



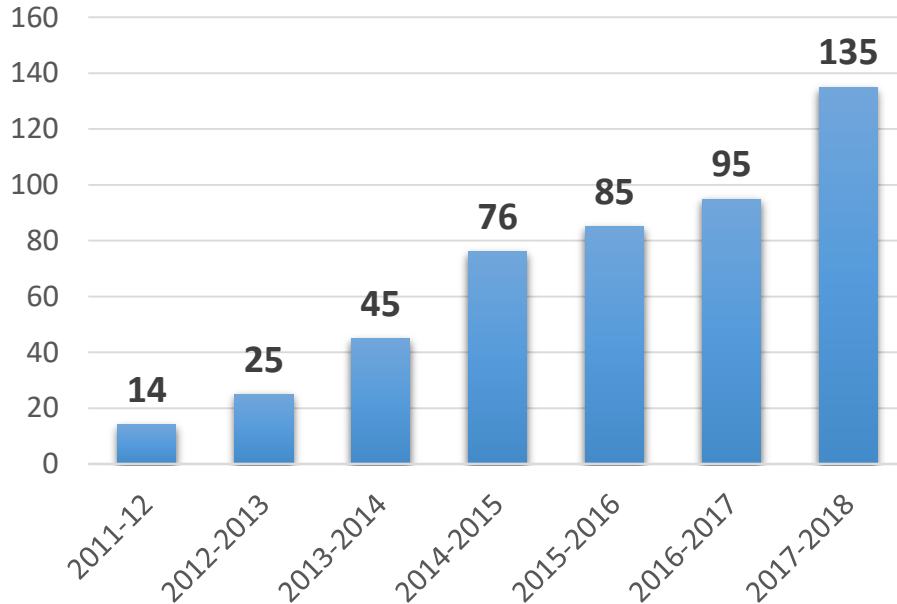
IN ACTION!

FRESNO  **STATE**

Supplemental Instruction

Funding to Support SI Growth

Number of SI Courses



- 2011-2013: Student Affairs Funding
- **2013-2014:** Permanent funding from Chancellor's Office to support 64 SI courses and staff growth (\$321,400)
- 2014-2015: Operating with only Chancellor's Office funding
- **2015-2016:** Permanent funding from Student Success to support additional sections in current SI courses (\$80,400)
- 2016-2017: One-time funding from Student Success Initiatives to support additional SI courses (\$100,000)
- **2017-2018:** Permanent Funding from GI2025 to sustain and grow SI program (\$300,000)

How Does SI Look at Fresno State?

- **SI targets courses with the following characteristics:**
 - High failure rate (30 percent or higher D, F, WU)
 - High repeat rate (30 percent or higher)
 - Large enrollment (100 students or more)
 - Gateway/Bottleneck courses (prerequisite courses)
- **Follows guiding principals by the International Center of SI through the University of Missouri-Kansas City (UMKC)**
 - SI is voluntarily; SI Leaders attend class lectures; SI participants are anonymous; sessions are peer-led and promote collaborative learning
- **Intensive and ongoing Training for SI Leaders**
 - 44 total hours of training per semester (includes beginning of semester, weekly and monthly)
 - Training topics include Bloom's Taxonomy Higher Level of Learning, Collaborative Learning Techniques, Learning Styles, Study tips, Non-verbal communication, Fresno State Student Population, etc.)
 - SI Staff and Mentors provide ongoing observations to produce quality SI sessions
 - Promote and develop student professionals for student staff team (SI Leaders and SI Mentors)
 - **Fall 2017: 67 SI Leaders and 5 SI Mentors total**
 - SI Mentors: Mentors are students who have successfully graduated from the role of an SI Leader and are assigned to provide support and training for SI Leaders; this position promotes professional development for student staff and supplement staff support for the program
- **Fresno State SI Program is the first institution within the CSU system to be SI Certified by UMKC**

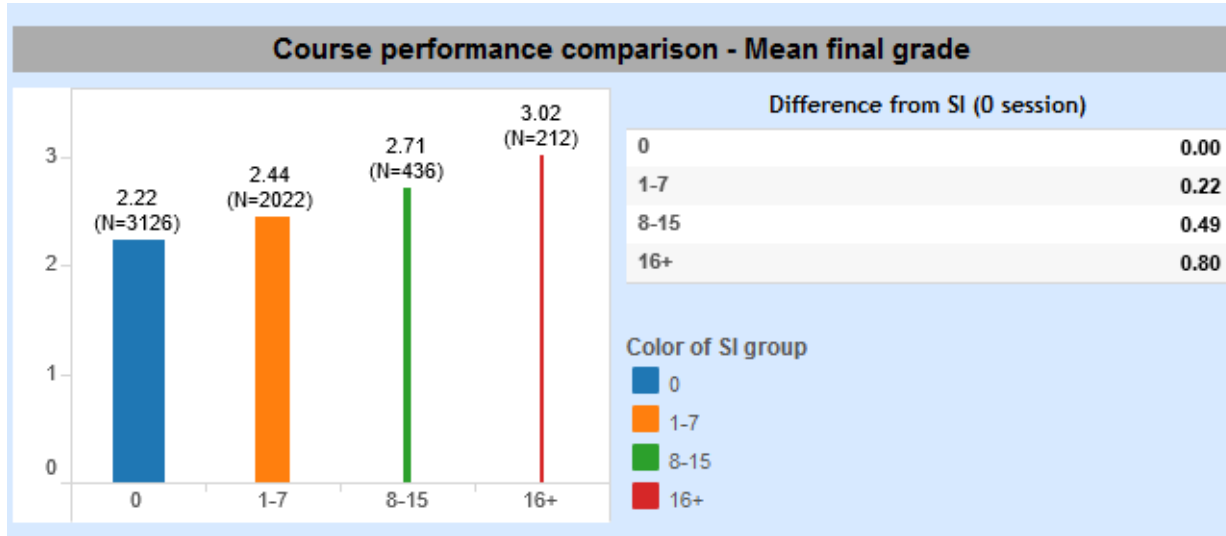


Impact on Courses – Spring 2017 SI Participants

SI participation			
SI participation		SI visits (for students who participated in SI)	
N	2,670	Total of SI visits	14,596
%	46%	Mean of SI visits	5

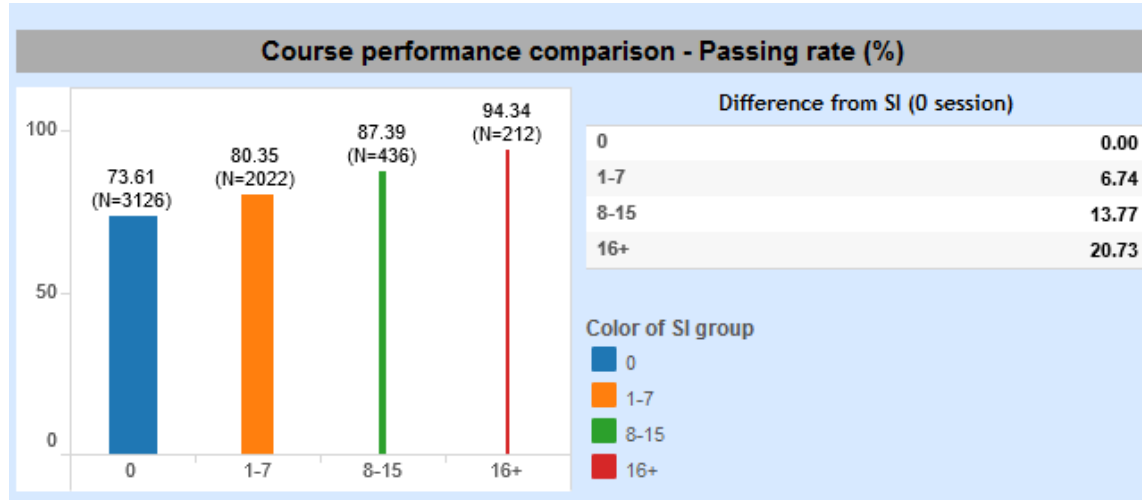
- SI provided support for **51 courses during Spring 2017**
- **5,796 students** were enrolled in the 51 SI courses
- **2,670 students attended SI (46% participation rate)**
 - National average for SI attendance is 40%
- **2,670 students** attended SI for **14,596 times** during Spring 2017

