**PSME Division**

**Program Review 2016 PSME Deans Summary**

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**PSME Departmental Level View:**

**Astronomy:** During the period in review the astronomy department continued to attain fill rates approaching 100% with additional waitlists, had very large class sizes (including many concurrent sections of 140 students), and had one of the highest productivity rates in the District. There is excess demand for astronomy courses, but growth and access are limited by available rooms for the very large lectures (140) that normally meet in the planetarium. Some lecture meetings have been moved to alternative rooms to free the planetarium for increased utilization and income generation by community education. The department would benefit from greater access to a large lecture facility that would further free the use of the planetarium for additional sections. The overall Astronomy success rate (80%) is higher than the college average (76%) and has remained essentially constant during the review period. The equity gap has risen over the three year from 15% to 19% and is of concern. The department has made changes in curriculum that foster a more hands on approach to the discipline, including adding a new laboratory component, that it hopes may partially address the equity gap. It is also expressed an interest in a closer integration with tutoring, mentoring, advising, and counseling services to see if this might also help decrease the equity gap. The department would greatly benefit from a counselor dedicated to the Division who would work with faculty and students to develop better strategies to further reduce the equity gap. The department has expressed interest in purchasing clickers to enhance student interaction in their large lectures. I agree that this would provide greater student engagement and hopefully be a factor in reducing the equity gap. The department has recently been granted a large equipment allocation that has allowed them to replace the aging and failing planetarium projection system, and it is believed that the new installation should provide excellent service for the next five years or more, although in the very long run, the Department will require substantial capital investment in the planetarium facility. The department also continues its close, cooperative arrangement with the Community Education program, and is especially excited about working with the newly hired director and planetarium technician to expand and improve their program offerings.

**Chemistry:** The chemistry department continues to have an extraordinarily high demand for all classes, with substantial wait lists on almost all of their courses. The department has completed a recent review of its programs and curriculum, and continues to alter its schedule to maximize room utilization. Despite these capacity improvements, the department has not been able to provide the numbers of sections needed to meet a continuing high demand. This has had a serious impact on those wishing to enter academic or career disciplines in the biological and health sciences. Chemistry continues to be a bottleneck in the bio-health science pipeline, with some students having to wait quarter after quarter for entry into a chemistry class required for them to meet their academic goals. Chemistry, like several other departments in the PSME Division, has had a continuous growth over the past 10 years resulting in more than a 50% net growth in total students served. The department currently has a low percentage of sections taught as full-time load (28%). This low FT/PT ration places an added burden on the full time faculty in terms of recruiting, training, and mentoring part-time instructors and makes it especially difficult to maintain the especially high degree of health and safety standards required in a chemistry program. The department is requesting two faculty positions; one to replace a recently hired full time faculty who has resigned and will be moving to the east coast and the other a growth position to address the long term unmet demand for sections. The department has met with me and with Vice President Espinosa-Pieb to present a very well thought out program of growth. Their plan would require an additional fully qualified laboratory technician in order to support the planned growth in sections, sustain department efforts in program improvement and equity balance, and alleviate the unmet needs of students wishing to prepare for careers in chemistry, pharmacy, and the biological and health sciences.

The chemistry department has had a modest increase, 5.9%, in the numbers of targeted students during a period when their total enrollment growth was 4.9%. Despite substantial gains during the review period in overall success rates from 73% to 80%, their programs continue to maintain a stubborn and steady equity gap of 15% in student achievement. The department has recently been involved in an AAPI grant funded program that has resulted in a significant decrease in equity gap for some targeted groups, however, the overall equity gap has not improved. I would strongly recommend additional efforts to better integrate tutoring, mentoring, advising, and counseling services into their program. The number of underrepresented students in chemistry and their relative success may be highly dependent on course level. Beginning next fall, data should be available to examine the finer structure of participation and success for underrepresented groups at the course level, and perhaps a more targeted approach to equity may help pinpoint problems and suggest additional approaches. Our new STEM Director may also be an important source of ideas and strategies to address these issues.

The department is also requesting an increased level of funding to help support their laboratory operations and maintenance and to purchase much needed laboratory equipment. The chemistry department, like several other PSME discipline areas, continues to struggle with the difficulty of funding repair and maintenance of key equipment. Although their chemical supply budget has been adequately funded through lottery funds and their equipment needs through continuing and generous equipment funds allocation, money for maintenance and repair are not allowed under those sources. The significant decrease in the past 8 years of “B Budget“ funding has resulted in a lack of funds for maintenance and repair, and left many expensive equipment items inoperable. A modest increase in “B Budget “funding to repair and maintain existing equipment could save a much greater amount required for replacement with new equipment.

**Engineering:** In response to previous program reviews the department faculty and dean participated in a comprehensive review of the engineering curriculum and offerings. Curriculum and strategies that would better meet the needs of students considering entry into engineering disciplines were formulated and put into place. Additional emphasis in improving overall student success and recruiting and supporting students underrepresented in engineering (including women) was incorporated into the program. The result has been both positive in its direction and magnitude. The changes begun during the previous review continue, and enrollment in the program has risen by an additional 77%. The success rate for the overall engineering program has changed from its earlier 57% level to 83% at the start of the current review cycle and continued its steady increase during this review cycle to 87%, one of the highest in the Division.

In addition to an impressive overall increase in student enrollment and success, even greater changes have taken place in the targeted student population. In the current review period the numbers of targeted students increased by 66%, and the overall per-cent of targeted students in engineering programs went from 25% to 28%. Targeted group enrollments are very high for a technical discipline and are the result of a conscious effort of the department to encourage underrepresented groups to consider engineering. Furthermore, currently the majority of engineering sections are taught by women, and we have seen a significant increase in the numbers of women (traditionally highly underrepresented in engineering disciplines) participating in engineering classes, with their success rates 3% above their male counterparts. The very recent hire of a STEM coordinator to encourage students, especially those in underrepresented groups, to enroll in technical majors should even further enhance our current successes. The department has made great efforts to recruit instructors who are sensitive to a wide variety of students, and has also encouraged student directed projects and employed curriculum that emphasizes topics of interest and activities that are engaging to our entire student population. During the current review period the equity gap, which had a few years earlier been one of the highest in the Division, continued at its very low rate of 4%, and is now one of the lowest in the Division.

