

Impact of Supplemental Instruction on Students in STEM Courses

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STEM Education Institute

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Supplemental Instruction Courses

- Support difficult **courses**, not high-risk **students**
- Peer facilitators
- Supplemental material/problems
- Embedded study and learning skills
- Cooperative learning
- Voluntary attendance

Findings from Literature

- Increases in course grades
- Decreases in D/F failures
- Higher retention rates – money savings
- Lower SAT/ACT than non-takers
- Benefit both genders, all races/ethnicities

San Francisco State University

- Urban campus
- Most students commute
- ~23,000 Undergraduates, ~6,000 Graduates
- 33% White, 25% Asian, 40% Various URM
- No doctoral programs (only master' s)
- Majority have outside jobs
- Average over 5 years for graduation

Supplemental Instruction at SFSU

- Began in 1999
- 22 different courses in 4 departments
- 500-600 students/year in recent years
- Up to 40% of some classes in SI
- SI courses in catalog
- Funded through NIH MORE grant; no institutional support

Impact of Supplemental Instruction at SFSU

- Higher course performance (passing and progressing)
- Takers tend to come to SFSU with weaker academic indicators
- Higher rates of taking subsequent courses in the discipline.
- Women take more but men, when they show up, benefit more
- Performance levels for URM students taking SI reach and often surpass non-SI takers
- URM students participate in SI more than students from other racial/ethnic groups

Data Description

Data collected from institutional records:

- Grades, semesters, & SI status for all STEM classes Fall 1992-Spring 2005
- Demographics: SAT, high school GPA, race/ethnicity, gender, major

Limitations of data analysis:

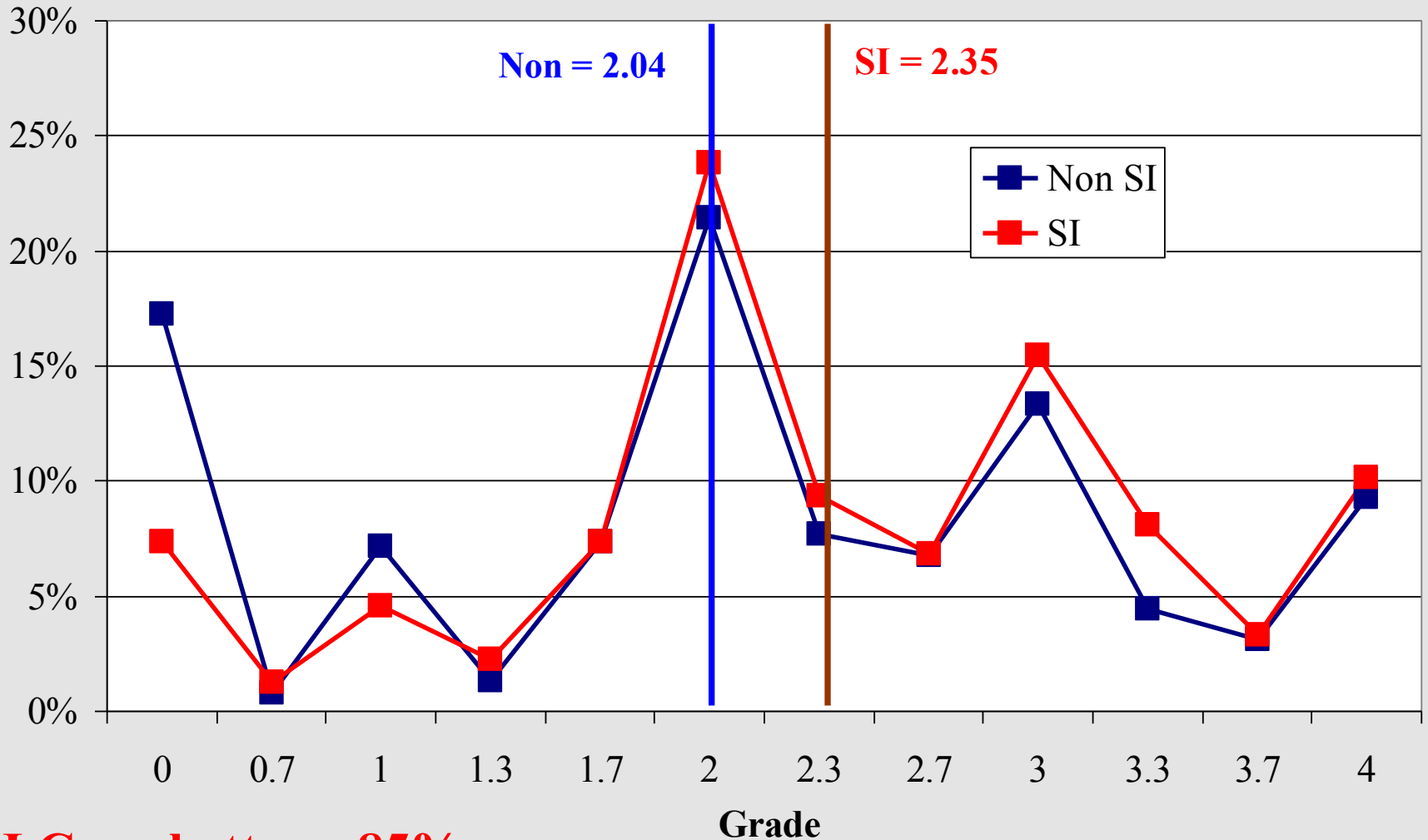
- Excluded if did not receive grade in SI or supported course
- Examined only last grade in class

Course Descriptions

Course	Semesters SI	N SI	N Non-SI
Introduction to Biology I	13	394	990
Genetics	11	195	568
General Chemistry I: Concepts	10	278	1511
Organic Chemistry I	11	209	626
General Physics I	12	113	1216
Calculus I	6	156	1195

Intro to Biology I

Intro Biology – Course Grades



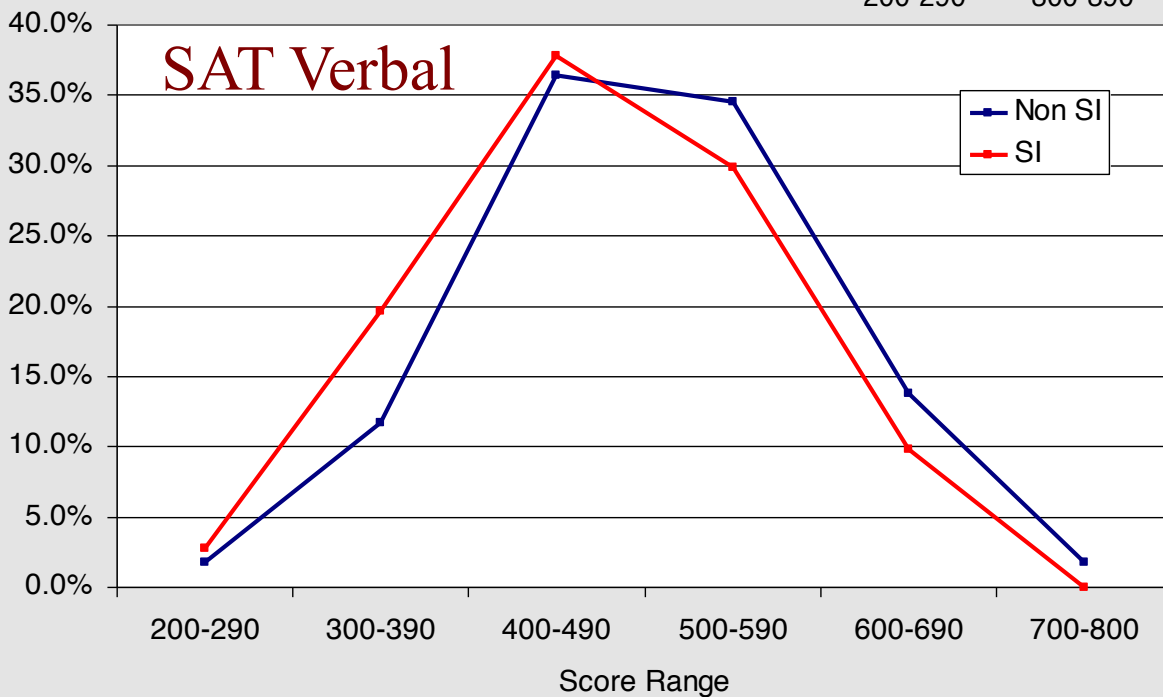
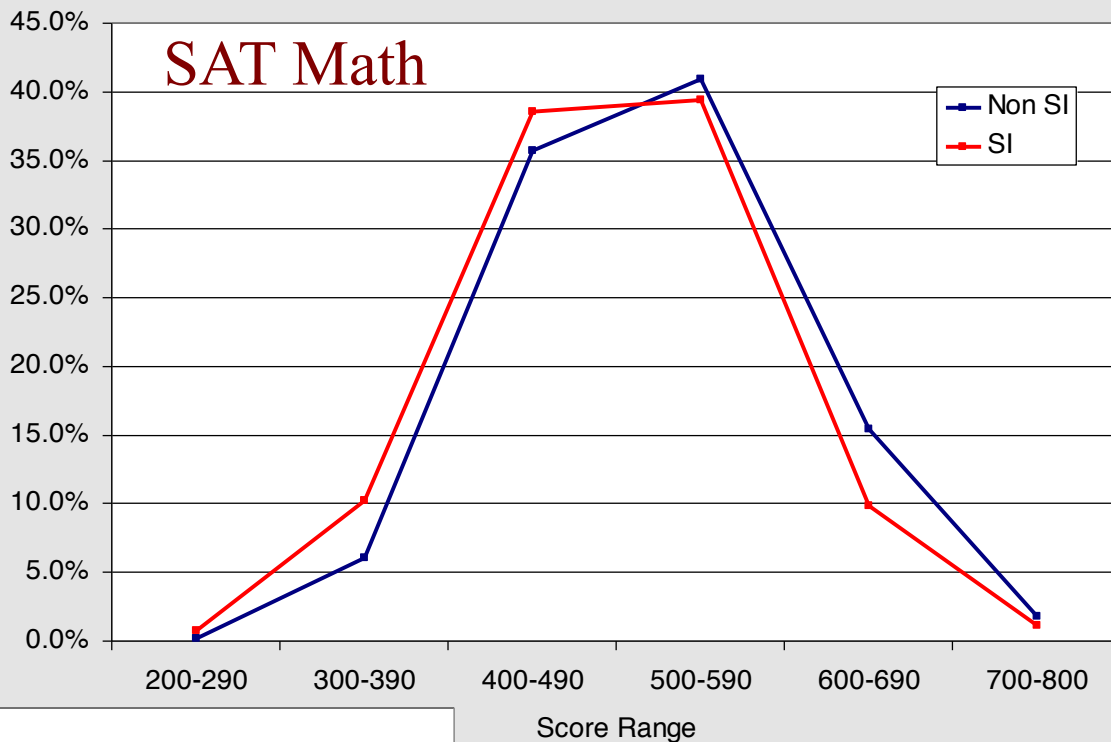
SI C- or better – 85%

Non C- or better – 73%

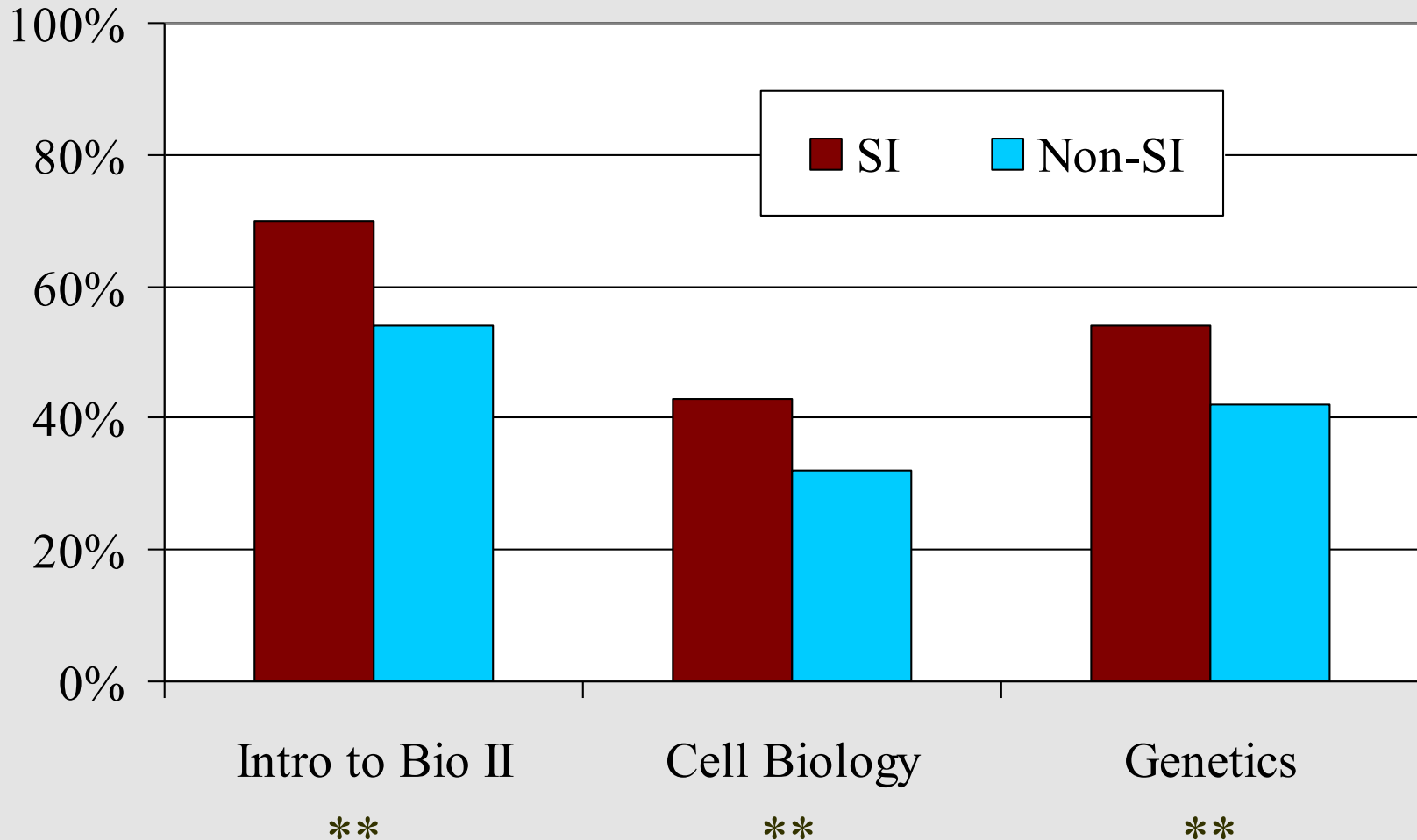
Intro Biology– Student Background

	SI	Non-SI
SAT I Math	492	518
SAT I Verbal	471	498
High School GPA	3.20	3.17

Intro Biology SAT Dist.