Impact on Courses – Spring 2017 Mean Final Grade



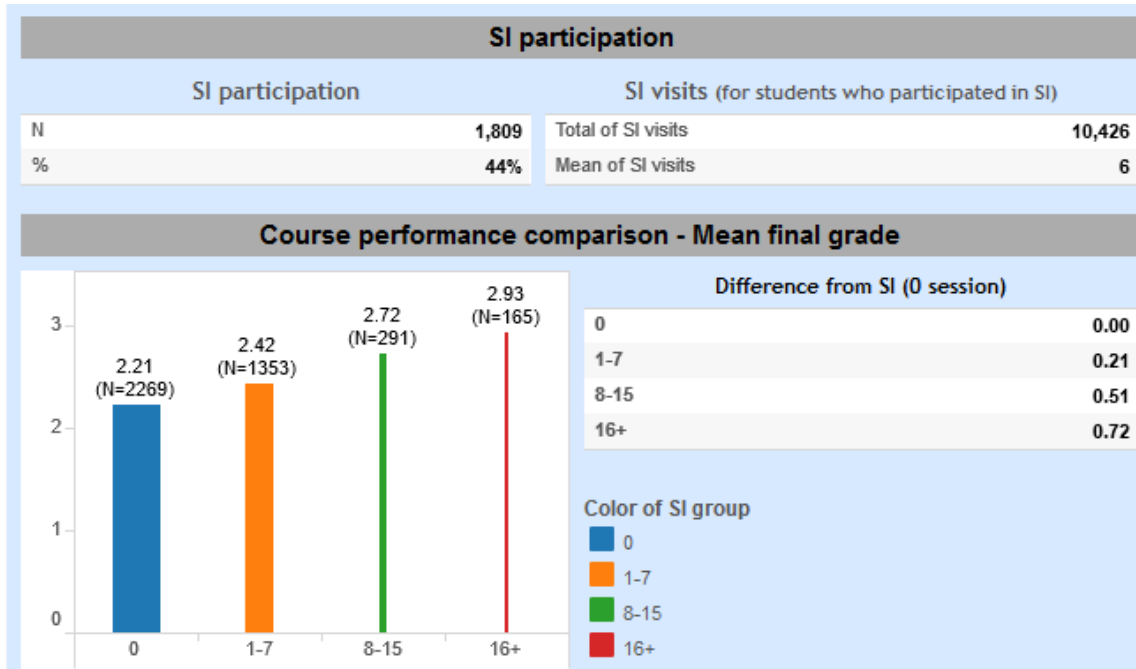
- Spring 2017 data for All Courses Combined (**51 courses**)
- Students who participated in SI perform better in courses compared to Non-SI students
- Nearly one letter grade variance for regularly attendance (16+ visits)
- **More attendance means better grade**

Impact on Courses – Spring 2017 Course Passing Rate



- Spring 2017 data for All Courses Combined (**51 courses**)
- 94% course passing rate for regularly attending SI (16+ visits)

Math and Science Courses Spring 2017



- Spring 2017 data for All Math and Science Courses Combined (**32 SI courses**)
- **1,809 students** participated in SI (**44%** participation rate)
- **1,089 students** attended SI for **10,426 times**
- Grade variance of 0.72 for regularly attendance (16+ visits) compared to Non-SI
- 95% passing rate for regularly attendance compared to 74% non-SI students (not shown here)

5-Year Research Study (2011 – 2014)

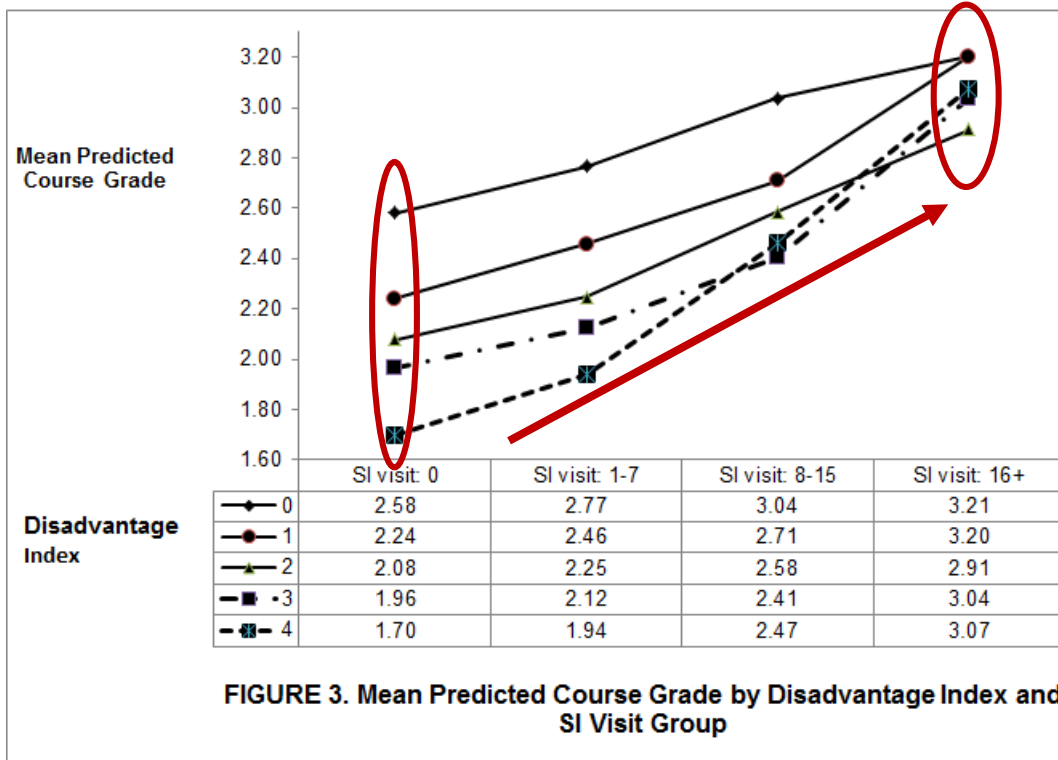
Enrollment & Percentage in Disadvantage Index

	Disadvantage index					Grand Total
	0	1	2	3	4	
Enrollment						
Enrolled HC	1,724	2,763	3,031	3,991	4,788	16,297
Enrolled %	10.6%	17.0%	18.6%	24.5%	29.4%	100.0%

