

*New Mexico Higher Education  
Assessment and Retention Conference,  
February 2014*

# **Stop, Switch or Stay:**

Research into STEM persistence at the  
University of New Mexico



## INTRODUCTIONS

### **TIM SCHROEDER**

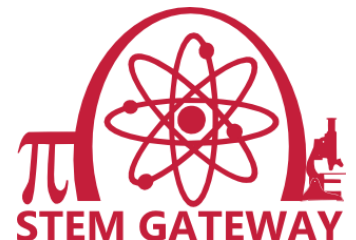
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## WEBSITE

<http://stemgateway.unm.edu>

### **For PDF of today's presentation...**

Click on first link "To learn more about the STEM Gateway Program, click here"

Click on the "Research" tab along the top

Click on "NMHEAR Presentation (long or short)"

### **For PDF of "Stop, Switch or Graduate" briefings...**

Click on first link "To learn more about the STEM Gateway Program, click here"

Click on the "Research" tab along the top

Scroll down to the description of "Stop, Switch or Graduate" study, click on "Briefing 1" and/or "Briefing 2"

***OR, FOLLOW THE DIRECT URL AT THE TOP OF EACH SLIDE***



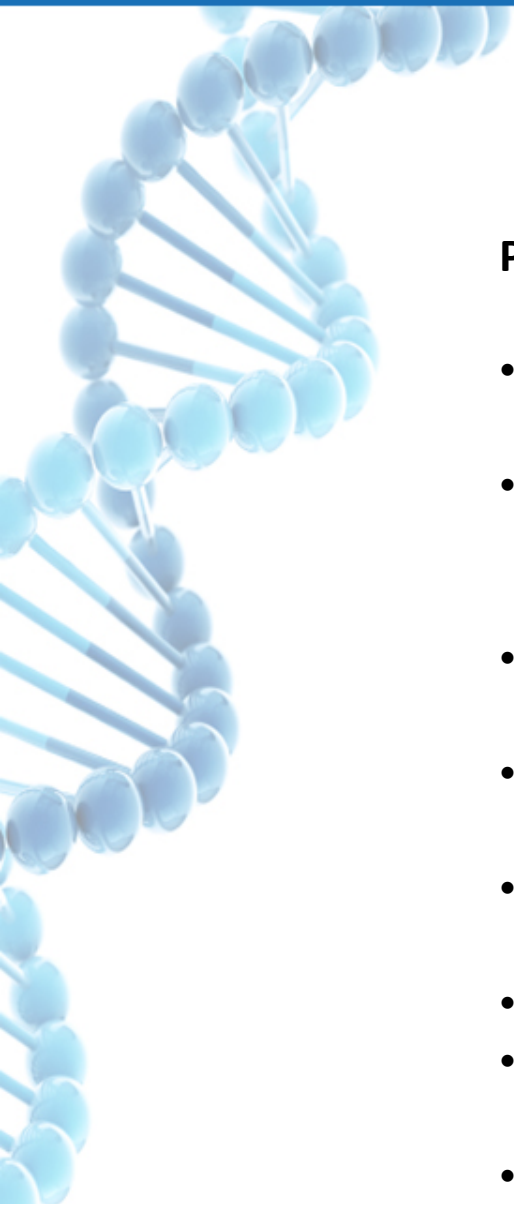
### **MISSION OF STEM GATEWAY:**

- Improve STEM instruction and student support at the University of New Mexico
- Improve STEM graduation rates among Hispanic and/or low-income students



### **GRANT OVERVIEW:**

- Funded by US Depart of Education Hispanic Serving Institution STEM Program
- \$3.8 million over five years
- October 2011 through September 2016



## **Project Team**

- Patrick Coulombe, Graduate Assistant, STEM Gateway, University of New Mexico
- Vicky Dueer, Senior Institutional Researcher (former STEM Gateway Institutional Researcher), University of New Mexico
- Phil Handwerk, formerly Office of Institutional Analytics, University of New Mexico
- Heidi Rodenbeck, formerly STEM Institutional Researcher, Office of Institutional Analytics
- Danielle Rudder, Graduate Assistant, STEM Gateway, University of New Mexico
- Tim Schroeder, Project Director, STEM Gateway
- Gary Smith, Principal Investigator, STEM Gateway, University of New Mexico
- Terry Turner, Office of Institutional Analytics, University of New Mexico



## ***Goal of this Study***

**OUR GOAL IS TO STUDY THE UNM STEM UNDERGRADUATE STUDENT EXPERIENCE FROM BEGINNING TO END, AND WITH A REASONABLE EXPECTATION OF A MAXIMUM SIX YEAR TIME TO GRADUATION.**

This information will be used to improve the STEM education experience at UNM.

This data should not be used to blame departments or individuals in any way. Our data does not go deep enough to draw such conclusions.



## ***Definition of STEM***

For the purpose of this study, STEM (Science, Technology, Engineering and Mathematics) degrees are defined narrowly as those bachelor's degrees within the following disciplines: astrophysics, biology, biochemistry, chemistry, computer science, earth & planetary sciences, engineering (all majors), environmental science, mathematics, physics, and statistics.



## STOP, SWITCH OR STAY...

### *Research Questions*

Explores STEM degree completion patterns at UNM through two primary lenses:



**Degree outcomes.** How do undergraduate students who graduate with STEM degrees differ from those who switch majors out of STEM, and from those who stop attending UNM prior to completing their degrees?



**Course outcomes.** How do undergraduate STEM students perform in the core math & science gateway courses that lead into their STEM degrees?



## POPULATION DESCRIPTION / DEFINITIONS

For both of these lenses, we studied:

- 1503 **first-time full-time freshmen** students from the falls of 2005, 2006 and 2007 ...
- **who initially stated they were interested in STEM degrees ...**
- **representing 16.6% of the freshman population during these three fall semesters.**

These students indicated an interest in STEM majors when completing their admissions applications, or when visiting with academic advisors during their first semesters.



## DEGREE OUTCOMES LENS

### *Student Outcomes*

This portion of the study seeks to identify patterns regarding four subsets of STEM students from the 2005, 2006 and 2007 cohorts as described above:

- **ENROLLED:** Students who are still enrolled in courses at UNM, and who indicate that as of Fall 2012 they were still working towards STEM degrees.
- **GRADUATED:** Students who graduated with STEM degrees prior to the Fall 2012 semester.
- **SHIFTED:** Students who switched out of STEM areas, but who continued taking courses at UNM. These students may or may not have graduated with degrees in non-STEM disciplines.
- **STOPPED:** Students who stopped attending courses at UNM.



**Table 1. Overview of Population**

<b>Total Number of Students</b>	1503
<b>Number of students who changed majors out of STEM (SHIFTED)</b>	639 (42.5%)
<b>Number of students who graduated with STEM degrees (GRADUATED)</b>	<b>334 (22.2%)</b>
<b>Number of students who stopped attending UNM (STOPPED)</b>	444 (29.6%)
<b>Number of students still enrolled at UNM (ENROLLED)</b>	86 (5.7%)



## DEGREE OUTCOMES LENS

### *Variables*

This study attempts to define patterns related to each group that could help UNM identify for whom the status quo is working best and for whom we most need to redesign the ways that we teach and support students. In exploring these patterns, we considered the following student variables:

- Ethnicity
- Gender
- Pell eligibility and median estimated family contribution (family income level)
- Lottery scholarship status
- First generation college student status
- Average high school GPA
- Average ACT scores
- ACT scores and high school GPAs correlated to account for possible grade inflation
- Cumulative college GPA at most recent semester completed
- Average number of semesters taken to matriculate into a STEM program
- Average number of remedial courses completed
- Number of credit hours completed at the time of shifting out of STEM (for “shifted” and “stopped” subgroups only)
- Number of semesters completed at the time of shifting out of STEM (for “shifted” and “stopped” subgroups only)
- Cumulative UNM GPA when shifting out of STEM (for “shifted” and “stopped” subgroups only)

## **COURSE OUTCOMES LENS**

### *Definition for STEM Gateway Courses*

**For purposes of the STEM Gateway Title V Program, STEM Gateway Courses are defined as those which meet at least one of the following criteria:**

- Entry level (100 and 200 level) program-requirement courses that lead to degrees in the approved STEM disciplines
- Companion courses (labs, problem solving courses, etc) that are connected to Core Requirement or Program Requirement courses (as specified above)
- Pre-requisite courses that are required by students to take Core Requirement or Program Requirement courses (as specified above)
- Large-enrollment (>500 students/year) courses required for degrees in the approved STEM disciplines and typically taken within the first two years in the field.