Additional efforts to improve curriculum are ongoing, and faculty and the dean are currently working to ensure curriculum is up to date and satisfies transfer requirements. The lack of a current full time faculty member teaching in the department and a recent death of one of the key part time instructors has slowed SLOAC and PLOAC progress, however, with contract changes that encourage part-time participation in the SLOAC process, plans to complete all reviews and assessments are back on schedule and should be completed by the required deadlines.

A large proportion of STEM students in the PSME Division are interested in engineering careers, and the engineering program is a key factor in all PSME enrollments. Engineering provides an opportunity for successful students to pursue high paying career pathways, which is particularly encouraging given the recent increases in targeted student enrollment and success rates in the program.

The Division would benefit from an in-situ counselor who would work with pre-engineering students to assist them in academic advising and career opportunities. This is especially true for first college generation and other students who lack familiarity with the requirements and opportunities offered in engineering disciplines.

Given the continuing interest in opportunities for high income employment in the engineering field, the net enrollment growth over the past three reporting years of 77%, and a program in which 100% of class sections are taught by part time faculty, there is a need in the for a full-time engineering faculty position. Enrollment growth is currently constrained by our ability to recruit, train, and mentor qualified part-time instructors and a lack of sufficient classroom and laboratory space. Curriculum and other necessary pedagogical support are hampered by the lack of a full-time faculty member assigned to this discipline. I expect that with a continuing significant growth in enrollment and success, in the near future the department will require a full time faculty member.

For many years the low enrollment and low success rates of engineering limited the ability to justify funding for laboratory equipment and facilities. During the past few years we have focused on developing an outstanding teaching staff and relevant and effective curriculum. The very significant increases in enrollment and success during the past four years has exacerbated the long neglect of existing equipment and supplies, and the department has requested a modest equipment budget to provide necessary classroom laboratory supplies and equipment. Providing a modest equipment budget for the engineering program will encourage student projects and laboratories that enhance their educational experience, provide engagement and excitement, and meet the hands-on component of curriculum required by transfer institutions. The department has also requested a longer-term equipment allocation to replace the current obsolete large desktop computers in S48 with laptops. In addition to providing a computer resource capable of running current software, it will greatly enhance the flexibility of room usage, so that the classroom can be used effectively for both laboratory and lecture sessions, and can be shared with math and other PSME departments.

**Geology:** During the current review cycle geology enrollment experienced a small gain and then a loss, with a net change decrease of 5.2% during the three years. Much of the decline can be attributed to the scheduling of sections too close together in the day; recent changes in scheduling that spread the sections over the day in order to serve multiple populations has resulted in improved enrollments.

The geology department serves a relatively high proportion of targeted students. Targeted students represent 39% of the department’s total enrollments. Overall success rates for the department have been rising, and have reached 80%. The equity gap has also been decreasing during the review period, from an initial value of 17% to a final value of 11%. Despite this significant improvement, the gap still remains relatively high, and given the high percentage of targeted students in the program, the remaining gap has a relatively large impact.

 The department is addressing the equity gap through changes in curriculum. The department is also investigating strategies to increase the use of tutoring, counseling, advising, and mentoring services. It hopes to encourage student tutors, mentors, and classroom assistants as part of its internal curriculum. It would also like to rekindle an older relationship that provided strong academic support through a STEM adjunct study skills program sponsored by the Student Success Center. The plan seems to be reasonable, and I look forward to faculty working with the supporting departments to further reduce the equity gap.

The department has requested a modest equipment budget to replace missing and broken rock samples and hand lenses used in the lab. The lab is an important component in the course, and recent emphasis on more hands-on activities seems to have been effective in the substantial decrease of equity gap of 6% during the past three years.

**Mathematics:** Mathematics enrollment trends which have continuously increased in the past 6 years continue as mathematics enrollment grew by 7.3% over the three year review period. During that same period a significant shift in the demographics of students taking mathematics, which began during the last review period, continued at a fast pace; the enrollment of targeted groups increased by 17% while that of non-targeted groups increased by only 2.6%.The net result of these changes is that the overall % of targeted students enrolled in mathematics has changed from 29% of the total population reported in the previous annual review to 35.7% at the end of the current review cycle.

Not only has enrollment in mathematics continued to substantially increase, many mathematics classes still have large wait lists, indicative of an even greater, unmet demand. Enrollment is currently limited by our inability to find qualified instructors and classroom space to accommodate existing demand.

Despite past full-time faculty replacement hiring, increasing demand over the years has caused a decrease in the per cent of classes taught by full time faculty, a ratio which now stands at 36.6%. There are now approximately 7300 more math enrollments each year than during my first year at De Anza. Although we anticipate we will have one new growth position beginning next fall, from the start of my tenure at De Anza in 2007 to today we have had no net new math faculty hired (and in fact lost some due to reassigned duties). These 7300 additional enrollments each year represent about 182 additional sections or about 20 additional FT equivalent instructors. It has become extremely difficult and taxing for the same number of full time faculty and staff to recruit, hire, train, mentor, and evaluate the large numbers of part time faculty required to provide our 20 additional FTEF needs. Many duties and obligations necessary for a smoothly functioning department and division have gone unsatisfied due to the large number of faculty teaching maximum allowable loads and the high proportion of part time employees who are not engaged in many of the critical department functions. This tendency will accelerate noticeably in the near future since the department is involved in updating its transfer degree program, and in the new State mandated requirements for multiple measures and common assessments and distinct honors course curricula.