- Large study of **16,297 undergraduate students** enrolled in **22 courses** offering SI
- Study focuses on the impact of SI on traditionally disadvantaged students (**underrepresented minority, first-generation, Federal Pell Grant eligible, remedial status**)
- A composite scale called the **Disadvantage Index** was developed (50% of students in study had 3 or 4 disadvantaged index)
- The higher the values on the index, the higher the disadvantage will be; **0 means the student did not have any disadvantaged factors**, and **4 means the student had all four disadvantaged factors**

5-Year Research Study 2011 – 2014

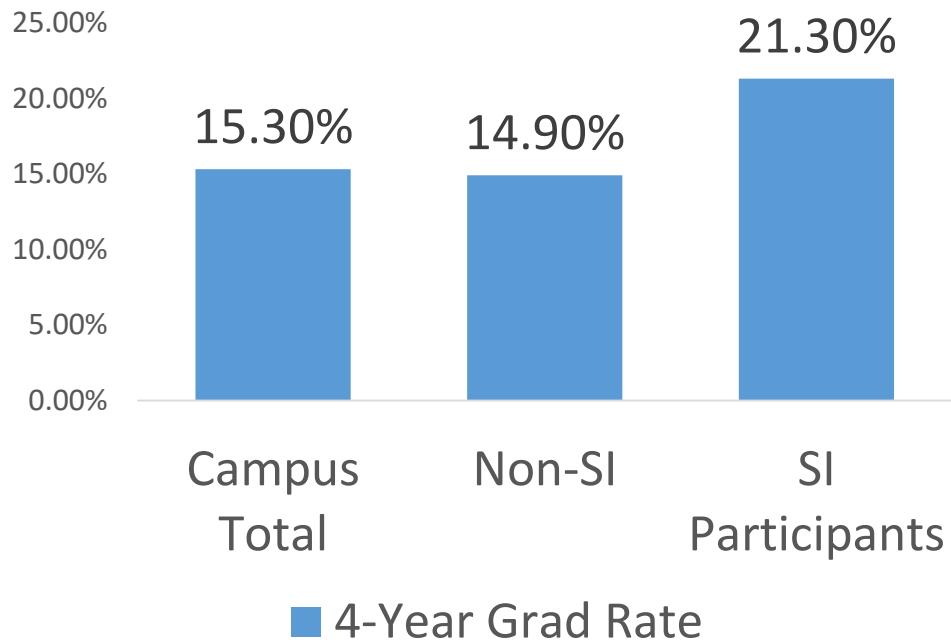
Eliminating the Achievement Gap



- As illustrated in the figure, an increase in SI visits leads to a smaller performance gap in SI courses
- The improvement for students who had one, two, three, and four disadvantaged factors are as follow:
 - 1 Disadvantage Index: 0.96 (=3.20 - 2.24)
 - 2 Disadvantage Index: 0.83 (=2.91 - 2.08)
 - **3 Disadvantage Index** : 1.08 (=3.04 - 1.96)
 - **4 Disadvantage Index**: 1.37 (=3.07 - 1.70)
- Students who had **three or four factors** and attended SI 16 or more times **received the largest improvement** (more than one point)
- The performance gap thus narrowed and even closed for the SI visit group of 16+

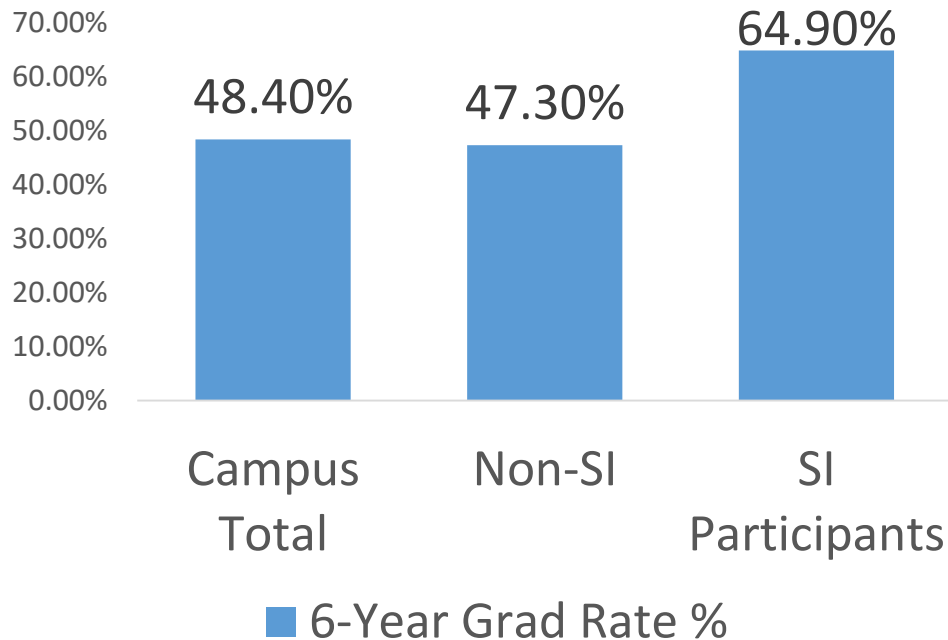
Increasing Graduation

2011-2012 First Time Full Time Freshmen Cohort (4-year Graduation Rate)



- 2011 – 2012 First Time Full Time Freshmen Cohort Study
- 2,831 students were enrolled in 14 SI courses
- 4-year Graduation Rate comparison:
 - Campus: 15.3%
 - Non-SI: 14.9%
 - SI Participants: 21.3%

Increasing Graduation 2011-2012 First Time Full Time Freshmen Cohort (6-year Graduation Rate)



- 2011 – 2012 First Time Full Time Freshmen Cohort Study
- 2,831 students were enrolled in 14 SI courses
- 6-year Graduation Rate comparison:
 - Campus: 48.4%
 - Non-SI: 47.3%
 - SI Participants: 64.9%

FRESNO STATE



Supplemental Instruction

California State University (CSU) Graduation Initiative 2025 Symposium

“Student Success through Innovation”

Long Beach, CA October 12th

Flipped Classroom + Increased Engagement = Student Success.

Cherie Ichinose

cichinose@fullerton.edu

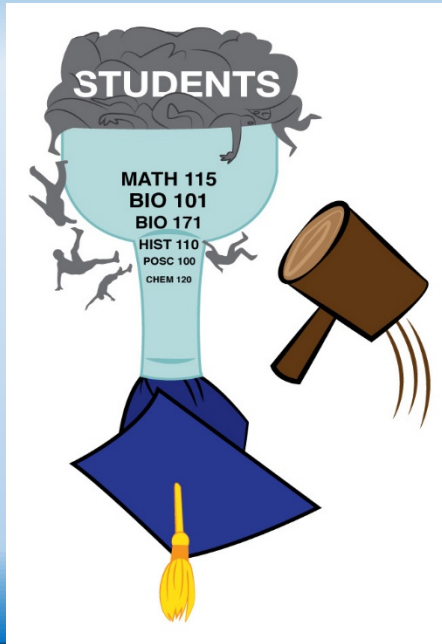


Flipped Classroom + Increased Engagement = Student Success.

- **Why Redesign?**
- **Expected Challenges and Non-Negotiables**
- **Flipped Classroom – How our Student Learn**
- **Student Success**
- **Institutionalized: University, System-wide, Nationally**



Why Redesign?



- Each year more than **1,000,000 students** take college algebra or a related course (Lutzer et. al, 2007).
- Moreover, studies have placed the non-success/withdrawal rate for these courses nationally in the **40-50% range** (Herriot, 2006).
- In 2013, **College Algebra and Pre-Calculus** were listed as one of the courses of the 22 system wide high-demand and low-success courses. College Algebra, specifically, was on the top of the list.