## GATEWAY COURSES STUDIED

BIO	201	Molecular Cell Biology
BIO	202	Genetics
BIO	203	Ecology and Evolution
CHEM	121	General Chemistry I
CHEM	122	General Chemistry II
CHEM	123	General Chemistry I LAB
CHEM	124	General Chemistry II LAB
CHEM	301	Organic Chemistry
CHEM	302	Organic Chemistry
CHEM	303	Organic Chemistry LAB
CHEM	304	Organic Chemistry LAB
CS	152	Computer Programming Fundamentals
ECE	131	Program Fundamentals
ENVS	101	The Blue Planet
ENVS	102	The Blue Planet LAB
EPS	101	Intro Geology, How Earth Works
EPS	105	Physical Geology LAB
EPS	201	Earth History

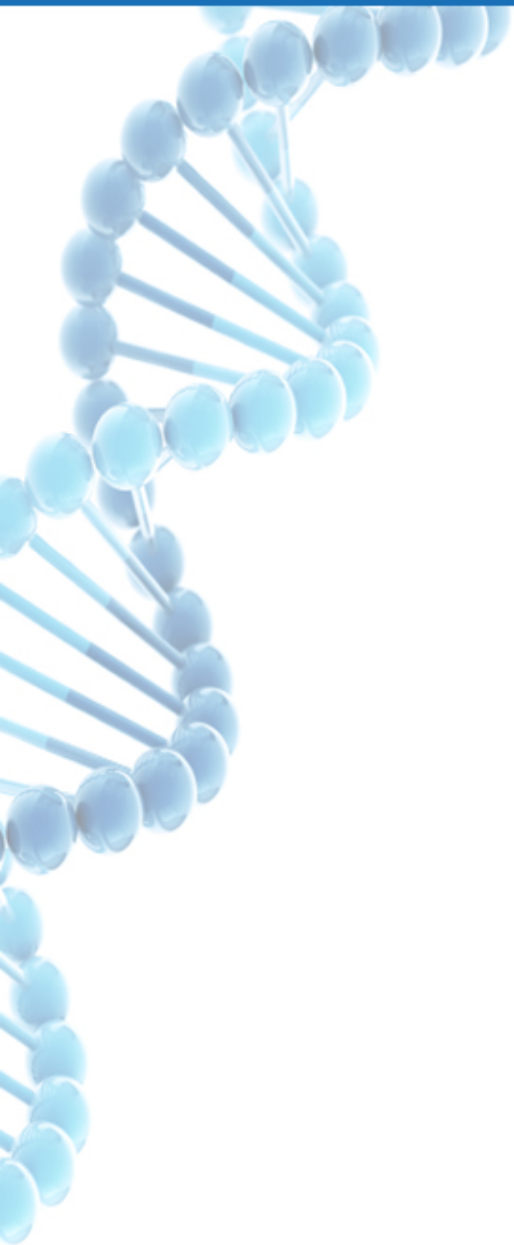


## GATEWAY COURSES STUDIED, continued

MATH	107	Problems in College Algebra
MATH	110	Problems in Elementary Calculus
MATH	120	Intermediate Algebra
MATH	121	College Algebra
MATH	123	Trigonometry
MATH	150	Pre-Calculus Math
MATH	162	Calculus I
MATH	163	Calculus II
MATH	180	Elements of Calculus I
MATH	181	Elements of Calculus II
PHYC	151	General Physics
PHYC	151L	General Physics LAB
PHYC	152	General Physics
PHYC	152L	General Physics LAB
PHYC	157	Problems in General Physics
PHYC	158	Problems in General Physics
PHYC	160	General Physics
PHYC	160L	General Physics LAB
PHYC	161	General Physics
PHYC	161L	General Physics LAB
PHYC	167	Problems in General Physics
PHYC	168	Problems in General Physics







# **SELECTED FINDINGS DEGREE OUTCOMES LENS**



# **Ethnicity and Gender: STEM Interest**



## SUBPOPULATIONS

### *Ethnicities in Students Opting to Go Into STEM*

	THIS POPULATION OF STEM STUDENTS	THE GENERAL POPULATION OF FRESHMEN ONLY FROM UNM FACTBOOKS (Falls 05,06,07 combined)
Percent American Indian	6.4%	5.3%
Percent Asian/Pacific Islander/Native Hawaiian	5.5%	4.2%
Percent Black/African American	2.3%	3.3%
Percent Hispanic	35.5%	37.6%
Percent White, Non-Hispanic	46.2%	45.5%
Percent Male	62.3%	<i>Freshman Data Not Available</i> <b>44.4% of general population of all UNM Main campus students (Fall 2011)</b>
Percent Female	<b>37.7%</b>	<i>Freshman Data Not Available</i> <b>55.6% of general population of all UNM Main campus students (Fall 2011)</b>



# **Ethnicity and Gender: STEM Achievement**



## SUBPOPULATIONS

### *Ethnicities in Degree Outcomes*

	Stopped	Graduated	Enrolled	Shifted	
American Indian	48	8	4	36	96
Asian/Pacific Islander	17	25	6	33	81
Black/African American	7	7	0	20	34
Hispanic	169	94	41	229	533
Non-Resident Alien	0	1	1	0	2
Native Hawaiian	2	0	0	0	2
Race/Ethnicity unknown	15	17	7	22	61
White, non-Hispanic	186	182	27	299	694
	444	334	86	639	1503



## SUBPOPULATIONS

### *Ethnicities in Degree Outcomes*

#### Group within each ethnicity

	Stopped	Graduated	Enrolled	Shifted	
American Indian	50.0%	8.3%	4.2%	37.5%	100.0%
Asian/Pacific Islander	21.0%	30.9%	7.4%	40.7%	100.0%
Black/African American	20.6%	20.6%	0.0%	58.8%	100.0%
Hispanic	31.7%	17.6%	7.7%	43.0%	100.0%
Non-Resident Alien	0.0%	50.0%	50.0%	0.0%	100.0%
Native Hawaiian	100.0%	0.0%	0.0%	0.0%	100.0%
Race/Ethnicity unknown	24.6%	27.9%	11.5%	36.1%	100.0%
White, non-Hispanic	26.8%	26.2%	3.9%	43.1%	100.0%



## SUBPOPULATIONS

### *Ethnicities in Degree Outcomes*

**American Indian STEM students** are 2.55 times as likely to stop attending UNM ( $p < .001$ ) and are 0.30 times as likely to graduate with STEM degrees ( $p < .001$ ) as non-American Indian students.



MORE  
LIKELY



LESS  
LIKELY

	ODDS RATIO	P-VALUE
STOPPED	2.55	< .001
SHIFTED	0.80	.338
GRADUATED	0.30	< .001





## SUBPOPULATIONS

### *Ethnicities in Degree Outcomes*

**Hispanic STEM students** are .65 times as likely to graduate with STEM degrees than non-Hispanic students ( $p=.001$ ).



	ODDS RATIO	P-VALUE
STOPPED	1.17	.175
SHIFTED	1.03	.827
GRADUATED	0.65	.001



## SUBPOPULATIONS

### *Ethnicities in Degree Outcomes*

**Black/African American STEM students** are 1.96 times as likely to switch majors out of STEM than non-African American students ( $p=.001$ ).



	ODDS RATIO	P-VALUE
STOPPED	0.61	.341
SHIFTED	1.96	.055
GRADUATED	0.91	> .999



## SUBPOPULATIONS

### *Gender in Degree Outcomes*

**Female STEM students** are .48 times as likely to pursue STEM degrees ( $p=.001$ ), and are 1.36 times as likely to switch majors out of STEM ( $p=.005$ ) than male students.



	ODDS RATIO	P-VALUE
STOPPED	0.88	.294
SHIFTED	1.36	.005
GRADUATED	0.89	.406



### Men and Women of Color

	Stopped	Graduated	Shifted	Enrolled	Total
White Male	126	114	176	23	<b>439</b>
Non-White Male	160	101	196	41	<b>498</b>
White Female	60	68	123	4	<b>255</b>
Non-White Female	98	51	144	18	<b>311</b>
<b>Total</b>	<b>444</b>	<b>334</b>	<b>639</b>	<b>86</b>	<b>1503</b>

	Stopped	Graduated	Shifted	Enrolled	Total
White Male	28.7%	26.0%	40.1%	5.2%	<b>100.0%</b>
Non-White Male	32.1%	20.3%	39.4%	8.2%	<b>100.0%</b>
White Female	23.5%	26.7%	48.2%	1.6%	<b>100.0%</b>
Non-White Female	31.5%	16.4%	46.3%	5.8%	<b>100.0%</b>
<b>Total</b>	<b>29.5%</b>	<b>22.2%</b>	<b>42.5%</b>	<b>5.7%</b>	<b>100.0%</b>

### Odds Ratios (Significance)

	Stopped	Graduated	Shifted	Enrolled
White Male	0.94 (0.664)	<b>1.35 (0.029)</b>	0.87 (0.229)	0.88 (0.714)
Non-White Male	1.20 (0.133)	0.84 (0.211)	<b>0.82 (0.086)</b>	<b>1.91 (0.004)</b>
White Female	<b>0.69 (0.024)</b>	<b>1.34 (0.069)</b>	<b>1.32 (0.044)</b>	<b>0.23 (0.001)</b>
Non-White Female	1.12 (0.403)	<b>0.63 (0.006)</b>	1.21 (0.139)	1.02 (1.000)



## SUBPOPULATIONS

### *Gender in Degree Outcomes*

**White females** are .69 times as likely to stop attending ( $p=.024$ ), 1.34 times more likely to graduate ( $p=.069$ ), 1.32 times as likely to switch majors out of STEM ( $p=.044$ ) and .23 times as likely to still be enrolled as students who are not white females ( $p=.001$ )



**Non-white females** are .63 times as likely to graduate as students who are not non-white females ( $p=.006$ ).





## SUBPOPULATIONS

### *Gender in Degree Outcomes*

**White males** are 1.35 times as likely to graduate than students who are not white males ( $p=.029$ ).



**Non-white males** are .82 times as likely to shift out of STEM degrees ( $p=.086$ ) and are 1.91 times as likely to still be enrolled than students who are not non-white males ( $p=.004$ ).





