Conference on Excellence in Gateway Course Completion

STOP, SWITCH OR STAY

Research into STEM persistence at the University of New Mexico



Conference on Excellence in Gateway Course Completion



TIM SCHROEDER Project Director STEM Gateway Program University of New Mexico <u>timschroeder@unm.edu</u> 505-277-1761 <u>http://unmstemgateway.blogspot.com/</u> (RESEARCH Tab)

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



GATEWA

GRANT OVERVIEW:

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

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Specialties:

- How the data is originally collected and entered into Banner
- How the data is pulled from Banner and organized into a single data set
- How the data is analyzed for statistical significance and predictive modeling
- How the data impacts policy and practice (my role)

Acknowledgments

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- Gary Smith, Principal Investigator, STEM Gateway, University of New Mexico

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THE UNIVERSITY OF NEW MEXICO, Main Campus...

- Is located in Albuquerque, New Mexico
- Is a Carnegie Research University Very High Institution
- Is a Hispanic Serving Institution
- Is the flagship research university in New Mexico
- Serves rural and urban students
- In the fall of 2011, enrolled 29,056 students
- In the fall of 2011, enrolled 10,749 Hispanic students (37% of student population)
- Is funded directly by the New Mexico legislature, and is not part of a state-wide University system

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STOP, SWITCH OR STAY...

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?

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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.

Underlying Assumptions

It is in the University's best interest for us to increase the number of STEM graduates and to diversify the STEM workforce. This leads us to a few assumptions that may or may not be true to varying degrees:

- When students state their STEM intent, they do so with self-knowledge and deliberation.
- When students encounter difficulties in their STEM pursuit, it is in their best interest and the institution's best interest for them to overcome those challenges and continue in STEM.

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			
Total Number of Students	1503		
Number of students who changed majors out of STEM (SHIFTED)	639		
Number of students who graduated with STEM degrees (GRADUATED)	334		
Number of students who stopped attending UNM (STOPPED)	444		
Number of students still enrolled at UNM (ENROLLED)	86		



DEGREE OUTCOMES LENS *Stem Definition*

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.



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 *Overview*

This portion of the study attempts to understand the impact of core gateway courses (courses that serve as gateway experiences to STEM degree programs) on STEM degree achievement.

- Each course was studied collectively, and was not broken out by section or instructor.
- Grade distribution patterns were collected only for students/enrollments who fit the "Population Description / Definitions" section above.



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
РНҮС	151	General Physics
РНҮС	151L	General Physics LAB
РНҮС	152	General Physics
РНҮС	152L	General Physics LAB
РНҮС	157	Problems in General Physics
РНҮС	158	Problems in General Physics
РНҮС	160	General Physics
РНҮС	160L	General Physics LAB
РНҮС	161	General Physics
РНҮС	161L	General Physics LAB
РНҮС	167	Problems in General Physics
РНҮС	168	Problems in General Physics



ANALYSIS PROCESS

- Faculty, staff and students will be invited to participate in focus groups the week of April 22nd
- Data summaries and charts will be emailed to them in advance
- Focus groups will answer three questions:
 - What are the limitations of this data?
 - What are the implications of this data?
 - What further research does this data point to?
- Based on this analysis, a final report will be published internally and online in July



PRELIMINARY FINDINGS DEGREE OUTCOMES LENS



SPECIFIC MAJORS

There is a significant relationship between specific majors and students classification among the four categories (p<.001).



MAJORS WITH SIGNIFICANT ODDS RATIOS (p=<0.1)

Graduated	Shifted	Stopped	Enrolled
Biochemistry 1.79 times as likely (p=.059)	General Engineering .62 times as likely (p<.001)	Biochemistry .43 times as likely (p=.028)	Chemistry 2 times as likely (p=.077)
General Engineering 2.05 times as likely (p<.001)	Electrical Engineering .51 times as likely (p=.025)	Computer Engineering 2.07 times as likely (p=.015)	Mechanical Engineering 1.85 times as likely (p=.081)
Mechanical Engineering .62 times as likely (p=.087)	Biology 1.39 times as likely (p=.004)	Electrical Engineering 2.47 times as likely (p=.001)	
Computer Science 0.27 times as likely (p=.001)			
Civil Engineering 0.33 times as likely (p=.014)			
Computer Engineering .07 times as likely (p<.001)			