During the current year, changes in the Faculty Association contract that reduced maximum class seat counts in developmental level mathematics classes has further exacerbated the need for additional full-time faculty. In recent past years we offered an average of 83 sections of developmental level mathematics classes *each quarter*. Given that the capacity for each section has been reduced by 5 students by the contract changes, beginning this year there have been (83 X 5) 415 additional students *per quarter* who are no longer able to register for these critical classes. Reincorporating these enrollments into our program would require the addition of more than (415/35 =) 11 new full-time equivalent mathematics instructors. Hiring this many new instructors would only bring us to the same level of service we provided last year and would not address growth or backlogged waitlist demand.

Recruiting, interviewing, hiring, training, mentoring, and evaluating the large numbers of part-time instructors required to just maintain our present enrollments (let alone any continuation in growth) has become a very difficult task. We have saturated the pool of qualified regional sources, and a large amount of time and resources is spent on this process. The department would greatly benefit from additional full-time hires, which would help alleviate some of this burden.

Overall student success rates in mathematics have remained constant at 64%, and the equity gap has also remained constant at a persistently high 17% rate.

The math department has found demonstratively effective methods for decreasing the equity gap and at the same time increasing overall student success. Through such special programs as MPS and Statway, the department has the documented capability of increasing success rates between 14 and 31% (depending upon the class); however, participation and growth in these programs was hampered by limitations on recruiting, registration, scheduling, advising, counseling, tutoring and other student support services- all of which have been severely affected by budget cuts.

During the current year we have hired a STEM Director, who has been able to better organize the recruiting and registration of students into special programs. She has also revamped the MPS tutorial efforts, which were no longer supported by the Success Center. The MPS tutoring and support center now has its own “home”, and is again running effectively after a year of interruption and uncertainty.

Although MPS has expanded slowly over the years, it has not nearly kept pace with the overall growth in enrollment. Only a small portion (about 10%) of all developmental level enrollments are participants in the MPS program. Furthermore, the existing single counselor who visits each MPS class several times a week and meets with students outside of class is unable to support all sections, and currently a temporary, grant funded counselor assists on a part-time basis. An effective strategy for improving the equity gap in mathematics would be to increase the number of sections of MPS, which in turn, would require permanent, additional counseling support for that program.

Finally, due to its large size and special requirements for printing and copying exams and other assessment materials, the mathematics department has been especially hard hit by changes in materials fees policies. A budget supplement is needed to ensure that there are sufficient funds to support at least the copying of exams and quizzes.

**Meteorology:** After a period of enrollment decline during the previous review period (due to the lack of availability of qualified part-time instructors), there has been a large net growth in enrollment during the current review period. Enrollment has grown by 27% for the current three year period of analysis. This was accomplished by substantially increasing the number of online sections, which enabled the department to hire additional faculty who do not have to commute to our campus.

The enrollment of both targeted and non-targeted populations increased; though targeted enrollment increased at a much higher (98%!) rate compared to non-targeted enrollment (8.8%) rate. The net result of the astounding growth in underrepresented students is that the per cent of targeted student enrollments in the department has reached a value of 41.7%.

 Overall success rates for Meteorology are relatively high at 83%. However, during the review period, with its 98% increase in targeted enrollments, there was a concurrent precipitous fall in the success rates of those targeted groups. Success rates for these students plummeted by 16% while those of non-targeted students actually rose by 2%. The corresponding equity gap during the period went from 1% (one of the lowest on campus) to 19% (one of the highest). During the next year, the department and I will need to focus on analyzing this drastic change and finding strategies and activities to ameliorate this situation. My initial thoughts are that the change is, at least in part, due to the sudden increase in online offerings, and we will need to investigate methods to insure that the online pedagogy meets the needs of all students and that the retention and success rates for all groups are enhanced in the online environment.

Recent contract negotiations have also had a significant effect on the department. Changes in load factors for the large meteorology sections has resulted in a reduction in the number of courses that can be taught by part-time and overload instructors and still be within the annual maximum contractual load limits. Coupled with the extreme difficulty of finding qualified instructors in this discipline, it will be very difficult to maintain the past number of sections offered. In addition, Paul Olejniczak, the only full-time meteorology instructor, will be retiring in June. Although a replacement position has been authorized, it will be difficult to find a qualified instructor and even more difficult to find one with the necessary experience to immediately tackle the equity issues the department now faces.

The Meteorology Department has successfully integrated several new laboratory facility acquisitions into their curriculum, and there is no immediate need for additional equipment.

**Physics**: Enrollments in physics have increased by about 11% during the review cycle. Increased enrollments were across all levels of physics courses. Although there were substantial increases in enrollment in for both targeted and non-targeted populations, the targeted growth(7.7%) was significantly smaller than the non-targeted growth (12%).

At the same time the department was undergoing growth in enrollment, the overall success rate underwent a small decline of 4% over the three years analyzed, with targeted group success declining by 3% and non-targeted success by 5%. Although there was a slight improvement in equity (the equity gap declined by 2%), during the most recent year of data, the equity gap between targeted and non-targeted success still remained at a relatively high 14%.

Preliminary analyses of equity data by course level show that equity issues differ widely at different course levels and different approaches may be needed for each. The department, as many others in the Division, will need to find new strategies to encourage underrepresented enrollment and success in more advanced courses. Improved connections with the Student Success Center and specialized counseling targeted to encouraging and supporting STEM students has made a great difference in special PSME programs such as MPS, and best practices from that model should be considered f or physics. The hiring of a new STEM Director, who has already begun to provide leadership in this area, is a hopeful start.