Why Redesign?



President Garcia's University Strategic Plan: Identify, track and integrate curricular and co-curricular High-Impact Practices and ensure participation in one HIP in the first year and one subsequent HIP in student's major field.



Expected Challenges



- Prior to the redesign College Algebra and Pre-Calculus instruction was offered in a traditional face-to-face model.
 - What technological environments will be used to increase student engagement and not distract from instruction?
 - What technological support will be provided?
 - How would redesign efforts contribute to Retention and Promotion Process – how to get Faculty Buy-in?
- With 20-30 course offerings per semester how would the design be institutionalized? How to switch the mindset from instructor-led to student-led learning environments?



4 Non-Negotiables



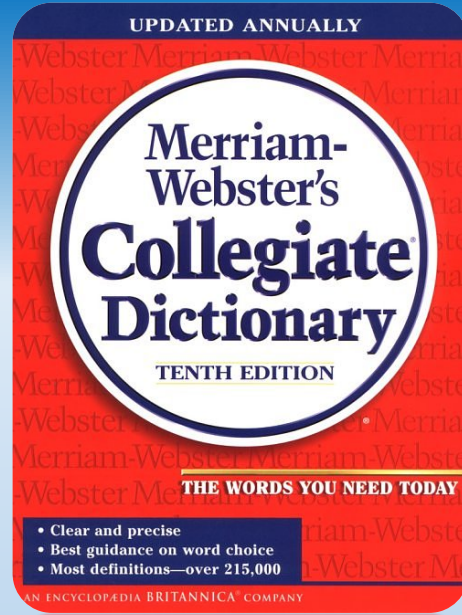
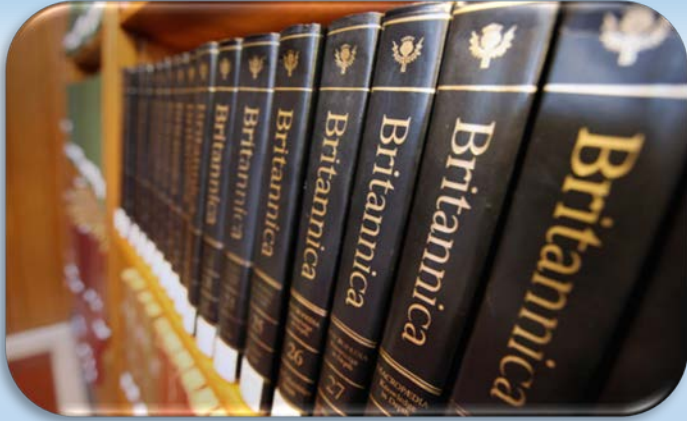
- Technology must not distract from instruction.
 - Technology must be interactive – *No Set it and Forget it*
 - Materials must ADA (504 & 508) Compliant.
- Technology would be supported (SCORM compliant) with current Learning Management System (LMS)



How Students Learn

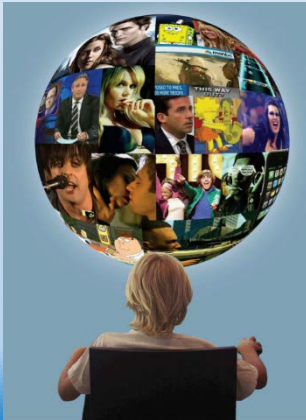


How Students Learn



How Students Learn

Students and Multi-Media



Among all 8- to 18-year-olds, average amount of time spent with each medium in a typical day:

	2009	2004	1999
TV content	4:29 ^a	3:51 ^b	3:47 ^b
Music/audio	2:31 ^a	1:44 ^b	1:48 ^b
Computer	1:29 ^a	1:02 ^b	:27 ^c
Video games	1:13 ^a	:49 ^b	:26 ^c
Print	:38 ^a	:43 ^{ab}	:43 ^b
Movies	:25 ^a	:25 ^{ab}	:18 ^b
TOTAL MEDIA EXPOSURE	10:45 ^a	8:33 ^b	7:29 ^c
Multitasking proportion	29% ^a	26% ^a	16% ^b
TOTAL MEDIA USE	7:38 ^a	6:21 ^b	6:19 ^b

– Kaiser Family Foundation, 2010

<http://kaiserfamilyfoundation.files.wordpress.com/2013/04/8010.pdf>



How Students Learn

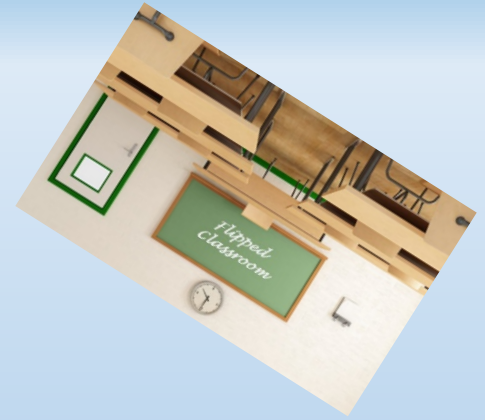


- To students...computers aren't technology
- Multi-Tasking is a way of life!
- Going to an mobile device is a common experience for students.



What is The Flipped Classroom?

With teacher-created videos and interactive lessons, **instruction that used to occur in class is now accessed at home**, in advance of class. **Class becomes the place to work through problems, advance concepts, and engage in collaborative learning.** Most importantly, all aspects of instruction can be rethought to best maximize the scarcest learning resource—time. www.educationnext.org



What is The Flipped Classroom?

Traditional

- Lectures are teacher directed
- Lessons introduced during class
- Students complete assignments at home

Flipped

- Students centered
- Content introduced at home
- Students apply it at school
- Teachers provide more one-on-one assistance



Advantages of the Flipped Classroom

Students can review **as many times** as needed

Students can **work at their own** pace

Students could learn at home or school

Students are **less anxious during class**

I have more time to personalize communications with students



Dis-advantages of the Flipped Classroom

Production Time*

Student Buy-in

Access*

Storage*

Homework – What if students do not complete online videos*

Students cannot ask questions during the recorded video



The Flipped Classroom is NOT:

Just online videos

About replacing teachers with videos

An online class

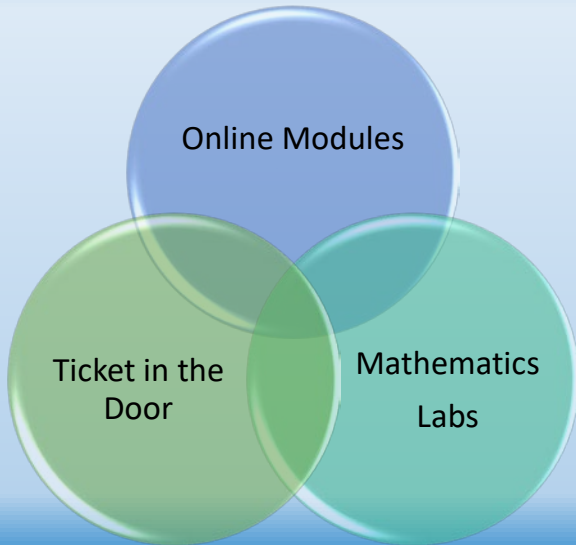
Students working without structure

Students working in isolation

Students spending the entire class online



Key elements of flipped instruction.



- Provide an opportunity for first exposure to objective/content.
- Provide incentive for students to prepare for class.
- Provide mechanism to assess student understanding.
- Provide in-class activities that focus on higher level cognitive activities.