# **Socio Economic Status: STEM Achievement**





## SUBPOPULATIONS

### *SES in Degree Outcomes*

**Pell-Eligible STEM students** are 1.43 times as likely to stop attending UNM ( $p=.007$ ) and are .46 times as likely to graduate ( $p<.001$ ) than non-Pell-eligible students.

**First Generation STEM students** are 1.62 times as likely to stop attending UNM ( $p<.001$ ) and are .42 times as likely to graduate ( $p<.001$ ) than non-First Generation students.



PELL ELIGIBLE	ODDS RATIO	P-VALUE
STOPPED	1.43	.007
SHIFTED	1.10	.456
GRADUATED	0.46	< .001
ENROLLED	1.34	.234

FIRST GENERATION	ODDS RATIO	P-VALUE
STOPPED	1.62	< .001
SHIFTED	1.12	.380
GRADUATED	0.42	< .001



Average Median Expected Family Contribution (EFC)  
for students who GRADUATED with STEM degrees

**\$13,371**

Average Median Expected Family Contribution (EFC)  
for students who SWITCHED MAJORS out of STEM

**\$7,151**

Average Median Expected Family Contribution (EFC)  
for students who STOPPED ATTENDING UNM

**\$5,114**



# **Commonly Studied Variables: STEM Achievement**

A light blue DNA double helix graphic is positioned on the left side of the slide, extending from the top to the bottom.

## INSTITUTIONAL PRIORITY OF OUTCOMES

Graduate STEM

Switch Majors

Stop Attending



## PRIORITY OF OUTCOMES

### *Variables*

VARIABLE	GRADUATE	SHIFT	STOP
Percent of this group who are Pell Eligible	13.5%	23.6%	27.3%
Average of High School GPAs within this group	3.75	3.45	3.27
Average of ACT Composite scores within this group	25.8	22.9	22.2
Average of ACT Math scores within this group	26.3	22.8	22.0
Percent of this group who are First Generation	19.5%	34.2%	40.6%
Average of College GPAs within this group	<b>3.51</b>	<b>2.95</b>	<b>2.09</b>



## PRIORITY OF OUTCOMES

### *Variables*

VARIABLE	GRADUATE	SHIFT	STOP
Percent of students in this group who required remediation	12%	30.7%	39.5%
Percent of students in this group who required MATH remediation	4.2%	18.2%	26.4%
Percentage of students in this group who received a Lottery Scholarship	91%	77.5%	36.9%
Percentage of Lottery-receiving students in this group who lost their Lottery Scholarship	18.4%	28.7%	42.1%



# **High School Origin: STEM Achievement**





## SUBPOPULATIONS

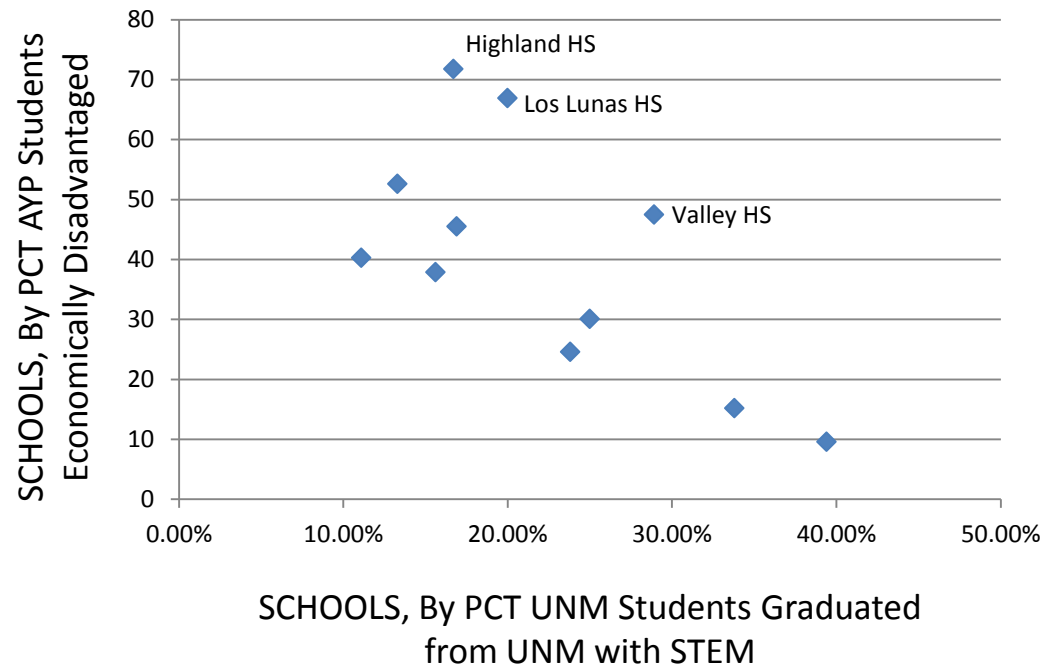
### *High School Origin in Degree Outcomes*

HIGH SCHOOL NAME	UNM STUDENTS	GRADUATED	AYP Students PCT Non-White	AYP Students PCT Econ Disadvant
MORIARTY HIGH SCHOOL	27	11.1%	44.6	40.3
<b>DEL NORTE HIGH SCHOOL</b>	<b>45</b>	<b>13.3%</b>	<b>74.2</b>	<b>52.6</b>
RIO RANCHO HIGH SCHOOL	90	15.6%	51.6	37.9
<b>HIGHLAND HIGH SCHOOL</b>	<b>36</b>	<b>16.7%</b>	<b>85.2</b>	<b>71.8</b>
<b>MANZANO HIGH SCHOOL</b>	<b>59</b>	<b>16.9%</b>	<b>62.1</b>	<b>45.5</b>
LOS LUNAS HIGH SCHOOL	25	20.0%	78.5	66.9
<b>SANDIA HIGH SCHOOL</b>	<b>80</b>	<b>23.8%</b>	<b>56.9</b>	<b>24.6</b>
<b>CIBOLA HIGH SCHOOL</b>	<b>96</b>	<b>25.0%</b>	<b>63.6</b>	<b>30.1</b>
<b>VALLEY HIGH SCHOOL</b>	<b>38</b>	<b>28.9%</b>	<b>90.9</b>	<b>47.5</b>
SAINT PIUS X HIGH SCHOOL	59	30.5%	na	Na
<b>ELDORADO HIGH SCHOOL</b>	<b>80</b>	<b>33.8%</b>	<b>37.0</b>	<b>15.2</b>
ALBUQUERQUE ACADEMY	26	38.5%	na	na
<b>LA CUEVA HIGH SCHOOL</b>	<b>104</b>	<b>39.4%</b>	<b>39.2</b>	<b>9.6</b>



## SUBPOPULATIONS

### *High School Origin in Degree Outcomes*





# **Stop and Shift Triggerpoints**

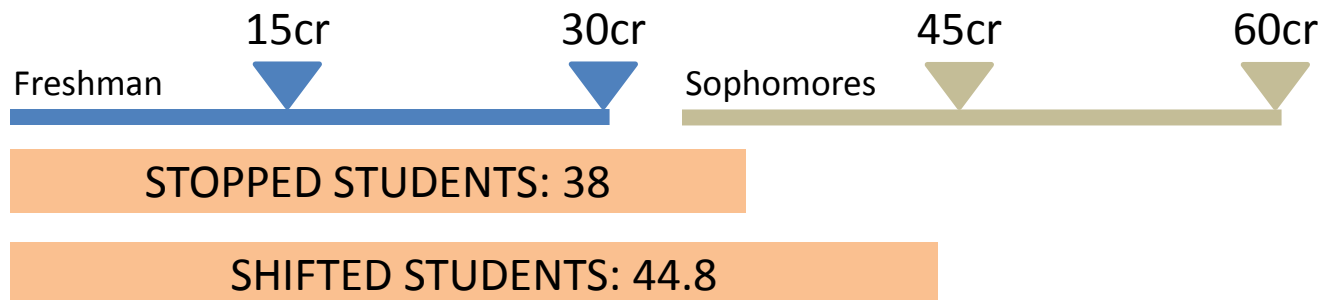


## TRIGGERPOINTS

### *Number of Credits*

The average number of credits completed when STEM students stop attending UNM is 38.

The average number of credits completed when STEM students shift majors is 44.8.



