Sometimes our Students Fail.

What if they didn’t?
Flipping the Instructor:
The Evolution of a Tried and True Lecturer
Chico State, General Chemistry, Chem 111

Who I was

- Caltech graduate
- Stanford graduate
- Legacy educator
- No Teacher Training
- Good peer reviews
- Good student reviews

- NOT a statistician
- NOT a ChemEd specialist
- NOT interested in ChemEd research
- NOT interested in publishing
- No idea where to start

Either accept this as normal or...
try to do something about it
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
**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

**DFW Rates Based on SI Attendance**

- Non-URM: 59% (0 visits to SI), 25% (1+ visit to SI)
- URM: 47% (0 visits to SI), 25% (1+ visit to SI)
Chem 111 Redesign - Differential Results

- Increased success greatest for the bottom half of the class.
- SI seemed to decrease success for top students.
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.

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

<table>
<thead>
<tr>
<th>Course</th>
<th>Without SI</th>
<th>Attending SI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem 111</td>
<td>(n=38,112)</td>
<td>(n=45,82)</td>
</tr>
<tr>
<td>Chem 111</td>
<td>(n=62,98)</td>
<td>(n=32,122)</td>
</tr>
<tr>
<td>Chem 108</td>
<td>(n=11,50)</td>
<td></td>
</tr>
</tbody>
</table>

Without SI:blue, Attending SI:green
## 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>ΔGPA</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><strong>Totals</strong></td>
<td><strong>1818</strong></td>
<td><strong>67%</strong></td>
<td><strong>5.72</strong></td>
<td><strong>1.85</strong></td>
<td><strong>2.36</strong></td>
<td><strong>0.51</strong></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
Increased visits to SI results in higher GPA – as expected

Balancing Student Success: Assessing Supplemental Instruction Through Coarsened Exact Matching
https://doi.org/10.1007/s10758-017-9317-0
And now for something completely different...

**General Chemistry: Studio Labs**

- Integrated Lab and Lecture
- New course Learning Objectives
- New curricular design
- Centralized active learning
- Imbedded metacognitive activities
- Low/No-cost texts
- Vertical class integration
- Imbedded SI Leaders
- Cross attendance SI
- Smaller class sizes
- General Chemistry Coordinator
Why?

Because our students have changed – and *continue* to change
Because I couldn’t look at myself in the mirror and say I did everything to help
Because we can’t expect our students to go the extra mile if we won’t
Because it reinvigorates our faculty and staff
Because it’s good for RTP
Because our students deserve our best
Because it’s fun

*Humility is not thinking less of yourself, but thinking of yourself less.*
- C.S. Lewis
Acknowledgements

The CO CRT Team:  
  Gerry Hanley  
  Kathy Fernandes  
  Brett Christie  
  Leslie Kennedy  
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  Leo Cota  
  Vicki Devore  
  Marie Andrews  
  Sandra Flake  
  Yvette Farmer  
  The CRT Proven Leads and  
  CRT participants

Dr. Randy Miller, CSUC Chem Department Chair  
Zach Justus, CSUC FacDev  
All the SI Leaders and Near Peers  
The faculty and staff of the CSUC Chemistry Department  
Dr. Robin Donatello and Ricardo Aguilar, CSUC Stats  
~1000 General Chemistry Students
The Graduation Rate Equity Gap: The Effect of Dismissals, Dropouts, and DFW grades

By Jeff Bell
Four-Year Graduation Rate Equity Gaps:
- There are URM* grad gaps (~13% for 4-yr, 10% for 6-yr) and gender grad gaps
- The two gaps are independent
- Thus, URM males are the most at risk population – they graduate at 1/3 the rate of white females
- *URM is Under-Represented Minority: Hispanic, African or Native American
• High School performance matters:
  • ~2% increase in 6-yr grad rate for each 0.1 increase in index
  • URM grad and gender grad gaps remain after correcting for HS preparation
    • These are smaller than the overall grad gaps (~6% instead of 10%)
  • URM females do better than white males with same Index
  • URM gap decreases as Index increases, and may be negative above 4.0
• ~30% of FTF fail to graduate
• Of FTF lost, ~60% dropout and ~40% are dismissed
• The same percentage of URMs dropout as non-URMs
• URM grad “gap” is entirely a result of a higher dismissal rate – URM are 75% more likely to be dismissed than non-URMs
• %DFW (D+, D, F, W, WU) rates exactly mirror the FTF dismissal rates
• Thus, poor performance in the classroom is likely the entire cause of our URM graduation gap
Dismissal and %DFW rates are strongly correlated with HS eligibility scores.