The department has particularly suffered from the elimination of the physics technician position. This has hampered the design of laboratory experiments, the repair and maintenance of laboratory facilities and the ordering and management of laboratory equipment. The lack of a physics technician has also placed a severe strain on the ability of instructors to perform in-class demonstrations, since it is almost impossible for an instructor to move the demonstration apparatus in and out of the classroom and calibrate and set it up so that it can be used during a class session. A laboratory technician also plays an important role in student learning, and in the past has served as a mentor and advisor to individual physics and engineering students and to discipline related clubs. The lack of a qualified laboratory technician has had a serious and significant effect on the quality of physics instruction, and I highly encourage restoration of funding for this position.

**Division Wide View:**

**Enrollment**:

Overall **Enrollment** in the PSME Division has grown during the three report years. There has been an **increase of PSME enrollment of** **7.4%** during a time in which the overall campus enrollment has decreased by **3.0%,** a net differential of more than 10%. During the period of analysis the PSME Division **added 2,277 new enrollments** , following a pattern of continuous PSME enrollment gain over the past eight years. Division **productivity** is relatively **high, and has maintained a nearly constant value for many years**. Physics (607), meteorology (848), and astronomy (988**)** were particularly productive during the 2012 – 2015 cycle.

There have been significant changes in the ethnic demographics of students enrolled at De Anza. Despite an overall campus decrease in enrollments, targeted campus student population has increased by 2.4% over the three years of study. Mirroring this campus trend, but outstripping it in magnitude, **targeted student enrollment in PSME has increased by 15.7%** during this time frame, while growth for non-targeted students, though positive, was only 3.6%. Given the 23% increase in targeted enrollment reported in the previous program review and the 15.7% for this cycle, **targeted enrollments have reached 33% of all enrollments in the PSME Division.** The steadily increasing numbers and proportion of targeted students highlight the problem of a continuing equity gap that exists in most PSME departments, and makes efforts to reduce that gap of even greater importance.

Despite a high demand in almost all courses (with continuing significant wait lists in astronomy, chemistry, mathematics, physics, and engineering), the **limiting factors of faculty and room availability** continue to be responsible for capping our enrollment.

In the mathematics department, which accounts for more than 70% of the total Division enrollment, for the fourth year in a row every faculty member (both full and part time) was maxed out in the number of classes they could (by contract or desire) teach. Similar situations occurred in astronomy, chemistry, meteorology, and physics. The resignation and retirement of full time faculty and turnover of part-time faculty (especially in mathematics, meteorology and chemistry) added to the difficulty of meeting student demand. Recruiting, hiring, training, mentoring, and evaluating new instructors to meet the enrollment demands continues to place an onerous burden on existing faculty and the Division Office staff and limits the number of sections that can be offered. Despite the recent hiring of full-time replacement faculty in mathematics and chemistry, continuing large increases in enrollment and enrollment demand during the review period demand have outstripped our capacity. As in past years, during 2015-16 year the Division has hired over 30 new part-time faculty to meet the increased student demand. Recruitment letters were sent to over 25 regional colleges, Universities, career centers, and high schools, and it appears that we have completely saturated the part time market. Even this extensive recruitment effort failed to attract enough instructors to meet student demand, and many students were left on wait lists because instructors were not available to teach additional sections. During the last review year, more than 2500 students in mathematics alone were left on wait lists on the first day of the quarter.

The generous allocation of 5 full-time positions (3 replacement and one growth in math and 1replacement in Meteorology/Astronomy) by IPBT for the upcoming fall included only a single growth position, and clearly does not begin to accommodate the 2,277 additional students we have to support as a result of growth in the past three years. Even at 40 students per section (our developmental sections are capped at 35), the 2,277 new enrollments would represent 57 new sections and would require more than 6 new full time equivalent instructors to teach, far greater than the single new growth position allocated. The enrollment numbers do not include the very large number of wait listed students in mathematics and chemistry, who we have not been able to serve.

The need for additional faculty has been even further exacerbated by recent negotiated changes in the seat counts for developmental level classes and changes in large class size load factors. During the current academic year we have offered an average of 83 sections of developmental level mathematics classes each quarter. Given that the capacity for each section has been reduced by 5 students, beginning this year there have been (83 X 5) 415 additional students *per quarter* who are no longer able to register for these critical classes. Reincorporating these enrollments into our program would require the addition of more than (415/35=) 11 new full-time equivalent mathematics instructors, and would only bring us to the same level of service we provided last year without addressing growth or backlogged waitlist demand.

Other negotiated changes in the faculty contract have had significant impacts on our need for additional faculty. Increases in load factors for courses with enrollments of over 50 students has severely impacted our physics and meteorology programs, and resulted in reductions in the number of courses that can be taught by part-time and overload faculty in order to stay within their maximum yearly load limits. This has caused a need for additional hiring to maintain past section offerings, and as described above, we have already saturated the regional part-time hiring pool.

Despite clear student demand and potential growth, due to the above factors we anticipate that the lack of available qualified instructors will halt enrollment growth in our Division, and if no new instructors become available for next year, the PSME will actually decline for the first time in 10 years. Given that the courses most impacted are those required by our most vulnerable students (at the developmental level and in large size GE science classes) and that the College as a whole is in need of additional enrollments, I feel that any allocation of scarce instructional resources to meet currently existing demand, especially in mathematics and chemistry, will be an excellent investment in the health of our institution and its students. The current relatively low proportion of sections taught as full-time (FT) in these two departments (36.6% in math and 27.9% in chemistry), the decline in FT percentage during the last study year, and the extreme difficulty finding and retaining qualified part-time faculty in these disciplines adds urgency to the need for additional full-time faculty. Consequently, I strongly urge that our Division be allocated as many positions as possible in mathematics and a new position in chemistry.

**Student Success and Equity:**

Despite the demands of continued Division growth, overall Division **success rates** remained about constant at 67% over the entire review period. There were small (less than 1%) gains in success of both targeted and non-targeted sub-populations.

