<u>The Math 105-Degree Requirement</u>

I. <u>Research design approaches</u>
   A. Examine trends in degree graduates
      a) Relate to past enrollment trends
         1. Who
         2. How many
      b) Determine if groups are graduating at the same rate
      c) Need to wait for students to complete under the new requirement
   B. Examine trends in course enrollment patterns
      a) Look at students in the pipeline
         1. Trends in "gateway" course
         2. Changes after new policy implementation
      b) Need to wait for sufficient number of students to start under the new requirement

II. <u>Cohort analysis approach</u>
   A. Track similarly situated groups before and after policy change
      a) New students
      b) Same number of quarters in start period
   B. Focus on students most likely to be impacted by the new requirement
      a) Students taking Math 101 their first year
         1. Math 101 was the degree requirement
         2. May have started in Math 200
   C. Examine changes in persistence to Math 105
      a) Shows potential negative impact if less students (number, percent) obtain new requirement
      b) Similar persistence rates might suggest policy is unlikely to have impact on the number of graduates
   D. Changes in Math Curriculum will complicate the analysis

III. <u>Math enrollment trends</u>
   A. Stable enrollment overall (Math 200, 101, 105)
   B. Historically, most degree graduates completed Math 105 or above before the policy change

Math 105 Course Success Rates
Cohort Analysis – Before and After Math 105 Became a Degree Requirement

Proposed Methodology for Review

5/11/04 DRAFT
　　This methodological approach is based on a proposal to the De Anza College Math Department on April 24, 2003. The proposal called for a study to examine the impact of the Math 105 degree requirement and was initiated after a discussion at the College Council. The department has continued to seek ways to improve student success in the math gateway courses, which include Math 200-Pre Algebra, Math 101-Elementary Algebra, and Math 105-Intermediate Algebra.

Overview

　　In Fall 2001, De Anza College changed the math requirement for the Associates degree from Elementary Algebra (Math 101) to Intermediate Algebra (Math 105). The rationale for increasing the requirement from Math 101 to Math 105 is that graduates need higher-level math, whether they transfer to a four-year institution or enter the job market. In addition, since many high schools had begun requiring the equivalent of Math 105, the College did not want to have a lower math requirement than the high schools.

　　The purpose of this research is to provide the Math Department faculty with information that can be used to improve the success of students. Obtaining similar rates of course success, degree, and transfer attainment among all ethnic groups is a goal of the College Equity Plan. A goal of the Master Plan is to increase the success of all students. With these goals in mind, this study assesses the success rates and student persistence to Math 105, before and after the policy change.

The Research Plan

　　The first step in examining the impact of the policy change is to examine trends in Math 105 success by ethnic group with particular attention to students entering De Anza College before and after the new requirements were implemented. The review will examine the total number of attempts (with the assumption that more students will take Math 105 post Fall 2001) and course success, by ethnic group. The review will also examine the previous academic background and the path taken by students to enroll in Math 105.

　　After sufficient time for a new cohort to graduate under the new requirements, the second step will be to examine students who have received a degree, by ethnicity and Math 105 attempts. Holding constant for enrollment changes, this review will examine whether the number and ethnic makeup of degree recipients may have changed due to the Math 105 requirement. A pilot review will be conducted prior to the 2004-05 Self Study, with a full review taking place after students starting with the Math 105 requirement have had at least three years to complete coursework for graduation.

Math Degree Requirement Study.pdf

Methodology

The Math 105 Study Methodology involves tracking two student cohorts, those with a first admit term before the policy change and those starting after the change. The cohorts are defined as students starting before and after the policy change who take Math 101 within their first calendar year of enrollment at De Anza College. Only students who take Math 101 before Math 105 are included in the analysis.

The approach was selected to achieve comparability between the groups by including new students starting in Math 101 over a set number of quarters. This approach focuses the analysis on students who previously would have only enrolled in Math 101, but now are required to take Math 105 in addition. This approach does not preclude students who start at Math 200 and move through Math 101 to Math 105. Students placing above Math 105 would not have been impacted by the change.