		Stopped	Graduated	Enrolled	Shifted	TOTAL
Astrophysics		7	6	0	5	18
Biology		132	101	21	234	488
Biochemistry		8	17	3	23	51
Chemistry		18	16	8	35	77
Computer Sci	ence	24	5	5	33	67
Earth & Plane	etary Sciences	2	5	0	5	12
ENGINEERING	3					
o Chem	ical Engineering	4	1	0	2	7
o Civil E	ingineering	21	5	2	29	57
 Comp 	outer Engineering	22	1	2	23	48
 Electr 	ical Engineering	27	8	4	15	54
o Engin	eering Science	0	0	0	3	3
 Gene 	ral Engineering	109	130	29	139	407
 Mech 	anical Engineering	32	16	10	46	104
 Nucle 	ar Engineering	6	3	0	6	15
Environment	al Science	8	2	0	14	24
Mathematics		14	10	0	17	41
Physics		8	7	2	10	27
Statistics		2	1	0	0	3
TOTAL		444	334	86	639	1503

Note. This table shows the distribution of students within each major, broken down by study category.

	Stopped Graduated		En	rolled	Sh	ifted		
	OR	р	OR	р	OR	р	OR	Р
Astrophysics	1.53	(0.436)	1.76	(0.257)	0.00	(0.620)	0.52	(0.237)
Biology	0.84	(0.148)	0.88	(0.354)	0.66	(0.123)	1.39	(0.004)
Biochemistry	0.43	(0.028)	1.79	(0.059)	1.03	(1.000)	1.11	(0.774)
Chemistry	0.72	(0.250)	0.91	(0.888)	2.00	(0.077)	1.13	(0.637)
Computer Science	1.35	(0.273)	0.27	(0.001)	1.35	(0.585)	1.33	(0.258)
Earth & Planetary Sciences	0.47	(0.527)	2.52	(0.153)	0.00	(1.000)	0.97	(1.000)
ENGINEERING								
 Chemical Engineering 	3.20	(0.205)	0.58	(1.000)	0.00	(1.000)	0.54	(0.706)
 Civil Engineering 	1.41	(0.237)	0.33	(0.014)	0.59	(0.768)	1.42	(0.219)
 Computer Engineering 	2.07	(0.015)	0.07	(0.000)	0.71	(1.000)	1.25	(0.461)
 Electrical Engineering 	2.47	(0.001)	0.60	(0.242)	1.33	(0.546)	0.51	(0.025)
 Engineering Science 	0.00	(0.560)	0.00	(1.000)	0.00	(1.000)	N/A	N/A
 General Engineering 	0.83	(0.162)	2.05	(0.000)	1.40	(0.169)	0.62	(0.000)
 Mechanical Engineering 	1.06	(0.824)	0.62	(0.087)	1.85	(0.081)	1.08	(0.758)
 Nuclear Engineering 	1.60	(0.398)	0.87	(1.000)	0.00	(1.000)	0.90	(1.000)
Environmental Science	1.20	(0.657)	0.31	(0.136)	0.00	(0.395)	1.91	(0.145)
Mathematics	1.24	(0.493)	1.13	(0.705)	0.00	(0.167)	0.96	(1.000)
Physics	1.00	(1.000)	1.23	(0.642)	1.33	(0.665)	0.79	(0.695)
Statistics	4.78	(0.210)	1.75	(0.530)	0.00	(1.000)	0.00	(0.266)

Note. This table shows the odds ratios (OR) and corresponding *p*-value for each major within each study category. For example, the odds ratio of 1.39 (*p* = .004) for biology students within "Shifted" means that biology students are 1.39 times more likely than non-biology STEM students to shift out of STEM. Odds ratios with corresponding *p*-values <= .10 are in bold. Odds ratio for Engineering Science students within Shifted could not be computed because all 3 students shifted out (yielding an unreliable OR = $+\infty$).



Unanswered Questions

Do the small N's call into question significant findings in individual degree programs?

Is there a relationship between a program's level of math rigor and GRADUATE, SWITCH and STOP rates?

Do these trends hold true at other institutions?

To what extent are these numbers impacted by students who switch out of hard STEM and into other similar non-STEM programs (for instance, from Biology to Health Science)?



SUBPOPULATIONS

Ethnicities in Students Opting to Go Into STEM

	THIS POPULATION OF STEM STUDENTS	THE GENERAL POPULATION OF CREDIT-BEARING STUDENTS FROM UNM 2011-12 FACTBOOK (Fall 2011)	ODDS RATIO (p- value)
Percent American Indian	6.4%	5.5%	1.17 (.148)
Percent Asian/Pacific Islander/Native Hawaiian	5.5%	3.5%	1.62 (< .001)
Percent Black/African American	2.3%	2.6%	0.87 (.503)
Percent Hispanic	35.5%	37.0%	0.94 (.239)
Percent White, Non- Hispanic	46.2%	42.4%	1.17 (.004)
Percent Male	62.3%	44.4%	2.08 (< .001)
Percent Female	37.7%	55.6%	0.48 (< .001)



SUBPOPULATIONS *Ethnicities in <u>Degree Outcomes</u>*

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.