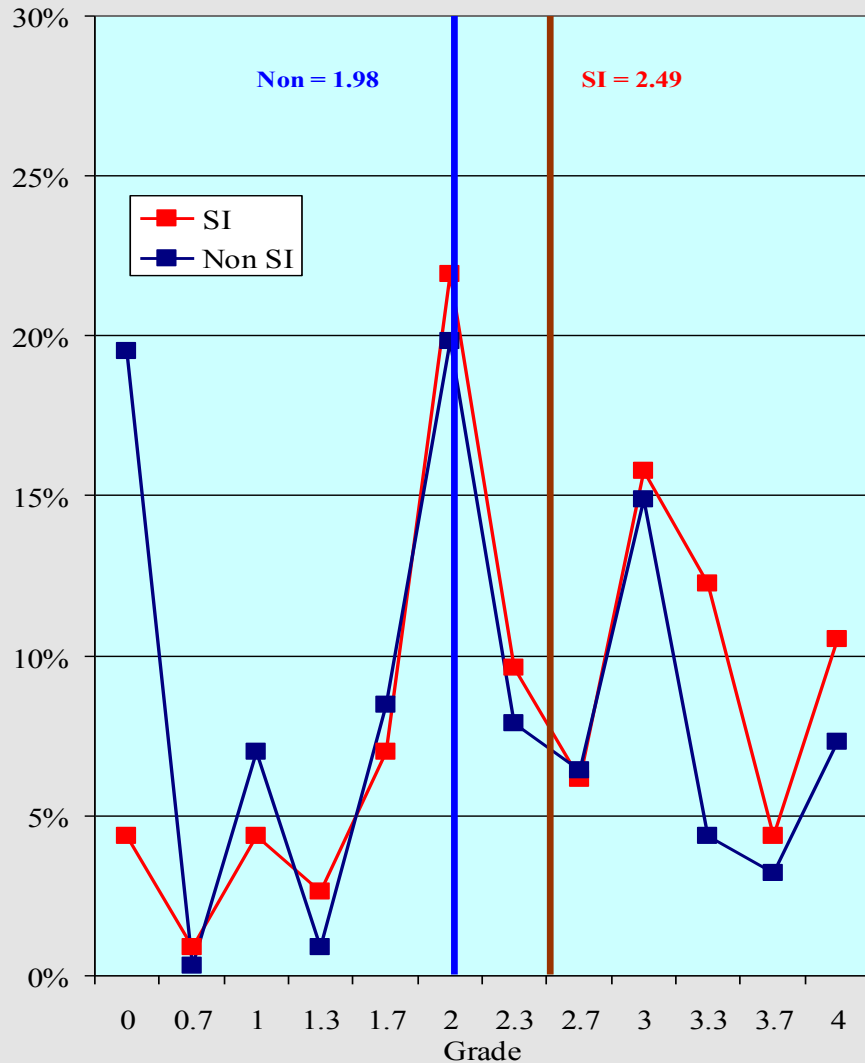


Intro Biology– Taking of Subsequent Classes

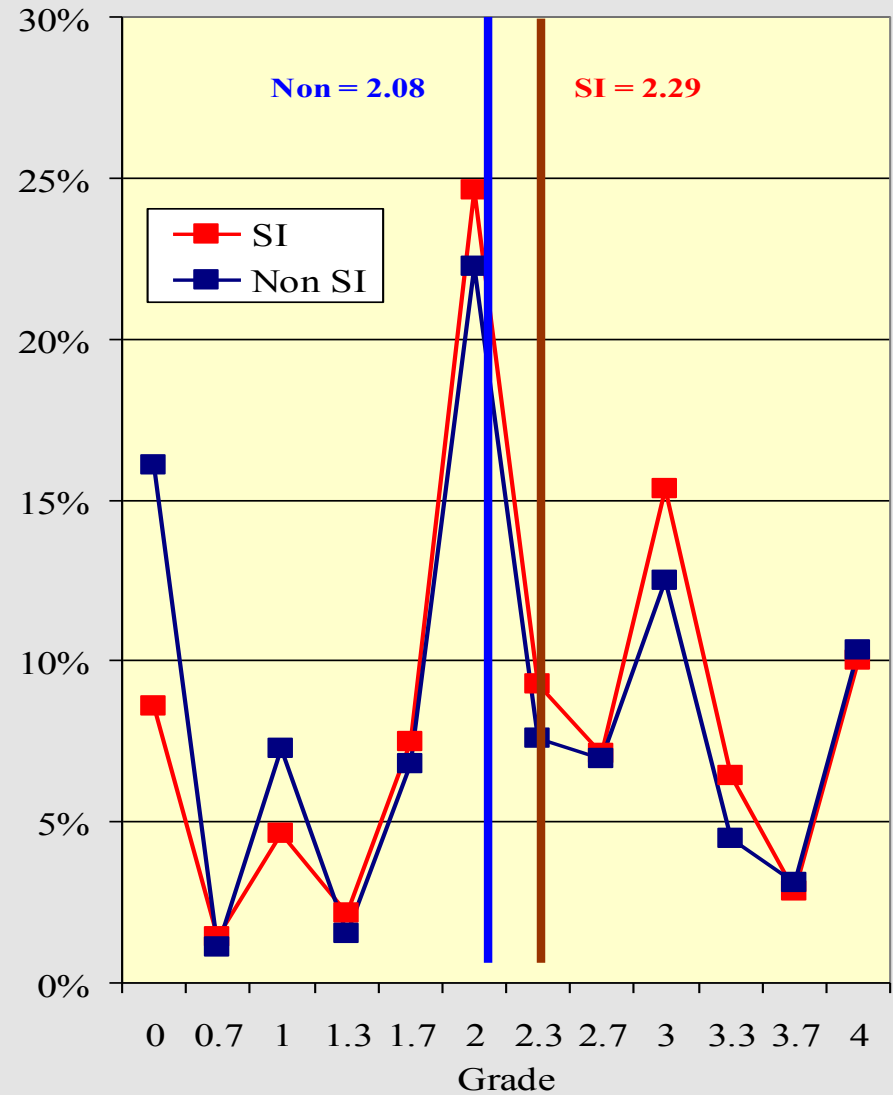


Intro Biology– Gender Differences

Males



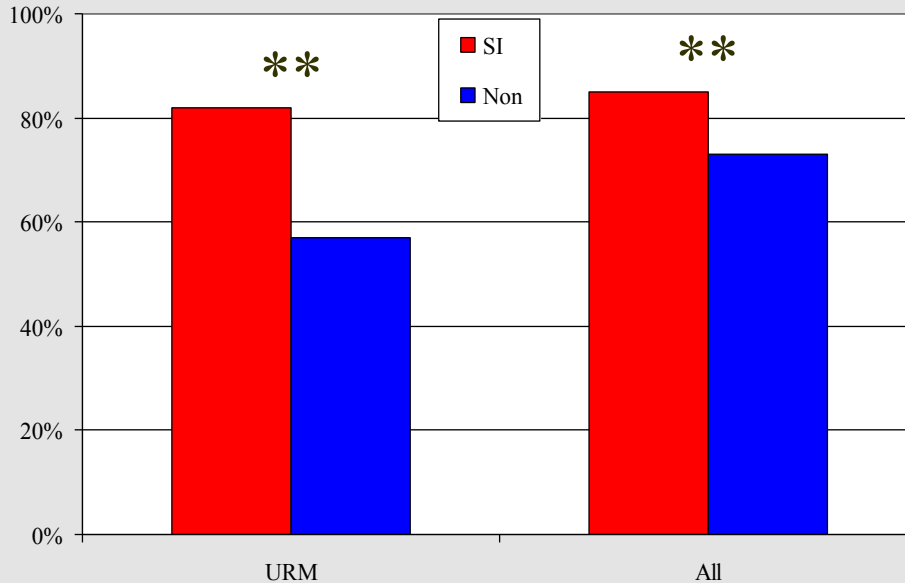
Females



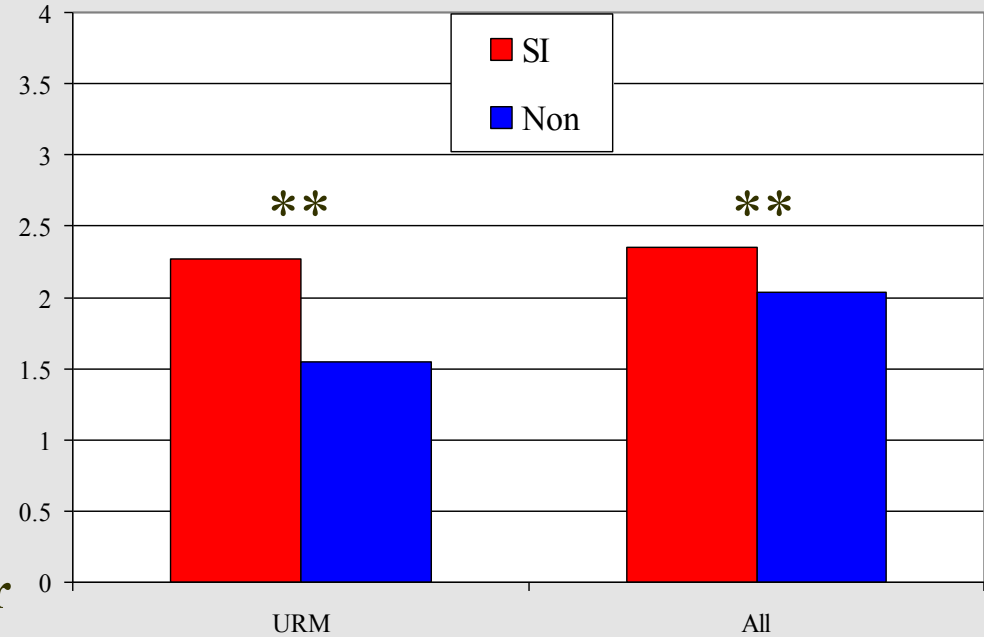
SI – 71% Females; Non – 65% Females

