



What Delays Student Graduation in Engineering

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BACKGROUND

The College of Engineering serves 3922 undergraduate students in 7 majors. Since 2012, the College's enrollment has consistently increased. However, the 4 and 6 year graduation rates are low and have not kept pace with this enrollment trend. Prior to 2012, Dr. Yusuf Ozturk, a member of the CoE DC/CSST, researched engineering student performance and found that there were specific courses critical to the engineering curriculum. This work led to the implementation of the impact criteria established in the 2012 catalog.

Impact criteria identified 6 courses in each major and required:

- Pass each impact course with a grade of C
- Maintain a GPA of 2.1 until 2015
- Maintain a GPA of 2.5 between 2015 and 2017
- Maintain a GPA of 2.7 after 2017

Entry Year	FTF Count	Percentage of students in pre-major status at			
		Term 5	Term 6	Term 7	Term 8
20114	408	44.36%	35.05%	17.16%	12.25%
20124	447	44.30%	29.53%	16.11%	11.41%
20134	559	38.82%	29.16%	15.56%	10.20%
20144	708	39.55%	25.42%	13.84%	9.89%
20154	759	35.05%	23.45%	12.38%	8.83%
20164	773	38.55%	23.16%	12.81%	9.44%
20174	772	44.30%	29.92%	0.00%	0.00%

RESEARCH QUESTIONS

The objective of this Data Champion/CSST project is to look into the area of impact criteria to determine where students may become delayed along the path to graduation. In relation to this, we will also look at how prepared incoming engineering students are to succeed in impact courses.

Overarching goal of this research is early identification of students not on track for impact completion. Specific questions we would like to address:

- How many semesters does it take for our students to achieve major status ?
- What percentage of upper division students are still in pre-majors status ?
- What are the causes of impact delays
 - Do course repeats (and frequency) impact the delay?
 - Does the first math course (where they start) impact the delay?
 - How are students performing in the 6 major prep courses that make up the impact within each major?
 - Are there specific courses creating the delay?
 - Does success (or lack of) in the 6 major prep course indicate future success (in subsequent courses)?
 - Is there an equity gap in achieving major status ? (First Gen, Pell, Underserved)

METHODS

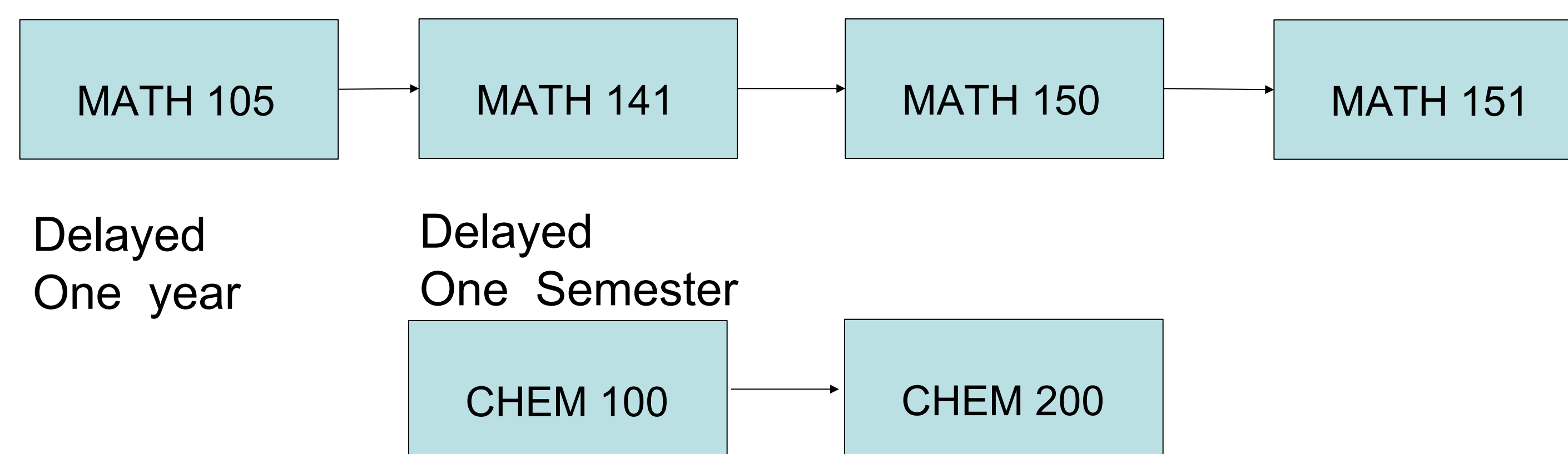
All College of Engineering programs include Math 150 as the first Math course however students may be placed in Math 141 (Precalculus) and Math 105 (college Algebra). Students placed in Math 105 are delayed one year while students starting their Math sequence with Math 141 are delayed at least one semester.

