

From Data to Changes to Data to More Changes: Inclusive Pedagogy at Bridgewater State University

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All College Professional Development Day

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STREAMS AT MIDDLESEX: INCLUSIVE PEDAGOGY





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STREAMS AT MIDDLESEX: INCLUSIVE PEDAGOGY



STREAMS: NSF STEP Grant DUE-0969109

- STudent
- Retention
- Enhancement
- Across
- Mathematics &
- Science
- 5 years, \$1 million,
May 2010-2015

PAL Colin Gregory (left) explaining some details in studio physics.



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And now Gateways . . .

- A Board of Higher Education VISION Project PIF grant, funded August 2013
- Help students in gateway courses to be more successful in their majors
- Extending STREAMS ideas into
 - Social Work
 - English
 - Communications
 - Accounting
 - Art History



DATA TO CHANGES . . . MOTIVATIONS

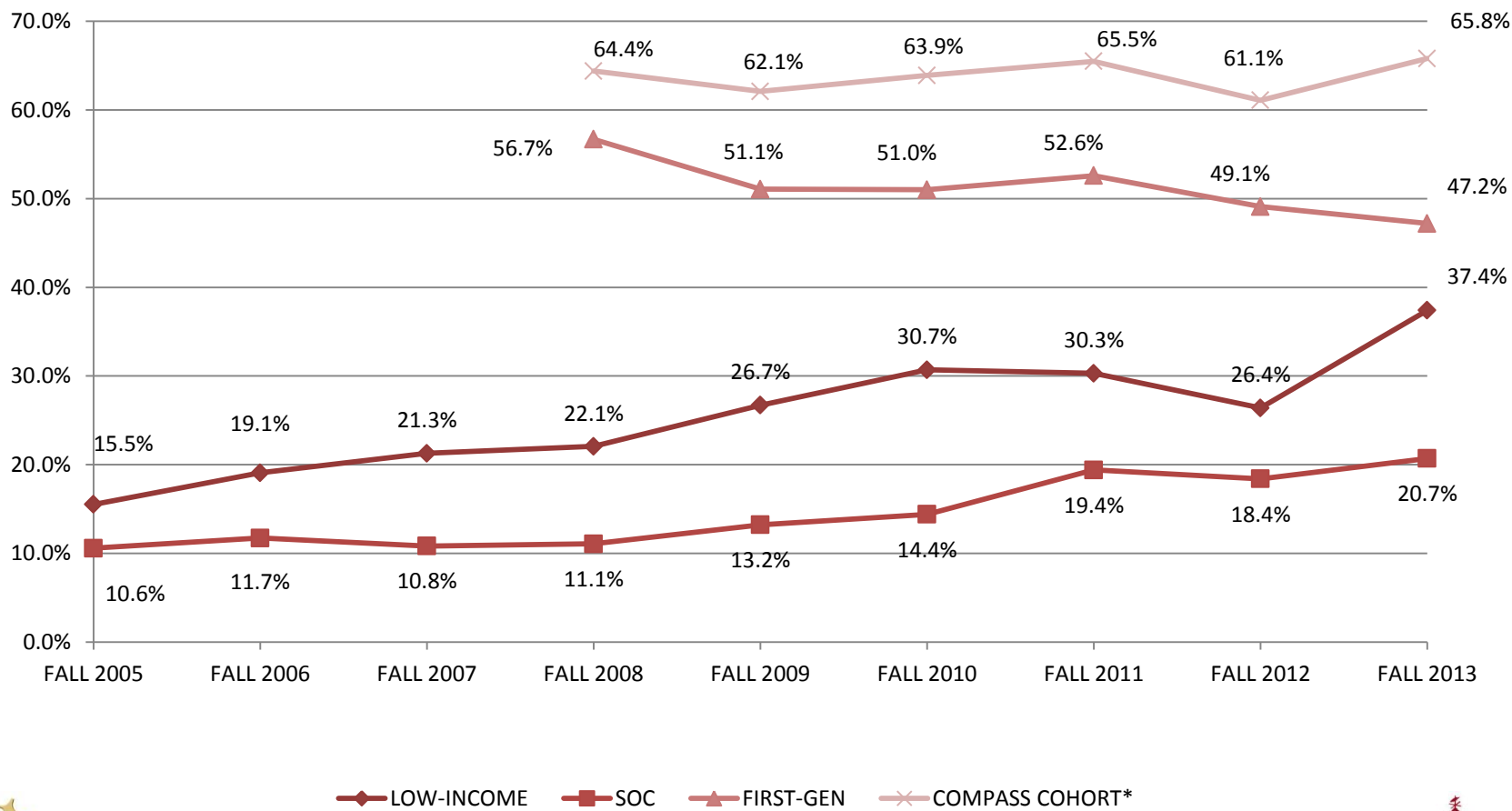


STREAMS AT MIDDLESEX: INCLUSIVE PEDAGOGY



BSU Entering First-Year Cohort Who Identify as Students of Color, First-Generation College Students, or From Low-Income Families (2005-2013)

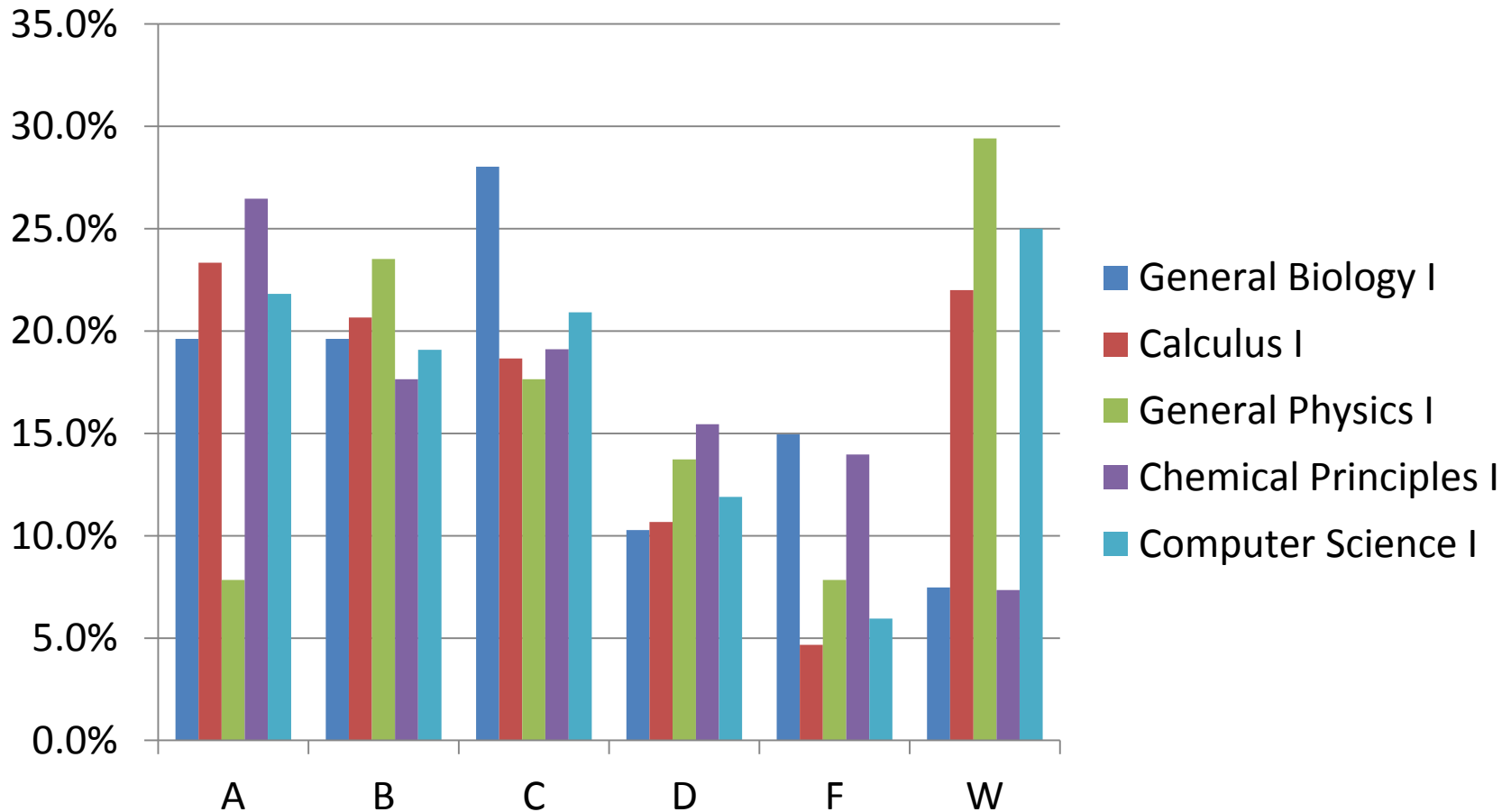
Prepared by the Office of Institutional Research