Intro Biology— Underrepresented Minorities

Proportion receiving C- or better

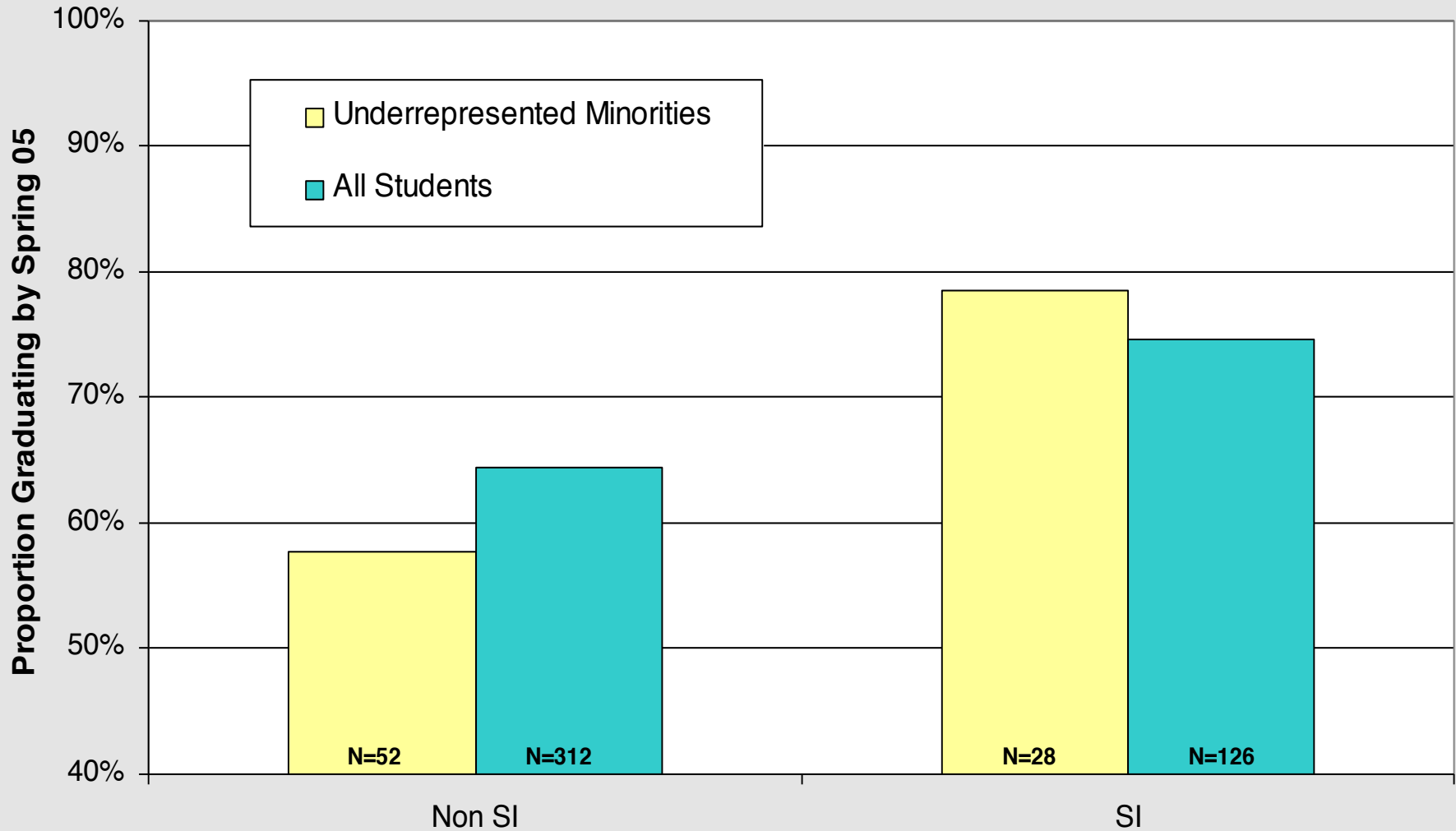


Mean grade in the class



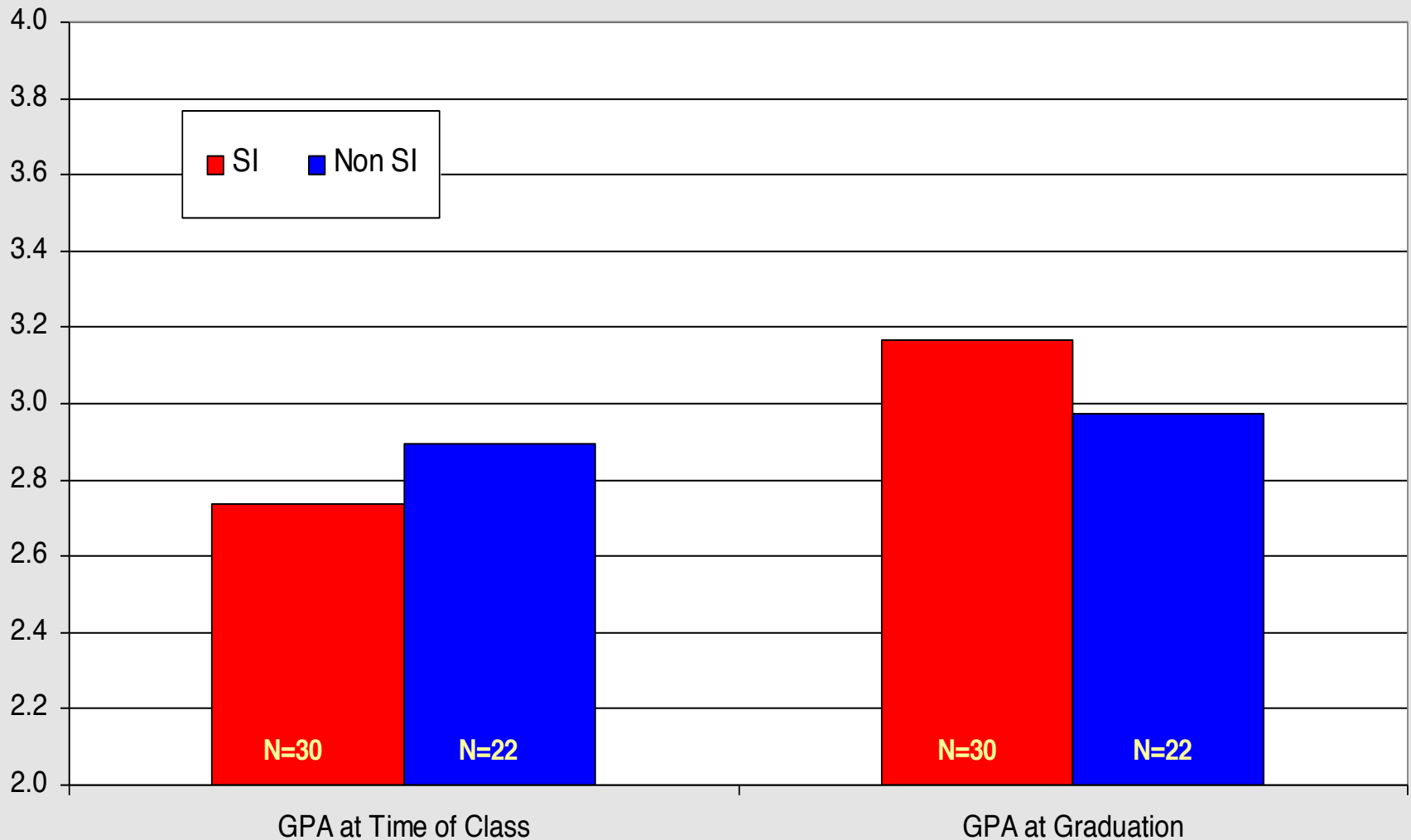
Graduation

Intro Bio SI Status: Minorities and All Students based on students enrolled Fall 99 – Spring 01