The study will not examine changes in placement rates that may have occurred due to changing student demographics / preparedness. This study is not intended to be a review of student success in all math courses; the focus is on students most likely impacted by the new degree requirement. Figure 1 provides a summary of the research approach.

Students Starting Before the Change

The program will examine student admission records to determine the first term of admission. For students in this group the first term of admission was either **Fall 1999, Winter 2000, or Spring 2000**. The cohort consists of students starting in these three terms who also attempted Math 101 in those terms or the adjacent summer and fall terms. For these students only the grade for the last attempt of Math 101 over the five terms is counted in the analysis. Math 105 grades (last attempt over the period) for this cohort (only those students passing Math 101 are included as eligible for Math 105) are examined for the terms Winter 2000, Spring 2000, Summer 2000, Fall 2000, Winter 2001, Spring 2001, Summer 2001, or Fall 2001.
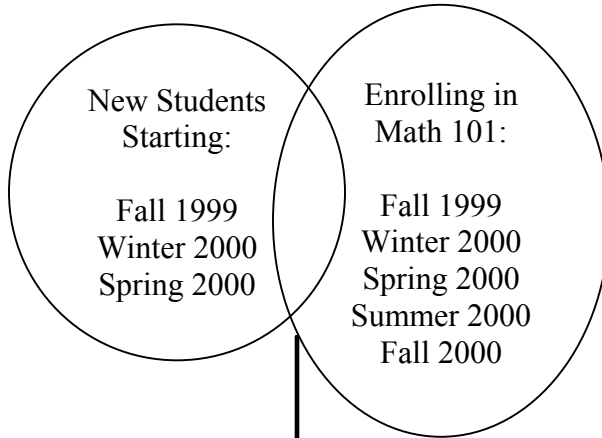
Students Starting After the Change

For students in this group the first term of admission was either **Fall 2001, Winter 2002, or Spring 2002** (since the degree requirement was implemented with students starting in the fall, the methodology does not include students starting in the summer term). The cohort consists of students starting in these three terms who also attempted Math 101 in those terms or the adjacent summer and fall terms. For these students only the grade for the last attempt of Math 101 over the five terms is counted in the analysis. Math 105 grades (last attempt over the period) for this cohort (only those students passing Math 101 are included as eligible for Math 105) are examined for the terms Winter 2002, Spring 2002, Summer 2002, Fall 2002, Winter 2003, Spring 2003, Summer 2003, or Fall 2003.

Figure 1

Math 105 Cohort Analysis Methodology

New Students Prior to Fall 2001   **New Student Beginning Fall 2001**

Elementary Algebra-Math 101 Required for a De Anza Degree	Intermediate Algebra-Math 105 Required for a De Anza Degree

New Students Starting:

Fall 1999
Winter 2000
Spring 2000

Enrolling in Math 101:

Fall 1999
Winter 2000
Spring 2000
Summer 2000
Fall 2000

New Students Starting:

Fall 2001
Winter 2002
Spring 2002

Enrolling in Math 101:

Fall 2001
Winter 2002
Spring 2002
Summer 2002
Fall 2002
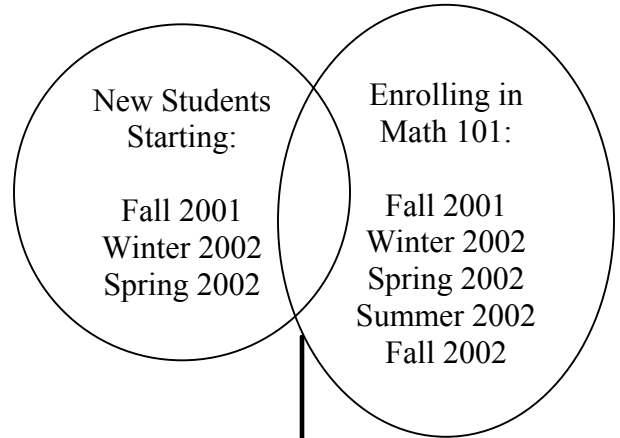
Persistence to /
Success in Math 105:

