, vice chair, and two mathematics faculty members attended a two-day training session in Program Assessment sponsored by the offices of Dr Gerald Patton and Dr Chris Renne. This session was extremely helpful in providing information and strategies to help the Department move towards ongoing program evaluation. Below we outline our overall assessment plan and a specific example of assessment of the Student Learning Outcomes (Table 18).

Formative Assessment

The Department will continue to track students across course levels as part of our programmatic formative assessment (Table 15). This information will be useful in determining how each key course prepares students for the next level of proficiency in higher mathematics.

Summative Assessment

Much of the Department's assessment work will be embedded in core courses that are taken by all majors toward the end of their undergraduate studies in mathematics. For the purposes of program assessment, the seven SLOs (Table 1) naturally cluster into three groups. Student learning outcomes 1, 2, and 3 can be assessed in Math 350, Advanced Calculus I. This course, perhaps the lynchpin course in the major, provides the theoretical basis for calculus and for post-baccalaureate study in all areas. Student learning outcomes 6 and 7 will be assessed in Math 380, History of Mathematics, which is the upper division writing course taken by all majors. As discussed in section II.A., SLOs 4 and 5 are more concentration-specific and are under review at the time of this writing.

Table 18
Assessment of Student Learning Outcomes by Mathematics Course

Student Learning Outcome	Course
SLO 1. To achieve mastery of basic mathematical ideas and techniques ranging across different fields.	**350**
SLO 2. To think analytically and critically to formulate problems, solve them, and interpret their solutions.	**350**
SLO 3. To develop a sophisticated understanding of the nature of proof.	**350**
SLO 4. To use technology as a meaningful tool in formulating and solving problems.	**401/402;439; 440/470**
SLO 5. To apply knowledge from one branch of mathematics to another and from mathematics to other disciplines.	**401/402;439; 440/470**
SLO 6. To communicate mathematics effectively both orally and in writing.	**380**
SLO 7. To develop essential information skills, including determining, accessing, and using electronic and printed information appropriately and professionally.	**380**

Table 19 gives a specific example of the rubric for SLO 6. The timeline for collecting data for SLO 6 is included in Appendix XI: Program Assessment Plan.

Table 19
Assessment Rubric for SLO 6

Category	Characteristics
4 Exceeds Expectations	Mathematics content is complete and correct. Writing style is clear, succinct, and technically correct. Ideas are logically organized and flow well. Writing reflects a high degree of competence in formally written English. The presentation is carefully organized and provides convincing evidence to support the mathematics solution.
3 Meets Expectations	Mathematics content is mostly complete and correct. Writing style is clear but may need minor technical or stylistic edits. Ideas are logically organized and flow well. Writing reflects a sufficient degree of competence in formally written English. The presentation has a focus and provides some evidence to support the mathematics solution.
2 Needs Improvement	Mathematics content is partially complete and correct. Writing style is adequate but may need substantial technical or stylistic edits. Ideas are not fully logically organized and/or do not flow well. Writing reflects an insufficient degree of competence in formally written English. The presentation lacks focus and provides limited evidence to support the mathematics solution.
1 Does Not Meet Expectations	Mathematics content is substantially lacking in completeness or correctness. Writing style is excessively flawed and needs substantial technical or stylistic edits. Ideas are not logically organized and do not flow well. Writing reflects a low degree of competence in formally written English. The presentation lacks focus and provides no evidence to support the mathematics solution.

<u>Summary and Recommendations</u>

Program assessment is an emerging area for the Department. While attention has been given to direct measures such as tracking student achievement, and indirect measures such as the use of embedded assessment, this information needs to be used more powerfully to informing programmatic and curricular direction. The identification of the seven specific SLOs will help to give a clearer focus to this work during the next PPR cycle.

D. *Modifications to Program to Enhance Student Learning*

The 2003 PPR study identified three main areas for curriculum development: (1) the use of technology, (2) the mathematics education program, and (3) the statistics masters program. We report here the progress made in each of these areas.

Use of Technology

During the past seven years the Department has successfully integrated technology into a wide range of its course offerings, from the use of the graphing calculators in the calculus sequence to the use of *MATLAB*, *Geometer's Sketchpad*, *Mathematica*, and a variety of statistical packages in upper-division courses. In addition, increasingly Department faculty members are using the web and packages such as Blackboard to disseminate course materials and to communicate with their students. We would note here that the Department allows individual instructors to use these technology tools as he or she feels is appropriate for his or her courses.

The greatest technological change has perhaps been the inclusion of on-line student work, including both homework and assessments. This has been included in all sections of Math 115, 125, 303A and 303B. While it has been met with mixed reviews by both students and faculty, there is no question that this has saved resources in terms of grader hours as well as minutes spent collecting and distributing papers during class time.

Increased use of technology in teaching and learning continues to be an area of opportunity and challenge for mathematics departments across the country. Meaningful use of technological tools can impact what is learned, why it is learned, and how it can be assessed. The CSUF Department of Mathematics strives to remain an active participant and practitioner in this national conversation.

Activities in Mathematics Education

Curriculum development in the Department is frequently impacted by the needs of our students in the teacher education programs with the CSUF College of Education and elsewhere. A large number of our students are served by courses directly or indirectly related to the mathematics content component of the Single Subject Credential Program or the Multiple Subject Credential Program—the former program representing our largest number of majors among the four concentrations (more than 60 %). In addition, other students are enrolled in mathematics education graduate courses and programs that are served by our Department. The set of core course offerings of the teaching concentration in the MA program has recently been reviewed and a new course special, Studies in Mathematics History, Math 580, has been developed as an elective in the program. It is anticipated that these demands will continue or increase in the years to come. In order to continue to meet these mathematics education and teacher training needs, members of the Department will continue to collaborate with the School of Education (for example, via SECTEP), and the CCTC to keep curriculum offerings up-to-date and relevant to student needs.

Statistics Masters Program

The significant increase in computing power in the last decade has made statistical theory and tools more accessible for analysis of data. At the same time, the internet technology has facilitated access to data in various forms. In response to the technological advances, the Department will increase its statistics offerings to respond to the need of the industry, and to attract students to the field of mathematics. Our primary effort will be in the establishment of an online Masters Degree program in Statistics, which has been approved for development at the Chancellor's Office and is currently under review at the University level. We hope and expect to have this program in place beginning fall 2012 (please see Appendix VII for more details).

Early Start Program

The Early Start Program has been designated by the Chancellor's Office as a way to "…achieve a full-scale implementation of pre-matriculation programs throughout the CSU."

(http://www.calstate.edu/bot/agendas/Mar10/EDPOL-Early-Start-PowerPoint.pdf) . The goal of the CSU is to have no more than 10% of entering freshmen in need of remediation. The Chancellor's Office also states that:

Early Start is a program designed for all incoming students deficient in English and mathematics, requiring that they BEGIN making up those deficiencies BEFORE matriculation. It DOES NOT mean they will be denied admission if they have not completed resolving the deficiency. Anticipated outcomes of this program are:

- *CSU more aligned with national standards on "cut" scores*
- *Near-proficient students will not take courses that are not required of them*
- *Faster progress to degree*
- *Serving more students by increased capacity*
- *Better information on performance of approaches to "remediate"*

By 2014, the CSU will begin reviewing its progress in a coordinated manner, reporting to the Board on its progress, and reviewing best practices in this field. The Department is committed to implementing this program in cooperation with various campus offices and other "stakeholders". Given the leadership role in education-related issues that the CSUF Mathematics Department has had, we anticipate being a primary player in this statewide effort.

E. Assessment Findings and Improvements/Changes

The literature in STEM education (science, technology, engineering, and mathematics) has long identified certain courses as being critical "gatekeepers" for students wishing to pursue a mathematics-based major. These courses include pre-calculus and calculus. Success rates in these courses are shown to be in the 50-60 % range nationally; stated differently, non-success rates (grades of C- or below, W, or U) are between 40-50 %. It is estimated that more than 80 % of these students attempt to retake the course at least once. Student achievement data in Precalculus and calculus at CSUF from the 2003 PPR showed similar patterns with a failure (non-success) rate of about 43 %. In our assessment of student learning in these courses, we observed low level student success and high failure rates. Besides the tremendous waste of human resources, this repetition of course phenomenon for a substantial number of students in the STEM disciplines is a huge financial investment on the part of both the student and the institution. As a response to this, the Department has been proactive in developing the supplemental instruction (SI) program, the growth of which is documented section II.D, as a means to improvement of student learning. A description of the program's impact is given here.

As part of the NSF Project TEST-UP, the Colleges of Natural Science and Mathematics at California State University, Fullerton and Santa Ana College proposed to improve student success and encourage greater numbers of students to persist as STEM majors by concentrating on key entry level mathematics courses. Incorporating small-group, student-centered activities into a course is well known to positively influence student learning.