There were large differences in success rates and equity gaps for various departments within the Division. Although astronomy had an overall success rate of 80%, it had a relatively large (19%) equity gap in the final year of the review. Chemistry had a very substantial growth in overall success from 73% to 80%, though the equity gap in that department remained at a relatively high 15%. Geology with an overall success rate of 80% was able to reduce its equity gap substantially, but the final difference between success in targeted and non-targeted populations was still 11%. And meteorology, also with a relatively high success rate of 83%, nevertheless had a very large increase in its equity gap from 1% to 19% over the review period.

Math (64%), and physics (58%) had substantially lower overall success rates than the rest of the division, with equity gaps in the 14 – 17% range.

Only engineering, with its overall success rate at 87% and equity gap of 4% might be considered within acceptable bounds.

As I have mentioned in past reviews, the issue of success rates and equity are not always a comfortable topic for discussion within our Division. It is easy to compare our Division performance to those of other institutions in the state and country. It can be fairly said that in comparison, our results “are much better than average”. Studies of mathematics success rates and equity gaps in 4th and 8th grade students show a very similar pattern, and so it may be fair to ask if the differential success rates are to some degree a product of our culture and history, and that the best way to make significant changes might be, as one faculty member put it, to institute a universal preschool program that begins to address these issues. On the other hand, we charge the same tuition for all of our students, and our job is to provide a meaningful and useful education for each of our students as they arrive, not as we wish them to have arrived. I certainly do not have any simple answers. As the Division administrator, I take the responsibility for providing a focus on these critical issues and providing leadership on finding strategies that will at least move our Division closer to our equity goals. One of the very real consequences of a continuous and draining effort to recruit and retain part-time faculty has been the loss of time available for addressing issues of equity.

Despite the less than satisfactory equity statistics, there have been some very positive developments in our Division regarding equity issues:

1. The maintenance, growth, and expansion of special programs that have demonstrated the possibility of low to zero equity gap education: The Math Performance Success (MPS) program has demonstrated, over a period of more than 15 years, that it is possible to provide developmental and transfer level mathematics education at high success rates and with no equity differences between sub-populations. A recently completed external review of the program completed this fall by Hanover Research confirmed these facts and demonstrated further impressive long term effects including an additional .5 successful course completions per quarter of enrollment over students’ entire De Anza career and a 28.8% greater 6 year graduation/transfer rate for MPS over non-MPS participants with similar backgrounds. In addition, 76% of MPS section enrollments are targeted students (compared to 36% for mathematics overall). Currently, the special program serves fewer than 10% of all students at the developmental math levels; however we are considering strategies for increasing MPS sections while reducing the less successful non-MPS sections. In order to do so, it is critical that we increase the counseling support available to our developmental students. The current number of sections offered has already surpassed the limit that can be supported by the single existing MPS counselor. Further expansion of the program will require the commitment of additional MPS counselor support, either through hiring or redirection of existing counseling resources. I highly recommend IPBT consider such an addition as one of the most practical, effective and cost efficient ways of reducing the equity gap. We have also begun offering Statway, another special program that has demonstrated significantly enhanced success rates while maintaining low to zero equity gaps.
2. The recently completed hiring of a STEM Director: The Director, Yvette Alva-Campbell, has already begun to provide key leadership in maintaining a more effective MPS program, working with outreach and PSME (and non-PSME STEM departments) to improve recruiting into STEM programs, especially those programs less traditionally prone to attract targeted populations, and working with faculty and students to find strategies that encourage the retention of students traditionally underrepresented in STEM; especially those in the physical sciences and mathematics. Yvette is working on developing faculty staff development opportunities specifically designed to provide useful strategies to increase success and retention of all students. I look forward to a visible effect from her efforts in the upcoming year.
3. The redesign of engineering program recruitment and curriculum: This redesign over the past three years has resulted in a startling improvement in enrollment and success and an almost complete reduction in the previous very large equity gap. The curriculum has been updated to include more student centered projects and group work and to bring in outside engineering speakers and mentors, including many from groups traditionally underrepresented in engineering.
4. The availability of success and retention data on a course by course basis: we have received access to data on demographics, success, and equity on a course by course basis. These data show that there are enormous differences between these measures across courses. For example, although the Physics Department has an overall success rate of only 58% and an equity gap of 14%, Physics 10 (a GE course) has an overall success rate of 87% and a negative equity gap of 9%; i.e. targeted students are significantly more successful than non-targeted students in that course. These course level data will be available to all departments next fall, and will help us take a more rational and selective approach to increasing success and decreasing the equity gap than we can do using only the very coarse department wide information.

**General Resource Needs**

**Facilities**

Our Division is in need of additional classroom space. I would recommend the following:

1. A three year plan for the conversion of the computer labs in S4 (S42, S44, and S48) to a dual (computer lab/lecture) mode with the purchase of desks that allow computers to be lowered and raised and the replacement of large, obsolete desktop computers that block the view of instructors and students and prevent the rooms from being useful for any lecture modes. This conversion will also require changes in power and network availability
2. Long term conversion of all classrooms to card based key systems. Almost every day I receive a report that a classroom has been left open overnight. With a high turnover of part-time faculty, many keys are not returned, and non-staff have access to classrooms and labs.

**Budget**

Continuous budget reductions during the past seven years have had a significant impact on our Division. By their very nature, the physical sciences require the use of laboratory equipment and supplies as a fundamental part of their pedagogical approach. The existence of a dedicated equipment budget was eliminated long ago, and our operating “B Budget” has declined in the recent past through the elimination of so-called supplements. Measure C funding is no longer available. In addition, the yearly three to five percent enrollment growth in our Division each year for the past 10 years has cumulatively increased our need for equipment and supplies.

Our Division also faces a deficiency in funding required maintenance and repairs. Although required equipment can be purchased with allocated equipment funds, and supplies (such as chemicals) can be purchased with lottery funding, neither of these funding categories can be used to pay for repairs and maintenance of existing equipment. Rather than fund very expensive new laboratory equipment as replacement for older but still useful items, it would be far more cost effective to allot a far smaller additional “B Budget” amount in order to maintain and repair existing useful equipment than to use equipment funds to purchase new equipment.

