

PSME

What are the programs individually going to do specifically to address the success/equity gaps? The gaps persist especially in math, but all areas of PSME face this challenge. What leadership can the division provide in this regard?

The following is a short review the overall success/equity statistics that may provide a better understanding of the underlying issues and help focus on areas of greatest concern.

Shown below is a table of success rate and equity gap for various institutional groupings. To simplify, only the most recent year for which data is available (2016-17) are shown; the results for other recent years are substantially the same and do not affect overall conclusions.

Entity	2016 Success Rate (%)	Equity Gap (%)
DA College	77	11
FH College	80	9
BUS/CS	73	15
CA	80	10
LA	80	10
PSME	68	15
PSME FH	67	14
SS	79	12
ASTR	79	17
CHEM	78	16
ENGR	91	0
GEOL	77	18
MATH	65	15
MATH FH	64	14
MATH U.S.	49	19
MET	88	6
PHYS	64	12

Equity Gap: success rate difference between targeted and non-targeted populations

Some general observations:

1. Success Rate
 - a. The PSME Division has a significantly lower success rate than most other divisions at De Anza
 - b. There are large variations within the PSME Division
 - i. 5 of the 7 PSME departments have success rates at or above the college average (ASTR, CHEM, ENGR, GEOL, and MET)
 - ii. 2 of the 7 PSME departments have success rates very much higher than the college average (ENGR and MET)

iii. *2 of the 7 PSME departments have success rates significantly lower than the college average (MATH and PHYS)*

2. Equity Gap
 - a. 2 of the 7 PSME departments have very low equity gaps, far below the college average (ENGR and MET).
 - i. ENGR has no equity gap
 - b. *4 of the 7 PSME departments have equity gaps that are significantly higher than the college average (ASTR, CHEM, GEOL, and MATH)*
3. Comparison to outside institutions
 - a. DA PSME and FH PSME have nearly identical success rates and equity gaps, and FH PSME has significantly lower rates than other divisions at FH
 - b. State and national college and university math success rates (reported by the Mathematical Association of America and others) are around 49%, far below that of FHDA. Likewise, estimates of equity gap in mathematics are reported around 19%, significantly worse than at FHDA.

Some general conclusions are:

1. The division (and College) has a need to improve all success rates, but Math and Physics stand out as having some of the greatest need for improvement.
2. Equity disparity is especially high in four areas; ASTR, CHEM, GEOL, and MATH, and these disciplines require active intervention.
3. Math and physical sciences at our District, at the state level, and throughout the U.S. have similar statistics and possibly similar causes, and we need to look to wider strategies and available literature in formulating responses.
4. Departments within PSME (ENGR and MET) that have very high success rates and small equity gaps (compared to all college departments) may be able to provide models for effective intervention.

Some specific initiatives to raise success rates and lower equity gaps that are being pursued include:

- *MPS and Statway*: these are two specialized math programs that have been successful in significantly raising success rates and lower equity gaps. Both programs have been evaluated by outside agencies and have been found to significantly improve success/equity statistics. Course success rates have been improved in the 10 – 20% range (depending on course level) and the equity gap has been reduced to nearly 0, and for some years has actually been negative (i.e. targeted students outperform non-targeted populations). In addition, an external review has shown long term benefits with significant increases in graduation rates for students participating in the program. The programs also significantly decrease the time for completion of transfer level mathematics. There are significant barriers to expanding these programs, including extra costs associated with longer class times, instructor training, and extra support services, such as counseling and tutoring. The Division has recently received a 1.3 million dollar grant to expand the program, and we anticipate that over the 3 year grant funding period, we will be able to double the number of mathematics sections offered under this program. As the program expands, it also trains more and more faculty in the

techniques and strategies that appear to improve success/equity, and we anticipate that these advantages will spread to other math classes outside the program.

- *STEM counseling services*: the division now includes three STEM counselors who specialize in math and STEM counseling issues. Given the positive effects of such counselor support in the MPS program, we anticipate the benefits will widen to students not involved in the special programs.
- *Assessment and placement*: the Math Department has been very actively engaged in changes to assessment and placement policies. Recent changes in re-test policy, placement test practice availability, and multiple measure assessment using high school transcript data have been approved and encouraged by the math department. Better placement strategies have been shown to improve overall success, time to completion, and equity.
- *Curriculum*: several departments, especially astronomy, engineering, geology, and meteorology, have moved to more active learning based learning strategies. These approaches involve more hands on activities that increase engagement and improve success and retention. Initiation of new lab courses and equipment requests in these disciplines reflect a shift to a more hands-on learning environment. In addition, several departments, including chemistry, math, and physics are reviewing their “preparation” courses to determine if curriculum and other changes might greatly improve the success rates in the subsequent courses and course sequences.
- *Open source (free) textbook adoption*: the astronomy department has adopted open source textbooks for their courses which are free to students, and the math department is doing so in many of their lower level courses. Likewise the chemistry department is reviewing open source text possibilities. These policies will presumably make these courses more accessible to lower income students and also provide greater incentive for students to make use of the text and other open source supporting materials.
- *Staff development*: changes in faculty approach can have a significant effect on success and equity. The greatest factor in predicting success is often the instructor. This year our Division is committed to providing effective staff development training that is specifically geared toward the special needs of math and science instruction. Our new STEM success director, Yvette Alva-Campbell, is leading this initiative, and we hope to see new positive outcomes in the next year or two.
- *Tutoring and mentoring*: we have increased our tutoring and required mandatory tutoring in certain circumstances. This seems to be improving our success and equity. The Division makes tutor funding requests to the Student Association each year, and we will continue to do so and ask for increases based on past success. We would like to increase tutoring in other PSME disciplines, with the expectation that it will also be effective in those areas. Our grant also has paid for additional tutoring and mentoring, but funding limitations are a barrier to expansion of these programs.
- *Clubs, peer mentors, and other student engagement strategies*: The striking increase in success (to a 91% success rate and 0% equity gap) of the engineering department during the past 6 years has resulted in part from changes to curriculum that increase the active participation of students in projects of their own choosing and from the very active student engineering clubs supported by our part-time engineering faculty. We hope to

expand these strategies to other departments, and chemistry, physics, and mathematics have made progress toward these goals. Students in the physics department are planning their second annual physics conference. Last year's conference was very successful and centered on the recruiting of women in physics. Such student initiated and run activities create an environment that encourages student success and equity.

- *Greater connections to the Office of Equity:* the Office of Equity has in the past encouraged meaningful and productive discussions with our faculty. Recent personnel changes in that office provide us with another opportunity to take advantage of their services and expertise and to provide a division forum in which equity discussions can take place in a safe and productive format.
- *Division and department leadership:* the dean and department chairs will be meeting to continue past discussions around success, retention, and equity. We hope to arrange a spring division convocation to address issues of student success, retention, and equity and to reformulate department improvement plans in these areas. The dean and department chairs will also continue to review national literature and present ideas and strategies that other institutions have found useful in addressing identical problems encountered at De Anza. As shown above, the problem of low success and poor equity in STEM disciplines is not unique to our campus, and we hope to utilize successful approaches from other institutions to improve success, retention, and equity in our division.