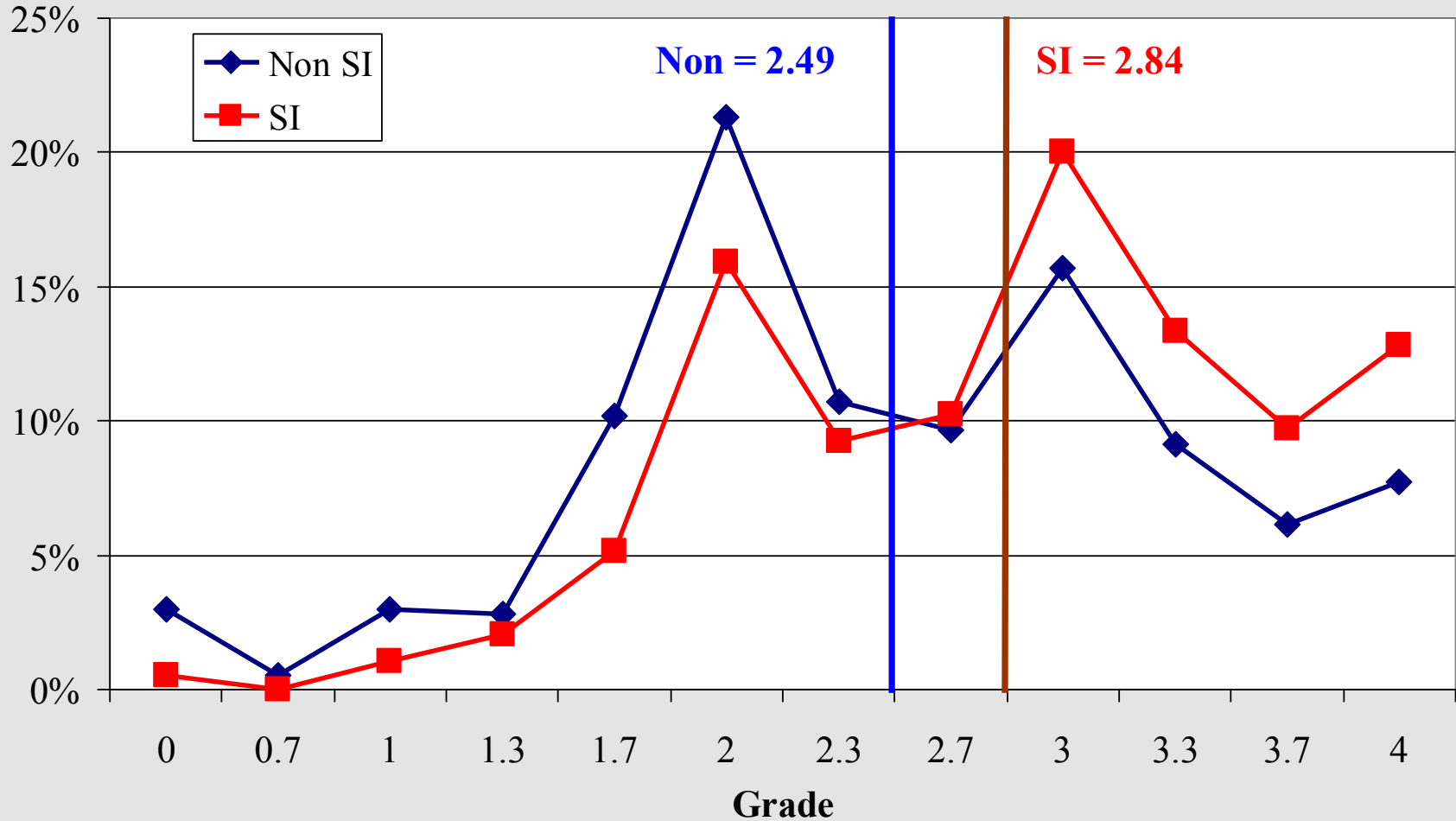
Minority GPA Changes by SI Status

GPA at time of taking Intro Bio and at graduation



Genetics

Genetics – Course Grades



SI C- or better – 96%

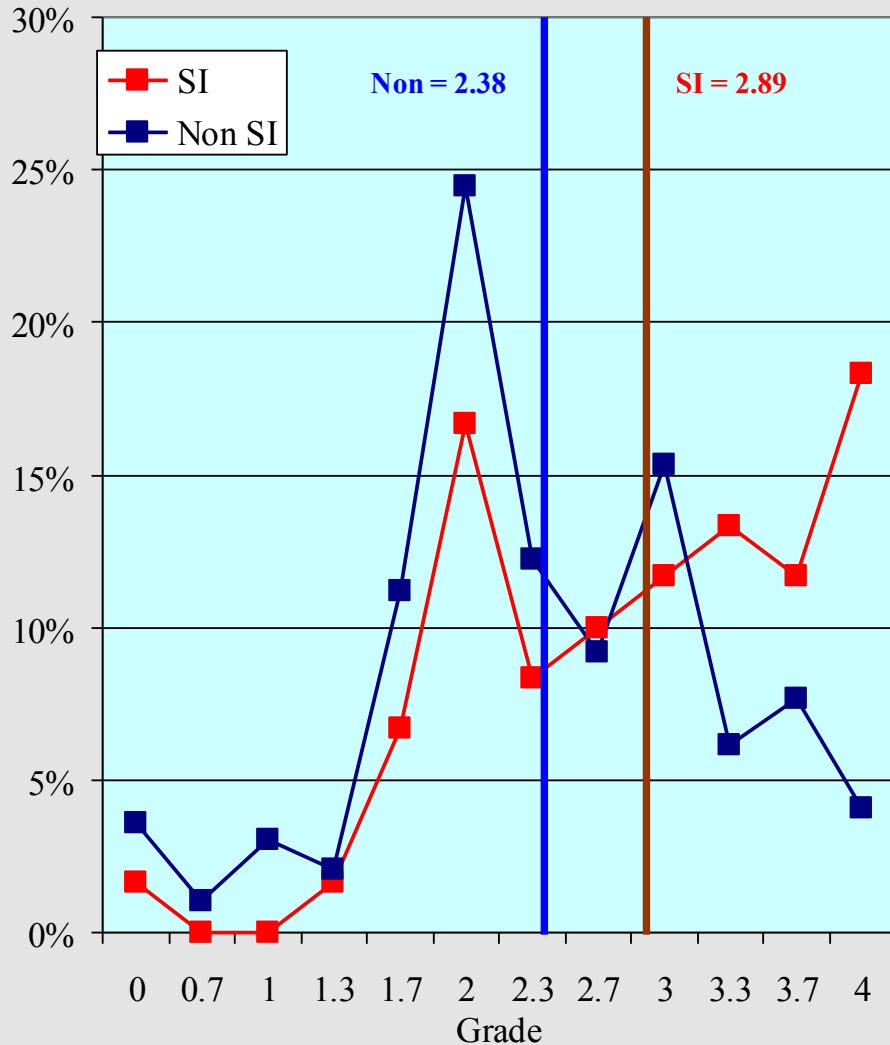
Non C- or better – 91%

Genetics – Student Background

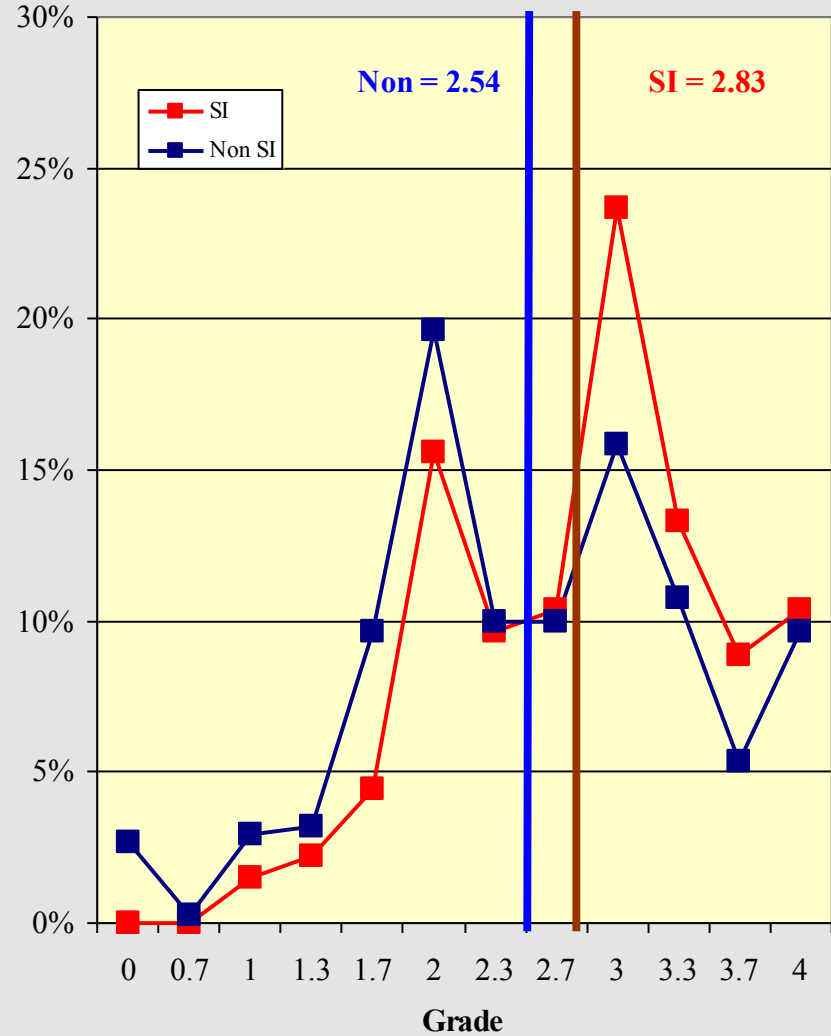
	SI	Non-SI
SAT I Math	514	517
SAT I Verbal	493	488
High School GPA	3.24	3.24