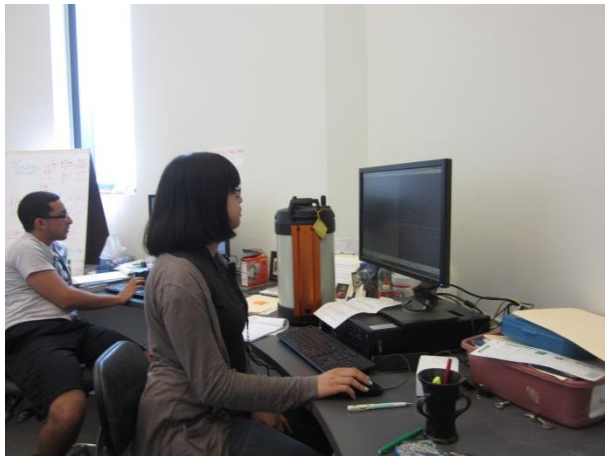
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STEM Student Retention: The Problem (2009 Data)



What does it mean for me, as a physics professor, when **10** students in my class of **20** are first generation college students?



What does it mean for me, as a physics professor, when **8** students in my class of **20** qualify as low income?



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QUICK STREAMS SUMMARY



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STREAMS & Gateways Goal:

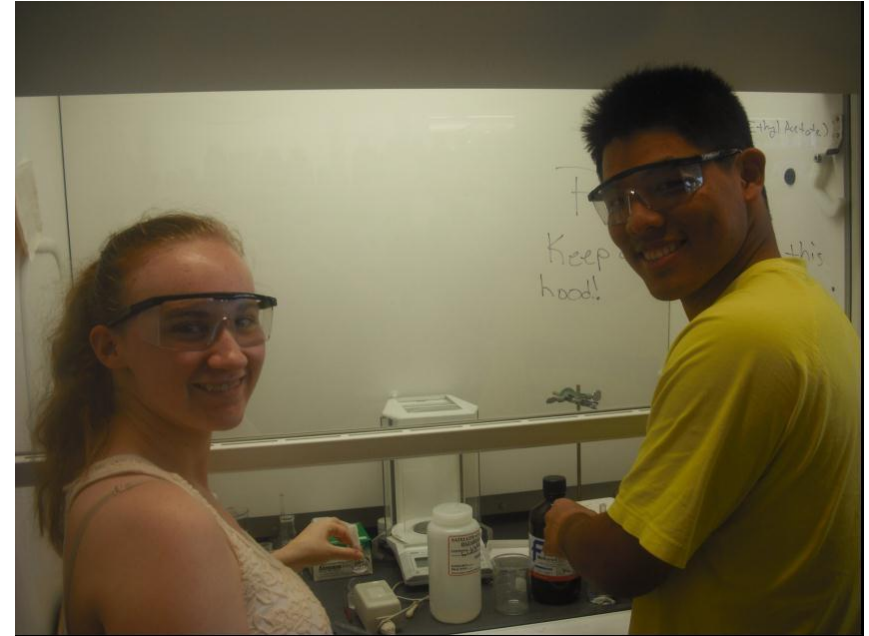
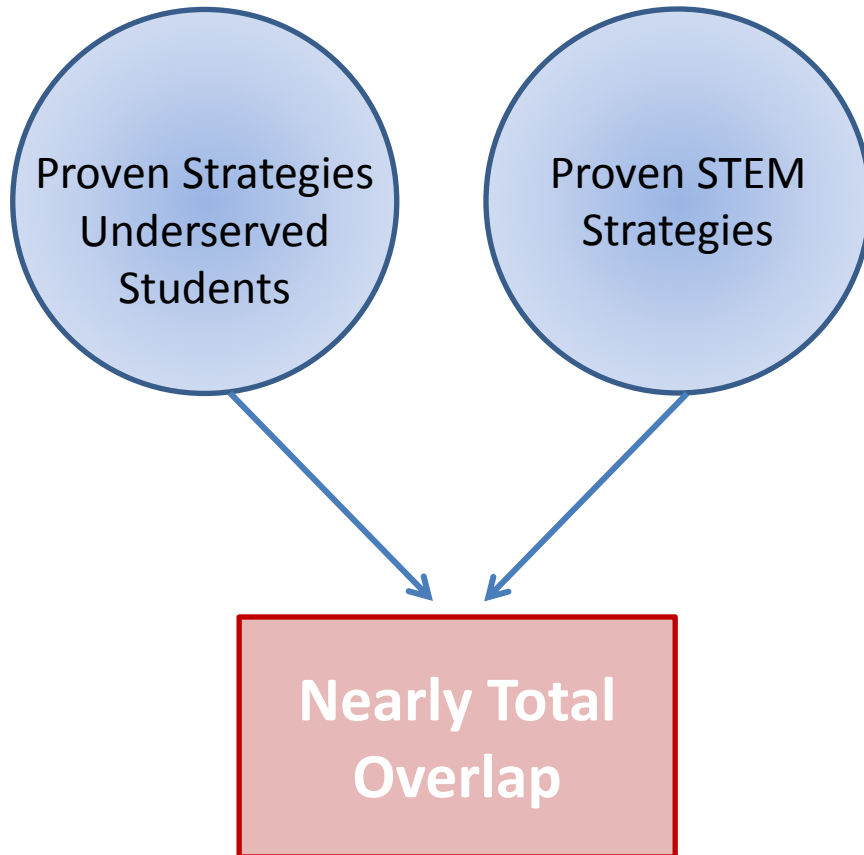
Improve retention of students in their major so that more students will graduate on time.



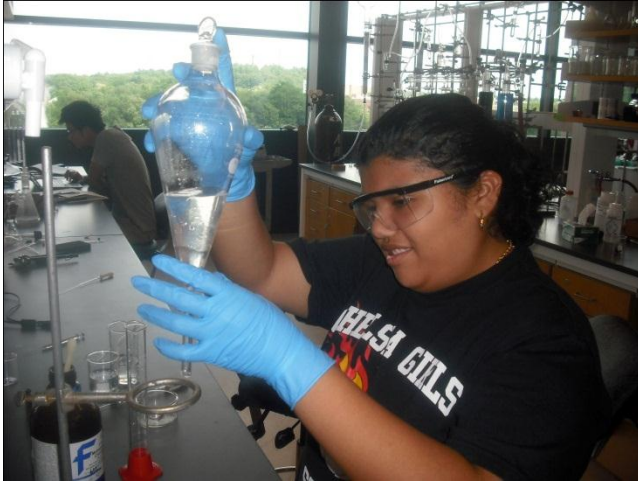
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Intervention Strategies



Guiding Principles



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Guiding Principles

- Inquiry-based learning
- Small groups, senior undergraduate peer-led
- Every student participates
- Focus on learning, not on skill deficits
- Connect new students to departments (upper-level students, faculty, staff) both socially & academically



Department Level Conversations:

What learning outcomes do you have that students are not meeting?