Each department has submitted a prioritized budget request spreadsheet, which will be aggregated and presented at a later point in the Program Review process, but overall:

I highly recommend equipment funding requests by the physics department. They have received relatively little equipment funding in the recent past, and are in great need of class demonstration and lab equipment. They also require funding for equipment maintenance and repair.

Likewise, the chemistry department has a justified need for some new equipment and especially for funds for the maintenance and repair of existing equipment. Their current lottery allocations are sufficient to purchase chemicals, hazardous waste disposal bottles, and other necessary supplies. Part of their equipment request is dependent on program expansion, and I would recommend gradual funding of that equipment as the need arises.

The engineering and geology departments have justified needs for modest equipment funding; In engineering, there is a need to provide laboratory stations for students to carry on group projects and labs required to meet transfer institution requirements. In geology, there is a need to replace lost or broken samples and magnifying lenses.

Our new STEM Director has requested a small budget of $3,000 for printing and publication costs associated with STEM advertising events and to pay guest speakers a small stipend to cover their local travel expenses.

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The math department could use additional funds to purchase desk copies of online “free” textbooks. These textbooks are a boon to students, and in order to encourage the adaption of these books, it is important that funds be available to print hard copies for use by the instructors.

**Personnel:**

**Faculty:**

We continue our need for additional full time faculty positions; especially in math and chemistry. The justifications, detailed in a previous section, include continued Division growth (during a period of decline in College enrollment), continuing large waitlists in mathematics and chemistry, increased need for new sections and instructors to allow enrollment for students who can no longer enroll in developmental level sections due to reduced seat counts, very low ratio of classes taught by FT faculty, and the extreme difficulty in recruiting, hiring, mentoring, evaluating and retaining qualified part time instructors in our disciplines. In order to maintain our current enrollment and retain a modicum of excellence, we require:

* As many math growth positions as is possible. As my earlier justification shows, we have a need for 5 additional mathematics instructors (beyond the past year’s 1 growth position) to just accommodate the current enrollment growth rates and another 11 math positions to compensate for the reduced seat count in development level math classes, for a total need of 16 additional FT faculty members. It is clear that we cannot possibly be allocated 16 new positions, but if 4 full-time positions were allocated and the remaining 12 somehow recruited from part time pools, the department would maintain its current enrollment status, albeit with a significantly reduced FT teaching %.
* A replacement position for a full-time chemistry faculty member who has resigned for family reasons.
* A chemistry growth position to help eliminate the very long chemistry waitlists, and reduce the bottleneck to students in bio and health sciences requiring chemical course sequences

The Math Performance Success (MPS) program has demonstrated, over a period of more than 15 years, that it is possible to provide developmental and transfer level mathematics education at high success rates and with little or no equity differences between sub-populations. An external review of the program by Hanover Research confirmed these facts and found impressive long term effects including an increase of .5 passed courses per quarter over students’ entire academic career at De Anza and a 28.8% increase in 6 year graduation/transfer rate for MPS over Non-MPS participants with similar backgrounds. In addition, 76% of MPS section enrollments are targeted students (compared to 36% for mathematics overall). Currently, the special program serves fewer than 10% of all students at the developmental math levels.

A key component in the success of the program is an MPS counselor, who visits MPS classes several times a week and meets with students and instructors to help improve participating student success and retention. The current number of MPS sections offered has surpassed the limit that can be supported by the single existing MPS counselor. Further expansion of the program will require the commitment of additional MPS counselor support, either through hiring or redirection of existing counseling resources.

The effectiveness of the use of additional in-class specialized counselor support for increasing overall success and reducing the equity is not limited to the MPS Program. If we are truly determined to increase the success of our students, especially for students in targeted populations, we need to expand this counseling model as a best-practice to a wider range of classes. Several departments, including mathematics, physics, engineering, geology, and astronomy have mentioned in their review providing closer counseling support as a strategy for reducing inequalities in success.

 I highly recommend IPBT consider the allocation of a Mathematics Department or PSME Division counselor as one of the most practical, effective and cost efficient ways of reducing the equity gap. The counselor would supplement the services of the existing MPS counselor as well as provide similar support for other developmental level mathematics courses and possibly other departments in the Division.

* 1 FT Faculty Counselor (Assigned to the Mathematics Department)

**Classified Staff:**

Lack of sufficient technical support personnel is negatively affecting our operations**.**

The loss of our physics technician position has made it difficult to specify, procure, repair, and maintain critical physics laboratory equipment and made it very difficult to do classroom demonstrations – a very traditional and necessary part of physics teaching. A physics technician is also needed to assist with specifying, ordering, and maintaining inventory for physics laboratory equipment and supplies. The technician often plays a key mentoring role to physics and engineering students. I highly recommend the restoration of a physics technician.

Our chemistry program is in dire need of a second laboratory technician. The additional technician would enable the expansion of chemistry offerings to meet the very large student demand and would help ensure a safe and smoothly functioning chemistry laboratory program.

**Division Wide View:**

**Enrollment**:

Overall **Enrollment** in the PSME Division has grown during the three report years. There has been an **increase of PSME enrollment of** **7.4%** during a time in which the overall campus enrollment has decreased by **3.0%,** a net differential of more than 10%. During the period of analysis the PSME Division **added 2,277 new enrollments** , following a pattern of continuous PSME enrollment gain over the past eight years. Division **productivity** is relatively **high, and has maintained a nearly constant value for many years**. Physics (607), meteorology (848), and astronomy (988**)** were particularly productive during the 2012 – 2015 cycle.