Winter 2000
Spring 2000
Summer 2000
Fall 2000
Winter 2001
Spring 2001
Summer 2001
Fall 2001

Persistence to /
Success in Math 105:

Winter 2002
Spring 2002
Summer 2002
Fall 2002
Winter 2003
Spring 2003
Summer 2003
Fall 2003

Variables Examined:
- ➤ **Percent Attempting**
- ➤ **Percent Succeeding (Grade of A, B, C, or P)**
- ➤ **Ethnicity**

How the Results are to be Analyzed

The analysis will examine success (grade of A, B, C or P) in Math 105 after completion of Math 101, before and after Math 105 became a degree requirement. That is, of those who were successful in Math 101, what percentage went on to be successful in Math 105 within the time period under study? The data will be broken out into four groups: students passing (grade of A, B, C or P), not passing (D or F), withdrawing, and not taking Math 105. In calculating the percent passing, the methodology excludes students who do not take Math 105.

A Priori Assumptions of the Results

Given the change in requirements, we would assume that the percentage of students who take Math 101 and go on to take Make 105 would show some increase. We might also assume that the rate of passage for Math 105 would be slightly less for the group after the change because more students who are not oriented towards transfer would be taking Math 105 than previously.

Math Enrollment Trends

As indicated in Figure 1 below, historically about 6% of De Anza College students receiving an associates degree each year have only completed math through elementary Algebra (Math 101). About 70% of the degree recipients each year complete a college level math course with an additional 20% exempted from the requirement because of previous math course work. As noted on Figure 2, of the approximately 65 students each year completing Math 101 only, more than nearly 40% select "white" as their ethnicity on the De Anza College application. While this figure is significantly above the percentage for the college population overall (at about 25%) the percentage of Asian students in the group is about one fifth of the overall college population.

While the new requirement is for a De Anza College degree, it should be noted that many students transfer without obtaining a degree. Of the students that transfer, it is likely that many will have completed up through Math 101 only. Each transfer institution has its own set of requirements for transfer and students may opt to meet the math requirement at the transfer institution rather than De Anza College.

Overall, there has been little change in Math 101 and Math 105 course enrollments from 1999-00 through 2002-03, with only Math 105 enrollments showing a slight increase. Both the number of enrollees and the ethnicity of those enrolled remained stable over the period. As noted in Figure 3, traditionally under-represented ethnic groups are over represented in Math 200, Math 101 and Math 105. The percentage of Asian students enrolling in Math 101 is about half of what would be expected from the overall population.

Figure 1

De Anza College Associate Degree Recipients
By Highest Math Course Completion at De Anza College and Fiscal Year

Highest De Anza Math	1999-00		2000-01		2001-02		2002-03	
Course Completed	#	%	#	%	#	%	#	%
Math 101	73	6%	66	6%	67	5%	66	5%
Math 105 / 104	53	4%	49	4%	67	5%	62	5%
Higher Math	790	67%	803	70%	896	71%	947	71%
No Math at De Anza	268	23%	235	20%	227	18%	263	20%
Total	1,184	100%	1,153	100%	1,257	100%	1,338	100%

Note: Includes only De Anza Courses. Higher Math includes students whose highest math
 class at De Anza College was transfer level.
 'No Math' includes students placing into Math 105 or higher (depending on degree requirement),
 students applying courses taken at other colleges, or students applying AP units.

Figure 2

De Anza College Associate Degrees Awarded By Fiscal Year and Ethnicity
Students Completing Math 101 as Highest Course at De Anza to Meet Degree Requirement

	1999-00		2000-01		2001-02		2002-03	
Ethnicity	#	%	#	%	#	%	#	%
Asian	7	10%	7	11%	9	13%	4	6%
Black	3	4%	3	5%	5	7%	0	0%
Filipino	3	4%	6	9%	2	3%	6	9%
Hispanic	14	19%	10	15%	10	15%	13	20%
Native American	1	1%	0	0%	2	3%	0	0%
Other	0	0%	2	3%	2	3%	1	2%
Pacific Islander	0	0%	0	0%	0	0%	2	3%
Unrecorded	9	12%	9	14%	6	9%	13	20%
White	36	49%	29	44%	31	46%	27	41%
Total	73	100%	66	100%	67	100%	66	100%

Figure 3

MATH200.