As URM students enter with lower average HS eligibility scores, this explains part of the URM gap.

Even correcting for HS eligibility scores, there is still a large URM gap (this is also true for the gender gap).

- Gap disappears at the high end.
Principles of Financial Accounting is the first required course for business majors. Traditionally, the repeatable course grade (grade of C- or lower) has approximated 50%. Using a flipped classroom, Dr. DeWitt requires students to view classroom lectures before the first class meeting each week. In the second meeting, students are broken into four groups of 25, with each sub-group broken down into groups of five. The breakout sections are led by four outstanding senior accounting majors, called mentors. During the breakout session, students do their "homework" during class time. Hence, what formerly was homework becomes classroom work that was classwork now becomes homework.

CSU Course Redesign Initiative
Review the description of the CSU statewide initiative supporting faculty redesigning their courses to improve student success.

A free and open online library of online teaching and learning materials across a wide variety of disciplines and education levels. MERLOT provides you the link to the material as well as peer reviews, member comments, lesson plans, and other quality assurance information.

Principles of Financial Accounting Syllabus (for redesign)
In Spring 2014, 120 students enrolled in this "flipped" course.

# Ten Features of the CSU, Chico Redesign Story

## Redesign Component | Description
--- | ---
1. Flipped classroom | • Classwork becomes homework, by watching videos and reading free, online accounting books and other online materials  
• Homework becomes classwork, when students work in their breakout sessions under the direction of a Breakout Session Mentor
2. No hardbound textbook | • With 110 students at a new book cost of $250, we save students over $25,000
3. New technologies | • Clickers allow for instant role taking and assessment; the instructor can also see where students need remediation, and he can then launch into the day’s large lecture using the questions as a springboard  
• Blackboard/Learn is a repository for all course materials, including syllabus, course schedule, cases, Excel spreadsheets, and links to YouTube videos
4. Use of Excel spreadsheets to teach students double-entry bookkeeping with and without debits and credits | • A manual system using the left/right, two-column, plus/plus bookkeeping system is compared with a computerized left/right, single-column, plus/minus bookkeeping system  
• The father of modern-day bookkeeping, Luca Pacioli, is honored by explaining his contribution, and comparing it to the 21st century approach to bookkeeping
5. Cases (individual & group) grow in complexity and encourage students to relate at a personal level before expanding to a business level | • Students start the course by calculating their personal net worth, and then preparing a budget for a month; from this, they then win the lottery and thereby are able to invest their personal cash to finance their sole proprietorship  
• Later, the sole proprietorship is expanded to a partnership and then a corporation
6. Real-world examples are used to show the importance of financial statements | • Wal-Mart is compared to Target  
• Coke is compared to Pepsi
7. Senior accounting majors serve as Breakout Session Mentors | • Four outstanding seniors lead each Thursday’s breakout session
8. Common final exam, constructed by a neutral expert in financial accounting | • Test is authored according to specific learning outcomes; results can be compared by class and by instructor to determine if the redesign effort is inferior, the same, or superior to the non-redesigned classes; formative assessment feedback can also be provided to each instructor
9. Students simulate working as an “audit team” when they attest to the fairness, completeness, and accuracy of “clients” on mid-term exams | • This is an “assessment-as-learning” technique that provides another learning opportunity for students; audit teams work together to render an audit opinion on their peers’ examinations
10. Students can choose to author a formal “Memorandum of Appeal” at the end of the semester | • This technique allows students who believe they should justifiably receive more points to reflect their actual learning (e.g., missing class due to illness, death in the family, or special occasions such as weddings, funerals, and participation in NCAA sports) are encouraged to author a formal written explanation for why more points should be added
Relevant Websites

- Merlot:
  

- Flipping the Classroom in Principles of Financial Accounting

  https://www.youtube.com/watch?v=2fG6vrSLDyM
Overall Objectives

- Reduce Bottlenecks
- Promote Student Success
- Utilize High-Impact Practices
- Support Student Engagement
- Implement Technology Solutions that Support Academic Success
Did We Reduce Bottlenecks?

No (not yet!)
Did We Promote Student Success?

Yes! Students responded favorably to

• the videos
• their breakout session mentors
• using Excel spreadsheets to learn fundamental accounting
Did We Utilize High-Impact Practices

Yes.

- We used a “super” form of Supplemental Instruction (SI) using Breakout Session Mentors

- We used clicker technology to assess students and adapt teaching strategies to accommodate students’ strengths and weaknesses

- We created YouTube videos, much like the Khan Academy, where students could watch videos before coming to class; videos were created with Camtasia
Did We Support Student Engagement?