The SI workshop is a structured learning environment where students gain additional experience in the subject matter taught in the course to which it is linked. Students do not simply review course material or do homework in SI workshops but undertake additional, challenging problems or assignments to build confidence in their abilities and to gain self-reliance. They engage in active learning and cooperative learning activities, utilizing peer facilitators as resource persons. A peer facilitator meets with students for one or two hours twice per week in highly focused sessions to solve new problems and present solutions. The peer facilitator attends each class lecture so that the workshop problems are relevant to course assignments. In doing so, the peer facilitator also serves as a role model for SI students and creates an increased culture of accountability in the classroom.

Beginning in fall, 2008, the program was initiated with three sections (43 students) of Math 125, Precalculus, and Math 150A, Calculus I. In spring 2009 the program was expanded to include four sections (63 students) of these courses plus Mathematics 150B, Calculus II. In fall 2009 the program included nine sections (137 students) of SI for these courses plus Math 115, College Algebra. In the spring 2010 semester, there were 14 SI sections (205 students) being offered in these four courses. In the fall 2010 semester there were 15 sections of SI serving about 220 students, with at least 20 more students wishing to enroll in SI but unable to do so because of enrollment caps and funding limits.

Aggregate results over the two-year period showed that (1) students participating in SI had a passing rate of approximately 81 % v. 62 % for the non-SI group; (2) students participating in SI outscored non-SI group by more than half a grade point (2.59 v. 1.91); and (3) students participating in SI had a F/WU failure rate less than half that of non-SI group. Table 20 gives results for both SI and non-SI students from the spring 2010 semester.

Table 20
Spring 2010 Mathematics SI Results

	SI Students Only		**non-SI Same Sections**		**non-SI All Sections**		**SI and non-SI All Sections**	
	n	**gpa**	***n***	**gpa**	***n***	**gpa**	***n***	**gpa**
M 115	24	2.71	119	1.93	573	1.82	716	1.87
M 125	49	2.52	173	2.16	87	1.74	309	2.10
M 150A	75	2.43	117	1.83	215	1.68	407	1.86
M 150B	57	2.09	97	1.78	54	1.68	208	1.84
Total	205	2.39	506	1.96	929	1.79	1640	1.91

While students self-selected into the SI, there was evidence of value-added from SI participation. First, there were no significant differences between SI and non-SI groups in SAT-M, SAT-V, or HSGPA, so that SI participants did not seem to have a pre-College academic advantage. Second, there were no significant differences between SI and non-SI groups in College GPA and course-repeating patterns, so that SI participants did not seem to have an in-College academic advantage. And third, in multiple-section courses such as Math 150A and Math 150B, the non-SI group achieved at or above the level of all other non-SI sections, suggesting that the achievement of SI students did not do come at the expense of the achievement of non-SI students (as per the table above). We would mention here that all students enrolled in SI sections are heavily recruited and encouraged to join SI via classroom visitation, individual email, and, as appropriate, personal invitation. In addition, there was evidence that the experience was valued by the SI leaders and helped give them the opportunity to view themselves as future professionals that they might otherwise not have had as undergraduate students (see Appendix XII, SI Impact). In summary, there is both quantitative and qualitative evidence to support the expansion and institutionalization of the SI program at CSUF.

F. Quality Indicators/Evidence of Departmental Effectiveness Other Than Assessment of Student Learning

In addition to direct and indirect assessment of student learning and student experience in the Department, there are other indicators of Departmental effectiveness. During the past PPR cycle, more than fifty of our credential students have obtained tenure track positions in area high schools. More than twenty-five of our masters degree graduates have obtained adjunct faculty positions in area community Colleges, and at least ten have been offered and have taken tenure positions in community College mathematics Departments. In addition, at least eight students have received full funding for doctoral programs in mathematics, statistics or mathematics education programs in across the country.

G. Student Learning Assessment in On-Line Courses

The Department has offered a regular on-line course in Intermediate Algebra, Math 45, for many years. The course is designed to serve incoming freshman with a high fail score on the ELM exam and may only need a brief review of Algebra. Lessons are delivered via an online format, with the final exam taken in person by the student on campus. Assignments are completed on-line with the scores being recorded into the student's individual file, which can be accessed by the student at any time. Students may also participate in online chat rooms and Q&A sessions. This eight-day summer course has had a high success rate both in terms of students passing the course (> 80 %) and being successful in their subsequent GE mathematics course (> 75 %). Typically, there are about 400 students enrolled in the course each summer. Assessment of student learning in Math 45 is equivalent to that in our traditional courses.

As described earlier we are in the process of developing an on-line Masters program in Statistics, which will use a hybrid model for instruction and assessment. The Department is considering possible adaptations of online formats in other courses as well, including Liberal Arts Mathematics, College Algebra, Pre-calculus, and Business Calculus.

Off-site courses have been offered in conjunction with education-related grant projects, such as the Math Science Partnership project with the Norwalk-La Mirada Unified School District, a high-need school district west of Buena Park. We offered Math 403A on-site at Los Alisos Middle School in Norwalk as a 5-week summer course in 2007, followed by a 12-week semester course in the fall. Assessment in these courses was done using both on-line and face-to-face formats. Both courses had 100 % successful completion rates, and the mathematics courses were appropriate for teacher credentialing as well as district salary credit.

IV. FACULTY

A. FTEF Allocation and Faculty Changes

The period since our last Program Performance Review has been a time of substantial growth for the University and hence also for the Department of Mathematics. From 2003-2004 to 2008-2009, the Department had a 22.5% increase in FTES (1469.6 to 1800.1) and consequently a 30.5% increase in FTEF (54.5 to 71.1). With the budget constraints imposed in 2009-2010 and the consequent redirection of the our high school honors program to the Open University, FTES dropped to 1484.7 and FTEF to 58.8. With the high school honors program excluded from consideration, our eight-year growth in FTES and FTEF have both been in the 10-15% range, even with the recent budget declines (Appendix IV Table 9).

One of our goals from our 2002 – 2003 PPR Self-Study was the ongoing hiring of tenure track faculty members. Since that time, we have actively pursued this task and have successfully filled 12 tenure track faculty positions. Over this period, we have seen six faculty members retire and two resign, leaving us with a net gain of four tenure track faculty members. As a percentage of FTEF, we experienced an increase from 47.7% to 51.0%. Of the 19 tenured faculty members in the Department, 13 are full professors and six are associate professors. Of the 11 untenured faculty members, one is an associate professor and 10 are assistant professors.

In addition, one of the Department's goals in hiring has been to ensure capability to successfully offer our major program and to meet our substantial service course obligations. We have achieved this goal. Our academic offerings have increased over the period under review with no courses unoffered due to lack of faculty expertise or availability.

B. *Priorities for Faculty Hiring*

The Department currently has 29 tenured or tenure-track faculty members, including eight in applied mathematics (three in classical applied mathematics and five in computational/modeling applied mathematics); ten in mathematics education; six in pure mathematics; and five in probability/statistics. We anticipate that our service base of students will not decline over the next five to seven years; indeed, our FTES has been consistent for the past two years after a period of steep growth from 2003-2008. Thus, we anticipate that it will be necessary to replace any faculty members who retire or resign, as well as increase the FTEF by about 10% as the Department has been understaffed at the full-time faculty level.

In order to plan for this, a recent survey conducted in our Department asked faculty members to indicate their retirement expectations over the next seven years. Five faculty members responded that they definitely plan to retire during that time frame, with four more indicating that they would very likely do so. Based on this, together with anticipated growth in the statistics masters program, our long-range plan is to hire roughly two faculty members per year for each of the next seven years. Table 21, together with Appendix XIII, Hiring Priorities, summarizes and further explains the hiring plan.

Table 21: Projected FTF Hiring Needs, 2011 - 2017

	Current No. of FTF by Area	Projected No. of Retirements or Resignations	Projected Growth	Projected Hiring	Projected No. of FTF in 2017
Applied Math					
Classical	3	1	0	1	3
Computational	5	2	1	3	6
Math Education	10	4	0	4	10
Pure Math	6	1	0	1	6
Statistics	5	1	2	3	7
TOTAL	29	9	3	12	32

The mathematics education and probability and statistics concentrations are the areas where we foresee the biggest need in the near future due either to program growth as described above or imminent faculty retirement. Furthermore, these are the areas where we have had the most difficulty in attracting high quality faculty members, and therefore, as in the past, it may well take more than one hiring cycle to fill vacant positions. Consequently, these areas will be our top priority, with the expectation that if a search is unsuccessful, then it will automatically be rolled over to the next hiring cycle. As the table above shows, computational applied mathematics is also a strong hiring priority due to anticipated retirements. We have been successful in applied math searches in the past and anticipate future success in this area. Appendix XIII, Hiring Priorities, gives additional detail of hiring rationale in each of the four concentration areas.