Note: not focused on DFWI rate.
What did department faculty wish their majors would learn better?



STREAMS Learning Approach

Course Development Grants

- Design different approach for their class
 - Small group
 - Inquiry
 - Writing-to-learn, Writing-Across-the-Curriculum
 - Inclusiveness
 - Flipped Classrooms
- Sharing Opportunities

Structured Learning Assistance

- Departmental designed
 - Undergrad peer-led
 - Generally required for all students
 - Small groups of 6-8 students
 - Structured activities written by faculty
 - Range of models
- Collect lots of data



Data Table

Course	Semesters before/after	N before SLA	N after SLA	DFWI % before	DFWI % after	AB % before	AB % after
Bio 121	Fall 08,09 / Fall 10,11,12	196	386	30.6%	15.8%	41.3%	54.9%
Chem 141	Fall 09,10 / Fall 11, Spring 12, Fall 12	267	363	37.8%	20.1%	42.3%	59.0%
Chem 142	Spring 10,11 / Fall 11, Spring 12,13	217	304	29.5%	24.3%	44.2%	53.3%
Math 151/161 (fall)	Fall 09,10 / Fall 11, 12	284	215	39.8%	28.4%	42.6%	54.4%
Math 151/161 (spring)	Spring 10,11 / Spring 12,13	262	164	24.4%	19.5%	52.3%	54.9%
Physics 243	AYs 09-10, 10-11 / AYs 11-12, 12-13	162	115	43.2%	25.2%	32.1%	47.0%
Physics 244	Fall 09-Fall10 / Spring 11-13	68	111	38.2%	15.3%	33.8%	59.5%
Comp 151	Fall09-Fall11 / Spring 12-13	365	257	38.1%	41.6%	44.1%	42.0%
Math 150	AY 11-12 / AY 12-13	152	126	32.9%	23.8%	46.7%	58.7%

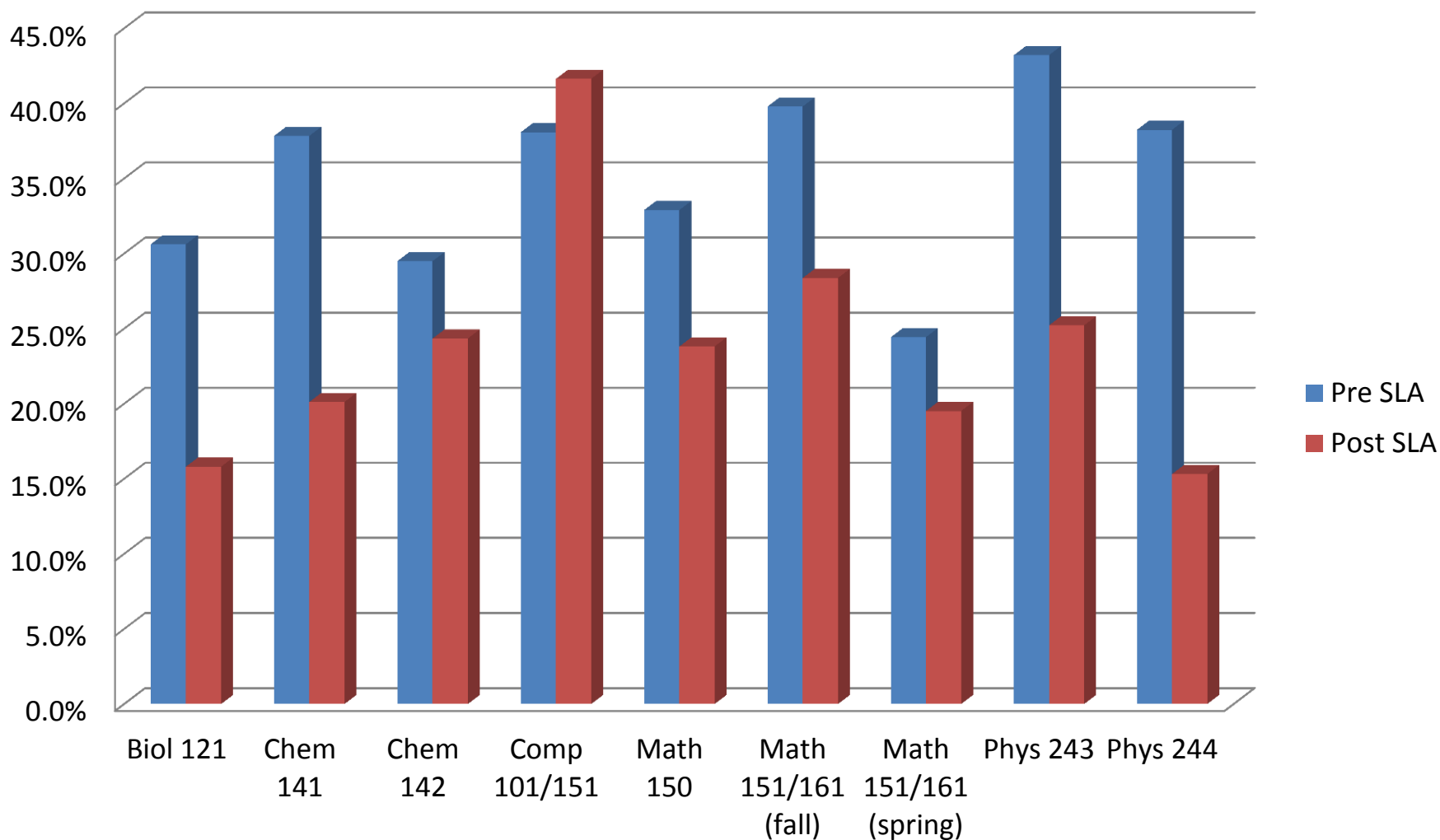
Items in **bold red** are statistically significant changes at $p < 0.01$. (The null hypothesis that SLA made no difference in the DFWI % or AB % fails at $p < 0.01$.)