There have been significant changes in the ethnic demographics of students enrolled at De Anza. Despite an overall campus decrease in enrollments, targeted campus student population has increased by 2.4% over the three years of study. Mirroring this campus trend, but outstripping it in magnitude, **targeted student enrollment in PSME has increased by 15.7%** during this time frame, while growth for non-targeted students, though positive, was only 3.6%. Given the 23% increase in targeted enrollment reported in the previous program review and the 15.7% for this cycle, **targeted enrollments have reached 33% of all enrollments in the PSME Division.** The steadily increasing numbers and proportion of targeted students highlight the problem of a continuing equity gap that exists in most PSME departments, and makes efforts to reduce that gap of even greater importance.

Despite a high demand in almost all courses (with continuing significant wait lists in astronomy, chemistry, mathematics, physics, and engineering), the **limiting factors of faculty and room availability** continue to be responsible for capping our enrollment.

In the mathematics department, which accounts for more than 70% of the total Division enrollment, for the fourth year in a row every faculty member (both full and part time) was maxed out in the number of classes they could (by contract or desire) teach. Similar situations occurred in astronomy, chemistry, meteorology, and physics. The resignation and retirement fo full time faculty and turnover of part-time faculty (especially in mathematics, meteorology and chemistry) added to the difficulty of meeting student demand. Recruiting, hiring, training, mentoring, and evaluating new instructors to meet the enrollment demands continues to place an onerous burden on existing faculty and the Division Office staff and limits the number of sections that can be offered. Despite the recent hiring of full-time replacement faculty in mathematics and chemistry, continuing large increases in enrollment and enrollment demand during the review period demand have outstripped our capacity. As in past years, during 2015-16 year we have hired over 30 new part-time faculty to meet the increased student demand. Recruitment letters were sent to over 25 regional colleges, Universities, career centers, and high schools, and it appears that we have completely saturated the part time market. Even this extensive recruitment effort failed to attract enough instructors to meet student demand, and many students were left on wait lists because instructors were not available to teach additional sections. During the last review year, more than 2,500 students in mathematics alone were left on wait lists on the first day of the quarter.

The generous allocation of 5 full-time positions (4 in math and 1 in Meteorology/Astronomy) by IPBT for the upcoming fall included only a single growth position, and clearly does not begin to accommodate the 2,277 additional students we have to support as a result of growth in the past three years. Even at 40 students per section (our developmental sections are capped at 35), the 2,277 new enrollments would represent 57 new sections and would require more than 6 new full time equivalent instructors to teach, far greater than the single new growth position allocated. The enrollment numbers do not include the very large number of wait listed students in mathematics and chemistry, who we have not been able to serve.

The need for additional faculty has been even further exacerbated by recent negotiated changes in the seat counts for developmental level classes and changes in large class size load factors. During the current academic year we have offered an average of 83 sections of developmental level mathematics classes each quarter. Given that the capacity for each section has been reduced by 5 students, beginning this year there have been (83 X 5) 415 additional students *per quarter* who are no longer able to register for these critical classes. Reincorporating these enrollments into our program would require the addition of (415/35) more than 11 new full-time equivalent mathematics instructors, and would only bring us to the same level of service we provided last year without addressing growth or backlogged waitlist demand.

Other negotiated changes in the faculty contract have had significant impacts on our need for additional faculty. Increases in load factors for courses with enrollments of over 50 students has severely impacted our physics and meteorology programs, and resulted in reductions in the number of courses that can be taught by part-time and overload faculty in order to stay within their maximum yearly load limits. This has caused a need for additional hiring to maintain past section offerings, and as described above, we have already saturated the regional part-time hiring pool.

Despite clear student demand and potential growth, due to the above factors we anticipate that the lack of available qualified instructors will halt enrollment growth in our Division, and if no new instructors become available for next year, the PSME will actually decline for the first time in 10 years. Given that the courses most impacted are those required by our most vulnerable students (at the developmental level and in large size GE science classes) and that the College as a whole is in need of additional enrollments, I feel that any allocation of scarce instructional resources to meet currently existing demand, especially in mathematics and chemistry, will be an excellent investment in the health of our institution and its students. The current relatively low proportion of sections taught as FT in these two departments (36.6% and 27.9% respectively), the decline in FT percentage during the last study year, and the extreme difficulty finding and retaining qualified part-time faculty in these disciplines adds urgency to the need for additional full-time faculty. Consequently, I strongly urge that our Division be allocated as many positions as possible in mathematics and a new position in chemistry.

***The large numbers of part time faculty and full time faculty teaching multiple overloads has a serious impact on our ability to carry out the many non-teaching duties required for a smoothly functioning Division (including such tasks as committee membership, SLO and program review obligations, curriculum development, and equity balancing efforts).***

**Student Success and Equity:**

Despite the demands of continued Division growth, overall Division **success rates** remained about constant at 67% over the entire review period. There were small (less than 1%) gains in success of both targeted and non-targeted sub-populations.

There were large differences in success rates and equity gaps for various departments within the Division. Although astronomy had an overall success rate of 80%, it had a relatively large (19%) equity gap in the final year of the review. Chemistry had a very substantial growth in overall success from 73% to 80%, though the equity gap in that department remained at a relatively high 15%. Geology with an overall success rate of 80% was able to reduce its equity gap substantially, but the final difference between success in targeted and non-targeted populations was still 11%. And meteorology, also with a relatively high success rate of 83%, nevertheless had a very large increase in its equity gap from 1% to 19% over the review period.

Math (64%), and physics (58%) had substantially lower overall success rates than the rest of the division, with equity gaps in the 14 – 17% range.

Only engineering, with its overall success rate at 87% and equity gap of 4% might be considered within acceptable bounds.