Chapter 3 When Lines Meet: Linear Systems

After reading this chapter, you should be able to:



interpret intersection points on graphs ^{a,b,c,f}

construct, graph, and interpret system of linear equations ^{a,b,c,f}

solve systems of linear equations ^{a,b,c,f}

use graphs and equations to find a solution for system of two linear equations ^{a,b,c,f}

Section 3.1 Solving Systems by Graphing

Not available unless: You achieve a required score in **Module 3.1**

Module 3.1

Section 3.2 Part 1 Solving Systems by Substitution

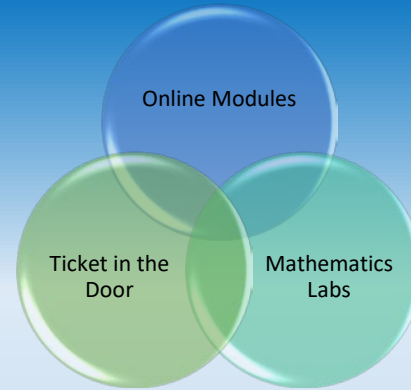
Not available unless: You achieve a required score in **Module 3.2.1**

Module 3.2.1

Section 3.2 Part 2 Solving Systems by Elimination

Not available unless: You achieve a required score in **Module 3.2.2**

Module 3.2.2



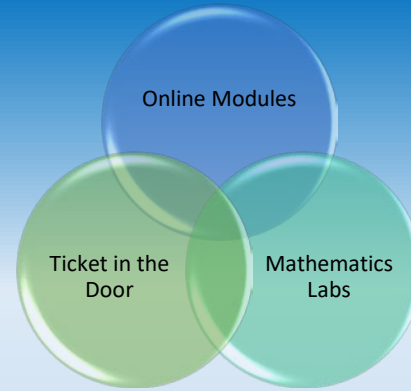
- **Pre-Assessment**
- Once student earn at **least 75% accuracy** on the online modules, they are given access to the ticket in the door.
- Students are to turn the ticket in the door **immediately upon arriving to class**
- **Feedback is given** and returned the next class period
- **Each student has the opportunity** to present the ticket to the class



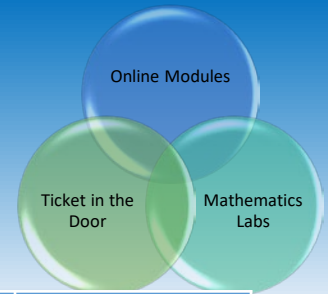
DEPARTMENT of MATHEMATICS

COLLEGE of NATURAL SCIENCES & MATHEMATICS

- Student-Centered
- Actively Engaged
- Groups of 4 – 6
- Students Present Word-Problems



CALIFORNIA STATE UNIVERSITY
FULLERTON

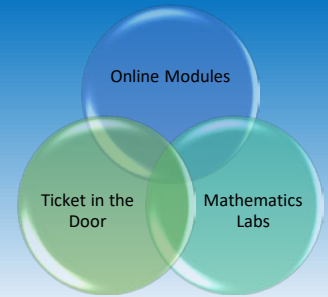


Results of the Pilot (College Algebra)

	Exam 1*	Exam 2	Exam 3*	Exam 4*	Final Exam*	Semester Grade*
Flipped (n = 133)	78%	72%	60%	71%	60%	72%
Lecture (n = 534)	69%	71%	50%	64%	54%	65%

*statistically significant difference, $\alpha = .01$ or better

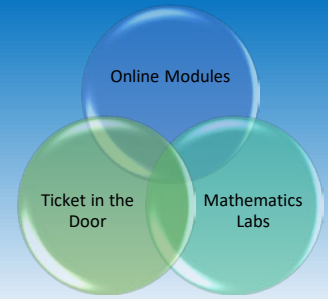




Results of the Pilot (Pre-Calculus)

	Exam 1	Exam 2	Exam 3	Exam 4	Final Exam	Semester Grade
Flipped (n = 232)	80%	74%	60%	69%	69%	71%
Lecture (n = 132)	77%	67%	53%	57%	58%	55%





Flipping College Algebra: Effects on Student Engagement and Achievement.

Source: Learning Assistance Review (TLAR) . Spring2016, Vol. 21 Issue 1, p115-129. 15p.

Author(s): Ichinose, Cherie; Clinkenbeard, Jennifer

The flipped course experience was especially impactful for Hispanic women.



Achievement and Engagement in Flipped vs. Traditional College Algebra and Pre-Calculus

Jennifer Clinkenbeard, 2017. Doctoral Dissertation, Claremont Graduate University
jennifer.clinkenbeard@csuci.edu

Pass rates were significantly higher in flipped modality.

	Traditional	Flipped	Significance
College Algebra Spring 2014- Fall 2015	68% n = 2755	74% n = 908	$p < 0.001$; $t = -4.004$
Pre-Calculus Spring 2015 – Fall 2015	55% n = 588	70% n = 380	$p < 0.001$; $t = -4.824$

Minimized bias: No self-selection, common assessments & syllabus.

For 11 instructors who had taught in both models,
any significant differences in pass rates favored flipped modality.

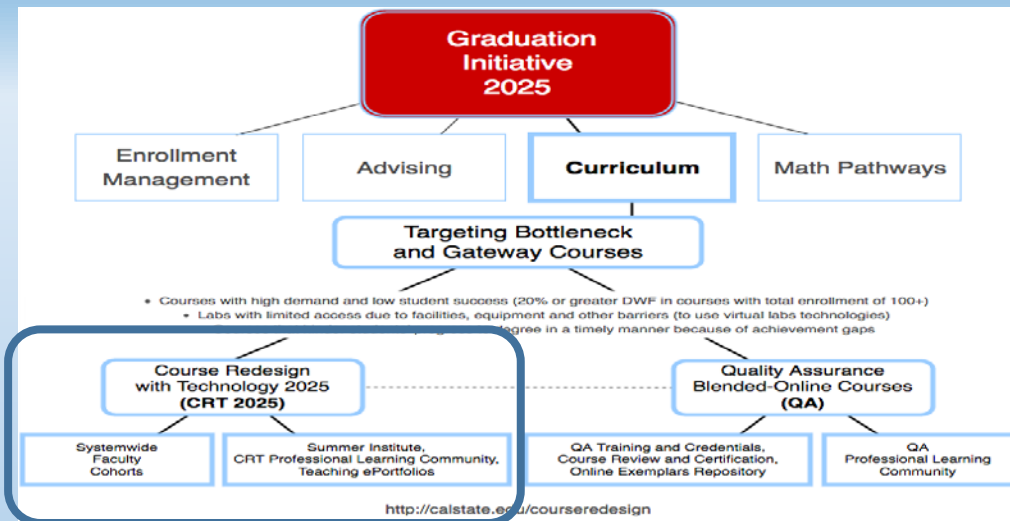


Institutionalized: University, System-wide, Nationally

- 20 new instructors
- Developed Training Module (Instructional Scripts)
- 9 Semesters of Data*
 - **Jennifer Clinkenbeard** [jennifer.clinkenbeard@csuci.edu]
- College Algebra, Pre-Calculus
- Business Calculus, Short Course Calculus, Calculus (1) and (2) Spring 2018
- College Algebra, Pre-Calculus, Intermediate Algebra* **Fully-Online**
- Collage Algebra Split Course Pilot Fall 2018



Institutionalized: University, System-wide, Nationally



2017-2018 Mathematics Cohort

The main goal of the re-design is to 1) develop and implement multiple active learning in Mathematics (ALM) strategies in our Calculus I courses and 2) create a working group or "community" faculty who will help implement ALM strategies in courses taught by lecturers. Some of the pedagogies used include: flipped classrooms, active learning, project based learning and growth mindset.