Genetics – Gender Differences

Males



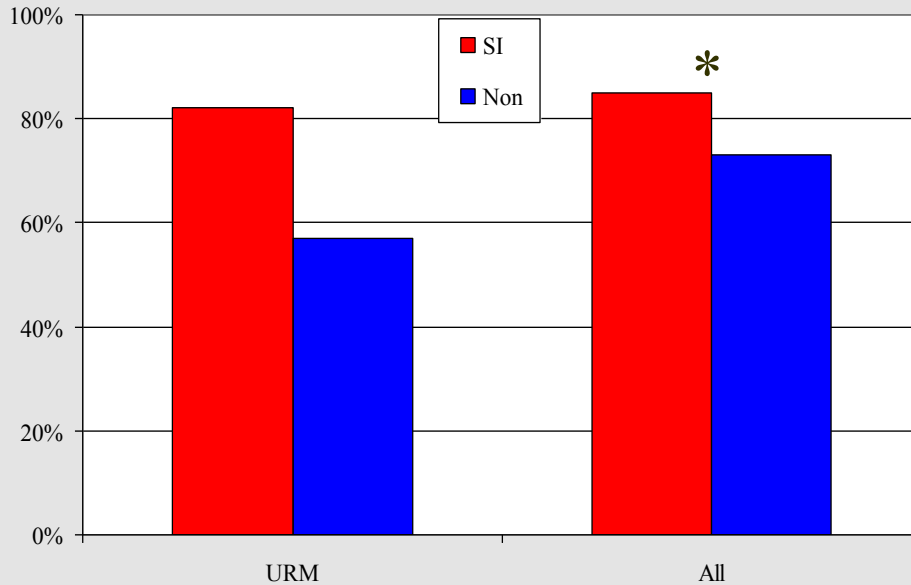
Females



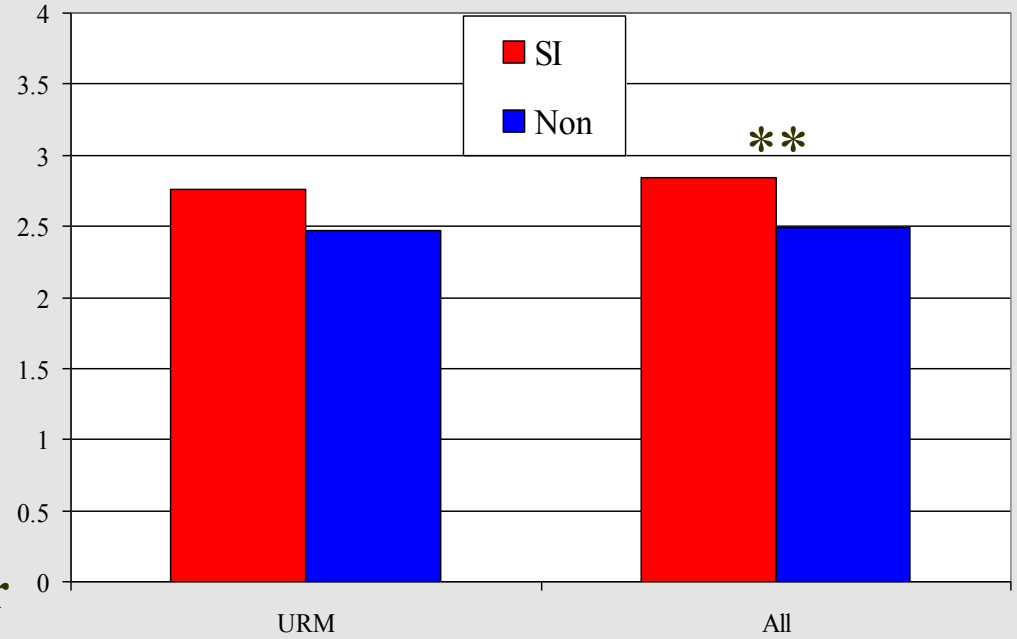
SI – 69% Females; Non – 65% Females

Genetics – Underrepresented Minorities

Proportion receiving C- or better

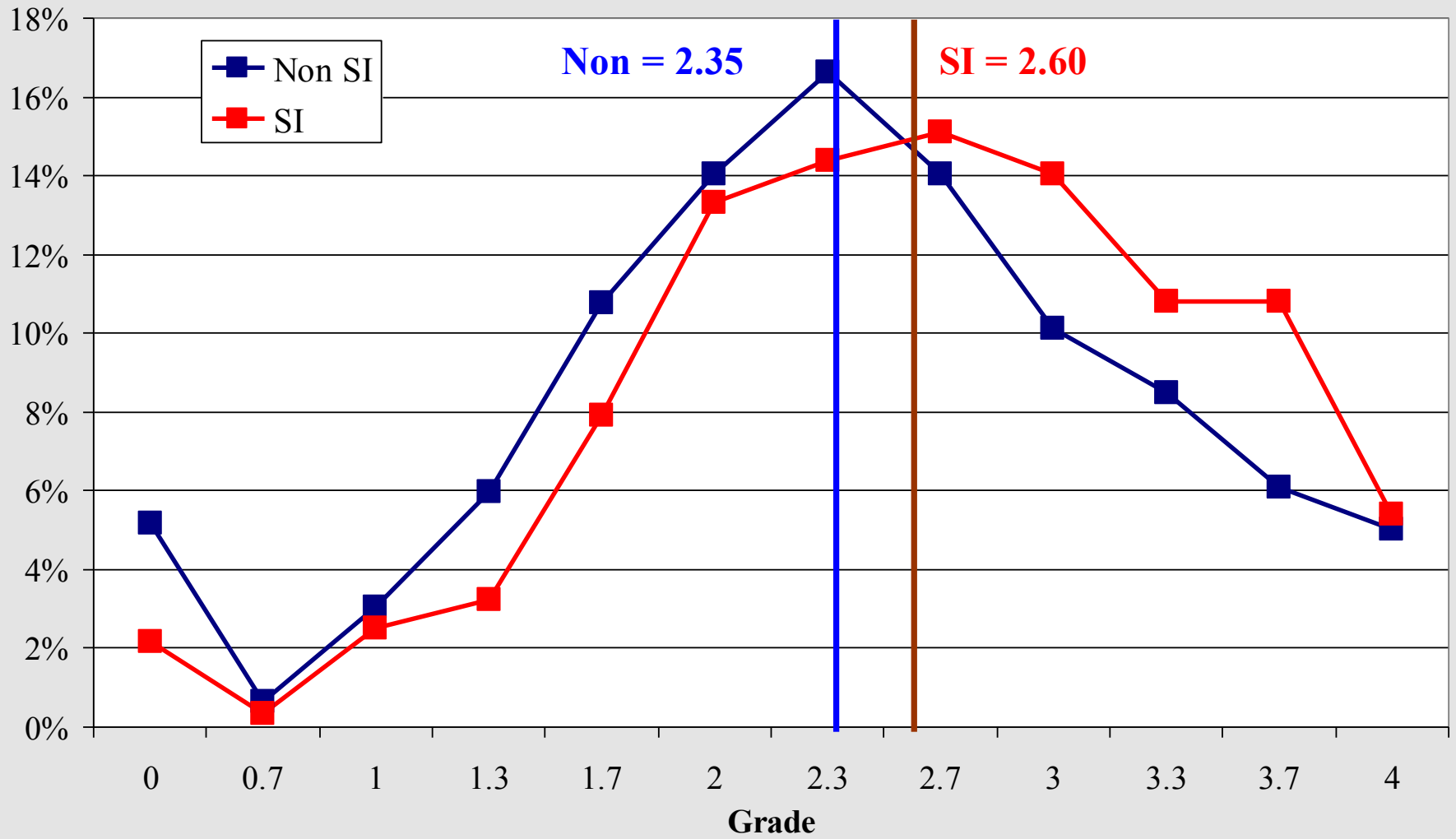


Mean grade in the class



Gen. Chem I: Concepts

Chem 1 – Course Grades



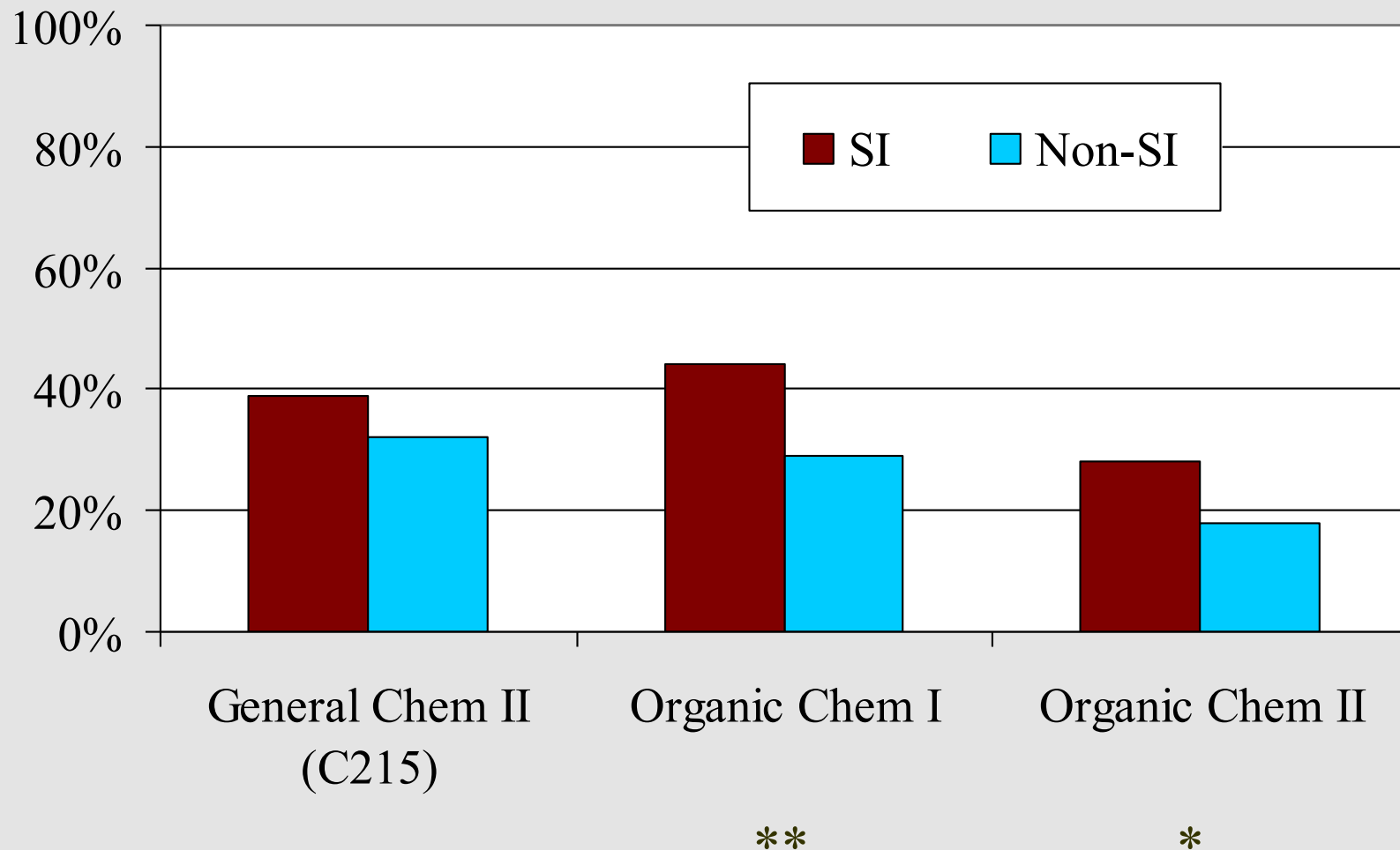
SI C- or better – 92%

Non C- or better – 85%

Chem 1 – Student Background

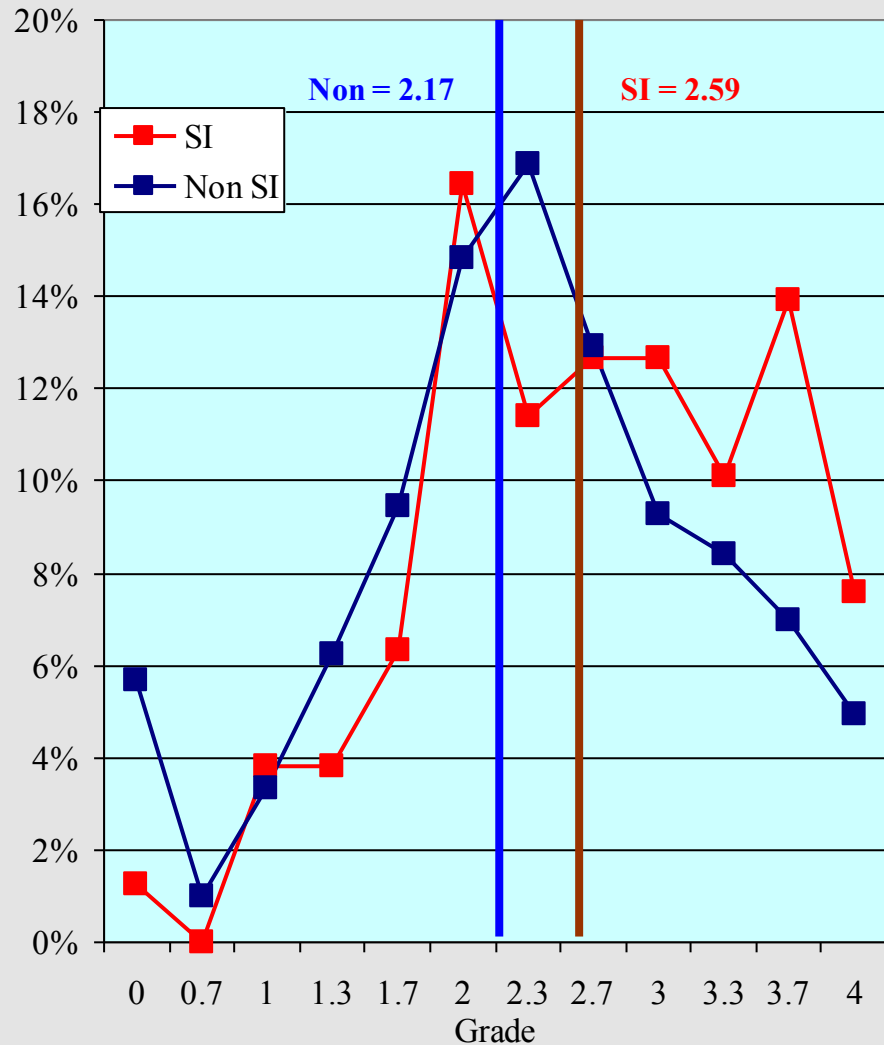
	SI	Non-SI
SAT I Math	488	523
SAT I Verbal	472	490
High School GPA	3.14	3.19