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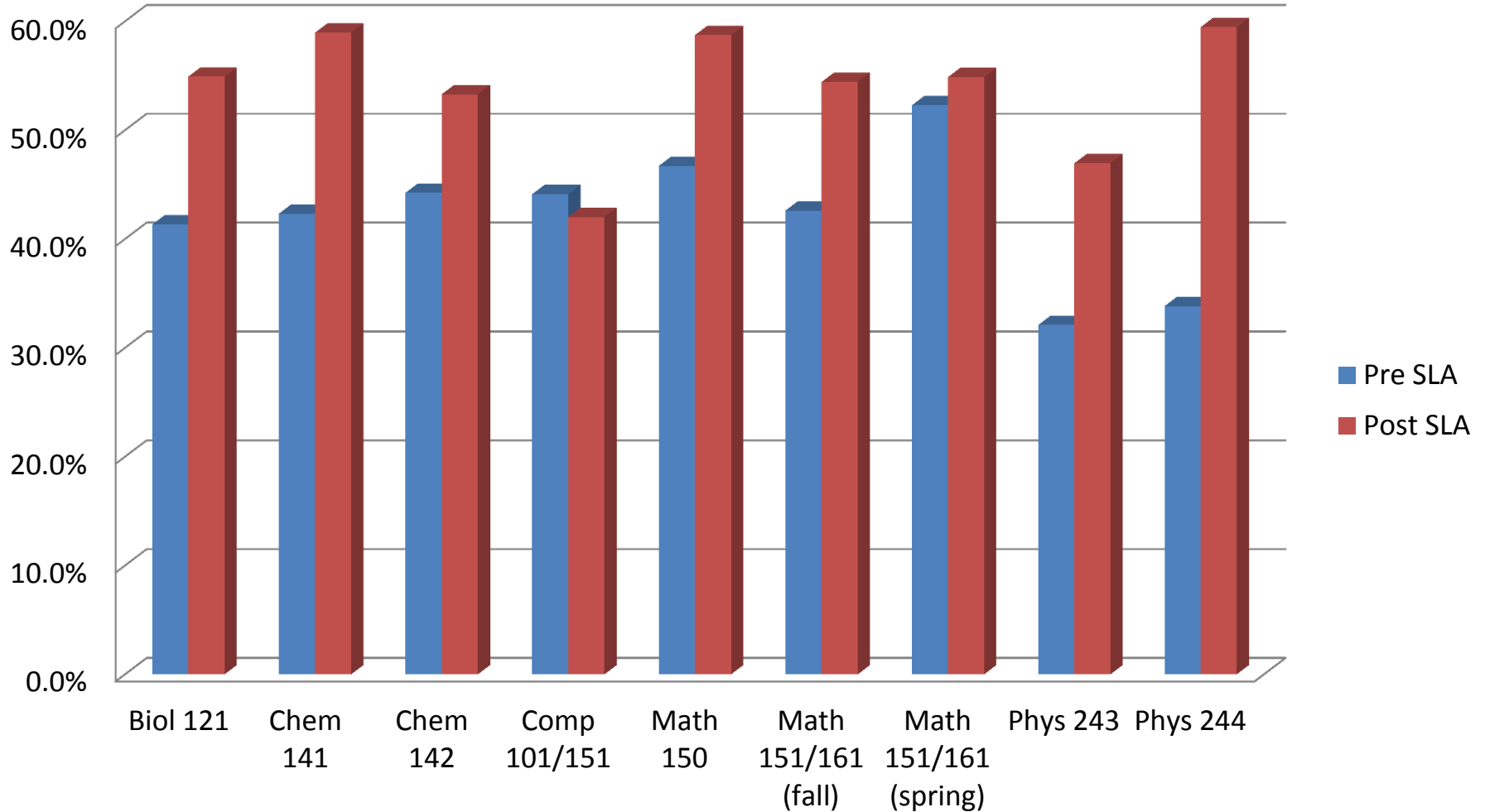
DFWI Rate, STREAMS SLA Supported Courses



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AB Rate, STREAMS SLA Supported Courses



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To date, **221** fewer
D, F, W, or I grades
were assigned since
SLA began.

To date, **229** additional
grades of A or B
have been earned
since SLA began.

Each year, **107** fewer
DFWI grades are assigned
because of SLA.

Each year, **110** additional
grades of A or B are earned
because of SLA.



Inclusive Pedagogy in Action



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Workshop: Inclusive Pedagogy

Think and report to group . . .

What factors do you find, in your work with Middlesex students, lead to trouble for students meeting the learning objectives of your classes?

What ideas have you heard about that you are beginning to try, or would consider trying to address those factor?

(We're going to explore ideas other colleagues have had, or that have arisen the STREAMS / Gateways to address the identified factors.)



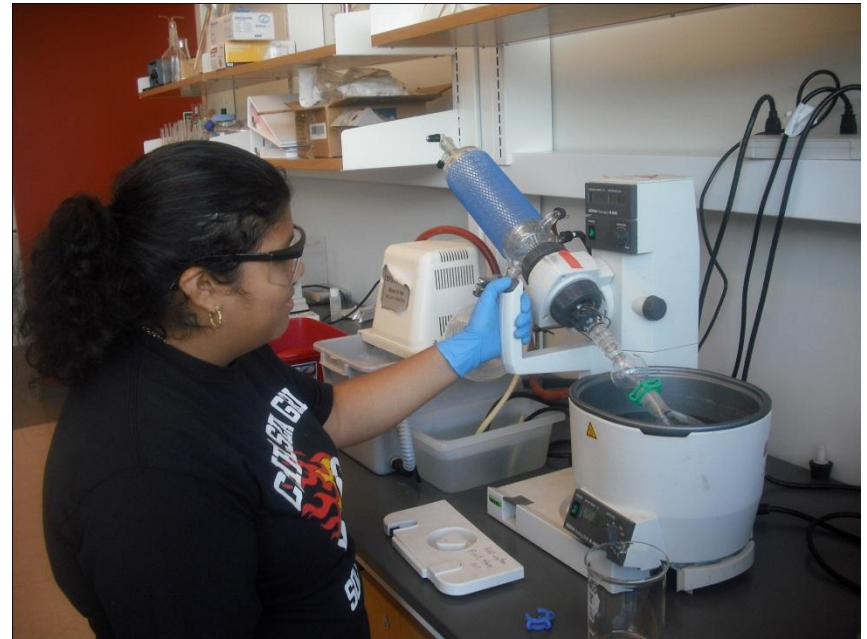
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Issue: (Perceived) Lack of Skills

Benefit: Sometimes skill deficits are real, and they can be addressed. Doing so can help motivated students see that there is a future for them in this field, college, etc.

Disadvantages: we're not trained in this stuff, it takes class time, it feels like "high school."



An incoming freshmen at BSU in our summer research bridge program.



Biology 121 Cognate Model

- Lecture of 32 breaks into 4 groups of 8
- Required co-registration in pass-fail, 1 hour course
- Led by junior level bio major
- Case studies, study skills



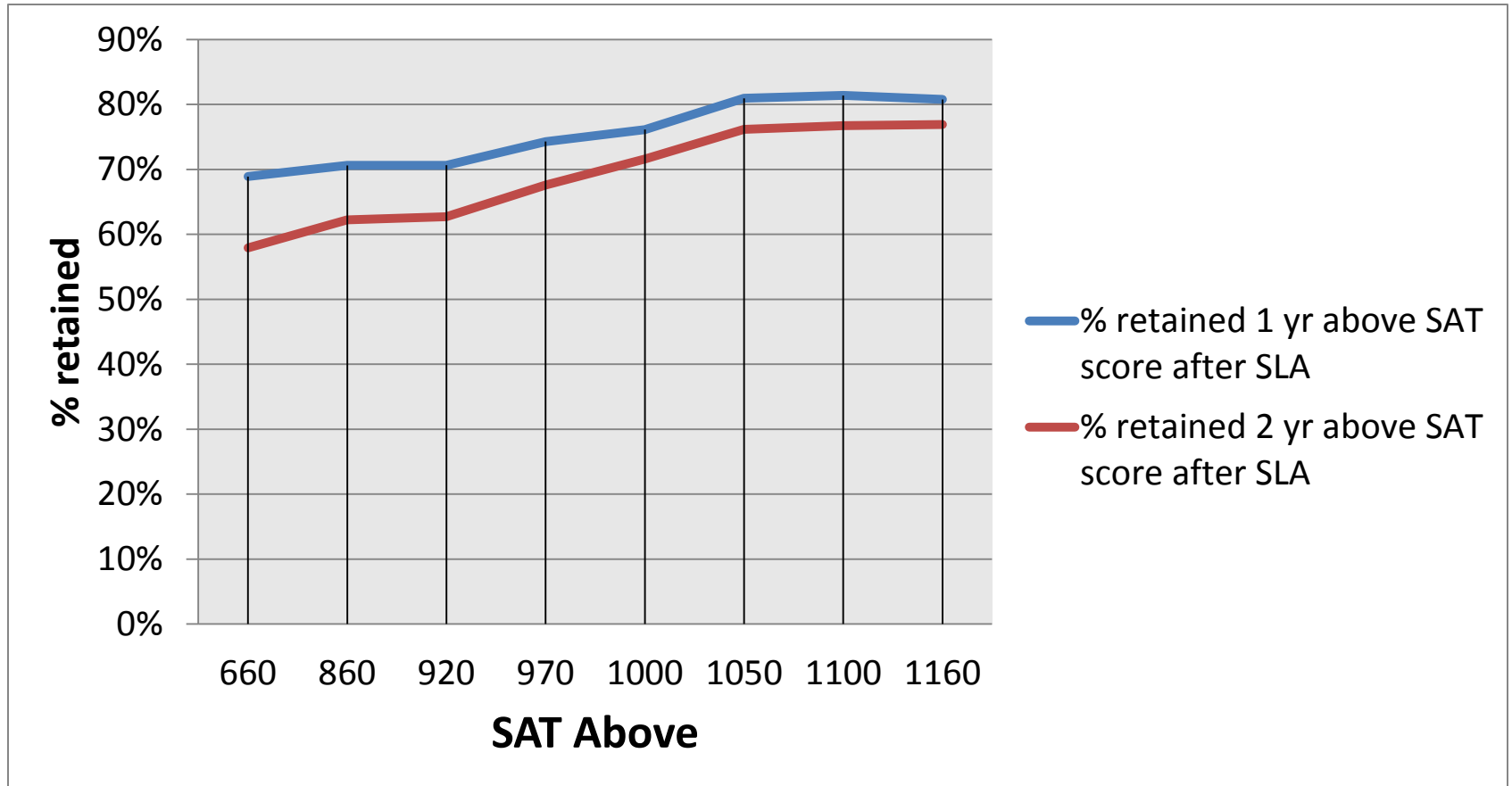
Also employed for Calculus & Computer Science. Coming soon to Accounting.