As I have mentioned in past reviews, the issue of success rates and equity are not always a comfortable topic for discussion within our Division. It is easy to compare our Division performance to those of other institutions in the state and country. It can be fairly said that in comparison, our results “are much better than average”. Studies of mathematics success rates and equity gaps in 4th and 8th grade students show a very similar pattern, and so it may be fair to ask if the differential success rates are to some degree a product of our culture and history, and that the best way to make significant changes might be, as one faculty member put it, to institute a universal preschool program that begins to address these issues. On the other hand, we charge the same tuition for all of our students, and our job is to provide a meaningful and useful education for each of our students as they arrive, not as we wish them to have arrived. I certainly do not have any simple answers. As the Division administrator, I take the responsibility for providing a focus on these critical issues and providing leadership on finding strategies that will at least move our Division closer to our equity goals. One of the very real consequences of a continuous and draining effort to recruit and retain part-time faculty has been the loss of time available for addressing issues of equity.

Despite the less than satisfactory equity statistics, there have been some very positive developments in our Division regarding equity issues:

1. The maintenance, growth, and expansion of special programs that have demonstrated the possibility of low to zero equity gap education: The Math Performance Success (MPS) program has demonstrated, over a period of more than 15 years, that it is possible to provide developmental and transfer level mathematics education at high success rates and with no equity differences between sub-populations. An external review of the program completed this fall confirmed these facts and demonstrated impressive long term increases in graduation and transfer rates and significantly higher overall college gpa’s for students participating in the program. In addition, 76% of MPS section enrollments are targeted students (compared to 36% for mathematics overall). Currently, the special program serves fewer than 10% of all students at the developmental math levels; however we are considering strategies for increasing MPS sections while reducing the less successful non-MPS sections. In order to do so, it is critical that we increase the counseling support available to our developmental students. The current number of sections offered has already surpassed the limit that can be supported by the single existing MPS counselor. Further expansion of the program will require the commitment of additional MPS counselor support, either through hiring or redirection of existing counseling resources. I highly recommend IPBT consider such an addition as one of the most practical, effective and cost efficient ways of reducing the equity gap. We have also begun offering Statway, another special program that has demonstrated significantly enhanced success rates while maintaining low to zero equity gaps.
2. The recently completed hiring of a STEM Director: The Director, Yvette Alva-Campbell, has already begun to provide key leadership in maintaining a more effective MPS program, working with outreach and PSME (and non-PSME STEM departments) to improve recruiting into STEM programs, especially those programs less traditionally prone to attract targeted populations, and working with faculty and students to find strategies that encourage the retention of students traditionally underrepresented in STEM; especially those in the physical sciences and mathematics. Yvette is working on developing faculty staff development opportunities specifically designed to provide useful strategies to increase success and retention of all students. I look forward to a visible effect from her efforts in the upcoming year.
3. The redesign of engineering program recruitment and curriculum: This redesign over the past three years has resulted in a startling improvement in enrollment and success and an almost complete reduction in the previous very large equity gap. The curriculum has been updated to include more student centered projects and group work and to bring in outside engineering speakers and mentors, including many from groups traditionally underrepresented in engineering.
4. The availability of success and retention data on a course by course basis: we have received access to data on demographics, success, and equity on a course by course basis. These data show that there are enormous differences between these measures across courses. For example, although the Physics Department has an overall success rate of only 58% and an equity gap of 14%, Physics 10 (a GE course) has an overall success rate of 87% and a negative equity gap of 9%; i.e. targeted students are significantly more successful than non-targeted students in that course. These course level data will be available to all departments next fall, and will help us take a more rational and selective approach to increasing success and decreasing the equity gap than we can do using only the very coarse department wide information.

**General Resource Needs**

**Facilities**

Our Division is in need of additional classroom space. I would recommend the following:

1. A three year plan for the conversion of the computer labs in S4 (S42, S44, and S48) to a dual (computer lab/lecture) mode with the purchase of desks that allow computers to be lowered and raised and the replacement of large, obsolete desktop computers that block the view of instructors and students and prevent the rooms from being useful for any lecture modes. This conversion will also require changes in power and network availability
2. Long term conversion of all classrooms to card based key systems. Almost every day I receive a report that a classroom has been left open overnight. With a high turnover of part-time faculty, many keys are not returned, and non-staff have access to classrooms and labs.

**Budget**

Continuous budget reductions during the past seven years have had a significant impact on our Division. By their very nature, the physical sciences require the use of laboratory equipment and supplies as a fundamental part of their pedagogical approach. The existence of a dedicated equipment budget was eliminated long ago, and our operating (B) budget has declined in the recent past through the elimination of so-called supplements. Measure C funding is no longer available. In addition, the yearly three to five percent enrollment growth in our Division each year for the past 10 years has cumulatively increased our need for equipment and supplies.

Our Division also faces a deficiency in funding required maintenance and repairs. Although required equipment can be purchased with allocated equipment funds, and supplies (such as chemicals) can be purchased with lottery funding, neither of these funding categories can be used to pay for repairs and maintenance of existing equipment. Rather than fund very expensive new laboratory equipment as replacement for older but still useful items, it would be far more cost effective to allot a far smaller additional “B” Budget amount in order to maintain and repair the equipment.

Each department has submitted a prioritized budget request spreadsheet, which will be aggregated and presented at a later point in the Program Review process, but overall:

I highly recommend equipment funding requests by the physics department. They have received relatively little equipment funding in the recent past, and are in great need of class demonstration and lab equipment. They also require funding for equipment maintenance and repair.

Likewise, the chemistry department has a justified need for some new equipment and especially for funds for the maintenance and repair of existing equipment. Their current lottery allocations are sufficient to purchase chemicals, hazardous waste disposal bottles, and other necessary supplies. Part of their equipment request is dependent on program expansion, and I would recommend gradual funding of that equipment as the need arises.

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Our chemistry program is in dire need of a second laboratory coordinator. This additional staff person would enable the expansion of chemistry offerings to meet the very large student demand, would help ensure a safe and smoothly functioning chemistry laboratory program, and would eliminate the need for an evening stockroom clerk, whose duties would be subsumed.

* 1 FT Classified Physics Laboratory Technician
* 1 FT Classified Chemistry Laboratory Coordinator