	1999-00		2000-01		2001-02		2002-03	
	Num	Per	Num	Per	Num	Per	Num	Per
Asian	120	12%	114	12%	146	13%	145	12%
Black	85	8%	73	8%	89	8%	118	9%
Filipino	49	5%	62	7%	63	6%	86	7%
Hispanic	260	26%	269	28%	287	26%	305	24%
Native American	9	1%	13	1%	9	1%	12	1%
Other	16	2%	24	3%	31	3%	37	3%
Pacific Islander	19	2%	19	2%	17	2%	22	2%
Unrecorded	145	14%	150	16%	192	17%	218	18%
White	299	30%	227	24%	270	24%	302	24%
Total	1,002	100%	951	100%	1,104	100%	1,245	100%

MATH101.

	1999-00		2000-01		2001-02		2002-03	
	Num	Per	Num	Per	Num	Per	Num	Per
Asian	298	15%	274	15%	277	14%	296	15%
Black	115	6%	105	6%	99	5%	113	6%
Filipino	110	6%	133	7%	132	7%	154	8%
Hispanic	404	21%	377	20%	398	21%	366	19%
Native American	9	0%	14	1%	15	1%	17	1%
Other	45	2%	50	3%	52	3%	42	2%
Pacific Islander	23	1%	34	2%	49	3%	34	2%
Unrecorded	307	16%	327	17%	334	17%	385	20%
White	652	33%	568	30%	569	30%	551	28%
Total	1,963	100%	1,882	100%	1,925	100%	1,958	100%

MATH105.

	1999-00		2000-01		2001-02		2002-03	
	Num	Per	Num	Per	Num	Per	Num	Per
Asian	574	23%	587	25%	655	26%	652	24%
Black	95	4%	100	4%	117	5%	116	4%
Filipino	171	7%	162	7%	180	7%	186	7%
Hispanic	387	16%	358	15%	369	14%	463	17%
Native American	19	1%	14	1%	20	1%	14	1%
Other	54	2%	52	2%	61	2%	60	2%
Pacific Islander	31	1%	26	1%	44	2%	42	2%
Unrecorded	410	17%	413	17%	420	16%	538	20%
White	714	29%	670	28%	697	27%	666	24%
Total	2,455	100%	2,382	100%	2,563	100%	2,737	100%

All Other MATH Courses

	1999-00		2000-01		2001-02		2002-03	
	Num	Per	Num	Per	Num	Per	Num	Per
Asian	3,678	42%	4,287	46%	4,407	45%	4,208	45%
Black	220	3%	204	2%	249	3%	204	2%
Filipino	422	5%	441	5%	431	4%	373	4%
Hispanic	685	8%	627	7%	766	8%	684	7%
Native American	45	1%	36	0%	27	0%	23	0%
Other	148	2%	189	2%	212	2%	205	2%
Pacific Islander	114	1%	88	1%	82	1%	109	1%
Unrecorded	1,478	17%	1,579	17%	1,845	19%	1,902	20%
White	1,932	22%	1,818	20%	1,864	19%	1,602	17%
Total	8,722	100%	9,269	100%	9,883	100%	9,310	100%