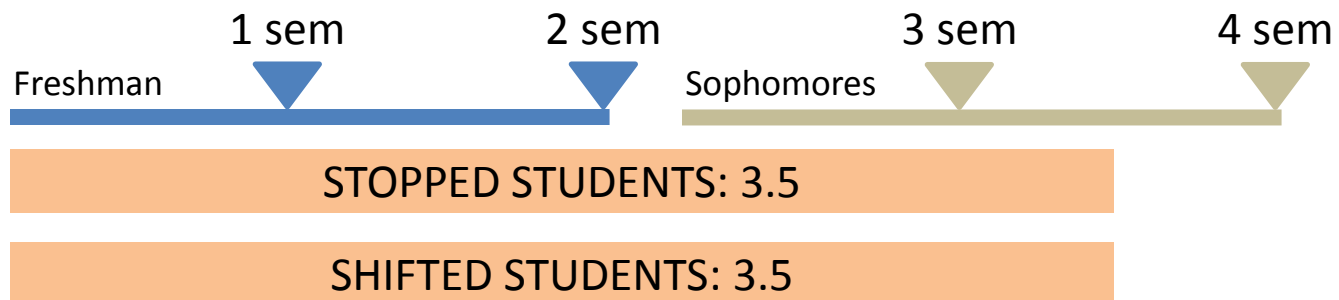


## TRIGGERPOINTS

### *Number of Semesters*

On average, STOPPED students leave UNM after 3.5 semesters.

On average, SHIFTED students changed majors after 3.5 semesters, the same as for STOPPED students.





## TRIGGERPOINTS

### *Grade Point Average*

On average, STOPPED students left UNM with an average cumulative GPA of 2.08. This is contrasted by SHIFTED students, who had an average 2.94 cumulative GPA when they changed majors.



2.09



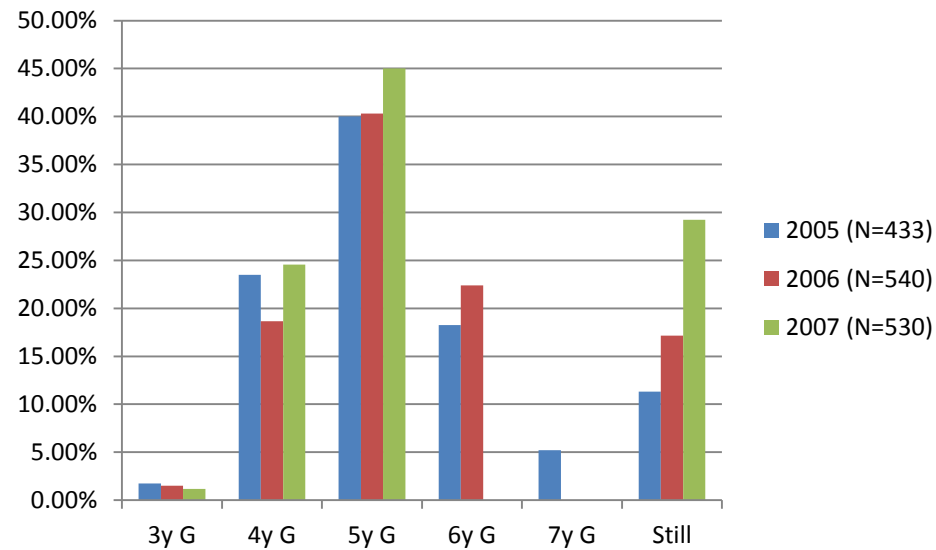
2.95



# **Time to Graduation**



## Time to Graduation for STEM at UNM

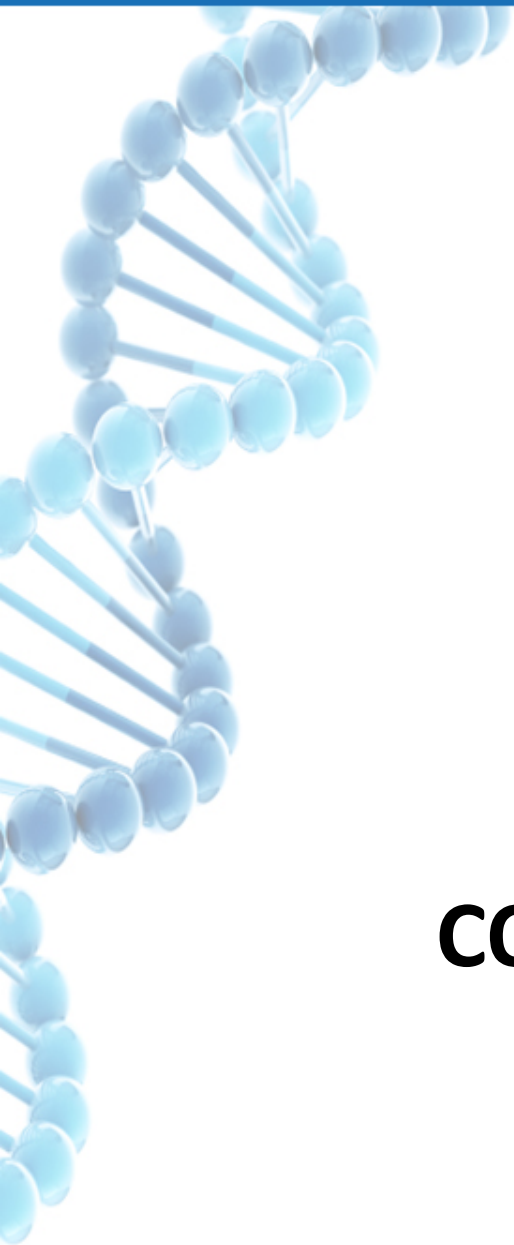






## Time to Graduation for STEM at UNM

TIME TO GRADUATION							
Cohort	Grad in 3 yrs	Grad in 4 yrs	Grad in 5 yrs	Grad in 6 yrs	Grad in 7 yrs	Still Enrolled	Total Grad or Still Enrolled
2005	2	27	46	21	6	13	115
Percent	1.7%	23.5%	40.0%	18.3%	5.2%	11.3%	100.00%
2006	2	25	54	30	NA	23	134
Percent	1.5%	18.7%	40.3%	22.4%		17.2%	100.00%
2007	2	42	77	NA	NA	50	171
Percent	1.2%	24.6%	45.0%			29.2%	100.00%
TOTAL	6	94	177	51	6	86	420



# **SELECTED FINDINGS COURSE OUTCOMES LENS**



# **Individual STEM Gateway Course Impact on STEM Graduation**



**AVERAGE PERCENT OF ENROLLMENTS THAT RESULT IN  
GRADUATION FOR ALL STEM GATEWAY COURSES STUDIED:**

**36.43%**



**TEN COURSES WITH...**

**THE LOWEST PERCENTAGES OF ENROLLMENTS RESULTING IN GRADUATION (enrollments > 100)**

SUBJECT	NUMBER	LAB	N	GRAD	SHIFT	STOP	PCT Grad	PCT Shift	PCT Stop
ENVS	101		229	17	162	35	7.42%	70.74%	15.28%
MATH	120		426	35	254	110	8.22%	59.62%	25.82%
EPS	101		189	23	117	37	12.17%	61.90%	19.58%
MATH	121		635	81	368	139	12.76%	57.95%	21.89%
CHEM	123	L	156	25	65	32	16.03%	41.67%	20.51%
MATH	150		518	90	231	136	17.37%	44.59%	26.25%
MATH	123		405	90	159	98	22.22%	39.26%	24.20%
MATH	180		406	111	219	52	27.34%	53.94%	12.81%
CHEM	124	L	169	54	54	22	31.95%	31.95%	13.02%
MATH	162		426	147	126	75	34.51%	29.58%	17.61%



**TEN COURSES WITH...**

**THE HIGHEST NUMBER OF ENROLLMENTS NOT GRADUATING  
STEM (enrollments > 100)**

SUBJECT	NUMBER	N	GRAD	SHIFT	STOP	PCT Grad	PCT Shift	PCT Stop	Number NotGrad
MATH	121	635	81	368	139	12.76%	57.95%	21.89%	507
CHEM	121	804	290	302	140	36.07%	37.56%	17.41%	442
MATH	150	518	90	231	136	17.37%	44.59%	26.25%	367
MATH	120	426	35	254	110	8.22%	59.62%	25.82%	364
MATH	180	406	111	219	52	27.34%	53.94%	12.81%	271
MATH	123	405	90	159	98	22.22%	39.26%	24.20%	257
CHEM	122	560	253	169	80	45.18%	30.18%	14.29%	249
MATH	162	426	147	126	75	34.51%	29.58%	17.61%	201
ENVS	101	229	17	162	35	7.42%	70.74%	15.28%	197
BIO	201	383	153	143	51	39.95%	37.34%	13.32%	194



**TEN COURSES WITH...**

**THE HIGHEST PERCENTAGES OF ENROLLMENTS RESULTING IN  
STOP (enrollments > 100)**

SUBJECT	NUMBER	LAB	N	GRAD	SHIFT	STOP	PCT Grad	PCT Shift	PCT Stop
MATH	150		518	90	231	136	17.37%	44.59%	26.25%
MATH	120		426	35	254	110	8.22%	59.62%	25.82%
MATH	123		405	90	159	98	22.22%	39.26%	24.20%
MATH	121		635	81	368	139	12.76%	57.95%	21.89%
CHEM	123	L	156	25	65	32	16.03%	41.67%	20.51%
EPS	101		189	23	117	37	12.17%	61.90%	19.58%
MATH	162		426	147	126	75	34.51%	29.58%	17.61%
CHEM	121		804	290	302	140	36.07%	37.56%	17.41%
ENVS	101		229	17	162	35	7.42%	70.74%	15.28%
MATH	163		382	186	79	57	48.69%	20.68%	14.92%