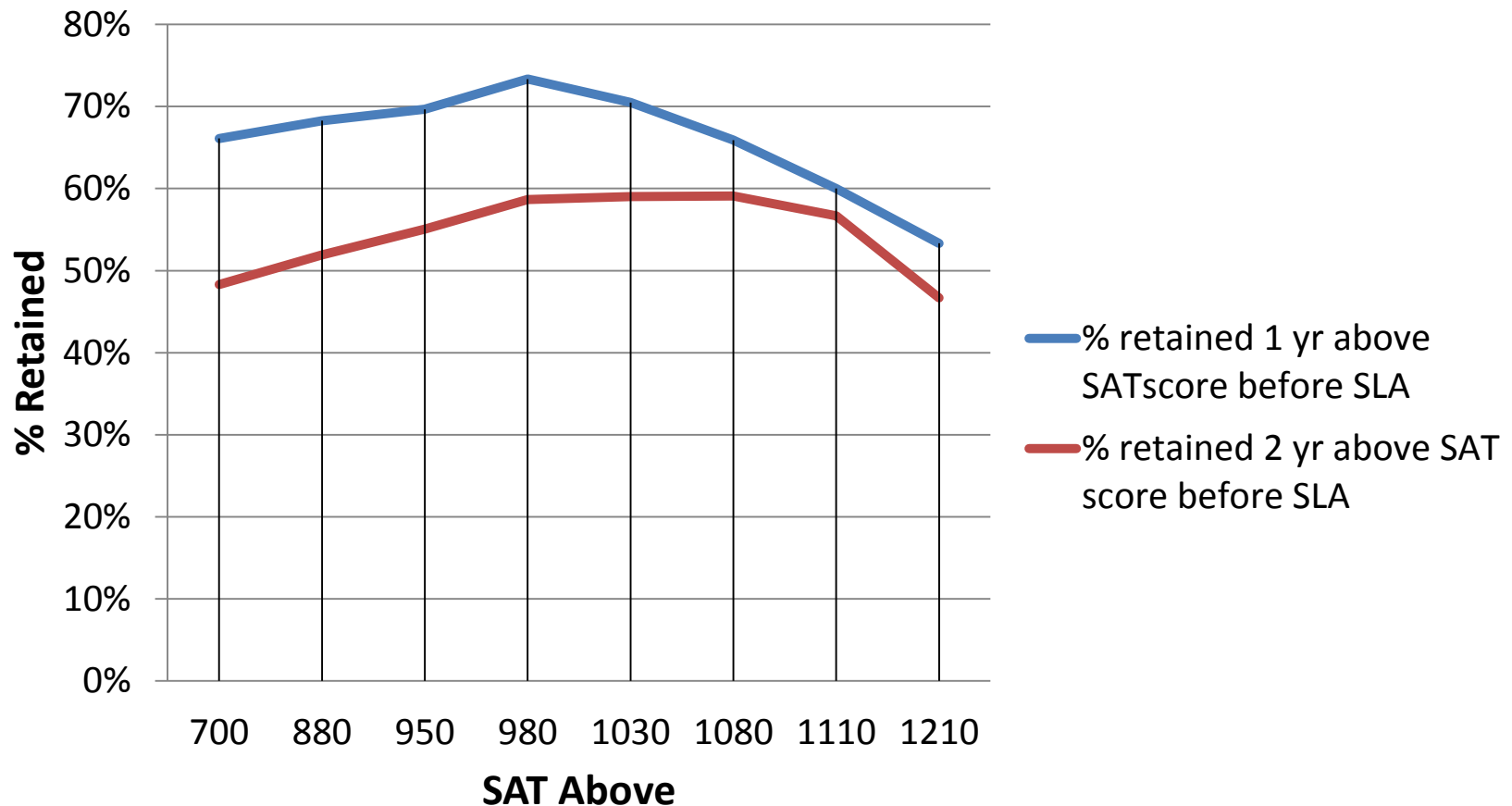
STREAMS AT MIDDLESEX: INCLUSIVE PEDAGOGY



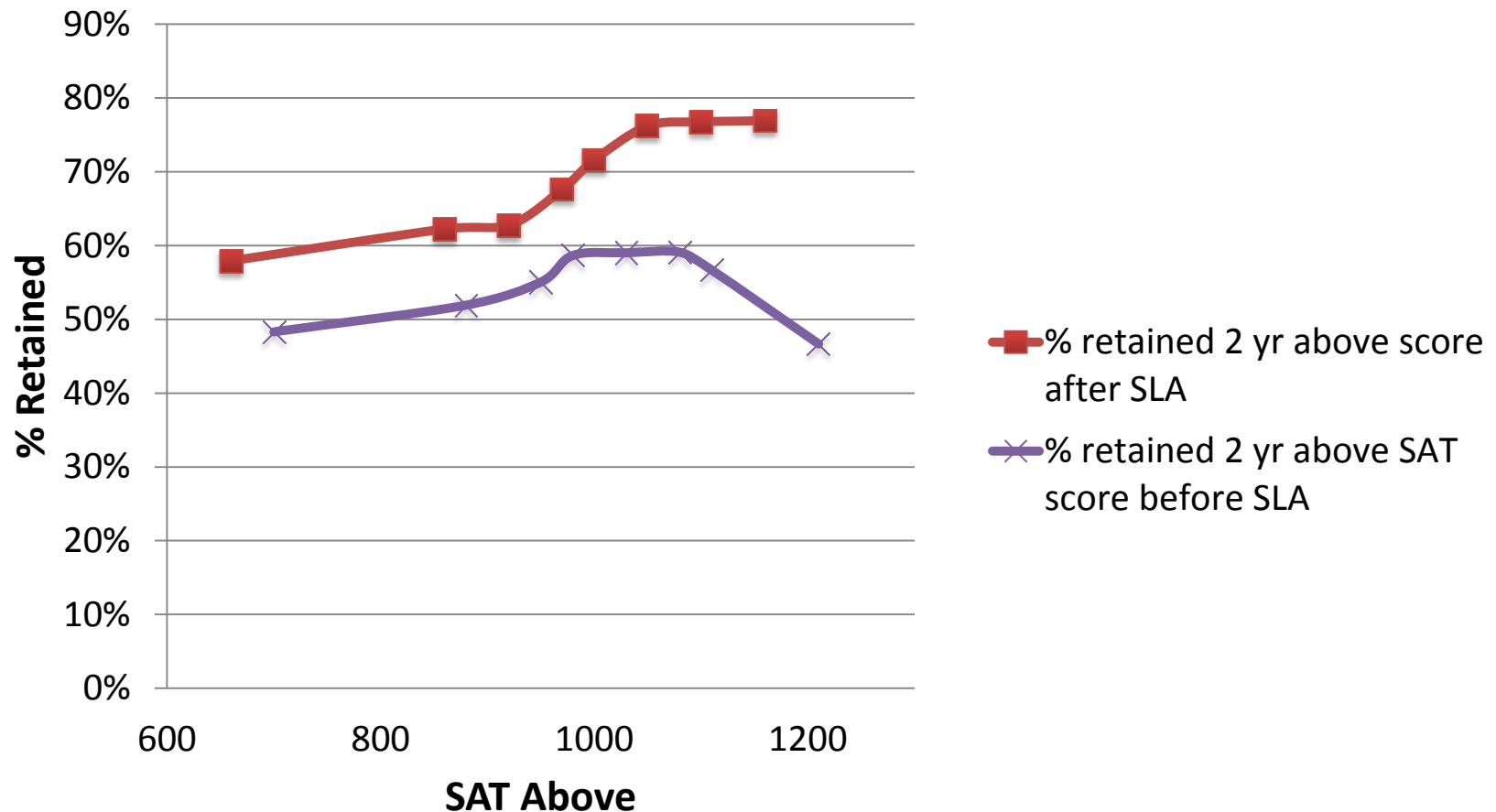
Relationship with SAT – POST-SLA



Relationship with SAT – PRE-SLA



2 Year Retention Before and After



Writing to Learn



Focus on **LOW STAKES** assignments that contribute to learning, not high stakes writing that you will grade.

- Major BSU Initiative – Content Based First & Second Year Seminars, Senior Capstone Courses
- First Year Seminar on “Scientists at Work” supporting Summer Bridge Program



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Issue: Work in Groups



Benefits: active engagement, opportunity to self-correct errors, constructivist theory

Difficulties: difficult to require outside class, “give up” class-time



Pre-Calculus Optional Structured Learning Assistance

- Required weekly assignment completed in one of two ways:
 - Meet in small group with PAL
 - Complete on own
- 100% credit if small group, graded otherwise
- Points towards the upcoming exam



Reworking “Existing” time

- Primary idea in Chemistry 141& 142 – redesign “pre-lab” time, which was poorly used to “go over” the lab
- Use recaptured time for small groups, peer-led work.



Coming soon in Communications, English & Social Work.



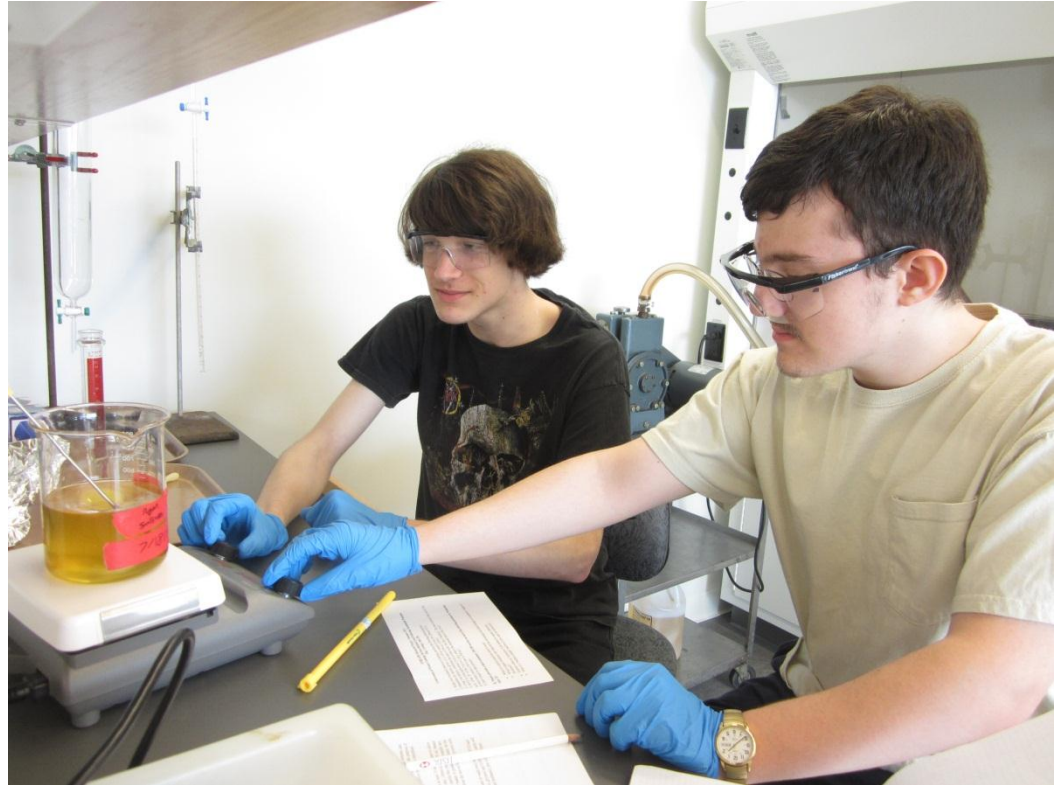
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Issue: Nature of Learning & Critical Thinking

Difficulty: students tend to think that the “answer” is in the instructor’s brain and needs to be transmitted / received.

Benefits: constructivism, deeper and more lasting retention



Inquiry-based, Studio-Style Physics

- Meet in lab space, 2 to 3 hours at a time