A quick analysis given in table 1 shows that more than 50% of the students starting Engineering in 2017, started their math sequence with MATH 141. In 2018 and 2019 22.42% and 23.36% of students started their Math sequence with Math 105. Again in 2018 and 2019 29.9% and 21.22% of the students started their Math sequence with Math 141.

FINDINGS

Table 1 : Percentage of Students Delayed because of Math Deficiency

	20174	20184	20194
MATH120/124/105	1.51%	22.42%	23.36%
MATH141	52.86%	29.90%	21.22%
MATH150	21.69%	27.71%	30.26%
MATH151	16.57%	11.98%	17.27%
MATH245	1.20%	0.77%	0.99%
MATH252	6.17%	7.22%	6.91%

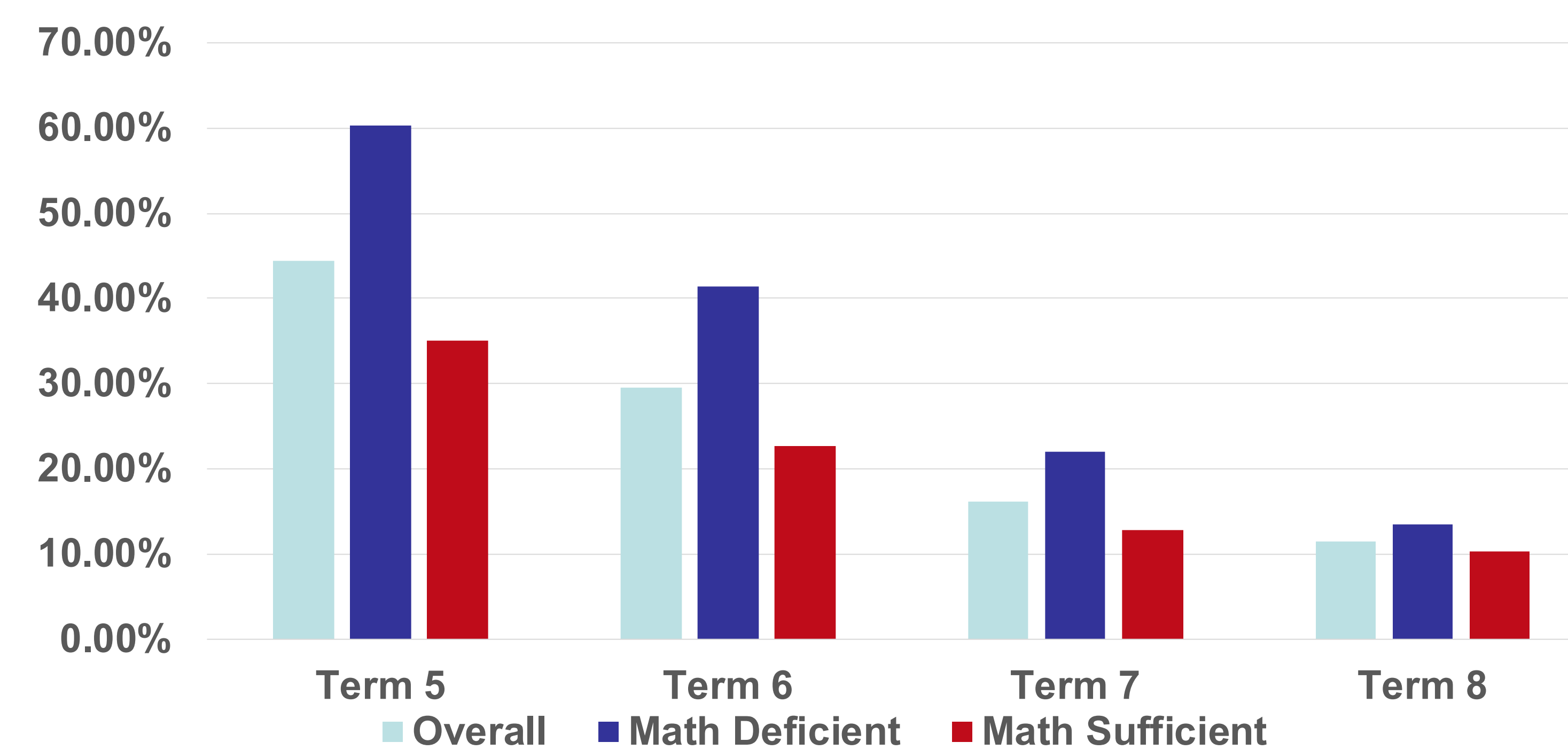


College of Engineering programs require Chem 200 as the first Chemistry course in the major. However students arriving with chemistry deficiency starts at Chem 100 as the first chemistry courses. This results in a delay of at least one semester in attaining major status.

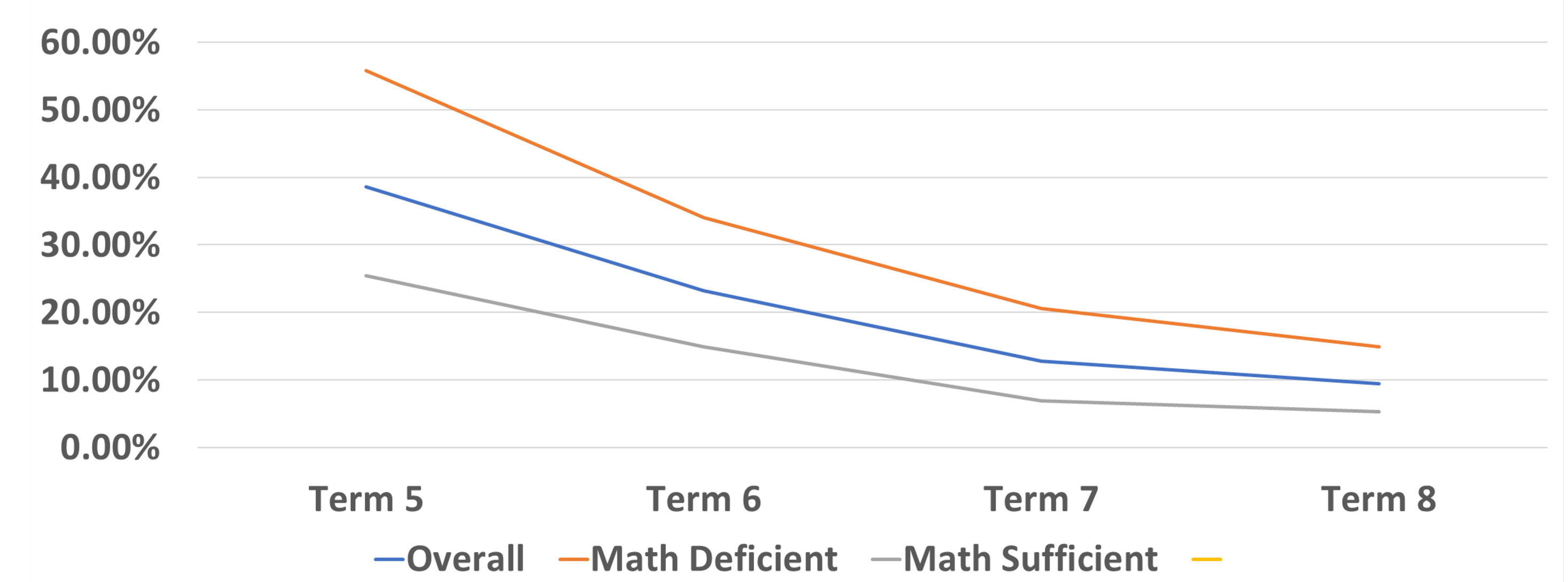
Table 2 : Percentage of Students Delayed because of Chem Deficiency