SQL Logic for Math Courses Taken by Associate Degree Recipients

```
CREATE VIEW IRPASL.MATH105_DEGREE_CHECK
(       DEGREE_FISCAL_YEAR, INST_CD, INST, SID, MATH_IND)
AS SELECT DISTINCT
        AL1.FISCAL_YEAR, AL1.INST_CD, AL1.INST, AL1.SID,
        case    when AL2.Course = 'MATH200.' then '1'
                when AL2.Course = 'MATH250.' then '1'
                when AL2.Course = 'MATH101.' then '3'
                when AL2.Course = 'MATH102.' then '3'
                when AL2.Course = 'MATH104.' then '5'
                when AL2.Course = 'MATH110.' then '3'
                when AL2.Course = 'MATH105.' then '5'
                when AL2.Course = 'MATH112.' then '3'
                when AL2.Course = 'MATH114.' then '5'
                when AL2.Course = 'MATH161L' then '3'
                when AL2.Course = 'MATH191.' then '3'
                when AL2.Course = 'MATH192.' then '3'
                when AL2.Course = 'MATH195.' then '3'
                when AL2.Course = 'MATH196.' then '3'
                when AL2.Course = 'MATH500.' then '0'
                when AL2.Course = 'MATH149A' then '500'
                when AL2.Course = 'MATH149B' then '500'
                when AL2.Course = 'MATH001A' then '500'
                when AL2.Course = 'MATH001B' then '500'
                when AL2.Course = 'MATH022.' then '500'
                when AL2.Course = 'MATH023.' then '500'
                when AL2.Course = 'MATH001C' then '500'
                when AL2.Course = 'MATH001D' then '500'
                when AL2.Course = 'MATH002A' then '500'
                when AL2.Course = 'MATH002B' then '500'
                when AL2.Course = 'MATH010.' then '500'
                when AL2.Course = 'MATH011.' then '500'
                when AL2.Course = 'MATH012.' then '500'
                when AL2.Course = 'MATH044.' then '500'
                when AL2.Course = 'MATH046.' then '500'
                when AL2.Course = 'MATH049A' then '500'
                when AL2.Course = 'MATH049B' then '500'
                when AL2.Course = 'MATH051.' then '500'
                when AL2.Course = 'MATH040X' then '500'
                when AL2.Course = 'MATH044.' then '500'
                when AL2.Course = 'MATH046.' then '500'
                when AL2.Course = 'MATH059A' then '500'
                when AL2.Course = 'MATH059B' then '500'
                when AL2.Course = 'MATH063.' then '500'
                else '0' end
FROM
        resdev.irpasl.Degrees AL1,
        resdev.irpasl.ENROLLMENT AL2
WHERE
            AL1.INST_CD = AL2.College
        AND AL1.SID = AL2.Sid
        AND AL1.INST_CD = 'DA'
        AND AL1.DEGREE_CD IN ('AA', 'AS')
        AND AL2.OFFICIAL_GRADE IN ('A','B','C','P')
```

```
CREATE VIEW IRPASL.MATH105_DEGREE_CRSE
(       DEGREE_FISCAL_YEAR,
        INST_CD,
        INST,
        SID,
        SCORE,
        MATH_CRSE_IND
)
AS SELECT DISTINCT
        DEGREE_FISCAL_YEAR,
        INST_CD,
        INST,
        SID,
        SUM(CONVERT (NUMERIC (8), MATH_IND)),
        case    when SUM(CONVERT (NUMERIC (8), MATH_IND)) = '1' then 'MATH 200'
                when SUM(CONVERT (NUMERIC (8), MATH_IND)) = '3' then 'MATH 101'
                when SUM(CONVERT (NUMERIC (8), MATH_IND)) = '4' then 'MATH 101'
                when SUM(CONVERT (NUMERIC (8), MATH_IND)) = '5' then 'MATH 105'
                when SUM(CONVERT (NUMERIC (8), MATH_IND)) = '6' then 'MATH 105'
                when SUM(CONVERT (NUMERIC (8), MATH_IND)) = '9' then 'MATH 105'
                when SUM(CONVERT (NUMERIC (8), MATH_IND)) = '8' then 'MATH 105'
                when SUM(CONVERT (NUMERIC (8), MATH_IND)) = '0' then 'NO MATH'
                when SUM(CONVERT (NUMERIC (8), MATH_IND)) > '9'then 'Other MATH'
                ELSE 'none' END
FROM
        IRPASL.MATH105_DEGREE_CHECK
GROUP BY
        DEGREE_FISCAL_YEAR,
        INST_CD,
        INST,
        SID
```