- “Lecture” lasts no longer than 15 minutes at a time
- Team work throughout, short lab activities, group problems
- 1 instructor + 1 PAL + 20 students



Flipped Classrooms: More Class Engagement



Provides an opportunity to build inquiry, group work into existing time.

- Using technology to deliver traditional lecture content outside class-time
- Starting in, or active in:
 - Organic chemistry
 - Upper level physics
 - Introductory computer science



Project Based Labs

- More open-ended, inquiry driven labs in
 - General Biology II
 - Organic Chemistry
 - Physics I & II
 - Modern Physics
 - Geodynamics
- Less directive instructions, more early technique, experimental design



Issue: Lack of Familiarity



Junior physics major (red) with two students in his summer research group.

Difficulty: students might not know how things connect, why what they are doing here and now will matter later, & what opportunities exist at later junctures.

Benefits: Use of peers can convey information in more direct, meaningful way. Students will listen.



A ton of lower level stuff . . .

- Whether to bring a calculator to class, and do they need that \$125 one their neighbor has?
- What help exists for students to support their writing or public speaking assignments or math?
- Where to study on campus?
- How to meet their professor?
- Students may feel that they are alone.

(Not true!)



Need Communication:

- First day, first thing in your classes . . .
- Peers (PALS), peer mentoring, peer advising, first year experience programs



Issue: Lack of Good Data

?

Who are our students really?

Who is being successful and who is not?



What data influences BSU folks?