	20174	20184	20194
CHEM100	64.43%	50.43%	70.32%
CHEM200	5.37%	20.04%	8.98%
CHEM202	30.20%	29.53%	20.70%

Percentage of Students in Pre-Major Status in Terms 5-8
2012 Cohort

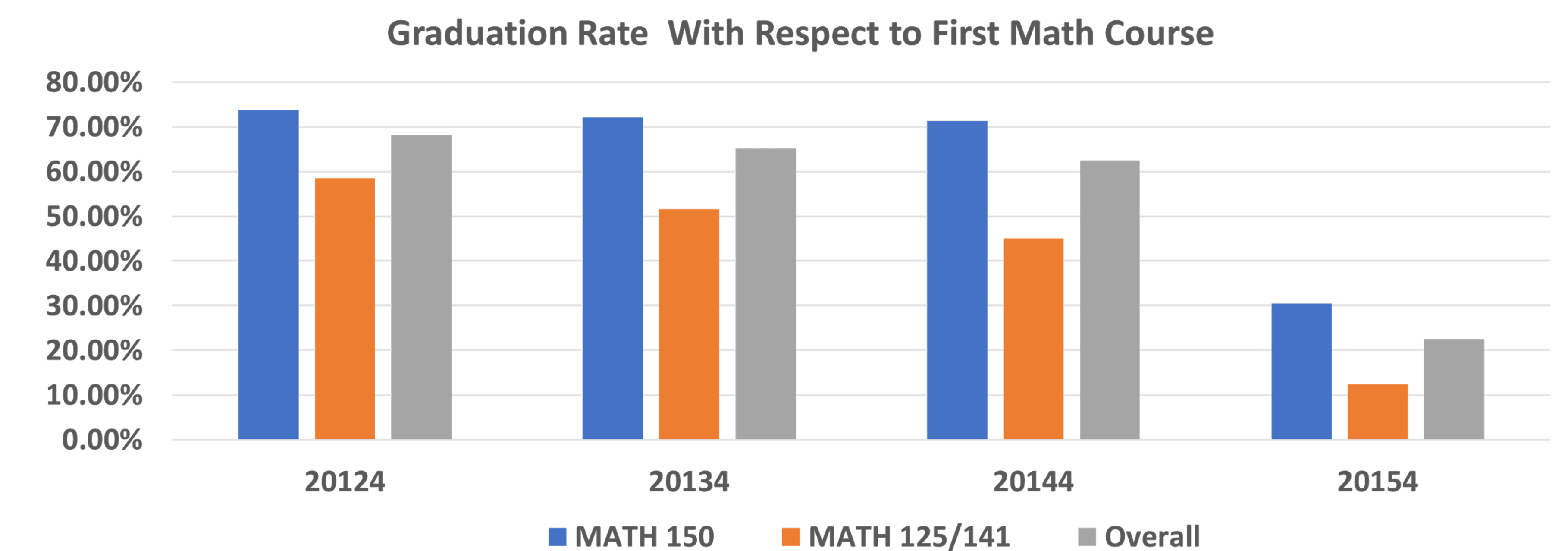


Percentage of Students in Pre-Major Status in Terms 5-8
2016 Cohort



FINDINGS

The figure below shows the impact of the first math course on graduation rates from SDSU. We provide 4, 5, 6, and 7 year graduation rates for 2015, 2014, 2013 and 2012 cohorts respectively.



CONCLUSIONS & FUTURE DIRECTIONS

Data analysis revealed that the first math course attended by Engineering students is critical in their progress to attaining major status and graduation. For example, for 2015 cohort, graduation rates for students that arrives calculus ready in their first semester is 30.44% versus 12.35% for students that needs math support. Similarly, for 2012 cohort, 7 year graduation rates for students that arrives calculus ready is 73.76% while the same rate for students that needs math support is 58%.

We have identified a critical factor in delaying our students attaining major status and graduation from SDSU. The problem is important however not without a solution. We identified several immediate interventions and started implementation of these interventions.

- Cooperate with the College of Sciences to offer MATH 125, MATH 141, PHYS 195 and CHEM 100 in the summer program for incoming students. First time freshman earning credit in MATH 141 will be Calc ready during the first Fall semester.
- Advise students to complete Calculus and Chemistry courses in the summer semester after the first year.
- Offer core engineering courses in the summer program to allow students to catch up with their plan of study.
- Offer closed loop tutoring for students who needs support in Math, Chemistry and core engineering courses.

While we identified immediate interventions to serve the existing body of Engineering students better, we believe these interventions will not address the issue without changes in our enrollment management and criteria with which students are admitted to engineering programs. We are looking forward to further the discussions started by Enrollment Management Task Force.

An important issue we yet to uncover is the equity gap in achieving major status. We will continue the research with the question : Who are the students that are arriving with math deficiency ? Is there an equity gap to start with and how do we close this gap?

ACKNOWLEDGEMENTS

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