C. *The Roles of Full-Time Faculty, Part-Time Faculty, Teaching Associates and Student Assistants in the Delivery of the Department's Academic Program*

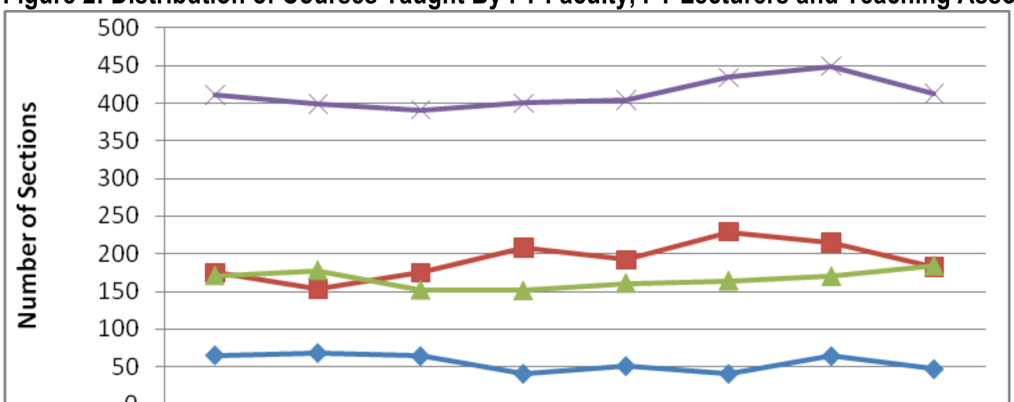
Full-time faculty members assume the principal responsibilities for teaching our upper-division and graduate courses, mainline Calculus courses, the mathematics sequence for prospective elementary school teachers, and General Education Probability and Statistics and share the teaching of the Business Calculus and Survey of Calculus courses. Fortunately, many of the Department's faculty, while trained and most interested in one of the concentrations areas with the undergraduate major, have the background, interest and willingness to cross over and teach in concentrations outside of their specialties. This is an important asset to the department when our upper division and graduate programs are being staffed. The part-time lecturers are the principal instructors in the Department's General Education level courses: Liberal Arts Mathematics, College Algebra and Precalculus. Teaching Associates are the principal instructors in the Department's Developmental Mathematics program teaching our Intermediate Algebra courses.

Instructional Student Assistants also contribute to the delivery of the Department's programs. They serve as graders, tutors in the Tutoring Center, workshop leaders in the Supplemental Instruction Program, and laboratory monitors in the Department's walk-in computer laboratory.

Figure 2 displays graphically and numerically the number of sections taught by full-time faculty members, part-time faculty members, and teaching associates over the past eight years. While there has been minor variability over time, both the number of sections and the proportion taught by FTF, PTL, and TAs have remained quite stable: 40.4% of Department sections have been staffed by full-time faculty members, 46.3% by part-time lecturers, and 13.3% by teaching associates. The courses taught by full-time faculty members tend to be more advanced, so the enrollments in these courses tend to be smaller than those in lower division, General Education and pre-baccalaureate courses taught mainly by Part-time Lecturers and Teaching Associates. Hence, when these section percentages are converted into number of students taught, the proportion of Department teaching responsibility shifts further away from the Full-time Faculty. Over the last eight years 33.4% of math students have had a full-time faculty member as their instructor, 52.6% a Part-time Lecturer, and 13.9% a Teaching Associate (Figure 3).

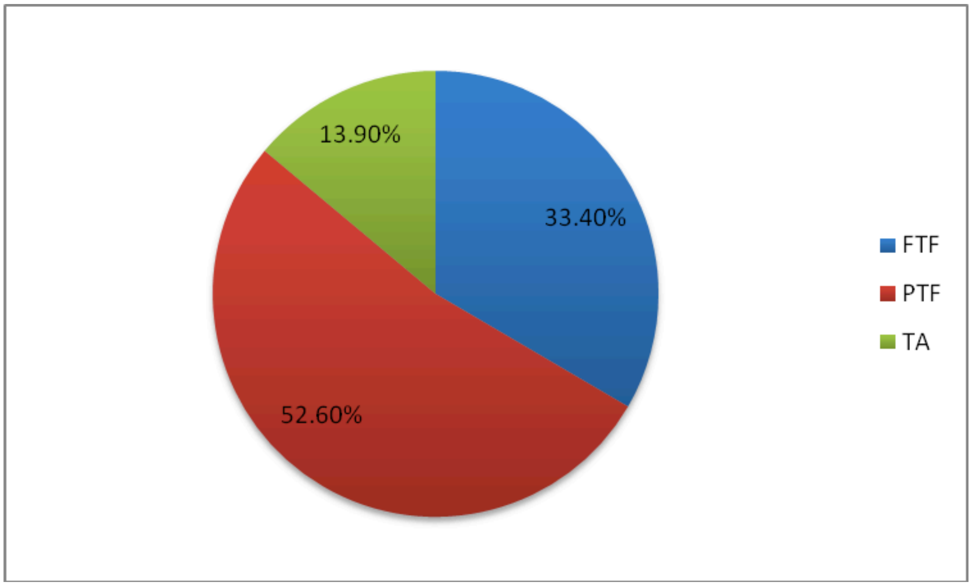
Figures 2 and 3 show the scale of the Department's teaching "operation" and the critical role that our Part-time Lecturers play in the Department. During the past several years the Department has increased its efforts to evaluate and monitor the quality of their teaching. Two Full-time faculty are given release time to be involved in classroom visitation and evaluation of Part-time Lecturers. Part-time Lecturers also complete a substantial teaching portfolio that undergoes a rigorous review each year. Approximately 40 to 50 portfolios are reviewed each spring by Full-time Faculty members, the Department Personnel Committee, and the Department Chair. This work, while critical to maintaining the quality of teaching in mathematics courses at CSUF, is extremely time- and labor-intensive.

Figure 2: Distribution of Courses Taught By FT Faculty, PT Lecturers and Teaching Associates



	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
TA	65	68	64	41	51	41	64	47
PTF	175	153	175	208	192	229	215	182
FTF	171	178	152	151	161	164	170	184
Total	411	399	391	400	404	434	449	413

Figure 3: Percentage of Students Enrolled in Mathematics Courses Taught By FT Faculty, PT Lecturers and Teaching Associates



D. Instructor Participation in Special Sessions Self-Support Program

The Department's principal special session self support program is mathematics summer course offerings. The Department has offered at least 30 sections each summer, and staffing determined by both University Extended Education and University and Department policies. Tenured and tenure-track faculty members are given first priority for teaching these courses followed by full time lecturers. Typically, at least 80% of these courses are staffed by Full-time Faculty members. Additional courses are staffed by temporary lecturers and occasionally by faculty members in other Departments.

E. Noteworthy Faculty Achievements

We are proud of the special recognition received by Mathematics Department faculty during the past seven years, including the following major awards:

2009/10	Martin Bonsangue	CNSM Award for Distinguished Faculty Member
2009/10	Nashat Saweris	CNSM Award for Outstanding Lecturer
2009	David Pagni	Outstanding Contributions to Education Award, Orange County Department of Education
2009	Scott Annin	MAA Henry L. Alder Award for Outstanding Teaching
2008	Scott Annin	CSUF Carol Barnes Award for Outstanding Teaching
2007/08	Kathy Lewis	CNSM Award for Outstanding Lecturer
2006/07	Scott Annin	CNSM Award for Outstanding Teaching
2006/07	Mori Jamshidian	CNSM Award for Outstanding Research
2005	David Pagni	Presidential Award for Excellence in Science, Math and Engineering Mentoring
2005/06	Gerald Gannon	CNSM Award for Distinguished Faculty Member
2005/06	Margaret Kidd	CNSM Award for Outstanding Contributions to Student Success
2004/05	Armando Martinez-Cruz	CNSM Award for Outstanding Teaching
2004/05	Ernie Solheid	CNSM Award for Outstanding Contributions to Student Success

Our faculty members continue to be remarkably active in research and during the last seven years have had a high level of success in disseminating their work through publications. During this time period, Department faculty members have published 7 books and 189 articles in refereed journals, many of which have appeared in very prestigious journals in mathematics, statistics and mathematics education. The Department has also enjoyed an unprecedented level of success in getting external funding. During the PPR period of review, more than twelve million dollars from statewide and national granting agencies, including the National Science Foundation, has been gathered. A sample of grants awarded during the period of review is listed below:

1. Teachers Assisting Students to Excel in Learning Math (TASEL-M2), NSF, 2009-2012, De Land, P., Pagni, D., Gannon, G.; $2,094,045.
2. Image Science for the Next, X-Ray: Taking NEQ to Task, NIH, 2007-2010, Pineda, A.; $96,825.
3. Improving Mathematics, Physics, and Chemistry Teaching (IMPaCT), NSF, 2006-10, Kidd, M., Pagni, D., Lodyga, R., $470, 588.
4. CA Math and Science Partnership Project (CaMSP), CA DOE, 2006-07, Albano, S., Bonsangue, M., Schmaulfield, R., $82,741.
5. Project Alpha, CA DOE, 2005-06, Shultz, H., $619, 999.
6. Non-deterministic Sequence Validation and Verification, NASA/JPL, 2003-04, Gearhart, W., $30,000.
7. Teachers Assisting Students to Excel in Learning Math (TASEL-M), NSF, 2003-2008, Pagni, D., $6,483,054
8. Orange County Math Project at Fullerton (OCMPF), UC Subject Matter Projects, 2003-04, Shultz, H. and Pagni, D., $168,000.