First-time, Full-time Freshmen STEM Major Continuation Rates

Cohort Year	Headcount	Percent Continued as a STEM Major				Fresh-Soph Retention	Soph-Junior Retention
		to 2 nd Year	to 3 rd Year	to 4 th Year	to 5 th Year		
2005	121	54.5%	38.0%	33.1%	19.0%	54.5%	69.7%
2006	126	60.3%	44.4%	36.5%		60.3%	73.7%
2007	137	56.9%	38.0%			56.9%	66.7%
2008	160	65.6%				65.6%	

And same data by gender, low income status & minority status



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And by department . . . (partial data, mathematics)

Freshmen (all)

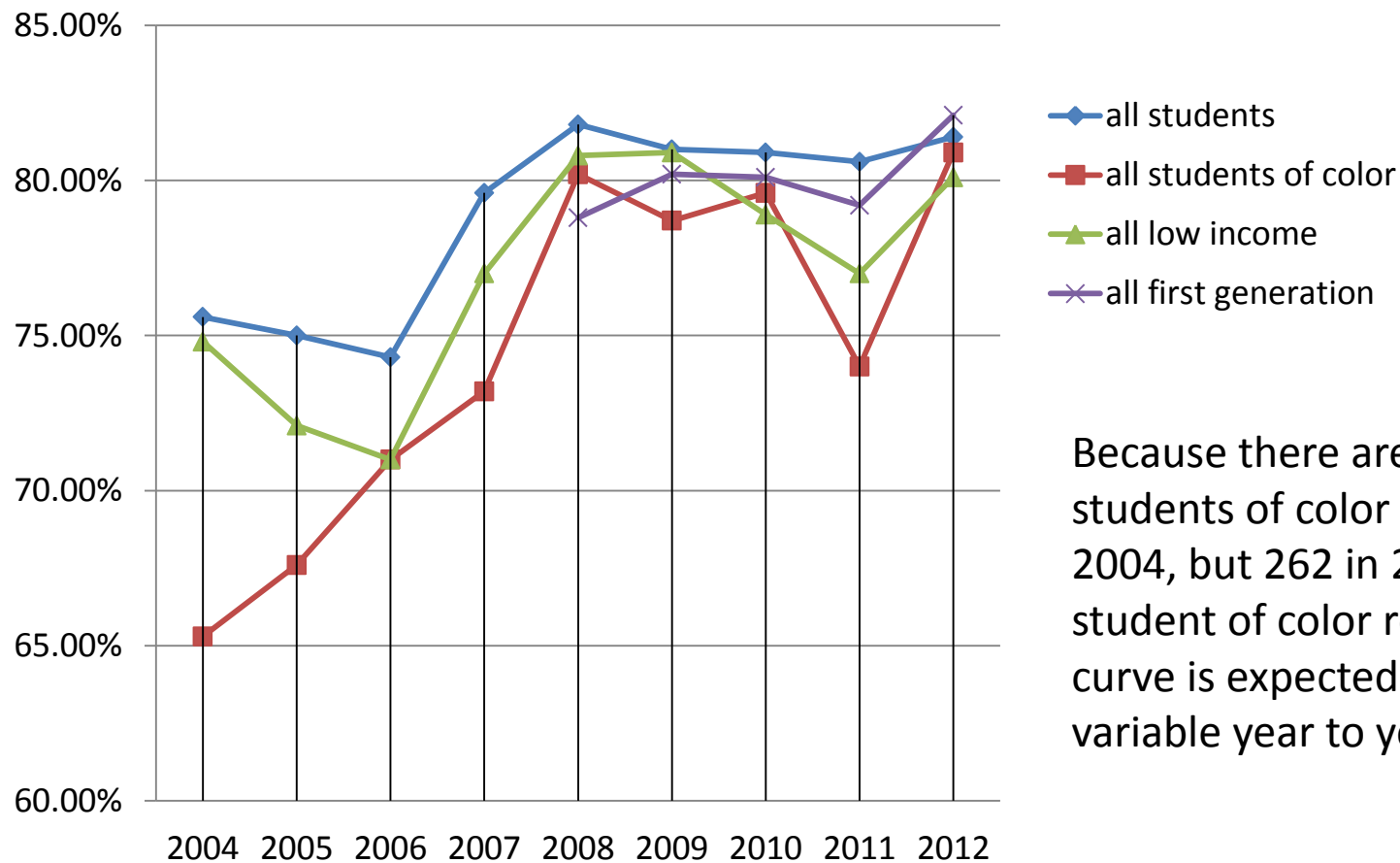
	Initial Cohort	Still Enrolled (the succeeding Fall)							
		Same Major		Diff Maj - STEM		Diff Maj - Not STEM		Total	
Fall 2009	51	36	71%	2	4%	10	20%	48	94%
Fall 2010	77	43	56%	1	1%	18	23%	62	81%
Fall 2011	55	32	58%	3	5%	9	16%	44	80%

Sophomores (all)

	Initial Cohort	Still Enrolled (the succeeding Fall)							
		Same Major		Diff Maj - STEM		Diff Maj - Not STEM		Total	
Fall 2009	71	50	70%	0	0%	16	23%	66	93%
Fall 2010	75	50	67%	3	4%	10	13%	63	84%
Fall 2011	71	48	68%	1	1%	14	20%	63	89%



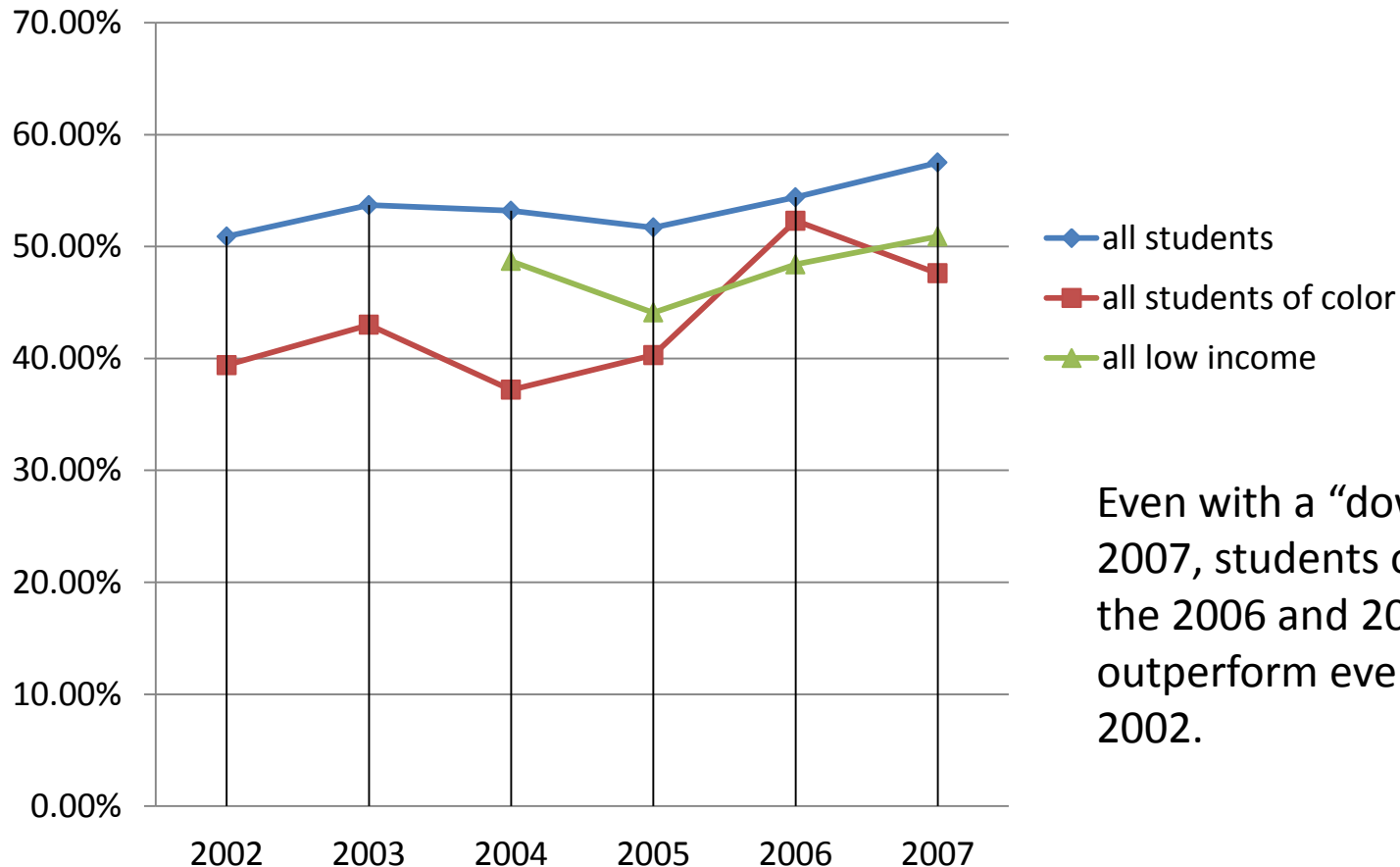
Full-time, First-time, 1st Year Retention



Because there are fewer students of color (121 in 2004, but 262 in 2012) the student of color retention curve is expected to be more variable year to year.