**TEN COURSES WITH...**

**THE HIGHEST NUMBER OF ENROLLMENTS WHO STOP**  
(enrollments > 100)

SUBJECT	NUMBER	N	GRAD	SHIFT	STOP	PCT Grad	PCT Shift	PCT Stop
CHEM	121	804	290	302	140	36.07%	37.56%	17.41%
MATH	121	635	81	368	139	12.76%	57.95%	21.89%
MATH	150	518	90	231	136	17.37%	44.59%	26.25%
MATH	120	426	35	254	110	8.22%	59.62%	25.82%
MATH	123	405	90	159	98	22.22%	39.26%	24.20%
CHEM	122	560	253	169	80	45.18%	30.18%	14.29%
MATH	162	426	147	126	75	34.51%	29.58%	17.61%
MATH	163	382	186	79	57	48.69%	20.68%	14.92%
MATH	180	406	111	219	52	27.34%	53.94%	12.81%
BIO	201	383	153	143	51	39.95%	37.34%	13.32%





*The Courses that appear on all four tables...*

***MATH 121: College Algebra***

***MATH 150: Pre-Calculus Math***

***MATH 120: Intermediate Algebra***

***MATH 123: Trigonometry***

***MATH 162: Calculus 1***



*And yet, pre-calculus math is crucial to STEM attainment...*

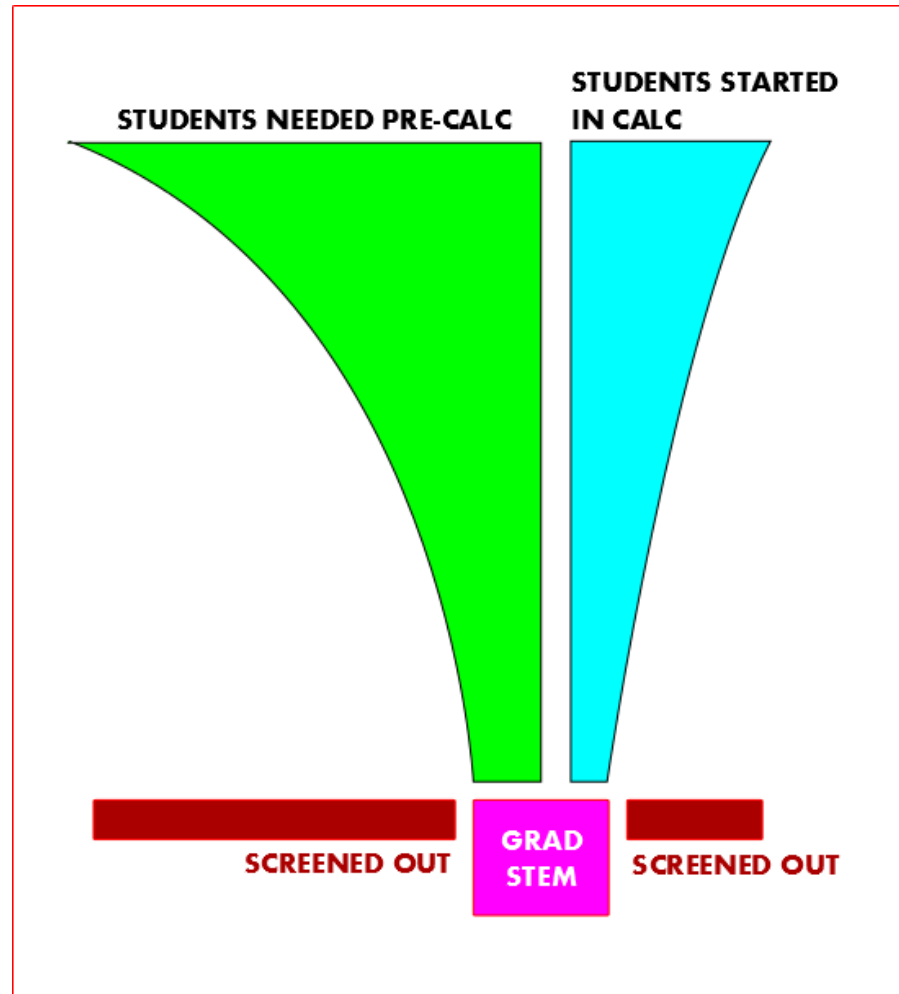
Percentage of STEM Bachelor's Degree Earners at UNM who Completed MATH 120 and MATH 121		
Population of students from first-time full-time freshman cohorts	Completed MATH 120 at UNM	Completed MATH 121 at UNM
<b>All STEM Degree Recipients</b>	19 %	41%
All Engineering Degree Recipients	10%	21%
All Arts & Sciences STEM Degree Recipients	23%	52%
Arts & Sciences: Biology Degree Recipients Only	28%	57%
Arts & Sciences: STEM Degree Recipients other than Biology	12%	40%



*... and to UNM enrollment for first time freshmen.*

**PERCENT OF UNM FIRST SEMESTER STUDENTS (ALL MAJORS)  
WHO ENROLL IN SPECIFIC MATH COURSES**

Enroll in any pre-calculus mathematics course	66%
Enroll in Calculus 1 or beyond	6%
Enroll in no math course	28%





# **Course Categories with Low Incidence of Students Graduating STEM Degrees**



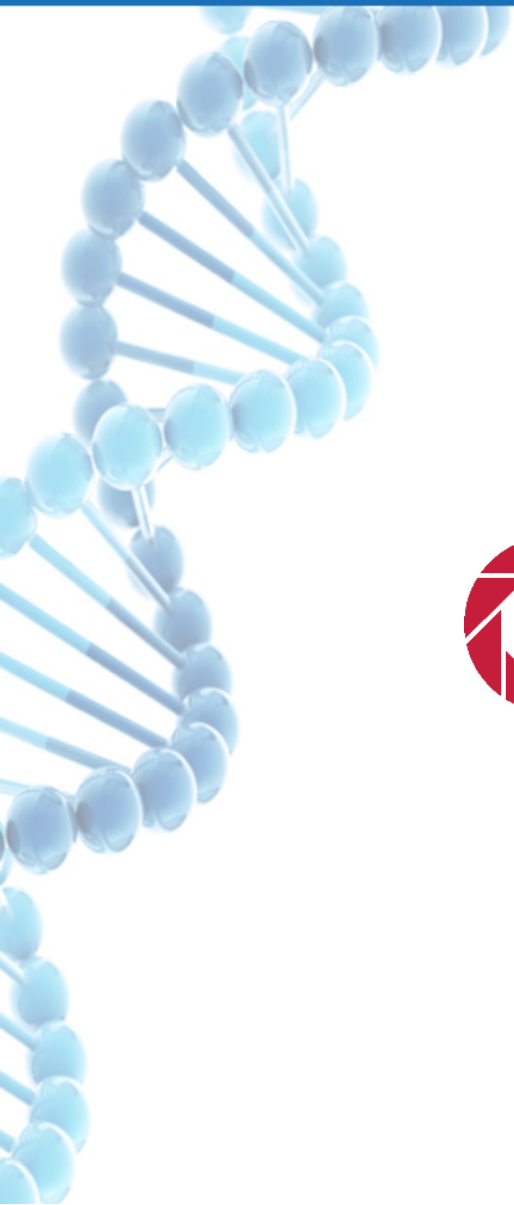
## COURSE CATEGORIES

*In the table below, for each course category listed, we see the Graduation percentage for all enrollments from that category*

SUBJECT	N	GRAD	SHIFT	STOP	PCT Grad	PCT Shift	PCT Stop
All Courses	9540	3475	3558	1470	36.43%	37.30%	15.41%
All Math Courses	3440	854	1523	693	24.83%	44.27%	20.15%
All Pre-Calc Math Courses	2044	309	1047	492	15.12%	51.22%	24.07%
All 100 Level Courses	7510	2451	2943	1288	32.64%	39.19%	17.15%
All <151 Level Courses	4359	1016	2016	878	23.31%	46.25%	20.14%
All 151-199 Level Courses	3151	1435	927	410	45.54%	29.42%	13.01%
All 200+ Level Courses	2030	1024	615	182	50.44%	30.30%	8.97%

**Of the enrollments in this population from pre-calculus mathematics courses, only 15.12% led to STEM bachelors degrees at UNM.**

Of the enrollments in this population from STEM Gateway courses at the 150 level or lower, only 23.31% led to STEM bachelors degrees at UNM.