**Math Redesign Cohort Lead,
Cherie Ichinose, Ph.D.**



About the Lead: Dr Ichinose is an associate mathematics professor at California State University Fullerton. She is the Single Subject Coordinator for the Mathematics department. In addition, she served as an ambassador for the CSU Digital Learning Ambassador Program. Dr Ichinose' research surrounds the learning and the 'flipped' classroom pedagogy. Dr Ichinose has participated and presented system-wide through the Professional Learning Communities (PLC) meetings, Summer Learning institutes and meetings with Presidents and Trustees. She has led numerous presentations at conferences both locally and nationally, including National Council of Teacher of Mathematics and Sloan-C Emerging Technologies for Online learning. Her dissertation, Learning Mathematics in the 21st century: High school students' interactions while learning mathematics online she showed the power of synchronous learning spaces when learning mathematics online.

Redesign Strategy: Redesigned College Algebra using online modules, pre-assessments and in-class mathematics labs. Produced forty-five 10-15 minute interactive modules that students in the course complete before coming to class.

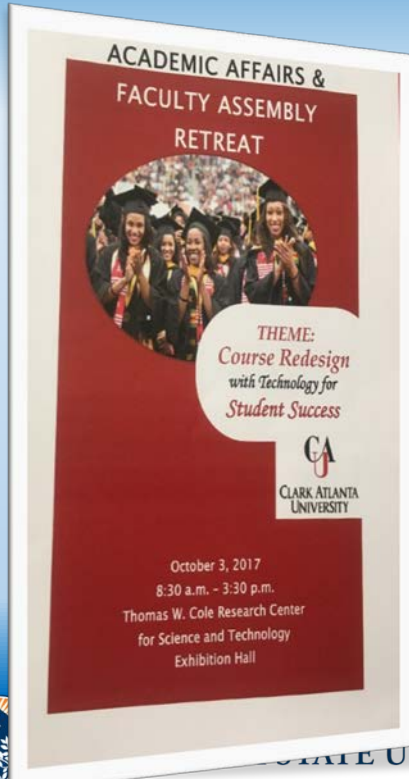
Redesign Outcomes: Class time is spent in active discussion and mathematical interaction.

Top 3 Pedagogies Used: Flipped classroom, active learning

<http://tiny.cc/lchinoseCRTLead>



Institutionalized: University, System-wide, Nationally



Student Testimonies



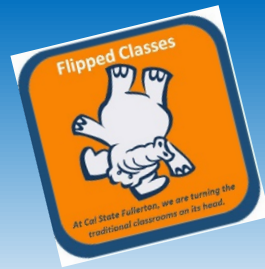
*I especially like the modules that are factored into our grades because it **means we have to do them.***

*I like the ticket in the door because I **do math everyday** and I get feedback*

*I like that we can **spend more time** in class working on **word problems.***

*I like the modules a lot because it helps with my visual learning needs and I can just **focus on the lesson** with out the worry of keeping up with writing notes in class*





Student Testimonies

I really liked the modules, it let us go over the topic before class and then in class go more in depth.

The modules were very consistent and were an essential key to passing the class. The pacing felt slow sometimes but it turned out better in the end.

The online modules were very helpful. I like that we could rewind and watch over again, unlike a normal class lecture.



Flipping the Instructor:

**How the Course Redesign with Technology Program
Is Reinventing the Chemistry Curriculum at Chico State**



My Journey





Course Redesign with Technology

Chem 111 Redesign

- Hybrid course design
- Content online
- Active learning components
- Metacognition
- Near Peer in-class assistants
- Supplemental Instruction
- Student-centered syllabus





Course Redesign with Technology

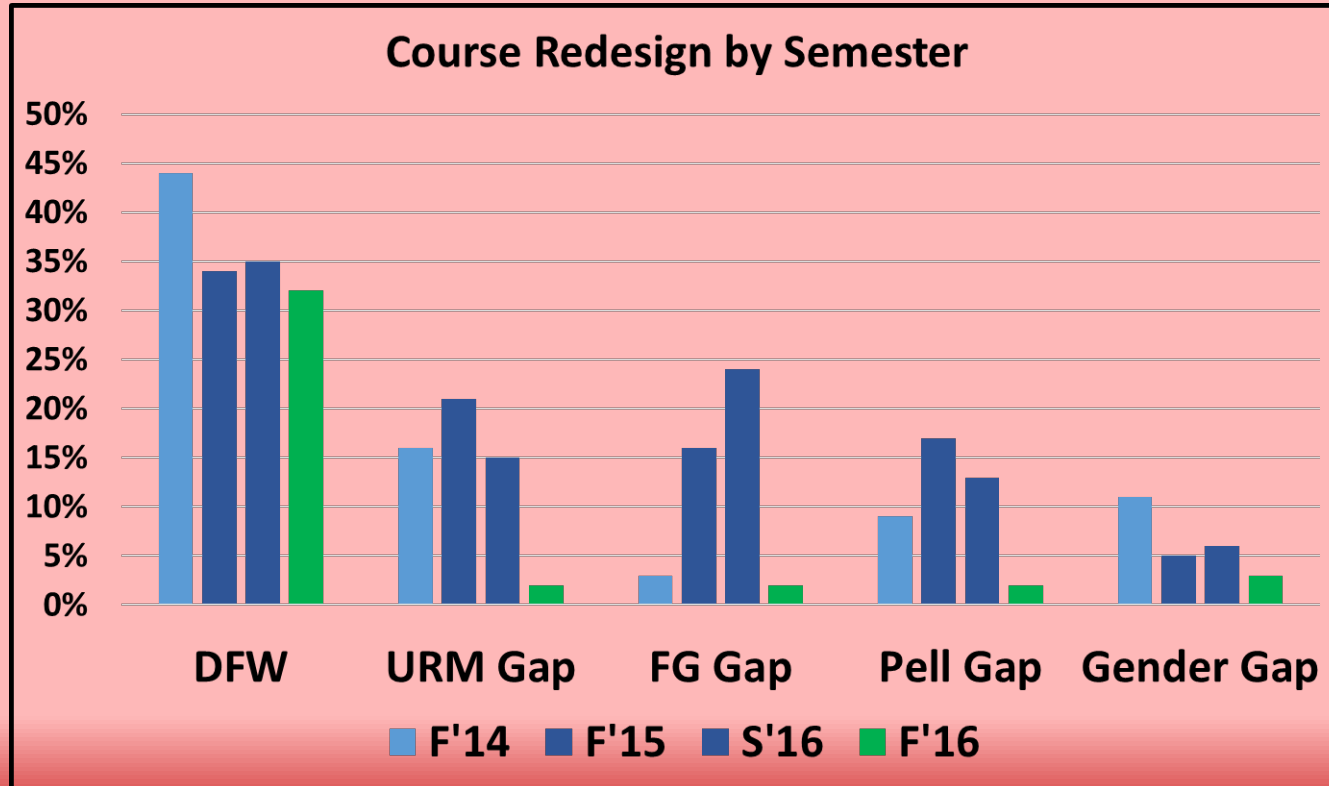
Chem 111 Redesign

- Hybrid course design
- Content online
- Active learning components
- Metacognition
- Near Peer in-class assistants
- Supplemental Instruction
- Student-centered syllabus



