Funding to Support SI Growth

- **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 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)
• 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

<table>
<thead>
<tr>
<th>Disadvantage index</th>
<th>Grand Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Enrollment</td>
<td></td>
</tr>
<tr>
<td>Enrolled HC</td>
<td>1,724</td>
</tr>
<tr>
<td>Enrolled %</td>
<td>10.6%</td>
</tr>
</tbody>
</table>

- 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+. 

**Figure 3. Mean Predicted Course Grade by Disadvantage Index and SI Visit Group**
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%
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:

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

– 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](http://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.
• **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
• Student-Centered
• Actively Engaged
• Groups of 4 – 6
• Students Present Word-Problems
### Results of the Pilot (College Algebra)

<table>
<thead>
<tr>
<th></th>
<th>Exam 1*</th>
<th>Exam 2</th>
<th>Exam 3*</th>
<th>Exam 4*</th>
<th>Final Exam*</th>
<th>Semester Grade*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flipped (n = 133)</td>
<td>78%</td>
<td>72%</td>
<td>60%</td>
<td>71%</td>
<td>60%</td>
<td>72%</td>
</tr>
<tr>
<td>Lecture (n = 534)</td>
<td>69%</td>
<td>71%</td>
<td>50%</td>
<td>64%</td>
<td>54%</td>
<td>65%</td>
</tr>
</tbody>
</table>

*statistically significant difference, $\alpha = .01$ or better
## Results of the Pilot (Pre-Calculus)

<table>
<thead>
<tr>
<th></th>
<th>Exam 1</th>
<th>Exam 2</th>
<th>Exam 3</th>
<th>Exam 4</th>
<th>Final Exam</th>
<th>Semester Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flipped (n = 232)</td>
<td>80%</td>
<td>74%</td>
<td>60%</td>
<td>69%</td>
<td>69%</td>
<td>71%</td>
</tr>
<tr>
<td>Lecture (n = 132)</td>
<td>77%</td>
<td>67%</td>
<td>53%</td>
<td>57%</td>
<td>58%</td>
<td>55%</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th></th>
<th>Traditional</th>
<th>Flipped</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>College Algebra</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spring 2014- Fall 2015</td>
<td>68%</td>
<td>74%</td>
<td>p &lt; 0.001; t = -4.004</td>
</tr>
<tr>
<td>n = 2755</td>
<td>n = 908</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pre-Calculus</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spring 2015 – Fall 2015</td>
<td>55%</td>
<td>70%</td>
<td>p &lt; 0.001; t = -4.824</td>
</tr>
<tr>
<td>n = 588</td>
<td>n = 380</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

http://tiny.cc/IchinoseCRTLead
Institutionalized: University, System-wide, Nationally
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.
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
Chem 111 Redesign

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

Course Redesign by Semester

DFW
URM Gap
FG Gap
Pell Gap
Gender Gap

F'14  F'15  S'16  F'16
Flipping the Instructor:

How the Course Redesign with Technology Program Is Reinventing the Chemistry Curriculum at Chico State
Surface Assessment
Supplemental Instruction

<table>
<thead>
<tr>
<th>SI Attendance</th>
<th>URM</th>
<th>Non-URM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>61%</td>
<td>71%</td>
</tr>
<tr>
<td>Women</td>
<td>86%</td>
<td>80%</td>
</tr>
<tr>
<td>Overall</td>
<td>72%</td>
<td>76%</td>
</tr>
</tbody>
</table>

- 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.

Dr. Robin Donatello; https://norcalbiostat.github.io/chem_ss/crt.html
### A Catalyst for Change

<table>
<thead>
<tr>
<th>Courses</th>
<th>Redesigns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem 107</td>
<td>SI, hybrid, CRS, Integrated LMS, metacognition</td>
</tr>
<tr>
<td>Chem 108</td>
<td>SI, hybrid, CRS, Integrated LMS, virtual labs, lab materials</td>
</tr>
<tr>
<td>Chem 111</td>
<td>SI, hybrid, metacognition, virtual labs, lab manual</td>
</tr>
<tr>
<td>Chem 112</td>
<td>SI, ALEKS, hybrid, metacognition</td>
</tr>
<tr>
<td>Chem 270</td>
<td>SI, CRS, videos</td>
</tr>
<tr>
<td>Chem 370</td>
<td>SI, CRS, videos</td>
</tr>
</tbody>
</table>
Supplemental Instruction Chemistry – F’16

Repeatable Grade Rates as a Function of SI Attendance

Chem 111 (n=38,112)
Chem 111 (n=45,820)
Chem 111 (n=62,980)
Chem 108 (n=32,122)
Chem 270 (n=11,50)

Without SI: 60%
Attending SI: 40%

Student Average: 11,50
In Spring 2017:

1592 students attended SI of 2480 enrolled for 8962 visits to SI (64% participation)

at a cost of $95,993* (5.6 visits per student) ($60 per attendee)
## Supplemental Instruction
### College of Natural Sciences – S’17

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

- 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