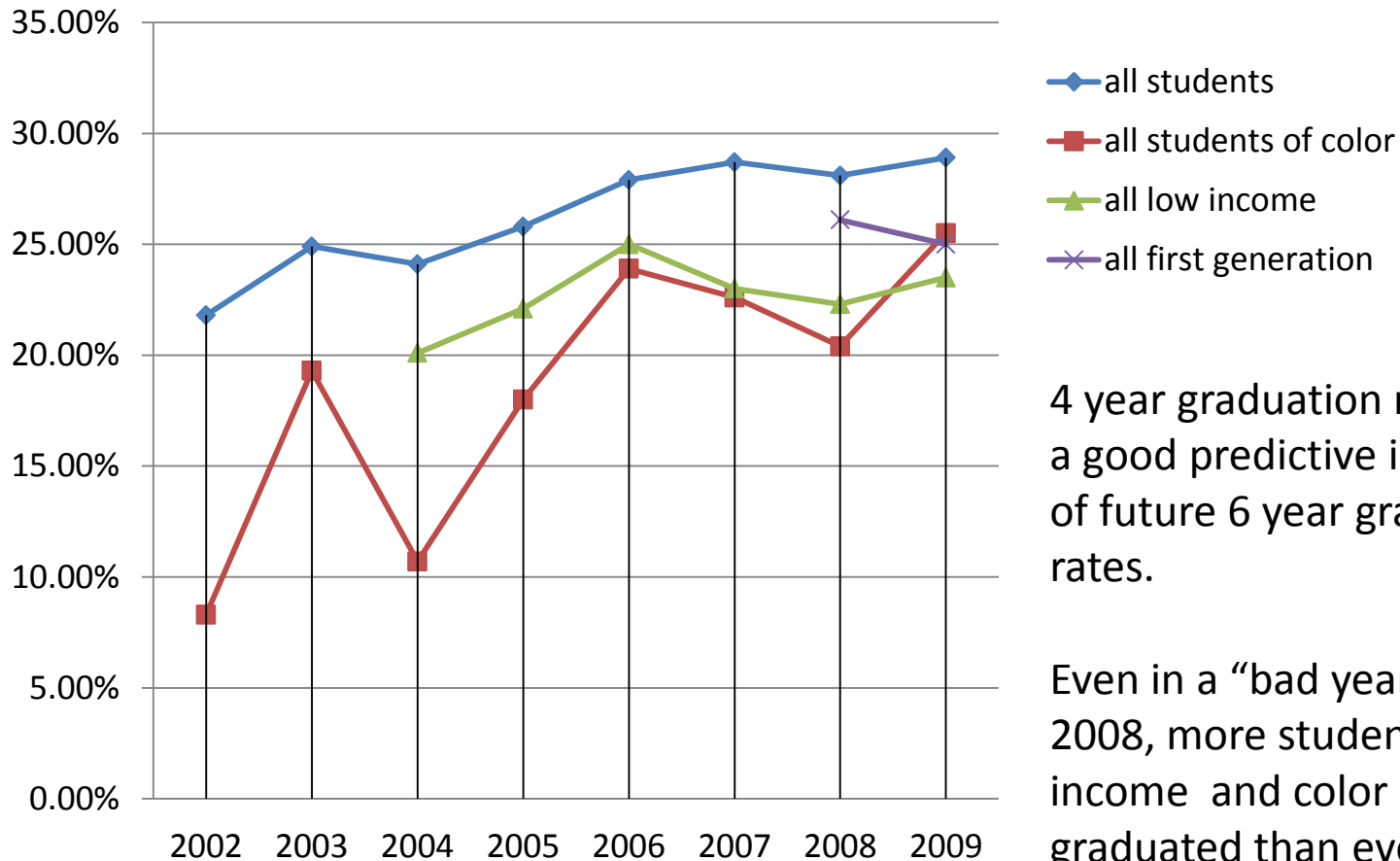
6 Year Graduation Rates



Even with a “down-tick” in 2007, students of color in the 2006 and 2007 cohorts outperform every year since 2002.



4 Year Graduation Rates



Deep, class-level work is the BSU

DATA FRONTIER



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Fall 2011 to 2012 retention by course grade

Course (Fall 2011)	Overall Retention of Majors	B- or better	C- or better	D, F, W, I	DFWI Rate for Majors
BIO 121	72%	87%	77%	39%	18%
CHEM 141	74%	84%	83%	25%	11%
MATH 161	60%	87%	78%	8%	26%
PHYSICS 243 / 244	73%	75%	80%	0%	9%
COMP 151	46%	62%	63%	15%	35%
Total	65%	82%	76%	27%	22%



More Details, Biology 121

- First to implement SLA
- Cleanest change – lecture remains same, added SLA
- SLA is 75 minute, group of 8, peer-led SLA
- Some focus on note-taking



Biology 121 Student Population

	Fall 2008	Fall 2009	Fall 2010	Fall 2011
Enrollment	89	107	109	135
Biology Majors and (%)	62 (70%)	80 (75%)	74 (68%)	102 (76%)
Incoming SAT-Math 25% - 75% quartiles	480-560	470 – 580	460-580	460-550
Women and (%)	60 (67%)	67 (63%)	73 (67%)	84 (62%)
First-Time, Full-Time Freshmen and (%)	52 (58%)	67 (63%)	57 (53%)	85 (63%)
Minority and (%)	12 (13%)	26 (24%)	25 (23%)	42 (31%)



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DFWI Rates: Biology 121

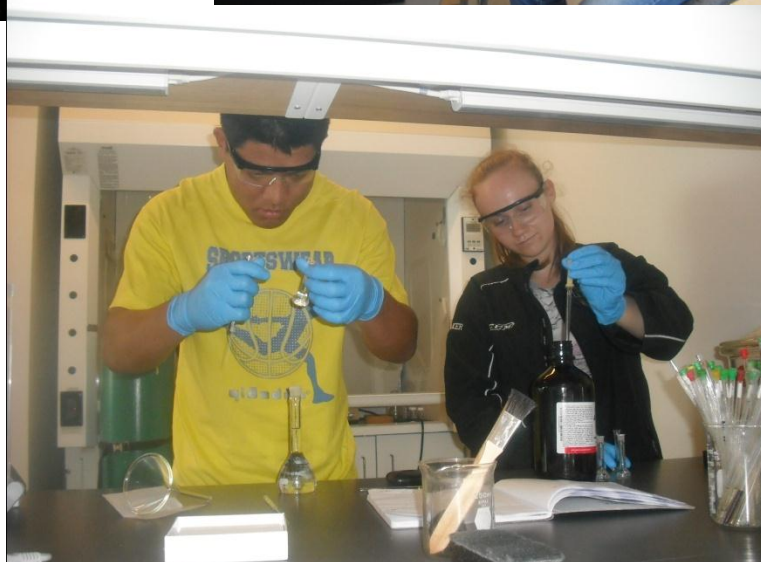
	N (pre / post SLA)	DFWI % Drop	AB % Gain
All Students	(196/244)	13.4%	13.2%
Men	(69/87)	9.7%	17.4%
Women	(127/157)	15.4%	10.8%
Students of Color	(38/67)	8.9%	-0.6%
Biology Majors	(142/176)	10.12%	13.27%
Freshmen	(119/142)	12.08%	11.48%

In bold red, changes significant at the $p < 0.05$ level.

The low number of men and students of color reduces the significance in the DFWI reduction.

The performance of students of color remains a concern.





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