V. STUDENT SUPPORT AND ADVISING

A. *Student Advising*

The emphasis on quality and comprehensive student advising has remained a priority in the last seven years. Students in the College of NSM are required to meet for advising twice a year prior to registration. Additionally, the University's has established New Student Orientation each summer for incoming freshmen and transfer students.

<u>Mandatory Advisement</u>
Bi-yearly advisement for mathematics majors is carried out in a two-week period prior to our first registration opportunity (October for spring semesters and April for fall semesters). Students are required to meet with a faculty advisor for a 30-minute discussion of their upcoming semester course schedule, academic progress, long-term goals and problem solving for grade deficiencies.

Faculty advisors represent the four concentration areas in our undergraduate degree and we attempt to pair students with an advisor who is versed in their concentration. Due to the large number of teaching concentration majors, we are unable to provide all those students with faculty advisors in their concentration area.

Faculty commitment to this advisement period involves sixteen individual meetings with their advisees. Most faculty members have a full docket of students. With the recent introduction of the Titan Degree Audit (TDA) system, faculty advisors may access up-to-date student records during their advising time. In addition, they are provided with the student's paper file where a written record is kept of plans and commitments made by the student. Additional information on advising procedures, changes in curriculum or University policies, information on the Titan Degree Audit graduation check procedures, tentative course offerings, and information on extra curricular opportunities are also provided for each faculty advisor. Appendix XIV, Advising Materials, includes copies of the advising support information currently provided to faculty.

Students who fail to participate in this advising time are blocked out of early registration and are required to contact their advisor and arrange for a time to meet. We normally see 75% our active majors prior to early registration. The rest trickle in during the end of the semester and must wait for late registration to register for their classes.

New student orientation advising is carried out by the Academic Advisement Center, with the assistance of mathematics faculty at scheduled times to meet with mathematics majors. This is done during summer and relies upon volunteer participation from the faculty.

Walk-In Advisement

In addition to the mandatory advisement carried out by the Department faculty, the staff regularly schedules inquiry appointments for potential new students. The Advising Committee has as a primary duty making themselves available for advising appointments throughout the academic year. During summer session, faculty members who are on campus for teaching duties are requested to be similarly available.

General informational questions and basic information about the degree and course prerequisites and equivalencies are routinely responded to by the office staff.

Graduate Program

Graduate Program advisement is carried out by the Graduate Program Advisors for each of our two programs. Review of student preparedness, explanation of the program and course requirements and content are discussed. Students admitted meet as needed to develop a study plan and other issues as they arise. All general and informational inquiries are handled by the graduate secretary.

B. Student Opportunities

The Department has a wide range of opportunities for students including employment, mathematical research and competition, internships and clubs. These activities are designed to support and complement the education of our students.

Instructional Student Assistants

Tutoring Center

Our Drop-In Tutoring Center has been a highly successful student support service. We have recorded approximately 30,000 student contact hours over the seven-year period, and have had about 350 students, mostly math majors, serving as tutors for credit or pay. In the recent past due to reduced operating expense funding, there has been a reduction in the number of paid hours for our students. Nevertheless, students continue to see this as a valuable opportunity to strengthen their command of mathematics content, as tutoring requires them to be able to answer questions over a broad range of topics. Consequently, we have been able to recruit strong students to work for reduced hours, volunteer or tutor for credit. Also, as an incentive to our students who are successful in the tutoring center and as a service to the community at large, we maintain a list of experienced tutors who are available for private tutoring. Our tutor list is one of our most requested items, both from CSUF students and the surrounding community.

Student Instruction Leaders

As part of the SI program, undergraduate students (primarily math majors) have been employed each semester as workshop leaders for Math 115W, Math 125W, Math 151A and Math 151B. This is a fantastic opportunity for these students to gain experience that lives somewhere in between individual tutoring and classroom teaching.

Student Employment Opportunities

Approximately 40-80 students (mostly mathematics majors) are employed each semester as course graders, SI leaders, tutors, and lab monitors. Although the budget for this has shrunk over the past several years as part of the CSU cutbacks, student payroll has continued to be a significant part of our operating expense budget. Since 2003-04 we have expended approximately $400,000 on student employment, using both state and non-state resources. Outside grant support has included, the Mathematics Intensive Summer Session (MISS) Program, Title V, MSTI and GPS-2. Other grants have occasionally provided resources for faculty research assistants. Since most of our student employment involves instructional support, opportunities for student enrichment in this venue are very strong.

Collaboration with Students

Student Research

There has been a significant increase in the collaboration between faculty and students in research over the last few years. This has been reflected in an increased number of presentations by students at conferences and student publications both at the undergraduate and graduate level. At least 15 faculty members have worked with 53 undergraduate and 27 graduate students on research resulting in 52 presentations at conferences and 32 papers, 21 of those in peer-reviewed journals as well as six papers in *Dimensions,* the colleges undergraduate research journal. Two of our faculty members were recipients of Center for Undergraduate Research in Mathematics grants, which included stipends for their students. Also, nine students presented results of their research at the January 2010 Joint Meeting of the American Mathematical Society and the Mathematical Association of America in San Francisco.

Financial support for student research has been limited. Our research cognate (added to the degree in 2005) provides student degree credits and faculty workload credit and is gaining more interest over time. External funding (from the CURM, NSF and NIH) has provided some support for both undergraduate and graduate student research. The Department is highly motivated to seek additional ways to support faculty/student research collaboration. We are looking for ways to strategize the use of faculty workload for student supervision as a possible option. We recognize these opportunities for students are very helpful to them in deciding whether to pursue advanced study and to further strengthen their applications for Ph.D. programs.

A subset of student research and tutoring is the opportunity for service learning. Our only opportunity for this took place during the summer of 2010. Using funding from NSF (with matching funds from CNSM), one of our graduate students participated in the volunteer lecturer program from the National Academy of Sciences in Cambodia. The Department has an interest in increasing service learning by incorporating it into classes and service projects including tutoring in the local community or as a service trip.

Internships

Internship opportunities for our students have not been extensive. Currently in collaboration with the Center for Insurance Studies, we offer a free actuary workshop every spring semester to approximately six to eight students to prepare them for the first actuary exam. We have also have had paid internships outside of the Actuarial field, for example, with the Southern California Coastal Water Research Project. One of our goals for the future is to increase the number of paid and unpaid student internships.

Putnam Exam

The William Lowell Putnam Competition is an annual nationwide examination and competition for undergraduates. Each year, the Department runs preparation workshops coordinated by several faculty members. The number of students participating in the national Putnam mathematics exam has varied between five and eleven over the last six years, with nine taking the exam this year and all nine of them participating in the preparation sessions. We saw our strongest team performance ever from last year's group, with our team being ranked 113th in the nation – our highest ranking ever. Also, four of our students scored 10 or higher with one student scoring an incredible 30. This is an exam on which the nationwide median and modal score is 0.

Colloquiums
Historically the Department has offered colloquiums that are accessible to undergraduate and graduate students. Speakers have included faculty members from a variety of areas and institutions, as well as our own. In addition to the traditional mathematical lecture, we have also run Alumni Panels where advanced degree and job experiences were discussed. During the University's 50th Anniversary celebration, we offered two such events, fall and spring semester. From Spring 2007 to Spring 2010 the Department and the math club sponsored a colloquium targeted at sophomore level math majors. It had two series of talks: "Meet the New Faculty", where the work of new faculty is showcased and "Mathematicians Outside of the Classroom", which showcases the outside activities of mathematicians such as Peace Corps experience. The addition of pizza made for a robust attendance and created a sense of community for our students.

Student Scholarships
The Department has regularly provided two kinds of gifts to our students: memberships to various mathematical journals and scholarships based on academic achievement. Student memberships are made available with the purchase of an Institutional membership. Due to operating expense reductions beginning 2009-10, all but one has been cut. We hope to reinstate them with improvements in our budget. Our scholarships are listed in Appendix XV, Mathematics Scholarships, and have been supported by non-state resources and private donations.

Math Club
Over the period of review the Department has had a very active math club providing social and educational events including activities such as colloquia, ice cream socials, student research talks, mathematical movie nights, etc. The Math Club has also helped to coordinate events at the College level, such as the symposium on women in science in 2010. As a service component, the club facilitates the attendance of undergraduate research students to present at conferences through the NSM ICC.

VI. RESOURCES AND FACILITIES

A. *Staff Support-Clerical and Technical*

The Math Department staff consists of five full-time positions: a full-time Administrative Support Coordinator II, 3 full-time Administrative Support Assistant II's and a full-time Information Technology Consultant. Additionally, we normally have one student assistant assigned to assist the support staff and one to assist the IT Consultant.

During the last seven years, we reorganized the staff, reclassifying an ASAI to an ASAII and added another Administrative Support Assistant II thus providing nearly adequate support for the Department. Our most recent hire was this additional position in 2008. Turn over in the last seven years has been minimal with hiring only in 2005 and 2008. The ASC has been with the Department for 31 years and the lead ASA and IT Consultant both for 10 years.