Chem 1 – Taking of Subsequent Classes

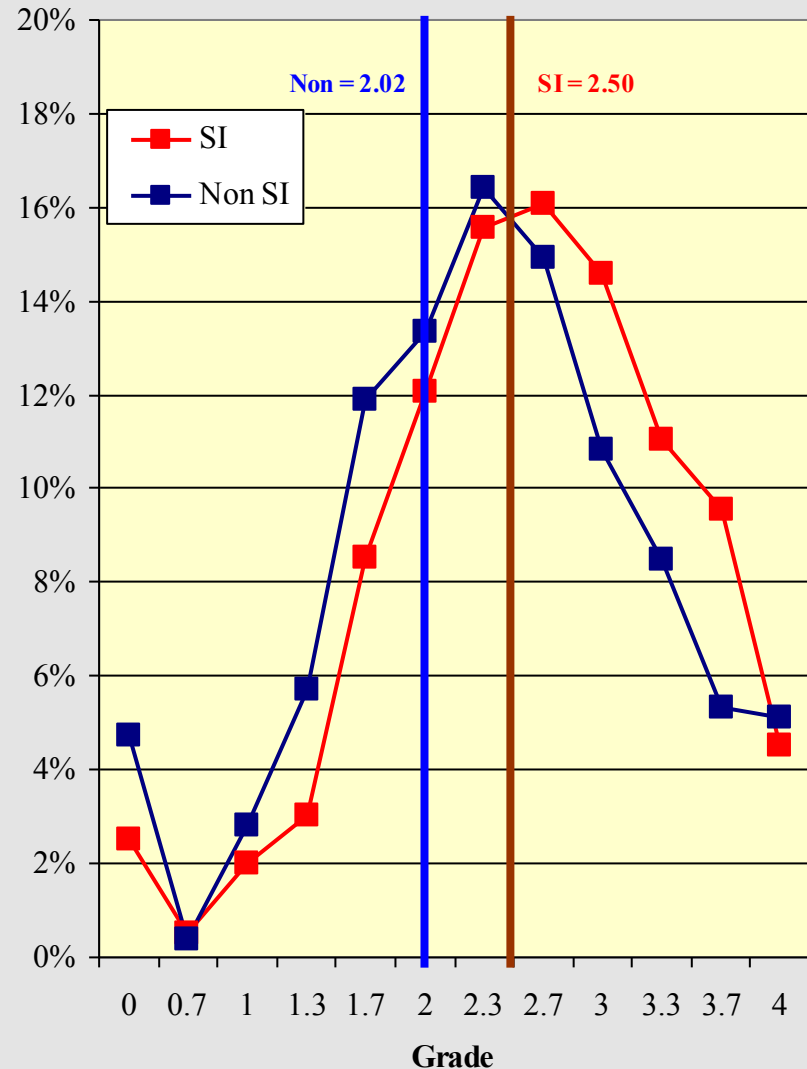


Chem 1 – Gender Differences

Males



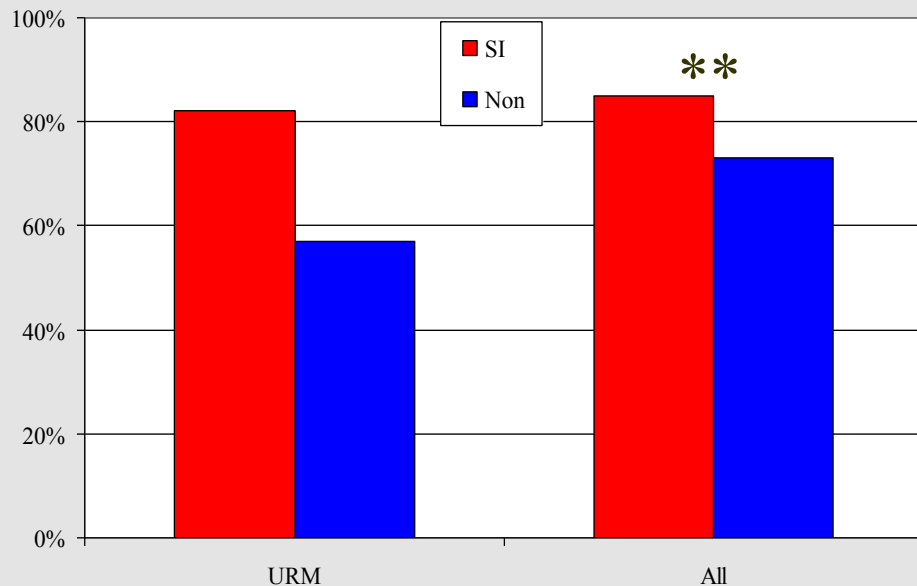
Females



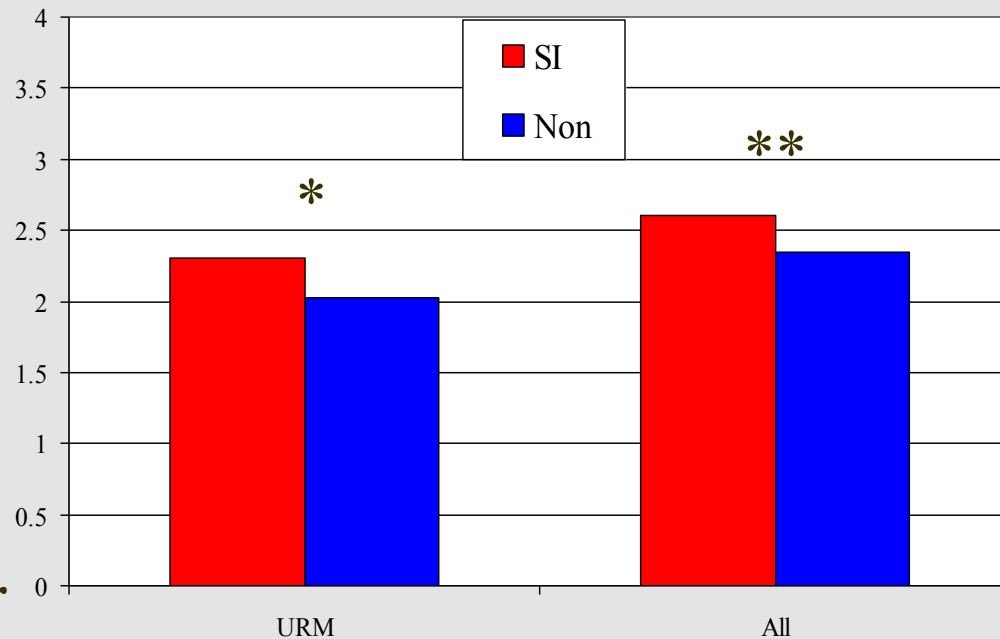
SI – 72% Females; Non – 54% Females

Chem 1 – Underrepresented Minorities

Proportion receiving C- or better

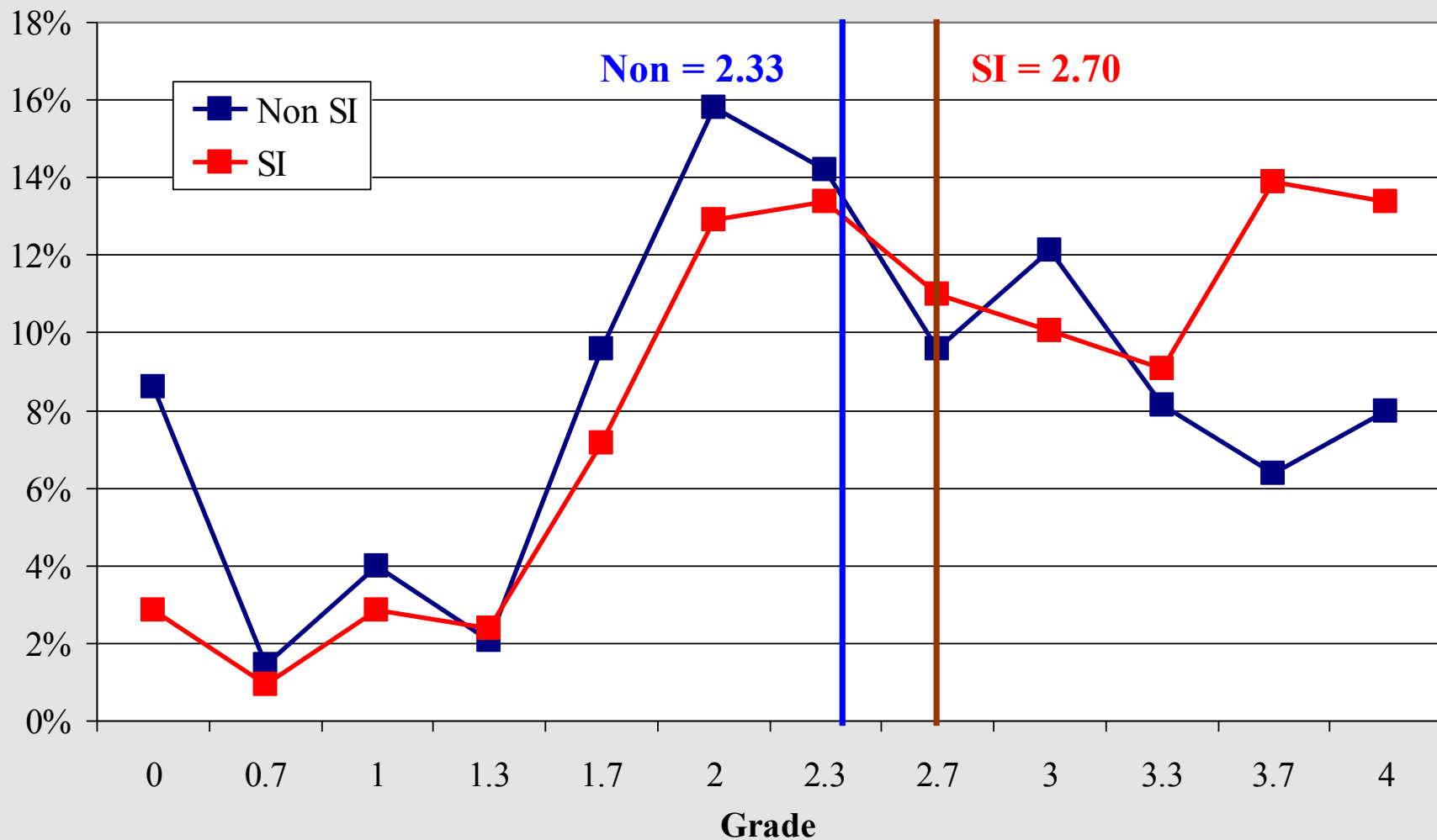


Mean grade in the class



Organic Chem I

O. Chem 1 – Course Grades



SI C- or better – 91%

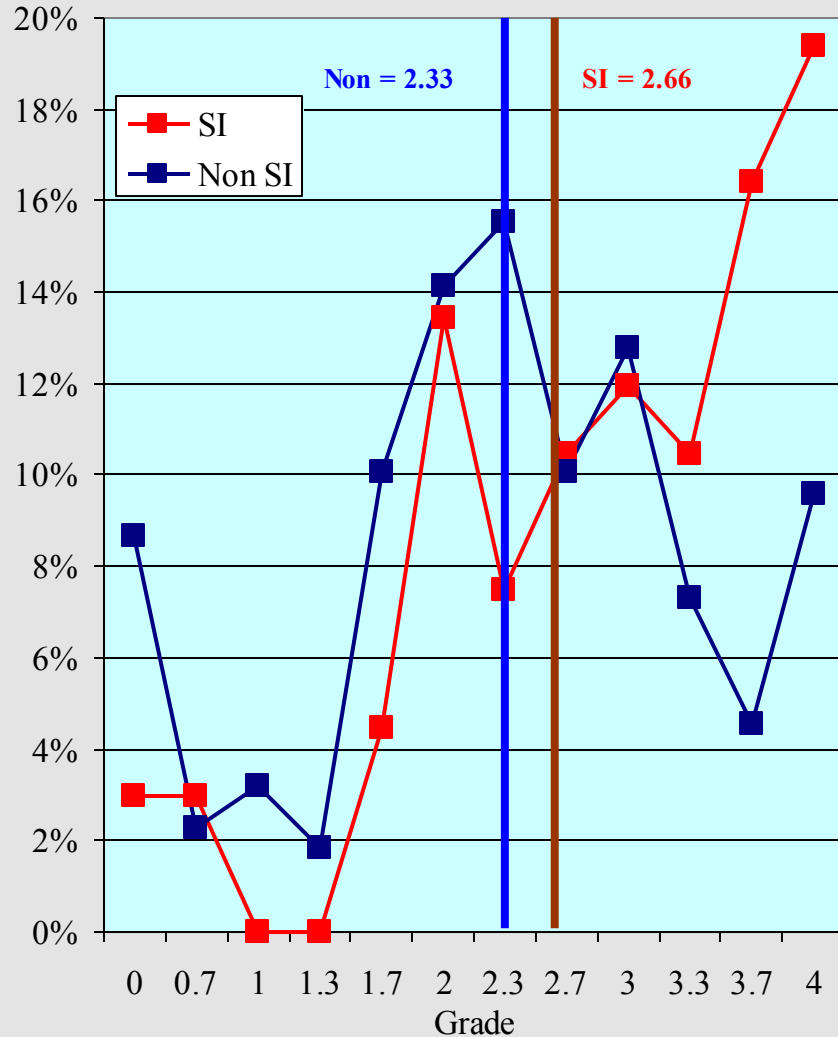
Non C- or better – 84%

O. Chem 1– Student Background

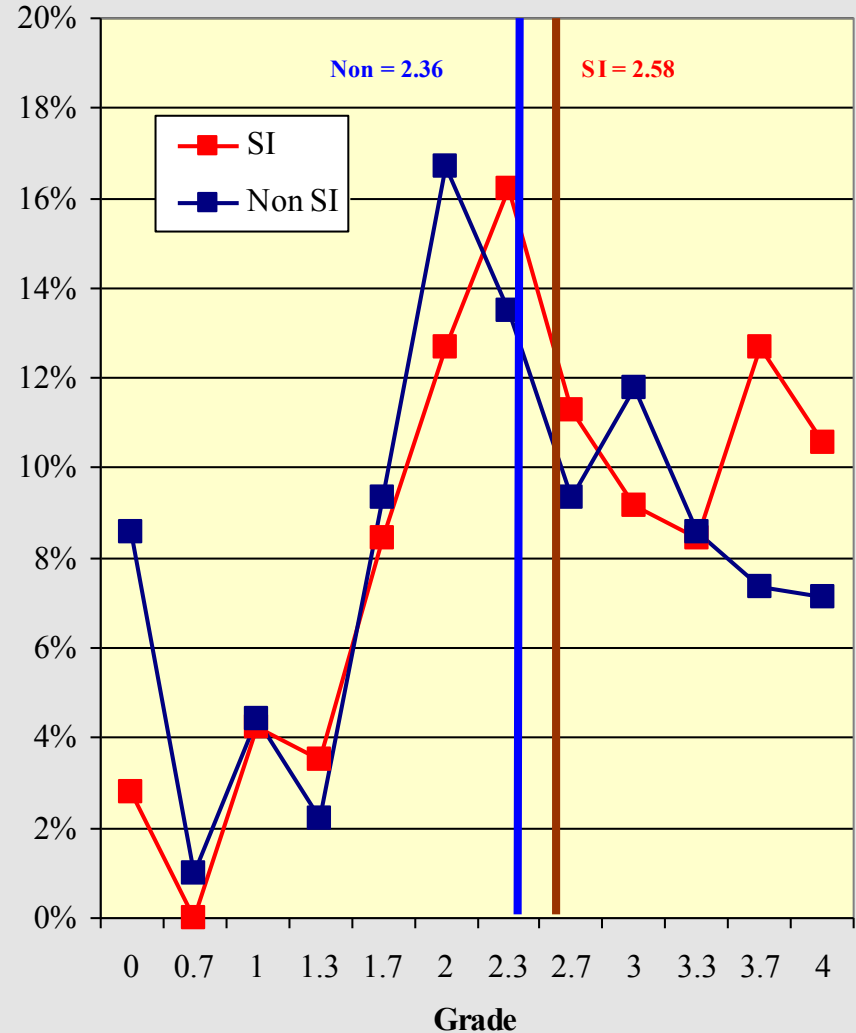
	SI	Non-SI
SAT I Math	500	529
SAT I Verbal	469	492
High School GPA	3.27	3.23