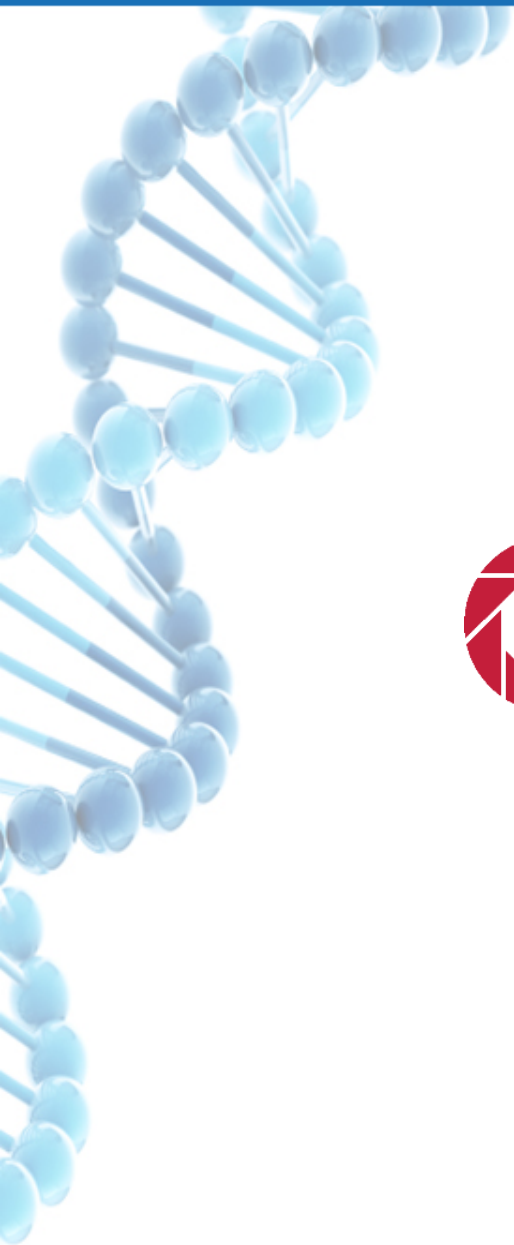
# **Course Categories with High Numbers of Repeat Enrollments**



**PERCENTAGE OF ENROLLMENTS THAT ARE REPEATS**  
(courses with enrollments > 100)

COURSE	PERCENT
<b>CHEM 301</b>	<b>23.06%</b>
MATH 123	17.79%
MATH 162	17.14%
<b>CHEM 302</b>	<b>16.93%</b>
MATH 163	16.91%
MATH 150	16.15%
MATH 121	15.14%
MATH 180	15.9%





# **The Impact of “A” Grades on STEM Graduation**



## ALL THE WAY TO “A”

### *Overview*

The “UNM Killer Course List” from Fall 2011 includes eighty two courses with high enrollments (121 and above) and low student pass rates.

STEM Gateway studied the grade distribution patterns for the following sixteen STEM-based courses on this list: MATH 120, 121, 123, 150, 162, 163, 180, 181; ENVS 101; CHEM 121, 122, 301, 302; BIOL 201, 202; PHYC 160. Taken together, these courses represent a sizable portion of the gateway courses that STEM students complete en route to their degrees.

	GRADUATED	SHIFTED	STOPPED
Percentage of enrollments in this group that resulted in an A, B or C	86.18 %	65.33% (20.85 points lower than GRADUATED)	54.36% (31.82 points lower than GRADUATED)



## ALL THE WAY TO “A”

### *Grade Distribution Patterns*

Comparing GRADUATED to SHIFTED									
	A	B	C	D	F	WD	CR	NCR	ABC
Graduated	37.78	32.74	15.66	3.72	0.84	7.09	1.80	0.04	86.18
Shifted	15.19	26.05	24.09	10.88	4.73	15.68	1.55	1.60	65.33
Difference	22.59	6.69	-8.43	-7.16	-3.89	-8.58	0.25	-1.56	20.85
Comparing GRADUATED to STOPPED									
	A	B	C	D	F	WD	CR	NCR	ABC
Graduated	37.78	32.74	15.66	3.72	0.84	7.09	1.80	0.04	86.18
Stopped	11.09	22.53	20.74	12.96	9.46	21.82	1.20	1.61	54.36
Difference	26.69	10.21	-5.08	-9.24	-8.61	-14.73	0.60	-1.58	31.82



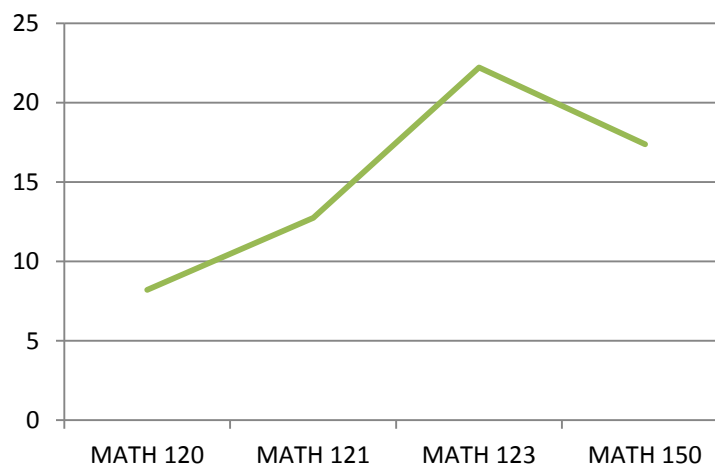
# **Pre-Calculus Math and Student Achievement for Traditionally Underrepresented STEM Students**

## Pre-Calc Math and Student Achievement

*Percent of enrollments that resulted in the following outcomes...*

Student Outcome	MATH 120	MATH 121	MATH 123	MATH 150
Stop	25.82	21.89	24.01	26.25
Shift	59.62	57.95	39.25	44.59
Graduate	8.21	12.75	22.22	17.37
Enroll	6.33	7.40	14.32	11.77

### Graduate



— Graduate

Compared to an  
average for all courses  
studied = 36.43%



## Pre-Calc Math, Ethnicity and Pell-Eligibility

MATH 120, Intermediate Algebra			
Subpopulation	N at end of semester	Pct "A"	Pct "A-B-C-CR"
<b>Hispanic</b>	<b>188</b>	<b>14.8</b>	<b>72.1</b>
<b>American Indian</b>	<b>45</b>	<b>8.9</b>	<b>50.0</b>
Asian / Pacific Islander	18	5.3	73.8
Black / African American	18	16.7	72.2
<b>White, Non-Hispanic</b>	<b>145</b>	<b>23.1</b>	<b>60.1</b>
<b>Pell-Eligible during first semester</b>	<b>136</b>	<b>17.3</b>	<b>67.2</b>



## Pre-Calc Math, Ethnicity and Pell-Eligibility

MATH 121, College Algebra			
Subpopulation	N at end of semester	Pct "A"	Pct "A-B-C"
<b>Hispanic</b>	<b>252</b>	<b>9.9</b>	<b>63.8</b>
<b>American Indian</b>	<b>41</b>	<b>7.7</b>	<b>59.6</b>
Asian / Pacific Islander	29	18.9	67.5
Black / African American	16	31.6	57.9
<b>White, Non-Hispanic</b>	<b>328</b>	<b>14.3</b>	<b>65.7</b>
<b>Pell-Eligible during first semester</b>	<b>198</b>	<b>13.8</b>	<b>63.0</b>



## Pre-Calc Math, Ethnicity and Pell-Eligibility

MATH 123, Trigonometry			
Subpopulation	N at end of semester	Pct "A"	Pct "A-B-C"
<b>Hispanic</b>	<b>131</b>	<b>13.2</b>	<b>57.2</b>
American Indian	29	5.7	48.5
Asian / Pacific Islander	20	18.2	59.1
Black / African American	4	14.3	42.9
<b>White, Non-Hispanic</b>	<b>198</b>	<b>18</b>	<b>61.2</b>
<b>Pell-Eligible during first semester</b>	<b>92</b>	<b>13.1</b>	<b>55.7</b>





## Pre-Calc Math, Ethnicity and Pell-Eligibility

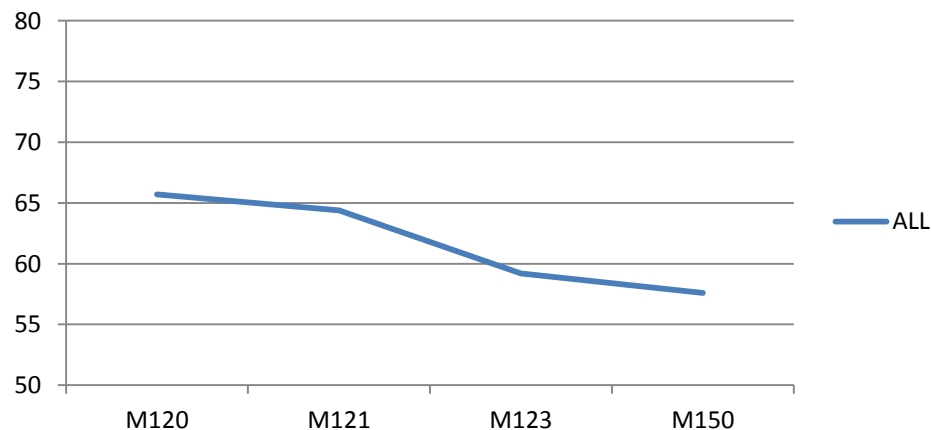
MATH 150, Pre-Calc Math			
Subpopulation	N at end of semester	Pct "A"	Pct "A-B-C"
<b>Hispanic</b>	<b>184</b>	<b>12.2</b>	<b>53.0</b>
<b>American Indian</b>	<b>41</b>	<b>0.0</b>	<b>52.4</b>
Asian / Pacific Islander	29	20.6	55.9
Black / African American	6	22.2	33.3
<b>White, Non-Hispanic</b>	<b>231</b>	<b>14.7</b>	<b>62.5</b>
<b>Pell-Eligible during first semester</b>	<b>126</b>	<b>8.0</b>	<b>52.0</b>