Surface Assessment

DFW Rates and Achievement Gaps



Flipping the Instructor:

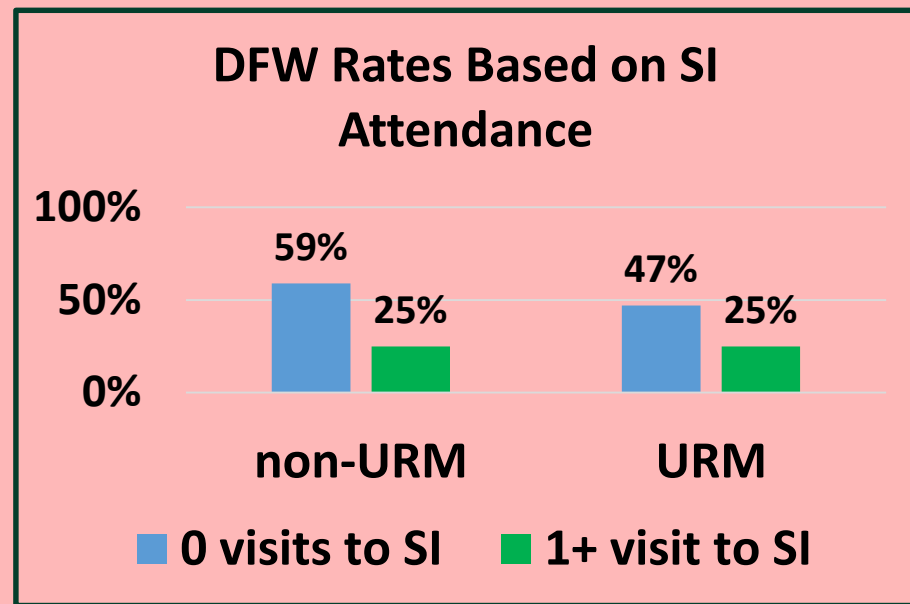
**How the Course Redesign with Technology Program
Is Reinventing the Chemistry Curriculum at Chico State**



Surface Assessment Supplemental Instruction

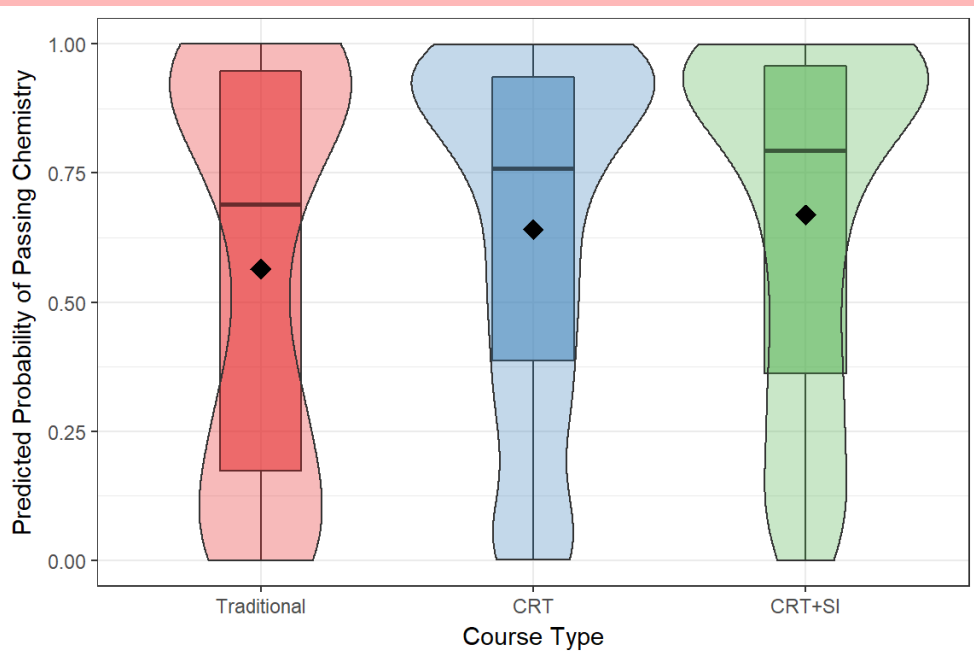
SI Attendance	URM	Non-URM
Men	61%	71%
Women	86%	80%
Overall	72%	76%

- SI significantly reduced the achievement gap for URM students
- Men attended less often



Chem 111 Redesign – Deeper Dive

“All other things being equal”



- Under the Traditional course offering, on average a student would have a 56.4% chance of passing the course.
- With CRT, on average a student would have 64.1% chance of passing the course.
- With CRT + SI, half the students were predicted to have up to 66.9% chance of passing the course.