O. Chem 1– Gender Differences

Males



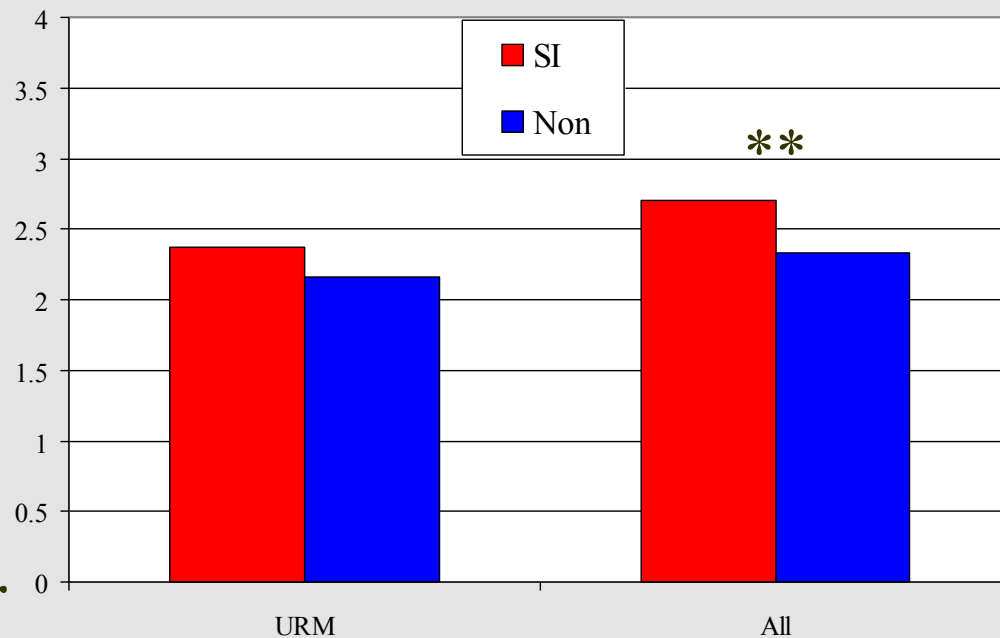
Females



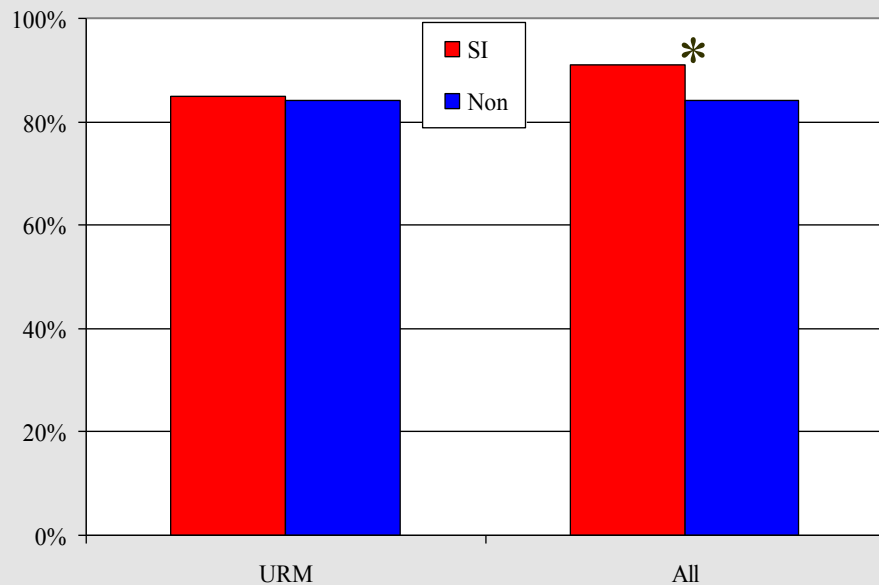
SI – 68% Females; Non – 65% Females

O. Chem 1– Underrepresented Minorities

Mean grade in the class

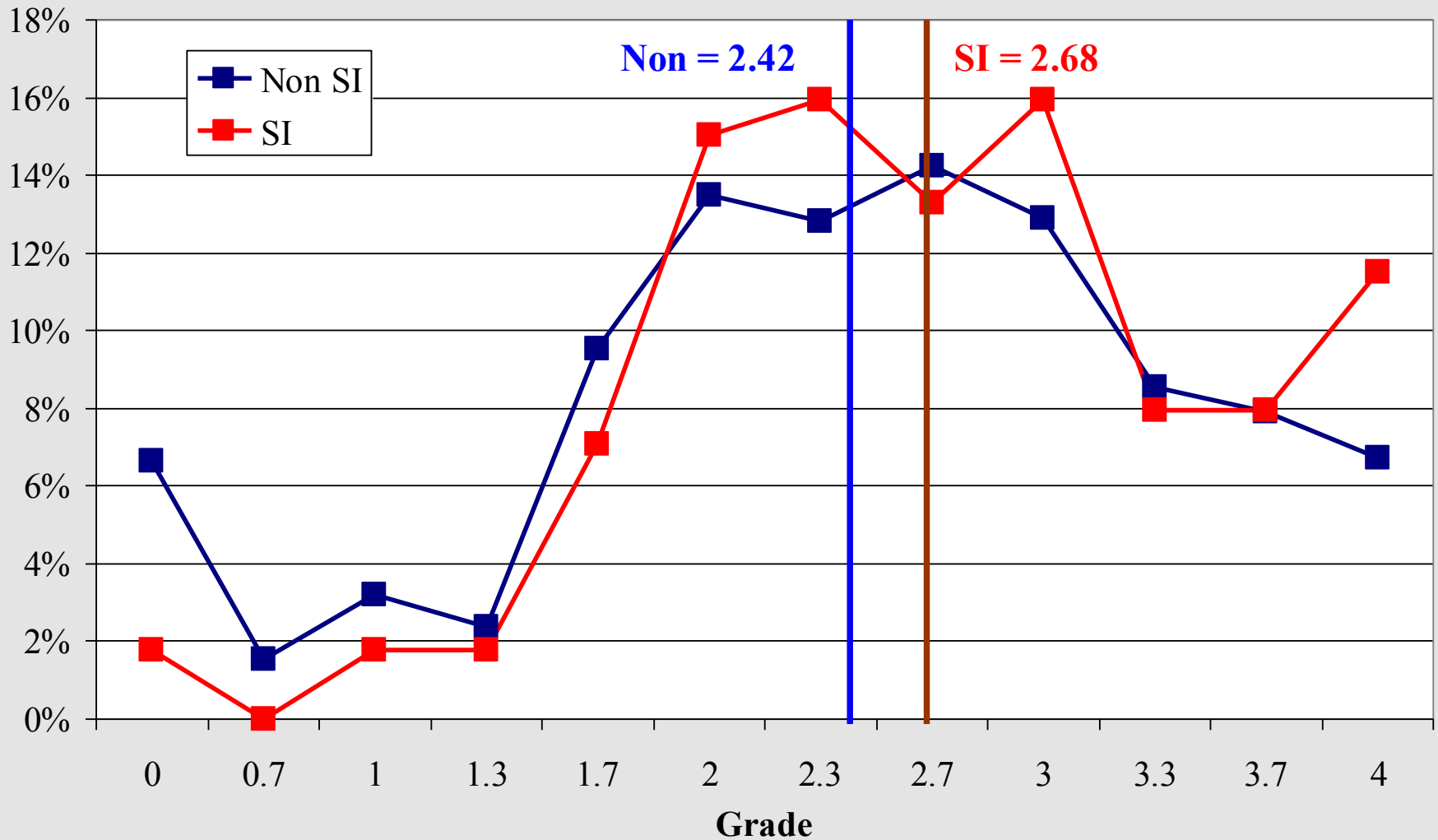


Proportion receiving C- or better



Gen. Physics I

Physics 1 – Course Grades



SI C- or better – 95%

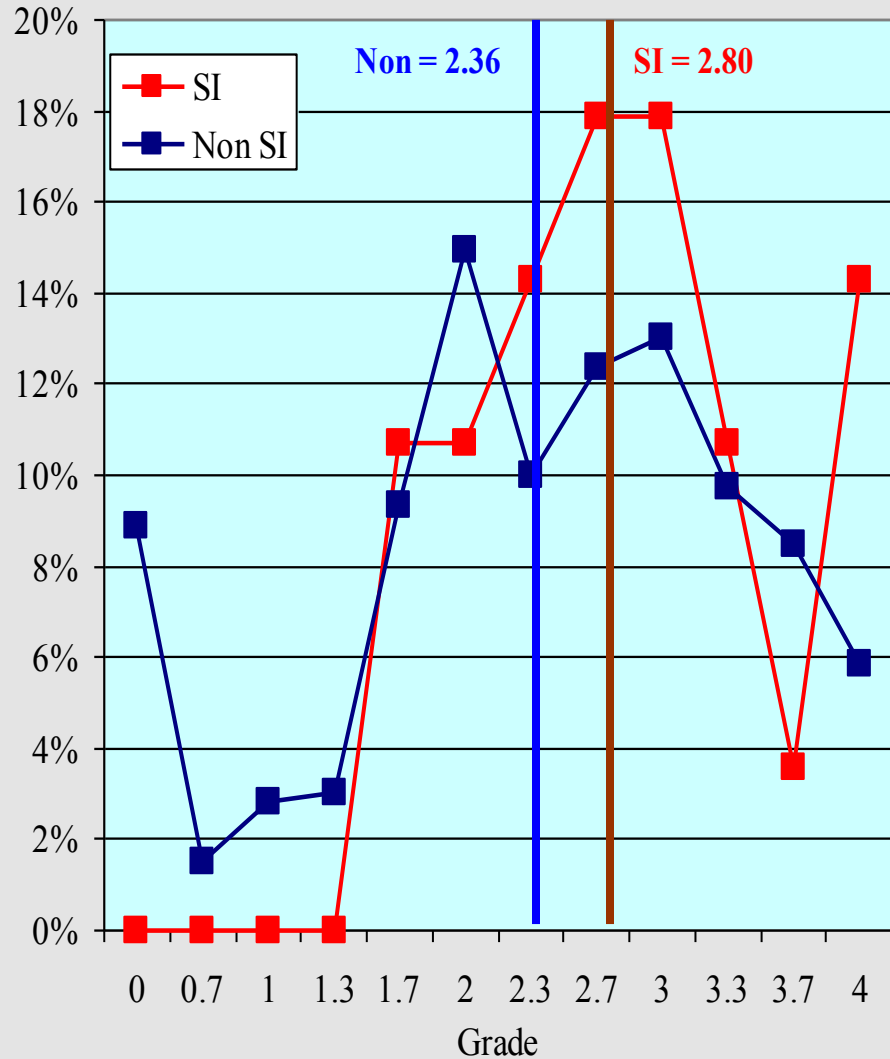
Non C- or better – 86%

Physics 1– Student Background

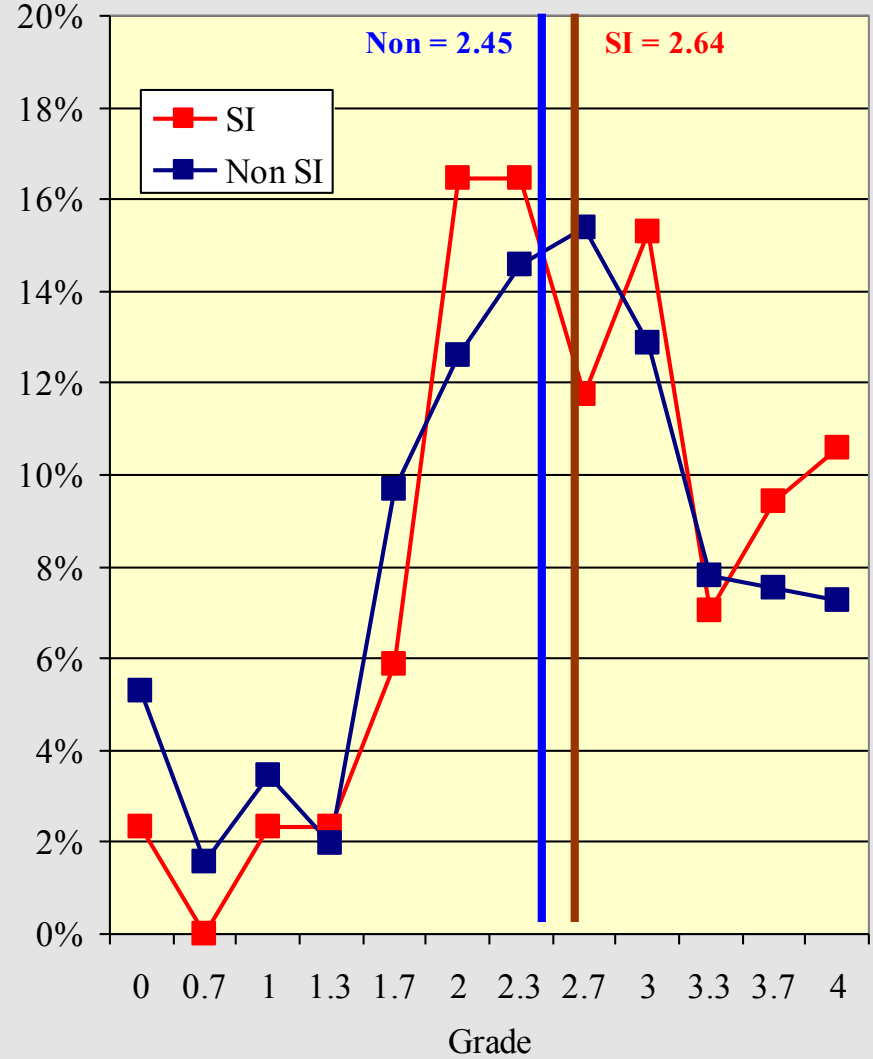
	SI	Non-SI
SAT I Math	487	526
SAT I Verbal	455	492
High School GPA	3.16	3.20