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



SUBPOPULATIONS *Ethnicities in <u>Degree Outcomes</u>*

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 <u>Degree Outcomes</u>*

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 SES in <u>Degree Outcomes</u>



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



SUBPOPULATIONS Gender in <u>Degree Outcomes</u>

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



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

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

Odds Ratios (Significance)

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





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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).





Possible Implications

UNM needs to do focus resources on recruiting women to STEM fields.

UNM needs to provide resources to connect STEM academic and support to the faculty, staff and departments who most understand the needs of Hispanic, American Indian, African American, Low-income, Firstgeneration and Female students.



Possible Implications

UNM needs to **improve instruction** to better meet the learning needs of students who are Hispanic, American Indian, African American, Low-income, First-generation and Female.



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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	3.51	2.95	2.09



PRIORITY OF OUTCOMES *Variables*

VARIABLE	GRADUATE	SHIFT	STOP
Percent of students in	400/	20.70	20.5%
this group who required remediation	12%	30.7%	39.5%
Percent of students in			
this group who	4.2%	18.2%	26.4%
required MATH			
Percentage of students			
in this group who	2424		26.224
received a Lottery	91%	//.5%	36.9%
Scholarship			
Percentage of Lottery-			
receiving students in			
this group who lost	18.4%	28.7%	42.1%
their Lottery			
Scholarship			

PRIORITY OF OUTCOMES *ACT Scores*

	Stopped vs. Not	Shifted vs. Not	Graduated vs. Not
	Stopped	Shifted	Graduated
ACT Composite	.03	.01	.09
ACT Math	.04	.01	.11
ACT English	.04	< .01	.08
ACT Reading	.03	< .01	.06
ACT Scientific	.04	< .01	.08
Reasoning			

Note. This table shows the proportion of variance explained by two-group distinctions in ACT scores. For example, the distinction between Stopped and Not Stopped accounts for about 4% of the variation in ACT-Math scores. Similarly, distinguishing between Shifted and Not Shifted students is effectively useless in trying to predict ACT scores, while the most useful distinction in predicting ACT scores is the one between Graduated and Not Graduated students.

Unanswered Questions

None of these numbers are surprising, since they often appear in the literature.

But how well do these factors, when combined to produce the most effective predictor, predict whether a student will graduate, shift or stop?

Stated another way, how much of the variance in student outcomes can be related to these factors that UNM routinely collects and reports?



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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.





Possible Implications

Students who SHIFT appear to be taking more credits per semester than students who STOP.

Leaving STEM may be more related to the number of semesters completed than it is to the number of credits completed. If so, what are the implications?



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.



Unanswered Questions

Does this imply that students who leave UNM may be heavily impacted by academic performance issues, while SHIFTED students may be less impacted by poor grades and more impacted by other factors?





PRELIMINARY FINDINGS COURSE OUTCOMES LENS



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									
	А	В	С	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 SHIFTED								
	А	В	С	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



Unanswered Questions

How much of this difference in "A" grades is actually a function of other factors (precollege preparation, ACT scores, etc)?

How would this same pattern hold in non-STEM disciplines?



Possible Implications

Colleges and universities often stress successful passing (A,B or C) as the desired course outcome for their students, and as a measure for their programs meeting student learning needs.

However, in STEM, it may be more important to stress **mastery** (in this case, as measured by "A" percentage) over passing or course completion.



COURSE CATEGORIES

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

						РСТ	РСТ	РСТ
	SUBJECT	Ν	GRAD	SHIFT	STOP	Grad	Shift	Stop
1	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.



Possible Implications

Resources and strategies for keeping students engaged in STEM should be focused on mathematics courses and first-year STEM courses.



PRE-CALC MATH, ETHNICITY AND PELL-ELIGIBILITY

The following tables show grade distribution patterns for enrollments in our population for the four primary pre-cal math courses: Intermediate Algebra, College Algebra, Trigonometry and Pre-Calculus Mathematics.



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



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



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



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





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

Unanswered Questions

To what degree are Pell-eligibility and Hispanic ethnicity related?

Why are Hispanic and Pell-eligible students decreasing in achievement as they proceed through the pre-calc math sequence?

How do female students progress through precalc math and beyond?

Discussion Questions

How do these preliminary findings relate to your institutions?

What are the implications for this data for STEM education in general?

What additional questions are raised by this research?



TIM SCHROEDER

Project Director STEM Gateway Program University of New Mexico <u>timschroeder@unm.edu</u> 505-277-1761 <u>http://unmstemgateway.blogspot.com/</u> (RESEARCH Tab)