## Pre-Calc Math, All Students Combined



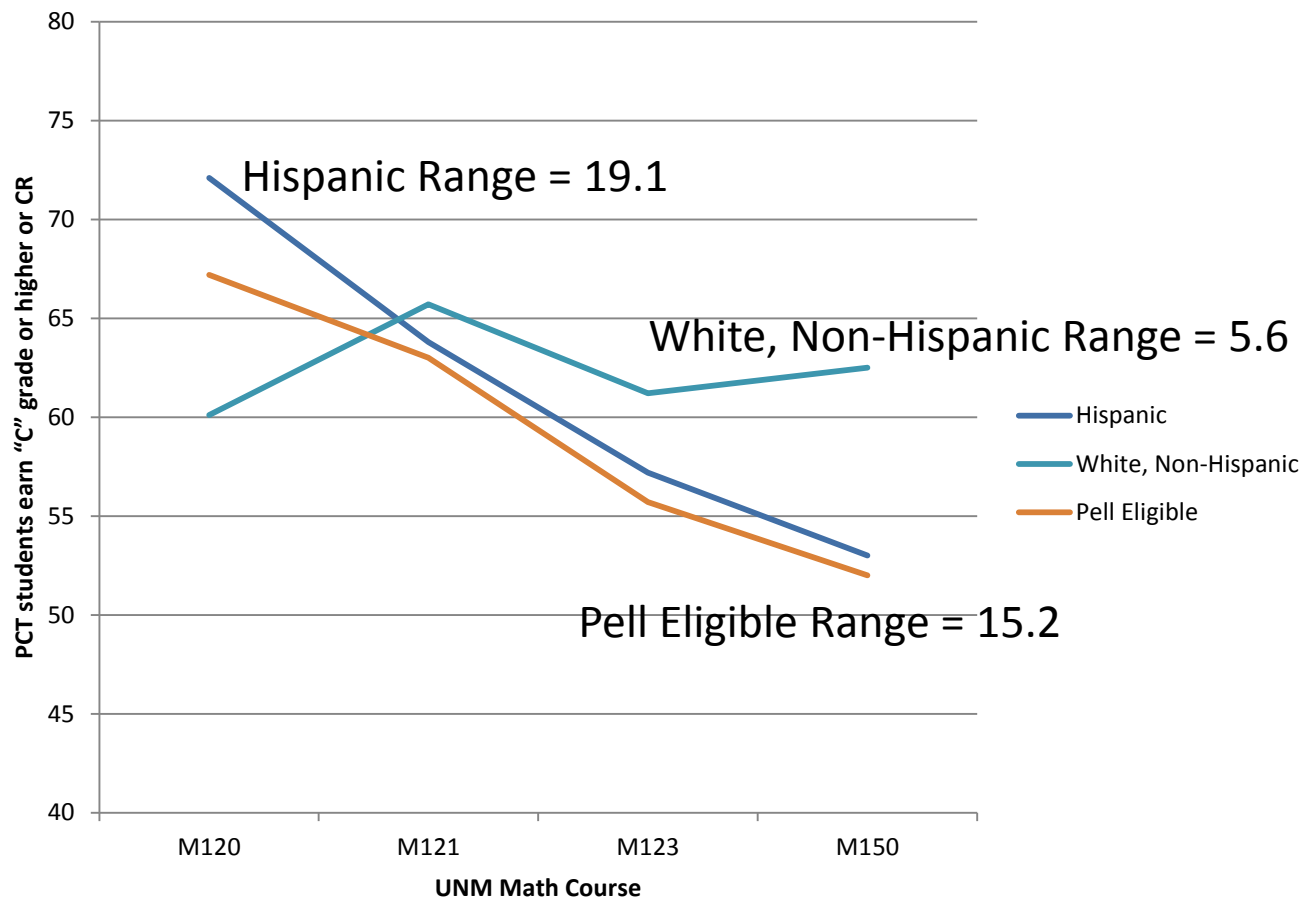
Subpopulation	N at end of semester	Pct "A"	Pct "A-B-C-CR"
MATH 120	426	15.4	65.7
MATH 121	635	12.9	64.4
MATH 123	405	15.4	59.2
MATH 150	518	13.4	57.6

Success Pct (A-B-C-CR) for  
All Students Combined





## Success Pct (A-B-C-CR) By Ethnicity and SES



*Other ethnicities excluded from this chart because their "N" in one or more of these classes was too small to be considered conclusive.*

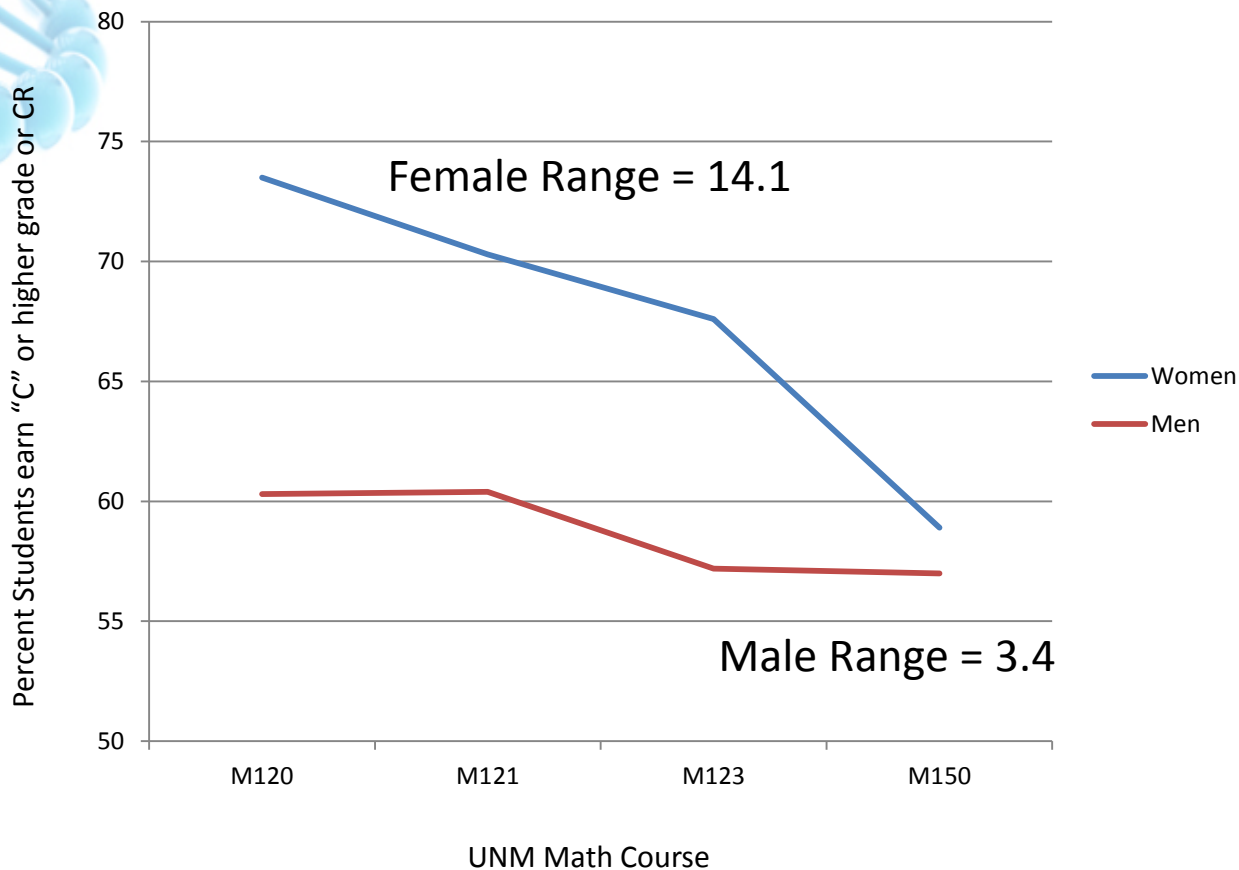


## Pre-Calc Math, Gender

MATH 120												
	A	B	C	D	F	W	I	CR	NCR	AU	TOTAL	ABC-CR
F	22.5%	25.5%	7.0%	2.0%	0.0%	9.0%	0.0%	18.5%	15.5%	0.0%	100.0%	73.5%
M	10.5%	22.0%	5.4%	4.4%	0.0%	17.3%	0.0%	22.4%	18.0%	0.0%	100.0%	60.3%
MATH 121												
	A	B	C	D	F	W	I	CR	NCR	AU	TOTAL	ABC
F	17.4%	25.5%	27.4%	12.3%	0.6%	15.5%	0.0%	0.6%	0.3%	0.3%	100.0%	70.3%
M	9.8%	22.6%	28.0%	18.8%	2.9%	16.6%	0.0%	0.4%	0.7%	0.2%	100.0%	60.4%
MATH 123												
	A	B	C	D	F	W	I	CR	NCR	AU	TOTAL	ABC
F	18.6%	32.4%	16.7%	13.7%	1.0%	16.7%	0.0%	1.0%	0.0%	0.0%	100.0%	67.6%
M	14.7%	18.0%	24.6%	12.3%	6.1%	24.3%	0.0%	0.0%	0.0%	0.0%	100.0%	57.2%
MATH 150												
	A	B	C	D	F	W	I	CR	NCR	AU	TOTAL	ABC
F	17.9%	28.0%	13.1%	21.4%	4.2%	14.9%	0.0%	0.6%	0.0%	0.0%	100.0%	58.9%
M	11.7%	20.4%	24.9%	20.6%	5.8%	15.9%	0.0%	0.2%	0.4%	0.0%	100.0%	57.0%