Physics 1– Gender Differences

Males



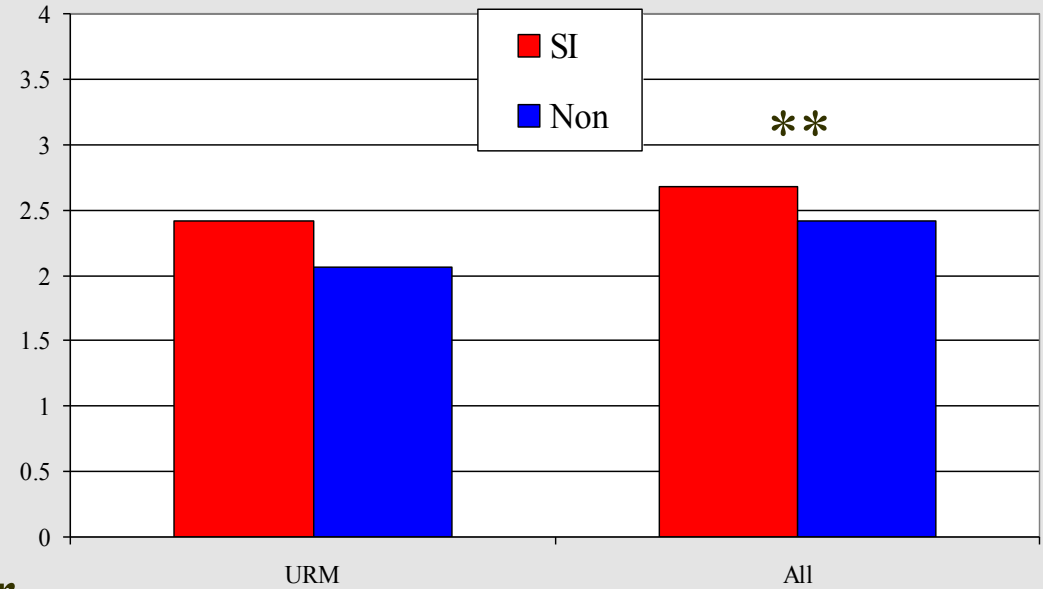
Females



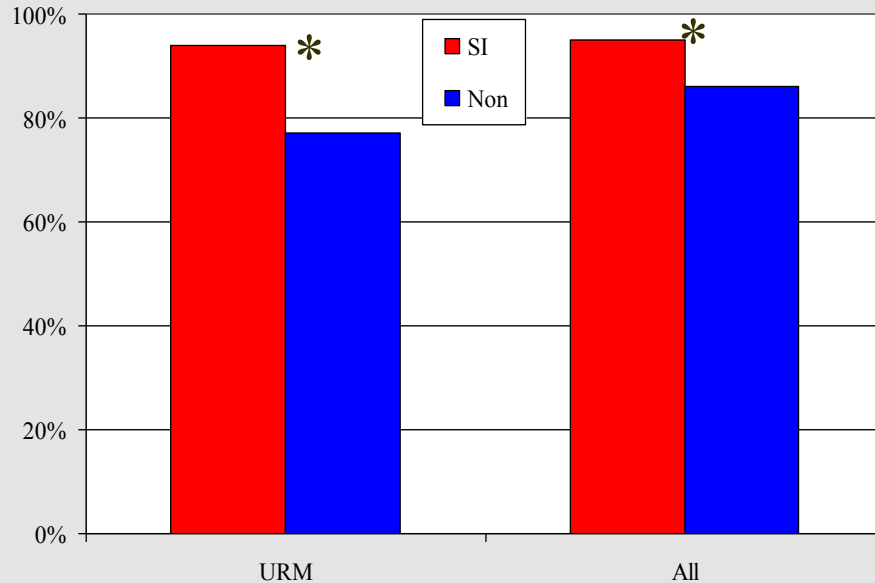
SI – 75% Females; Non – 62% Females

Physics 1– Underrepresented Minorities

Mean grade in the class

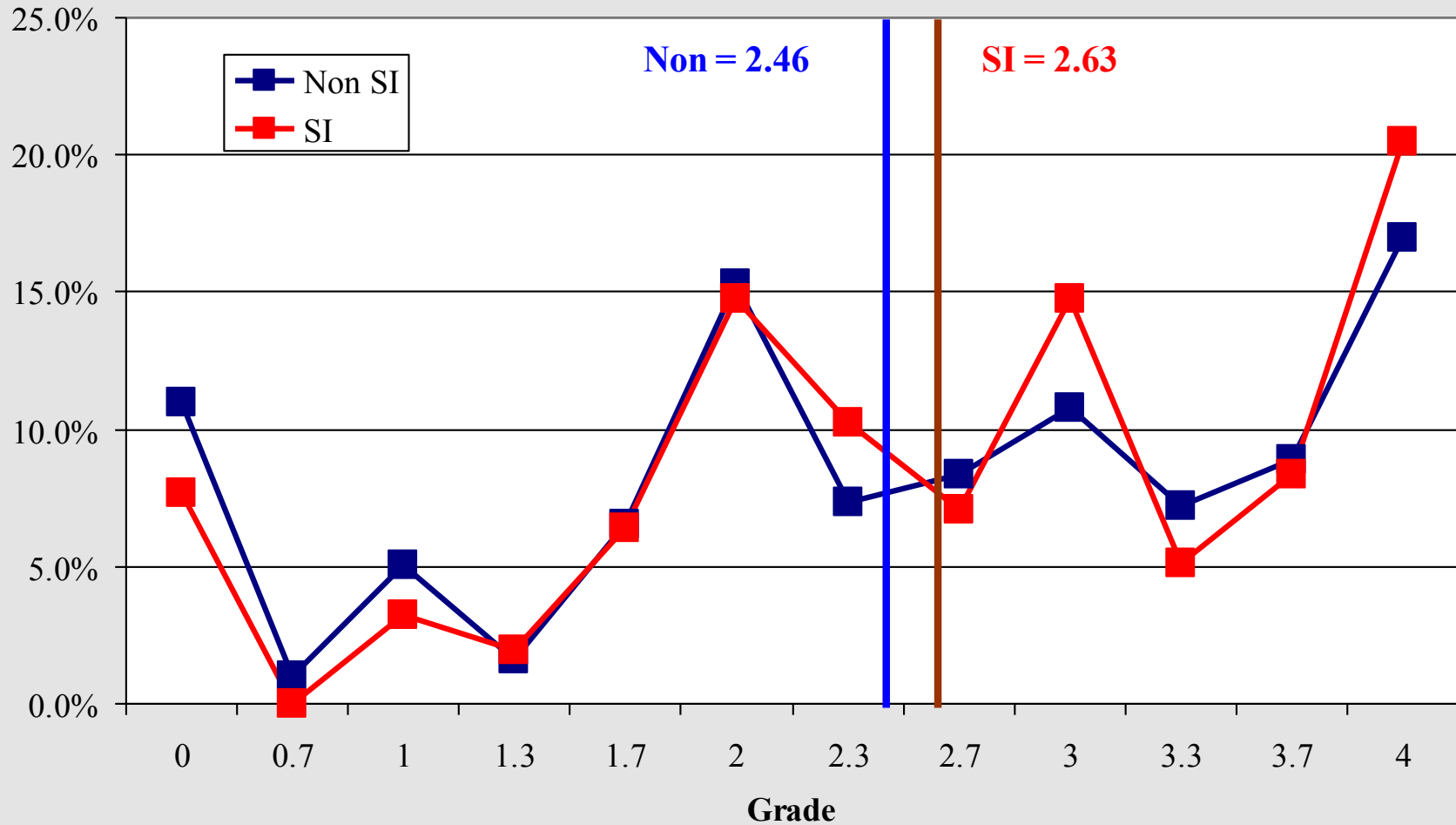


Proportion receiving C- or better



Calculus I

Calculus I– Course Grades



SI C- or better – 87%

Non C- or better – 81%

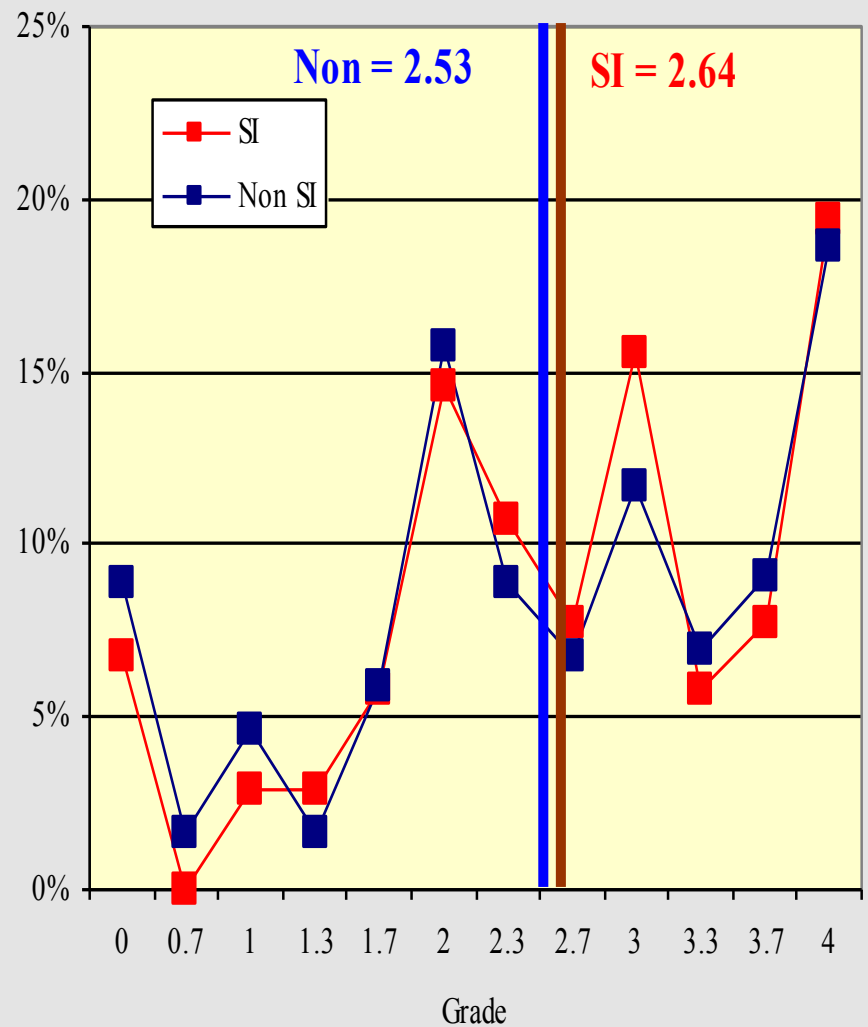
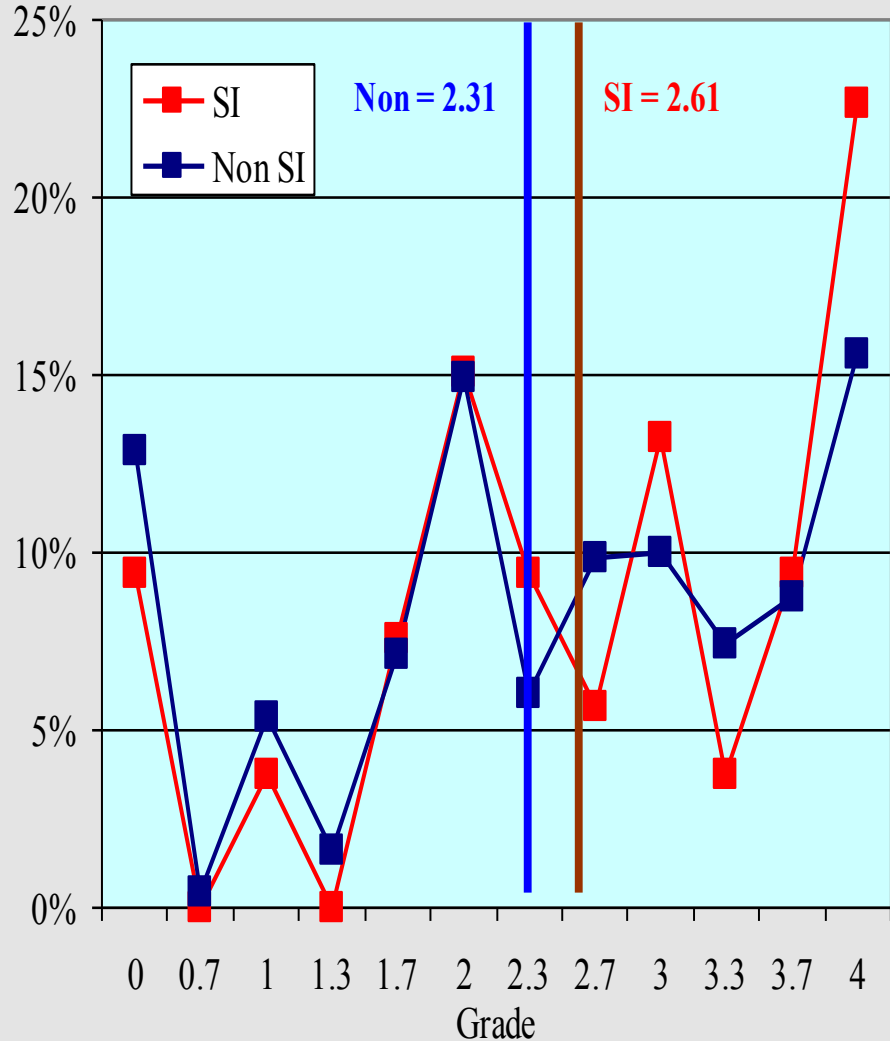
Calculus I – Student Background

	SI	Non-SI
SAT I Math	482	526
SAT I Verbal	466	480
High School GPA	3.14	3.20

Calculus I – Gender Differences

Males

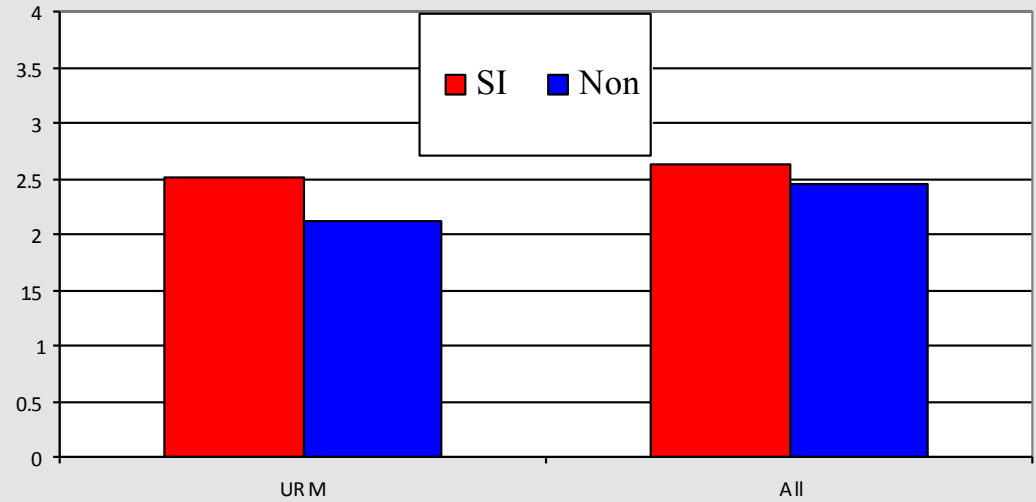
Females



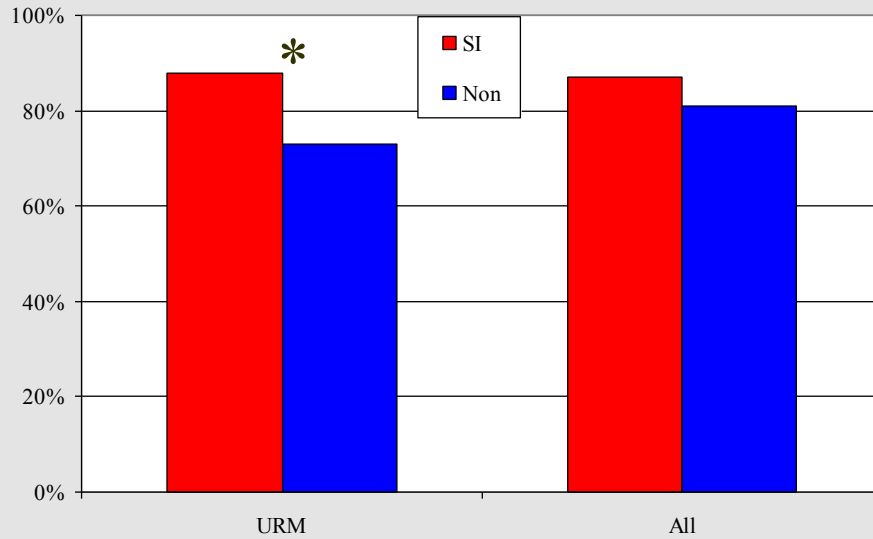
SI – 75% Females; Non – 62% Females

Calculus I – Underrepresented Minorities

Mean grade in the class



Proportion receiving C- or better



Cost Modeling

- ~\$115 per student
- Prevents **at least 170** students from D/F failing out over 5 years
 - Assumes failure rates equal to non-SI
 - Lower SAT would predict more
- Suggestion that retention rate changes higher than this
- Savings in lost tuition, recruitment

Ongoing Research

- Graduation rates and GPA changes
- Examination by student survey ratings
- Examination by specific situations – SI instructor survey
- Replication at New Mexico State University

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