Overall, staff moral is strong, with a strong sense of Department ownership and commitment to our mission. A strong team spirit permeates our Department office, and both students and faculty find our staff to be friendly, helpful and competent. Workload is heavy and demanding but can generally be managed. The physical office space is workable, but we have been discussing the possibility of extending the office into contiguous space to open up a larger work area for the ASA's and provide additional room for faculty course preparation and supplies. Budget issues have put this on hold for the time being.

The primary change in the last seven years was the system wide changeover to CMS, which affected all tasks associated with finance, scheduling and hiring. Additionally almost all administrative tasks are now web-based at some level. Task assignments by position are listed in Appendix XVI, Administrative Task List.

During the period under review staff have received five College and/or University-wide acknowledgements of excellence and achievement.

2009-10	Theodore Nguyen	Titan Excellence Award
2008-09	Kathleen Dische'	Titan Excellence Award
2007-08	Kathleen Dische'	CNSM Staff Excellence Award
2006-07	Jan Sheridan	Titan Excellence Award
2005-06	Theodore Nguyen	CNSM Staff Excellence Award

B. State Support and Non-State Resources

Appendix V, Table 10 overviews the state and non-state support received by the Department over the last five years.

An analysis of our resource allocation from the state indicates that the Department has been well supported in terms of course staffing via the part-time faculty (PTF) blanket allocation. Position allocations, both baseline and one-time, have enabled the Department to generally meet student demand in our pre-baccalaureate, general education, other service, major program, graduate and credential program offerings. In particular and largest in scale, the Department has provided the opportunity to each first time freshmen to fulfill the University General Education mathematics requirement immediately upon matriculation at CSUF. While this support has been significant, it has not necessarily allowed significant amounts of resources for intra-departmental faculty assigned time for research. During the years of 2005-2007 the PTF Blanket was allocated solely on an FTES position generated calculation, which for the Department was quite large. In the last two fiscal years, the College has increasingly centralized this allocation, providing sufficient income to cover Part-time Lecturer and Teaching Associate contract costs, with some additional funding for assigned time. Prior to this, the department was able to use under utilized PT Blanket funds to supplement our operating expenses. This was a significant resource for the Department as our baseline allocation for normal operating expenses is unrealistically low. Essentially the everyday non-direct teaching business of the Department has been supported via University Extended Education (UEE) funds and excess PTF Blanket funding. With the budget constraints now facing the CSU, the College is increasingly centralizing our funding resources. It is uncertain how this will affect the Department in the future. With improvements in the overall budgetary situation, a primary financial goal of the Department is to realize a baseline increase to our Operating Expense allocation.

In consideration of non-state resources, the Department has been very successful in obtaining grant awards from outside resources. This has enabled faculty release time and supplied a relatively stable resource via Indirect Costs (IDC) over the last five years. The Department has utilized a significant amount of these discretionary funds to supplement faculty travel expenses. Outside contracts to support our Applied Mathematics graduate program have been sought and obtained. In the five-year period we contracted with Raytheon and GE for our graduate program summer final project.

As state resources become less available, the Department is looking increasingly towards outside donations to fund special programs and support for our students and faculty. In 2006 one of our emeriti faculty, Dr. Edsel Stiel, established an endowment account to provide funding for our annual Outstanding Math Scholar Award. In spring 2010, one of our alumni began a commitment to annually fund the Cheryl Carrera Mathematics Scholarship for returning students. Additionally, a small number of alumni and faculty members regularly make monthly or annual contributions to our Philanthropic Foundation accounts as part of the It's Our University program. Efforts such as these are very welcome, and the Department will seek to improve its liaison with alumni with the assistance of the College's Director of Development.

C. Special Facilities/Equipment, Changes and Needs

Overview

The Department of Mathematics, unlike the science departments in the College of Natural Sciences and Mathematics, does not need wet lab facilities. Nevertheless, there are definite needs for space and technology for both faculty and students. Additionally, as the largest department on campus (based on both FTES and FTEF), our administrative space needs are significant. Our facilities are listed below in seven categories:

1. Specialized Classrooms
   - Smart Classrooms – MH 476, 480
   - Math Ed Classrooms – MH 380, 390
2. Computing Facilities
   - Department Servers
   - Computer Teaching Lab – MH 452 (24 student stations)
   - Portable Computer Lab (24 laptops) – MH 380
   - Student Computer Lab – MH 26
3. Student Support Facilities
   - Student Tutoring Center – MH 187
   - Student Study Area – MH 33, MH 112 (recently reclaimed by the VPAA)
   - Math Club Office – MH 187
4. Faculty Research/Seminar/Meeting Room – MH 484
5. Faculty/Staff Offices and Workspace
   - Full and Part-time Faculty Offices
   - Main Department Office
   - Administrative Storage
   - Event Preparation/Storage
6. Storage
   - Equipment and Supply Storage
   - File Archives
7. MDTP Processing Center – MH 434

Resources to establish and improve facilities in these areas have been invested primarily in equipment, software, space renovation and furniture purchases.

Specialized Classrooms

During the 1990's with the addition of Dan Black Hall, lab space in McCarthy Hall was allocated to the Department. Extensive renovations on both the third and fourth floors resulted in three dedicated mathematics classrooms. One on the third floor, MH 390, was designed to support our Mathematics Education courses, and the rooms on the fourth floor, MH 476, 480, and 484, our Calculus program.

MH 476 and 480 were ground breaking in their time, as they were the forerunners of our normal smart classroom today. Outfitted with laptops, LDC projectors and teaching walls consisting of moveable white boards, they still serve us well for our mainline Calculus program. Adjacent to these classrooms, MH 484 was used to support the project component of our Calculus program. At this time the space, which has been altered and reduced, is mostly used for meetings, student workshops, and faculty research seminars.

MH 380 and 390 are prioritized for mathematics education courses. Initially we had only the one room MH 390, and MH 380 was later transferred to the Department in a space exchange with the Dean. Along with the room came computer tables and chairs. The room, which was originally intended to be a computer lab, was not designed for the purpose of teaching Mathematics Education courses. During the period of review, we have invested in MH 390 by replacing the carpet and one white board and the LCD projector. The furnishings continue to be adequate as is the space and storage. We recently became the recipients of a mathematical education library, which we will house in this room by adding bookcases to the south wall.

MH 380 has been more problematic. In dire need of new carpeting and furnishings, we have been unable to renovate it due to budget freezes and lack of resources. A new LCD projector and a portable computer lab (laptops) located in this room were updated in 2008. This room provides a large space and room for storage of mathematical manipulatives, but the furniture is not designed for group interaction and needs to be upgraded as soon as possible.

Computer Facilities

As part of the response to a changing technological and mathematical world and workplace, the Department has strived to maintain and anticipate computer and other technological needs. Our facilities include 17 servers, providing database, website and file sharing support, (located in MH 452 adjacent offices), a teaching computer lab (MH 452), a student drop-in computer lab (MH 26), and a portable computer lab (MH 380). MH 452 is also space allocated to the Department in the 1990's. It includes adjacent space, which houses our IT Consultant, servers and equipment storage. During the period of review, we have expended significant resources to upgrade and maintain the server support to the department and the lab equipment located in this area. Of significance is the replacement of all the computer workstations (in 2008) and replacement of tables with hide-away computer desks, such that the monitors can be rotated under the desk to create horizontal workspace when not using the computers. We also purchased 10 additional servers to accommodate the increasing numbers of website, users, databases and software used by the Department. Also added to the lab in MH 452 is *ComWeb*, a computer classroom collaboration control system. Using *ComWeb* instructors and students can broadcast and share their computer screens in real time. It allows the instructor to help the students to solve their math problems interactively and remotely. The use of *ComWeb* also prevents students from inappropriate computer use (e.g., web surfing, games, I.M., etc.) during class and work sessions.

MH 26 houses a small student computer lab that is open 24 hours per week (M-Th 9-3). This lab space was made available beginning in 2009. Prior to that, MH 452 was scheduled so that there were some open lab hours for our students. With the addition of MH 26, we are now able to provide longer periods of open time for students. Student demand for this lab is mostly met, except during certain peak times. Costs to maintain this lab include employing student assistants to monitor and assist users during open hours. Additional resources would enable us to open it for an additional day or perhaps during the evening.

The portable computer lab in MH 380 is essentially a fixed cabinet that provides storage and charging for 24 laptops used in MH 380. Purchased a number of years ago, the laptops have been replaced twice (in 2006 and 2008). Time for students to remove the laptops and set up has curtailed the value of this mobile lab. By keeping it as a fixed storage unit in MH 380, we have been able to utilize it the most efficiently.

Details on purchases and upgrades over the period of review are given in Appendix XVII.