A Catalyst for Change

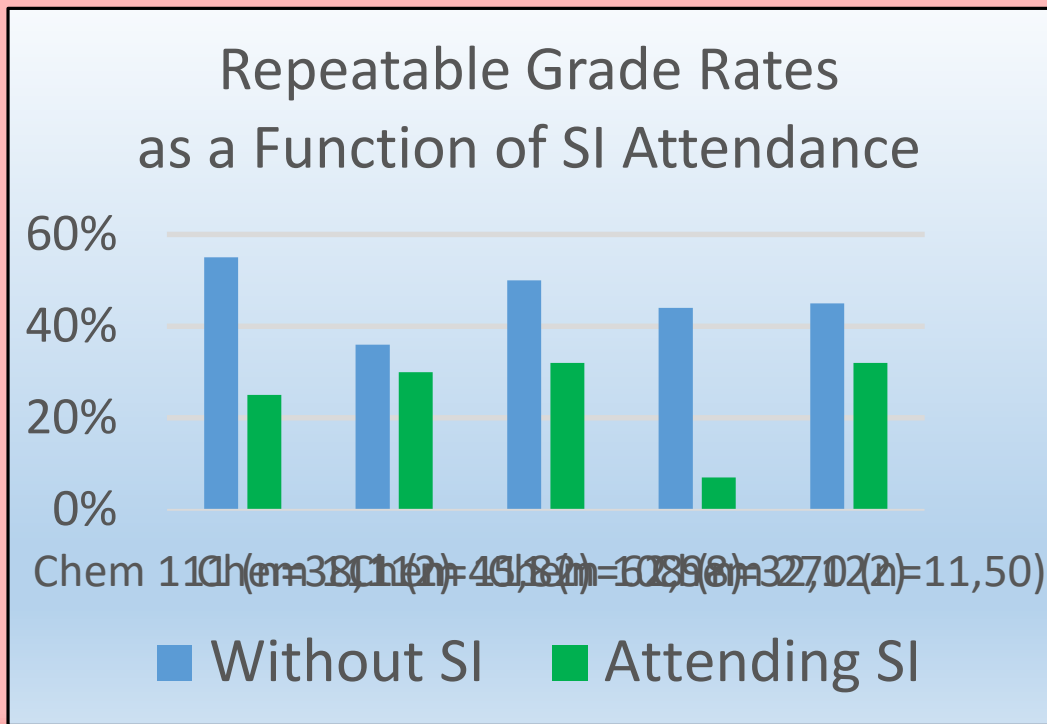
Courses

- Chem 107
- Chem 108
- Chem 111
- Chem 112
- Chem 270
- Chem 370

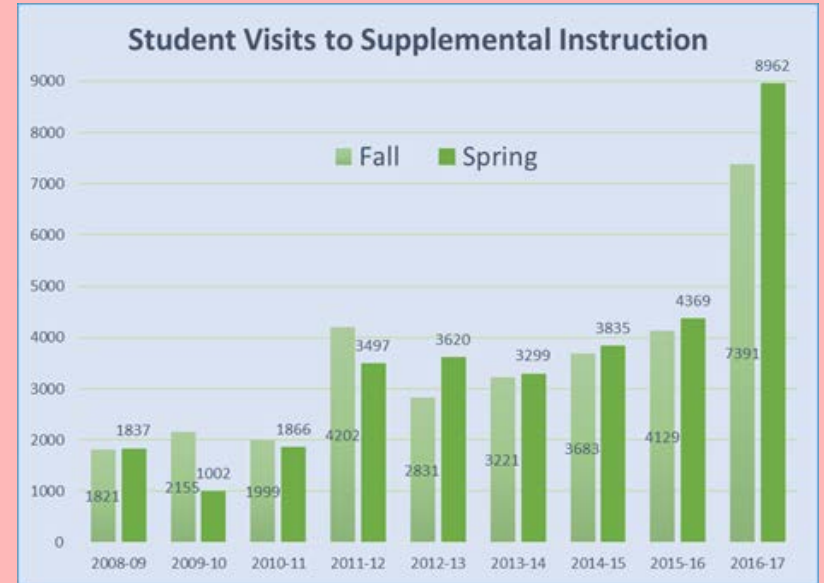
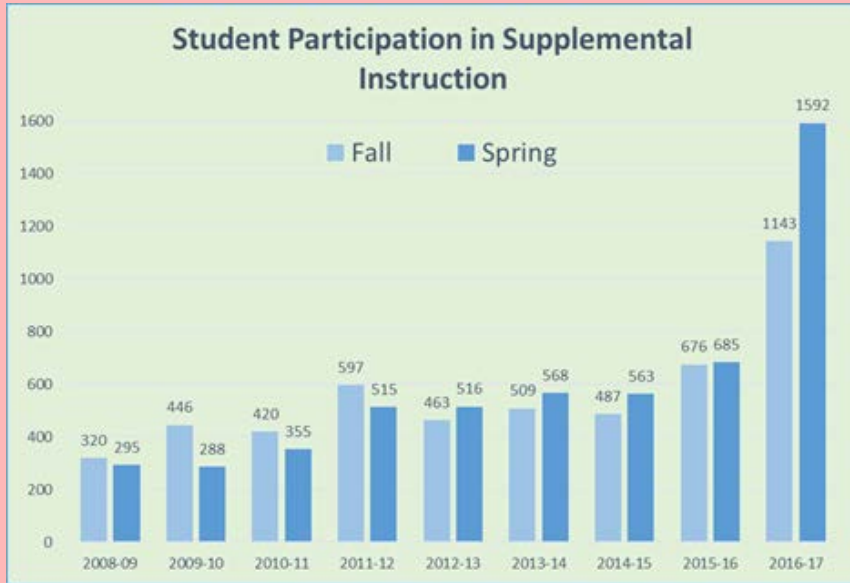
Redesigns

- SI, hybrid, CRS, Integrated LMS, metacognition
- SI, hybrid, CRS, Integrated LMS, virtual labs, lab materials
- SI, hybrid, metacognition, virtual labs, lab manual
- SI, ALEKS, hybrid, metacognition
- SI, CRS, videos
- SI, CRS, videos

Supplemental Instruction Chemistry – F'16



Supplemental Instruction Campus



In Spring 2017:

**1592 students attended SI of 2480 enrolled
for 8962 visits to SI
at a cost of \$95,993***

**(64% participation)
(5.6 visits per student)
(\$60 per attendee)**

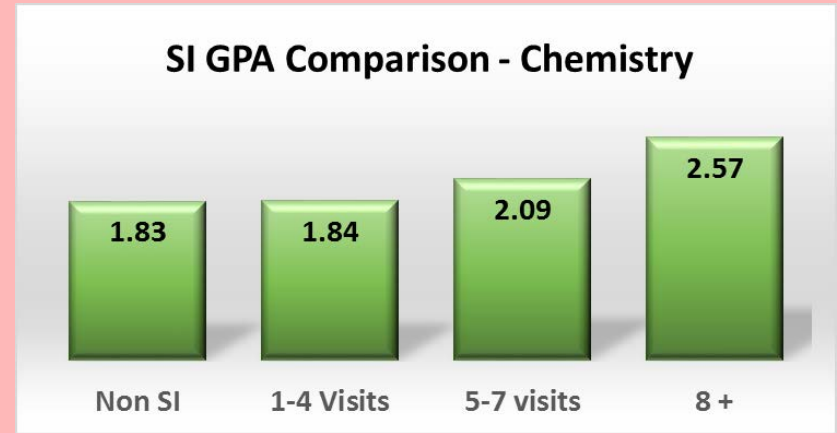
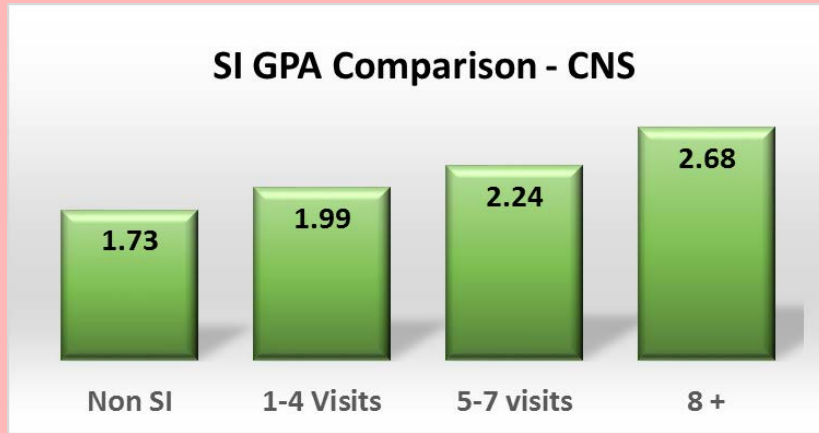
Supplemental Instruction

College of Natural Sciences – S'17

Course	Enrolled	Participation Rate	Visits per Student	GPA (0 visits)	GPA (1+ Visits)	Δ GPA
BIOL103	291	78%	4.74	1.10	2.00	0.90
BIOL104	353	56%	4.03	2.40	3.20	0.80
BIOL 211	137	74%	5.93	2.10	2.70	0.60
CHEM107	314	63%	4.55	1.70	2.24	0.54
CHEM108	124	90%	9.39	1.80	2.70	0.90
CHEM111	296	57%	3.50	1.82	2.10	0.28
CHEM112	197	74%	8.31	1.28	1.83	0.55
CHEM270	106	68%	4.36	1.88	2.08	0.20
Totals	1818	67%	5.72	1.85	2.36	0.51

- Participation rate much higher than national norms
- Visits per student on par with others
- Increase in GPA nice... but not enough

Supplemental Instruction – S'17



- Increased visits to SI results in higher GPA – as expected

Supplemental Instruction Going Forward

- So far....
 - Faculty with passion and intent to change
 - Students on-board
 - Positive outcomes in DFW and gaps
 - HOPE!
- What we need.... In a word - SUPPORT
 - Line Item Funding
 - Continued Cultural Change
 - Training for Faculty and SI Leaders
 - Integration with Institutional Research