Yes

- By creating “personalized” homework assignments
- By assigning students to groups
- By allowing students to complete homework in Breakout Sessions with the help of their assigned Breakout Session Mentor,
- By “auditing” one another’s exams and being allowed to challenge one’s preliminary audit score
- By permitting students to write a Memorandum of Appeal claiming more points for justifiable reasons
Did We Implement Technology Solutions?

- YouTube videos created with Camtasia
- iClicker technology
- Excel spreadsheets linking transactions to financial statements
Lessons Learned

• Students who watched the videos reported that they helped them learn the material
• Breakout session mentors were extremely helpful, but they need to do less “Main Instruction” and more “Supplemental Instruction”
• Professor needs to do more “Main Instruction” and less “Supplemental Instruction”
• Homework assignments must be more carefully structured and more timely feedback needs to be provided
The Future

- Repeat large-lecture course in Fall 2014 using Supplemental Instruction (SI)
- Offer “small” flipped classroom course using SI
- Compare F2014 with S2014 between small-lecture traditional class, large-lecture flipped class, and small-lecture flipped class
- If funding permits, rehire three or four breakout session mentors (e.g., SIs); using sound SI techniques, these students will not lead any instruction; instead they will conduct office hours devoted to students who volunteer to use them
- A method must be devised to ensure that all students watch the videos before the large lecture class
- Create Excel homework assignments that provide students with more guidance and feedback
Second-Year Student Success Program

A.K.A. The Game Changers

Dr. Darin R. Haerle
Student Success Summit:
Tipping Point
January 17th, 2019
Program Origin

• Achievement gaps identified in BSS
• Student learning fee (SLF) proposal for pilot program
• Use of criminal justice (CJ) majors for pilot
  – 4th largest major on campus at 683 students
  – One of the most diverse majors (61% URM)
• Goals: Persistence, academic achievement, & student experiences
Program Description

• Cohort model
• Eligibility criteria – one or more of the following:
  – Lower socio-economic status
  – First generation college student
  – Underrepresented minority
• Continuity is key
  – 30 students have class in Fall and Spring together
  – Faculty advisor teaches both courses
• Financial incentive of free textbooks
• Additional incentive of peer mentors…
Program Description

• Cohort model + mentorship = success
  – Jacobi, 1991; Nakkula & Harris, 2005; Terrion & Leonard, 2007; Wilson et al., 2010

• Three upperclassmen mentors
  – High GPAs
  – Seniors / 4th-year students
  – Ideally past Cohort participant (or would have been eligible for program, in case of Cohort 1)
Assessment

• Survey data collected pre- and post-Cohort year
  – Items related to self-confidence, utilization of campus resources, experiences with advising, connectedness to campus, etc.

• GPAs tracked to graduation
Average GPAs

Cohort 1
(AY 2016-2017)

Pre- Cohort Year
Post- Cohort Year
Post- Spring 2018
Post- Fall 2018

Cohort 2
(AY 2017-2018)

Pre- Cohort Year
Post- Cohort Year
Post- Fall 2018
<table>
<thead>
<tr>
<th>Survey Item</th>
<th>Pre-Cohort Year</th>
<th>Post-Cohort Year</th>
</tr>
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<tbody>
<tr>
<td>During the previous school year, to what extent did you feel connected to</td>
<td>13% quite or very connected</td>
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### Cohort 1 Findings

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<td>How confident are you that you have the skills and abilities to succeed at Chico State?</td>
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<td>Last year, how satisfied were you with the availability of faculty outside</td>
<td>19% very satisfied</td>
<td>64% very satisfied</td>
</tr>
<tr>
<td>of class?</td>
<td></td>
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<td>Last year, how satisfied were you with the availability of faculty outside of class?</td>
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<td>To what extent have your school experiences during the previous year contributed to your growth in writing effectively?</td>
<td>6% a lot</td>
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</tr>
<tr>
<td><strong>To what extent have your school experiences during the previous year contributed to your growth in participating in class discussions?</strong></td>
<td>6% a lot</td>
<td>23% a lot</td>
</tr>
</tbody>
</table>
Next Steps

- SLF proposal for Cohort 4 is under review
- Collect post-data for Cohort 3 in May
- Continue to track GPAs
- Cohort 1: Comparison group data
  - Non-program participants taking the same courses with me each semester AY 2016-2017
  - Analysis in progress
- Qualitative interviews with random sample from first three cohorts
Many of Cohort 1 graduate in May!

Thank you for listening!
Darin Haerle
dhaerle@csuchico.edu

And Cohort 2 is well on their way!