Student Facilities

Our student facilities include our Tutoring Center (MH 187), Math Club office (MH 187) and a common study area (MH 33). The Tutoring Center has been housed in MH 187 since the early 1980's. It is designed to function as a walk-in center for brief assistance from student tutors and a general study area for students. During the period of review via Lottery funding, we upgraded the tables and chairs and established a small office for the student Math Club in this space. The Tutoring Center is open daily and usually employs one to three tutors per hour. Due to budget cuts the number of student tutor hours has been reduced. As budgets return to historical levels, the Department will hopefully be able provide full funding for the staffing of these tutors.

Additional student study areas were secured due to space reallocations in the last two years. MH 33 is part of a faculty office complex and was furnished and upgraded with Lottery money in 2007-08. Close proximity to faculty offices makes this a well-appreciated and much-used area by our students. The area in MH 112 was centered around five Department Part-time Faculty offices. Beginning spring 2011 this space was reallocated to other needs and our faculty were moved. Student use in this area was sporadic and minimal.

Faculty/Staff Offices
Full-time faculty office space is generally acceptable and adequate in size; however the lack of contiguous space remains a problem. Faculty offices are located from the fifth floor to the basement. Locating faculty offices to encourage and support collegiality and access is not possible for all. Recent improvements in this situation have benefited math education faculty who now have a suite of seven offices located in close proximity to the two math education classrooms. This still leaves three faculty members located on other floors away from their colleagues. Nevertheless, it has been a great improvement and has provided some of our younger faculty members the opportunity to work closely with each other and with more senior faculty mentors.

A second area of concern for space allocation is the Department's main office. Designed in the 1970's to house two secretaries, it is now rather close quarters for four staff members and the Chair. Presently it is lacking in adequate workspace for the Administrative Support Assistants, faculty course preparation and storage. Plans to enlarge this space by pushing into current faculty office space to the west have been put on hold indefinitely pending improved budget conditions. During the period of review the only improvements to the space was furnishing the Administrative Support Coordinator's Office, providing adequate workspace for the tasks associated with that position.

Faculty Research/Seminar Room
During the period of review, the only space usable for faculty research meetings and presentations was MH 484. Since this space was accessed for our Calculus courses and other purposes, faculty members were, and still are often, left to hunt for classroom space in which to meet and carry out small seminars. Additional space for this purpose is not normally perceived as a high priority in space allocations.

Storage
The Department uses small rooms throughout McCarthy Hall to store supplies, faculty personnel documents, archive student files and other documents that need to be retained. As mentioned, MH 452 has contiguous storage space for computer equipment, but there is inadequate space for other kinds of storage needed by the Department. Storage is located on the first floor in four different areas as well as on the fourth floor. With the lack of contiguous space a significant amount of staff time is spent walking to and from these areas. Enlargement of the main office area would provide some solutions for this problem.

Storage for Mathematics Education efforts, outreach grants, and the SI program is very limited. Presently we have large storage cabinets placed in faculty offices and on the first floor. SI materials are located in the basement. None of this is optimal and makes for stresses and challenges in carrying out our regular business.

Our need for storage may not be fully appreciated since it seems clerical in nature, as opposed to instructional. Nonetheless, this is a real need and continues to challenge the staff and many faculty members in maintaining good historical records and access to specialized materials. While some improvements may be made with the use of the copier/scanner and storing data electronically, assistance in this area would be very helpful for the daily operations of the department.

MDTP Processing Center
The Department has run a Mathematics Diagnostic Testing Project support office since the 1980's. The MDTP provides free testing materials to local schools. Dr. Pagni, who oversees this, is housed in MH 434. This space is nearly adequate in terms of square footage, although Dr. Pagni has very limited personal office space. Normally two to three part-time staff personnel assist with this operation. Recent acquisition of a scanner has made the activities increasingly noisy, and there have been some complaints from

adjacent classrooms. The primary need of this space is renovation. However, fire code issues and prohibitive costs have precluded a simple fix.

In summary, the Mathematics Department is a very large operation with over 100 faculty and staff employees, serving 5,000 to 8,000 students each semester. The Department needs to accommodate not only the people who work in the Department, but also its necessary equipment and supplies. Space, always at a premium, remains one of our significant needs.

D. *Library Resources, Priorities and Needs*

Many of the essential library databases are available to faculty and students though the library web page of the University. These databases for mathematics, statistics, and mathematics education include MathSciNet (AMS), Web of Science (Thomson), Oxford Reference Online Premium, JSTOR , Academic Search Premier (EBSCO) , OmniFile Full Text Mega (Wilson) , Oxford Journals , ScienceDirect , SpringerLink Journals, NCTM, and Wiley InterScience . We have access to most of the articles online; however, those for which we don't have access can easily and quickly be obtained through interlibrary loans (ILLiad).

Our book collection available at the Pollack Library is satisfactory for most of the subjects in mathematics, statistics, and mathematics education. The library has several of the classic titles related to the research areas of our faculty members as well as some books that reflect the recent developments in the fields. In addition to purchasing books from important collections such as *Lectures Notes in Mathematics and Statistics (Springer)* and *Graduate Texts in Mathematics (AMS)*, the library also acquired most of the books requested by the library committee in the last three years.

During the next seven year PPR cycle it will be important to maintain all the web resources we have in place and continue to acquire, either physically or electronically, new titles in mathematics, statistics, and mathematics education. The Department is grateful to the office of Library Services for its continued support despite severe budgetary constraints.

VII. Long Term Plans

A. *Long Term Plan Summary, Implementation of University Mission and Goals, and Evidence to Be Used to Measure Results*

Section I.C. identified four general areas, or Goal Clusters (GC), as our priorities for the future. They are:

- GC 1 Developing New Instructional Modalities
- GC 2 Institutionalizing the Supplemental Instruction Program
- GC 3 Strengthening Undergraduate Programs
- GC 4 Strengthening Graduate and Professional Programs

Within these broader priorities we have identified eight specific goals for the next PPR cycle.

Goal 1: Explore Increasing the Number of On-line/Hybrid Courses

As discussed in I.C., the Department is striving to find the optimal balance between on-line and face-to-face instruction. These curricular and instructional decisions need to be informed by the specific goals and outcomes for the course, as well as the availability and accessibility of hardware and software necessary for instruction. The Department will continue to monitor Math 45 as well as the MS in Statistics program as described earlier. We plan to develop these courses according to University, College, and Departmental needs, in conjunction with faculty interest and expertise, with special consideration given to our primary service Departments and Colleges. With this in mind, candidate courses may include pilot online or hybrid sections of Math 130 (A Short Course in Calculus for Biology and Chemistry majors), Math 135 (Business Calculus for Business Majors), Math 150AB (Calculus I and II for ECS and NSM majors), and Math 270 AB (Mathematical Structures for ECS majors). In addition, courses related to Mathematics Education, such as Math 403AB (Middle School Math) may be possible candidates as well.

Recent faculty hires have brought the Department increased expertise in the inclusion of technology in mathematics courses, including the use of on-line and hybrid approaches to teaching. We anticipate that the Department will continue to move in this direction in a way that reflects best educational practices.

Metrics to measure success will include the creation of such courses; evidence of teaching and learning effectiveness; and faculty participation in this effort.

Goal 2: Institutionalize the Supplemental Instruction Program

As detailed in this document, our SI program has shown strong evidence of impacting student achievement in key gateway mathematics courses. Data from the first two years of the program shows that SI participation significantly reduces the need to repeat courses and therefore helps students move through the mathematics or mathematics-based major in a timely way. This not only shortens the time to graduate for these STEM students, but reduces the need to run additional sections for course repeaters. Funding for this program has, to date, come from a variety of external and internal grant sources. Given the impact of this program, not only academically but financially, as well as the constraints of seeking "soft" funding every semester to keep the SI program going, we strongly recommend that SI in mathematics be institutionalized at CSUF. We understand that can be a stepwise process over time, and we hope to work with the College and University to move in this direction.

The metric used to assess success will be the increasing institutionalization of SI in mathematics at CSUF.

Goal 3: Increase Number of Undergraduate and Graduate Majors

As discussed in I.C, during the past seven years there has been a steady increase in the number of bachelors and masters degrees awarded in mathematics at CSUF. The extent to which this reflects the general increase in undergraduate enrollment in the University as opposed to a larger proportion of students attracted to and persisting in the mathematics major, as well as possible market influences, is unclear. However, there is some evidence that the “production rate” of majors has increased, that is, the percentage of students completing a math major compared to the number of students declaring a math major. In addition, there is evidence of an increased “capture rate” of our undergraduate students continuing on to the masters program. As with the undergraduate program, the Department has been intentional in its efforts to attract and retain graduate students, as evidenced by an increased presence at partner community Colleges in grant projects such as TEST-UP.

The metric used to assess success will be the number of undergraduate and graduate majors, with a goal of a 20% increase over the next seven years.