## Success Pct (A-B-C-CR) By Gender





## ***SELECTED IMPLICATIONS***



***Students may not know what they want to be when they originally declare a major.***



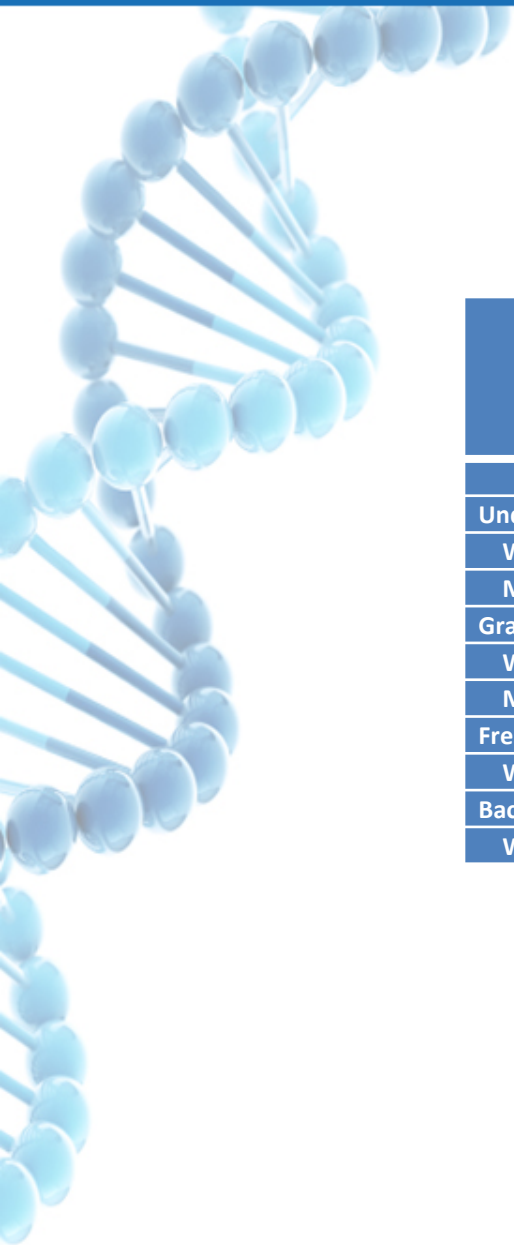
***The status quo is not highly effective for traditionally underrepresented STEM students. However, the proportions of these students are growing at UNM.***





**Underserved Student Populations as Proportions of Enrollments,  
Freshmen Classes and Bachelor's Degree Earners (source: UNM Factbooks)**

	Fall 1996	Fall 2012	Difference
<b>Undergraduate student enrollment</b>			
African American students	2.7%	2.7%	0.0
American Indian students	5.0%	6.4%	+1.4
Hispanic students	28.7%	43.0%	+14.3
Female students	56.7%	55.7%	-1.0
<b>Graduate student enrollment</b>			
African American students	1.4%	1.7%	+0.3
American Indian students	2.3%	3.9%	+1.6
Hispanic students	12.5%	23.5%	+11.0
Female students	53.5%	57.6%	+4.1
<b>Freshman student enrollment</b>			
African American students	3.1%	2.6%	-0.5
American Indian students	5.1%	5.6%	+0.5
Hispanic students	35.0%	48.5%	+13.5
<b>Bachelor's degree earners</b>			
African American students	2.1%	2.8%	+0.7
American Indian students	4.9%	4.9%	0.0
Hispanic students	24.9%	38.1%	+13.2

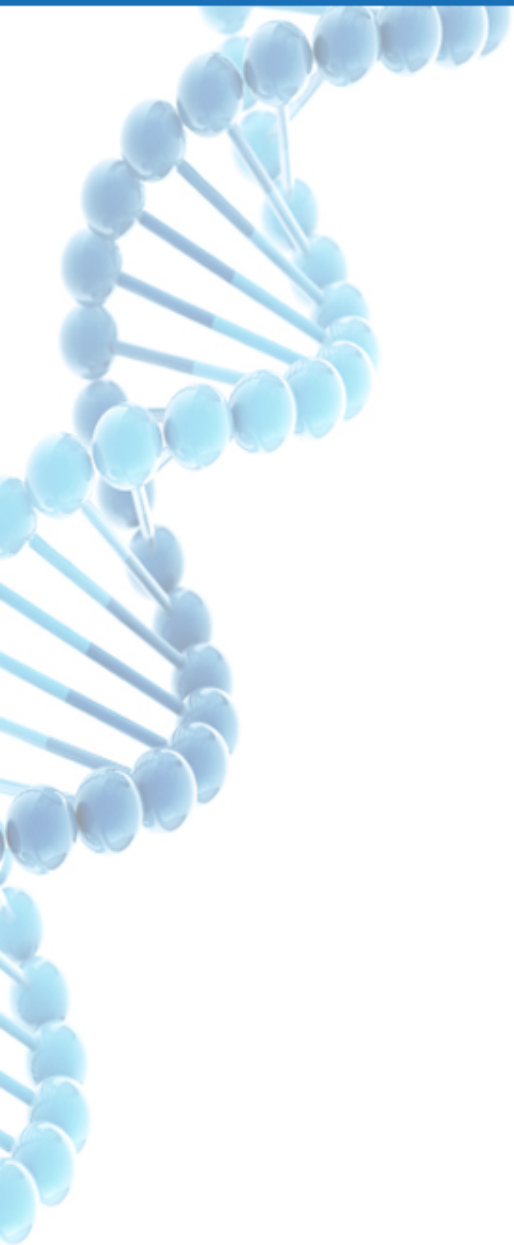


**White Male Populations as Proportions of Enrollments,  
Freshmen Classes and Bachelor's Degree Earners (source: UNM Factbooks)**

	Fall 1996	Fall 2012	Difference
<b>Undergraduate student enrollment</b>			
White students	57.5%	38.3%	-19.2
Male students	43.3%	44.3%	-1.0
<b>Graduate student enrollment</b>			
White students	72.1%	49.9%	-22.2
Male students	46.5%	42.4%	-4.1
<b>Freshman student enrollment</b>			
White students	50.5%	33.3%	-17.2
<b>Bachelor's degree earners</b>			
White students	63.5%	44.4%	-19.1



***Students are struggling to get through the pre-calculus math sequence.***



**Pre-Calculus Courses on UNM's Killer Course List  
Percent of Enrollments "Did Not Pass"**

	MATH 120	MATH 121	MATH 123	MATH 150
<b>Spring 2013</b>	69% 1 <sup>st</sup> on the list	41% 12 <sup>th</sup> on the list	53% 2 <sup>nd</sup> on the list	52% 3 <sup>rd</sup> on the list
<b>Fall 2012</b>	43% 8 <sup>th</sup> on the list	39% 10 <sup>th</sup> on the list	57% 1 <sup>st</sup> on the list	51% 2 <sup>nd</sup> on the list
<b>Spring 2012</b>	47% 5 <sup>th</sup> on the list	52% 3 <sup>rd</sup> on the list	51% 4 <sup>th</sup> on the list	68% 1 <sup>st</sup> on the list
<b>Fall 2011</b>	55% 3 <sup>rd</sup> on the list	43% 6 <sup>th</sup> on the list	51% 4 <sup>th</sup> on the list	64% 1 <sup>st</sup> on the list

**Pre-Calculus Courses on UNM's Killer Course List  
Number of Enrollments Resulting in "Did Not Pass" Outcome**

	MATH 120	MATH 121	MATH 123	MATH 150
<b>Spring 2013</b>	704 1 <sup>st</sup> on the list	438 2 <sup>nd</sup> on the list	251 6 <sup>th</sup> on the list	195 11 <sup>th</sup> on the list
<b>Fall 2012</b>	581 2 <sup>nd</sup> on the list	584 1 <sup>st</sup> on the list	246 10 <sup>th</sup> on the list	262 8 <sup>th</sup> on the list
<b>Spring 2012</b>	506 1 <sup>st</sup> on the list	475 2 <sup>nd</sup> on the list	217 12 <sup>th</sup> on the list	238 10 <sup>th</sup> on the list
<b>Fall 2011</b>	747 1 <sup>st</sup> on the list	596 2 <sup>nd</sup> on the list	193 14 <sup>th</sup> on the list	295 9 <sup>th</sup> on the list



***When students give up on UNM or on their STEM degrees, they usually do so early in their educational careers.***



***UNM needs to help students understand the value of mastery (“A” level grades) in their STEM gateway courses.***



***Most UNM students take longer than four years to earn STEM bachelor's degrees.***



### **For More Information...**

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