Goal 4: Increase the Number of Single Subject Mathematics Credential Program Graduates and Support K-12 Mathematics Teacher Professional Development

Despite a sluggish economy, there has been an ongoing demand for mathematics teachers at the secondary level in the past two years, though at a slower rate than during the period from 2002 to 2008. The Department has remained committed to attracting and developing future teachers at all levels, and especially at the secondary and community College levels. Indeed, the Department has remained pro-active in obtaining grants aimed at teacher development, with more than ten million dollars in NSF and state-wide educational grants garnered in the past four years. We look forward to continuing and, as feasible, increasing our involvement in this area. The Chancellor’s Office has recognized the Department of Mathematics at CSUF as a leader in mathematics education in the state.

The metric used to assess success will be the number of successful credential students, with a goal of a 20 % increase over the next seven years.

Goal 5: Launch the MS Program in Statistics
We see this program as being a turning point in the Department as it is the first program to be delivered entirely in a non-traditional format using a hybrid of both on-line and real-time (face-to-face or on-line) interaction. The statistics team has researched best models for this type of program and is confident that it can deliver an outstanding program. The Department anticipates substantial graduate enrollment in this program since participation is not necessarily limited by geography.

The metrics used to assess success will include be the number of students enrolled in and completing the program, with a goal of a 100% increase from year 1 to year 7. We also will assess non-academic measures, such as geographic "reach" and enrollment by minority and female students as well as job placements of the graduates.

Goal 6: Launch the ESP Program
As described in section III.D., the Department is committed in its role to launch the ESP program. Given the leadership role in education-related issues that the CSUF Mathematics Department has had, we anticipate being a primary player in this statewide effort.

The metrics used to assess success will include be the number of students enrolled in and competing the program. It is unclear what numeric goals are appropriate at this time. The Department also will assess non-academic measures such as enrollment by minority students.

Goal 7: Hire New Faculty
As described in IV.B., we anticipate needing to make 12 Tenure Track faculty hires (nine replacement and three growth) over the next six years. A non-trivial constraint for the Department has been the relatively small number of non-junior faculty who can serve on hiring committees. We look forward to the continued success of our current junior faculty as they move through the RTP process. The Department will aim specifically to identify and hire "balanced" faculty who will feel that CSUF is a good fit for them throughout their careers.

The metrics used to assess success will be the number of faculty hired as well as their successful movement through the RTP process.

Goal 8: Continue to Expand the Department's Assessment Efforts and Use Assessment Outcomes to Improve the Department's Programs
The Department has experienced the benefits of its initial efforts in assessment of student learning outcomes and now has a better understanding of the direction that this assessment needs to take. It will be an ongoing activity that needs to become a component of the culture of the Department. Included in the implementation of this goal is the identification of University resources that can be utilized at the Department level for assessment efforts and that will allow the Department to realize a successful and stable assessment program.

Summary
Clearly, each of these six specific goals is consonant with and informed by the University Mission and Goals. We feel that MG I, II, III, and V are strongly linked to them:

(I) To ensure the preeminence of learning.
(II) To provide high quality programs that meet the evolving needs of our students, community, and region.
(III) To enhance scholarly and creative activity.
(V) To expand connections and partnerships with our regions.

B. *Long Term Budget Plan*

Below is a listing of the eight specific goals from sections VII.A. with a brief description of the anticipated budget implications for each.

Goal 1: Explore Increasing the Number of On-line/Hybrid Courses
Online courses will vary in their additional costs depending on the their mode of delivery. Anticipated start up costs would include funding to support assigned time for faculty members who are preparing these courses. (Assigned time @ 3 units/semester = $4747).

Goal 2: Institutionalize the Supplemental Instruction Program
The effectiveness of SI has established it as a valuable component in the delivery of the Department's courses. The FTES it generates does not fully support the program, and in fact, since the compensation for workshop leaders is drawn from operating expenses, that support is indirect. The University or the College will need to provide additional funding for SI, funding that in our pilot program has been provided by various external grants. (Present costs average at $25,000/semester)

Goal 3: Increase the Number of Undergraduate and Graduate Majors
No immediate or direct additional costs are associated with this goal, depending on the Department's level of success. A substantial increase in the number of students who study mathematics would increase the need to hire faculty and staff to teach the additional classes that would be required, advise these students, and provide the general support services that these students would need.

Goal 4: Increase the Number of Single Subject Mathematics Credential Program Graduates and Support K-12 Mathematics Teacher Professional Development
The principal cost increase here would be the compensation required for additional teacher supervisors. (Cost per student averages $750/semester).

Goal 5: Launch the MS Program in Statistics
The online component of this program will require substantial equipment expenditures to support the goal of streaming the courses in this program online. The Department anticipates needing to provide assigned time to faculty members teaching in this program in order for them to prepare these courses and to become well versed in online course delivery. (Assigned time @ 3 units/semester = $4747; Minimal equipment purchases expected to be $10,000).

Goal 6: Launch the ESP Program
The Department anticipates needing to hire a developmental mathematics coordinator perhaps at the full time lecturer level who would oversee ESP as well as other components of the Department's developmental mathematics program. Student support services including tutoring and increased staff support will also be necessary. (Coordinator, $18,000/semester).

Goal 7: Hire New Faculty
Hiring will be an ongoing goal for the Department and will be at a pace that will just stay ahead of retirements and other separations. Costs associated with new hires include: start-up expenses, assigned time, and additional travel support.

Goal 8: Continue to Expand the Department's Assessment Efforts and Use Assessment Outcomes to Improve the Department's Programs
The assessment task will be ongoing, labor intensive and demanding. The Department will seek resources to support assessment, at least sufficient funds for assigned time for an Assessment Coordinator (Assigned time @ 3 units/semester = $4747).

Summary

In light of the current budgetary climate, the Department understands the severe limitations placed upon the state, the University, and the College for resources. The above goals are fiscally modest but programmatically powerful. We look forward to a continued meaningful and honest dialogue with all stakeholders and decision-makers to help realize these goals.

VIII. APPENDICES (REQUIRED DATA)

APPENDIX I: UNDERGRADUATE DEGREE PROGRAMS

TABLE 1-A First-time Freshmen: Program Applications, Admissions, and Enrollments

Academic Year	# Applied	# Admitted	% Admitted	# Enrolled	% Enrolled
2004-2005	226	157	69%	45	29%
2005-2006	265	181	68%	36	20%
2006-2007	303	215	71%	52	24%
2007-2008	361	267	74%	68	25%
2008-2009	418	289	69%	54	19%
2009-2010	384	237	62%	58	24%

TABLE 1-B Upper Division Transfers: Program Applications, Admissions, and Enrollments

Academic Year	# Applied	#Admitted	%Admitted	# Enrolled	% Enrolled
2004-2006	156	102	65%	63	62%
2005-2006	198	127	64%	64	50%
2006-2007	164	115	70%	63	55%
2007-2008	151	99	66%	54	55%
2008-2009	127	73	57%	41	56%
2009-2010	109	57	52%	34	60%

TABLE 2-A Undergraduate Program Enrollment in FTES

Academic Year	Enrollment in FTES		
	Lower Division	Upper Division	Total
2003-2004	1,191.3	247.6	1,438.9
2004-2005	1,257.9	227.8	1,485.7
2005-2006	1,350.1	230.6	1,580.6
2006-2007	1,369.7	218.2	1,587.9
2007-2008	1,437.0	211.3	1,648.3
2008-2009	1,568.6	203.5	1,772.2
2009-2010	1,254.5	195.1	1,449.5

TABLE 2-B Undergraduate Program Enrollment (Headcount)

Academic Year	Majors				
	Lower Division	Upper Division	Post Bacc (2nd bacc)	Total	FTES per headcount
2003-2004	62.5	171.5	1.0	235.0	0.78
2004-2005	67.0	190.0	3.0	260.0	0.79
2005-2006	71.0	191.0	3.5	265.5	0.81
2006-2007	82.0	203.5	3.0	288.5	0.78
2007-2008	100.5	207.0	1.0	308.5	0.79
2008-2009	99.0	199.5	1.0	299.5	0.80
2009-2010	104.0	197.0	1.0	302.0	0.80

TABLE 3-A First-time Freshmen Graduation Rates for Majors

Entered In:	Headcount	% Graduated in 4 years		% Graduated in 5 years		% Graduated in 6 years		% Graduated in 6 years plus 7th year persistence	
		in major	not in major	in major	not in major	in major	not in major	in major	not in major
Fall 1998	22	9.1%	4.5%	4.5%	9.1%	4.5%	4.5%	9.1%	13.6%
Fall 1999	21	4.8%	9.5%	4.8%	33.3%	9.5%	4.8%	0.0%	19.0%
Fall 2000	22	13.6%	13.6%	9.1%	13.6%	0.0%	4.5%	0.0%	0.0%
Fall 2001	26	3.8%	11.5%	7.7%	15.4%	3.8%	7.7%	3.8%	11.5%
Fall 2002	26	7.7%	0.0%	15.4%	7.7%	0.0%	11.5%	11.5%	15.4%
Fall 2003	26	11.5%	19.2%	7.7%	7.7%	3.8%	11.5%	3.8%	3.8%

TABLE 3-B Transfer Student Graduation Rates for Majors

Entered In	Headcount	% Graduated in 3 years		% Graduated in 4 years		% Graduated in 5 years		% Graduated in 6 years plus 7th year persistence	
		in major	not in major	in major	not in major	in major	not in major	in major	not in major
Fall 1998	21	9.5%	9.5%	9.5%	4.8%	0.0%	0.0%	0.0%	4.8%
Fall 1999	33	24.2%	12.1%	3.0%	12.1%	3.0%	3.0%	26.8%	17.3%
Fall 2000	25	24.0%	16.0%	16.0%	0.0%	4.0%	0.0%	8.4%	7.8%
Fall 2001	24	8.3%	8.3%	0.0%	12.5%	4.2%	4.2%	16.7%	13.1%
Fall 2002	24	33.3%	4.2%	12.5%	8.3%	4.2%	0.0%	11.9%	1.8%
Fall 2003	23	17.4%	8.7%	4.3%	13.0%	0.0%	13.0%	2.1%	3.3%

TABLE 4 Undergraduate Degrees Awarded

Academic Year	Degrees Awarded
2003-2004	30
2004-2005	37
2005-2006	33
2006-2007	41
2007-2008	44
2008-2009	52
2009-2010	32
Total	269

APPENDIX II: GRADUATE DEGREE PROGRAMS

TABLE 5 Graduate Program Applications, Admissions, and Enrollments

Academic Year	# Applied	# Admitted	% Admitted	# Enrolled	% Enrolled
2003-2004	98	63	64%	33	52%
2004-2005	84	65	77%	42	65%
2005-2006	91	65	71%	32	49%
2006-2007	87	73	84%	38	52%
2007-2008	92	62	67%	39	63%
2008-2009	61	46	75%	31	67%
2009-2010	98	63	64%	33	52%

TABLE 6-A Graduate Program Enrollment in FTES

Academic Year	Enrollment in FTES
2003-2004	30.3
2004-2005	29.6
2005-2006	29.3
2006-2007	27.5
2007-2008	29.1
2008-2009	29.9
2009-2010	30.8

TABLE 6-B Graduate Program Enrollment in Headcount

Academic Year	Master's Headcount	Master's FTES	FTES per Headcount	Credential Headcount	FTES per headcount
2003-2004	79.0	30.3	0.38	31	1.00
2004-2005	79.5	29.6	0.37	23	1.00
2005-2006	76.0	29.3	0.39	21	1.00
2006-2007	70.0	27.5	0.39	26	1.00
2007-2008	67.5	29.1	0.43	17	1.00
2008-2009	69.0	29.9	0.43	19	1.00
2009-2010	69.5	30.8	0.44	28	1.00

TABLE 7 Graduation Rates for Master's-Seeking Students

All Master's Enrolled in:	Headcount	% Graduated within 3 years	% Graduated in 4 years	% Graduated in 5 years	% Graduated in 6 years plus 7 year persistence
Fall 1998	20	70.0%	5.00%	0.00%	0.00%
Fall 1999	24	66.7%	8.33%	0.00%	0.00%
Fall 2000	18	83.3%	0.00%	0.00%	0.00%
Fall 2001	17	41.2%	17.65%	0.00%	0.00%
Fall 2002	20	60.0%	15.00%	0.00%	0.00%
Fall 2003	35	68.6%	0.00%	0.00%	0.00%

TABLE 8 Master's Degrees Awarded

Academic Year	Degrees Awarded
2003-2004	19
2004-2005	15
2005-2006	25
2006-2007	33
2007-2008	33
2008-2009	28
2009-2010	25

APPENDIX III: PLAN FOR DOCUMENTATION OF ACADEMIC ACHIEVEMENT (ASSESSMENT OF STUDENT LEARNING)

P = Planning E = Emerging D = Developed HD = Highly Developed

	Achievement Plan Component	**P**	**E**	**D**	**HD**	**Comments/Details**
I	**Mission Statement**					
	a. Provide a concise and coherent statement of the goals and purposes of the department/program			D		
	b. Provide a comprehensive framework for student learning outcomes			D		
	c. Describe department/program assessment structure, e.g. committee, coordinator		E			
II	**Student Learning Goals**					
	a. Identify and describe knowledge, skills, or values expected of graduates			D		
	b. Consistent with mission			D		
	c. Provide the foundation for more detailed descriptions of learning outcomes			D		
III	**Student Learning Outcomes**					
	a. Aligned with learning goals			D		
	b. Use action verbs that describe knowledge, skills, or values students should develop			D		
	c. Specify performance, competencies, or behaviors that are observable and measurable			D		
IV	**Assessment Strategies**					
	a. Use specific multiple measures for assessment of learning outcomes other than grades		E			
	b. Use direct measures of student learning outcomes		E			
	c. Indirect measures may also be used but along with direct measures		E			
	d. Measures are aligned with goals/ learning outcomes		E			
	e. Each goal/ outcome is measured	P				
V	**Utilization for Improvement**					
	a. Identify who interprets the evidence and detail the established process		E			
	b. How are findings utilized? Provide examples		E			

Appendix IV: Full-Time Instructional Faculty, FTEF,FTES, SFR

Table 9 Full-Time Instructional Faculty, FTEF, FTES, SFR

YEAR	Tenured	Tenure Track	Sabbat-icals at 0.5	FERP at 0.5	Lecturers	FTEF Allocation	FTES Target	Actual FTES	Budgt SFR
2003-2004	16	10	1	6	6	54.5	1400	1469.6	25.7
2004-2005	16	7	0	7	5	56.0	1430	1517.8	25.5
2005-2006	17	7	1	5	5	63.0	1611	1611.1	24.1
2006-2007	17	8	1	3	6	63.0	1617	1617.4	25.6
2007-2008	17	12	1	3	5	64.6	1675	1674.7	25.0
2008-2009	18	13	1	2	5	71.1	1800	1800.1	23.6
2009-2010	16	14	1	2	5	58.8	1485	1484.7	30.6

Note: Tenured and tenure track totals Include faculty members on leave and administrators with retreat rights.

APPENDIX V: RESOURCES

TABLE 10 State and Non-State Resources

	2009-10	2008-09	2007-08	2006-07	2005-06	Total
State Support/Self-Support						
PTF Blanket Allocation	$1,426,010	$1,162,817	$1,199,260	$1,255,196	$1,027,892	$6,071,175
OE Baseline Allocation	$8,609	$8,609	$8,609	$8,609	$8,609	$43,045
UEE (Regular and Summer)	$98,469	$101,161	$96,939	$73,037	$81,914	$451,520
Misc Course Fees	$14,578	$14,812	$15,419	$13,683	$10,983	$69,475
Search and New Fac Support	$-	$13,052	$56,062	$46,914	$-	$116,028
Sabbatical Replacement	$-	$56,943	$17,986	$16,484	$13,281	$104,694
Grants/VPAA/FDC/Other*	$86,400	$125,428	$163,874	$131,835	$86,913	$594,450
Lottery	$-	$-	$80,505	$-	$-	$80,505
Dean Additional Funding*	$105,345	$-	$55,800	$48,700	$34,300	$244,145
Other*	$11,244	$7,713	$7,000	$2,800	$-	$28,757
Sub-Total	**$1,750,655**	**$1,490,535**	**$1,701,454**	**$1,597,258**	**$1,263,892**	**$7,803,794**
Non-State Support						
Faculty Grants/Rel Time Support	$124,377	$81,810	$77,012	$57,613	$91,330	$432,142
IDC	$8,562	$6,708	$10,565	$10,302	$12,009	$48,146
Contracts*	$-	$-	$40,000	$-	$-	$40,000
Donations*	$5,240	$3,739	$2,259	$36,210	$3,215	$50,663
Sub-Total	$138,179	$92,257	$129,836	$104,125	$106,554	$570,951
Grand Total Fiscal Year	**$1,888,834**	**$1,582,792**	**$1,831,290**	**$1,701,383**	**$1,370,446**	**$8,374,745**

***NOTES:**

State/Self Support

Grants/VPAA/FDC/Other

2008-09: College, Campus Funded Fac Release, MSTI, Title V
2007-08: College, Campus Funded Fac Release, MSTI Grant, AMP, Fac Dev Funds, Title V, Travel Grants
2006-07: College, Campus Funded Fac Release, Fac Dev Funds, AMP, Dean Fac/Staff Awds, Retention Proposal, GE Assessmt Funding
2005-06: College, Campus Funded Fac Release, AMP, Fac Grants, New Fac Dev

Dean Additional Funding

2009-10:Dean Augmentation
2007-08 Equipment Support
2006-07: Equipment Support
2005-06: Equipment Support

Other

2009-10: CalPers Savings
2008-09: Misc Income
2007-08: 50th Anniv Funding
2006-07: 50th Anniv Funding

Non-State Support

Contracts:

2007/08: Applied Math Project Contracts

Donations:

2009/10: Fac/Alumni Donors
2008/09: Fac/Alumni Donors
2007/08: Fac/Alumni Donors
2006: Edsel Stiel, Endowment, Fac/Alumni Donors

APPENDIX VI THROUGH APPENDIX XVIII SEE ENCLOSED CD