The Effectiveness of Supplemental Instruction Closing the Gap between URM & Non-URM Students in STEM Courses

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Sunny Moon (hmoon@fullerton.edu)
Ed Sullivan (esullivan@fullerton.edu)
James Hershey (jrhershey@fullerton.edu)

Institutional Research and Analytical Studies
California State University, Fullerton

Marty Bonsangue (mbonsangue@fullerton.edu)
Sean Walker (swalker@fullerton.edu)
Mark Filowitz (mfilowitz@fullerton.edu)

College of Natural Science and Mathematics
California State University, Fullerton
Two Gateway Courses

**BIOL 171 (Evolution/Biodiversity)**
- Biology
- Kinesiology (part of pathway to 300 level Human Anatomy course)
- Biochemistry (part of pathway to Cellular Basis of Life)
- Geology (option)

**MATH 150A (Calculus 1)**
- Engineering and Computer Science majors
- Chemistry/Bio-Chemistry
- Mathematics
- Physics
- Biology (option)
- Geology (option)
Two Gateway Courses

**BIOL 171 (Evolution/Biodiversity)**
- Fall 2006 (before SI)
  - 224 attempts (10 sections)
    - 1.94 mean course GPA
    - 1.37 low section GPA
    - 2.35 high section GPA
- Fall 2010
  - 239 attempts (10 sections)
    - 2.68 mean course GPA
    - 2.29 low section GPA
    - 3.18 high section GPA

**MATH 150A (Calculus 1)**
- Fall 2007 (before SI)
  - 261 attempts (9 sections)
    - 1.68 mean course GPA
    - 0.93 low section GPA
    - 2.38 high section GPA
- Fall 2010
  - 333 attempts (11 sections)
    - 1.83 mean course GPA
    - 1.35 low section GPA
    - 2.46 high section GPA
<table>
<thead>
<tr>
<th>Natural Sciences and Mathematics</th>
<th>Engineering and Computer Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2006 — 36%</td>
<td>Fall 2006 — 34%</td>
</tr>
<tr>
<td>Fall 2007 — 34%</td>
<td>Fall 2007 — 39%</td>
</tr>
<tr>
<td>Fall 2010 — 17%</td>
<td>Fall 2010 — 34%</td>
</tr>
</tbody>
</table>
Theoretical Background of Supplemental Instruction

- Academic Integration / Social Integration
  - Tinto’s Theory
  - Cognitive & Affective Learning Outcomes
- Culturally-Sensitive Strategy
  - Collaborative Settings
  - Closing the achievement gap between URM & Non-URM
- Vygotsky’s Zone of Proximal Development
- Meta-Cognition
  - Self-monitoring/Self-regulating strategy
- Cost-effective strategy to improve retention
Historical Trends of Two STEM Gateway Courses:

BIOL171 (Evolution & Biodiversity)
MATH150A (Calculus I)
BIOL171 Course Grade (CSUF Natives)


Average of Grade: 2.06, 1.86, 2.05, 1.87, 2.09, 1.99, 1.65, 1.74, 1.83, 1.74, 1.97, 2.03, 2.29, 1.58, 2.45, 2.52, 2.71, 2.30

BIOL171 Course Grade (Transfers)

Average of Transfer GPA: 3.03, 3.09, 3.20, 3.05, 3.15, 3.06, 2.94, 2.85, 2.97, 3.01, 2.92, 2.83, 2.96, 2.97, 3.01, 2.74, 2.84, 3.01

Average of Grade: 2.24, 2.48, 2.12, 2.36, 2.63, 2.08, 1.87, 1.72, 2.24, 2.25, 2.50, 2.41, 2.41, 1.76, 2.91, 2.51, 2.95
BIOL171 Success Rates (CSUF Natives)

BIOL171 Success Rates (Transfers)
MATH150A Course Grade (CSUF Natives)

<table>
<thead>
<tr>
<th>Year</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>3.18</td>
<td>1.53</td>
</tr>
<tr>
<td>2003</td>
<td>3.22</td>
<td>1.69</td>
</tr>
<tr>
<td>2004</td>
<td>3.19</td>
<td>1.60</td>
</tr>
<tr>
<td>2005</td>
<td>3.28</td>
<td>2.03</td>
</tr>
<tr>
<td>2006</td>
<td>3.23</td>
<td>2.07</td>
</tr>
<tr>
<td>2007</td>
<td>3.23</td>
<td>1.75</td>
</tr>
<tr>
<td>2008</td>
<td>3.24</td>
<td>1.55</td>
</tr>
<tr>
<td>2009</td>
<td>3.23</td>
<td>1.42</td>
</tr>
<tr>
<td>2010</td>
<td>3.24</td>
<td>1.37</td>
</tr>
<tr>
<td>2011</td>
<td>3.24</td>
<td>1.75</td>
</tr>
</tbody>
</table>

MATH150A Course Grade (Transfers)

<table>
<thead>
<tr>
<th>Year</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>2.87</td>
<td>1.77</td>
</tr>
<tr>
<td>2003</td>
<td>2.86</td>
<td>1.67</td>
</tr>
<tr>
<td>2004</td>
<td>2.98</td>
<td>1.56</td>
</tr>
<tr>
<td>2005</td>
<td>2.99</td>
<td>2.47</td>
</tr>
<tr>
<td>2006</td>
<td>2.99</td>
<td>2.06</td>
</tr>
<tr>
<td>2007</td>
<td>2.96</td>
<td>1.80</td>
</tr>
<tr>
<td>2008</td>
<td>2.93</td>
<td>1.82</td>
</tr>
<tr>
<td>2009</td>
<td>3.14</td>
<td>1.63</td>
</tr>
<tr>
<td>2010</td>
<td>2.97</td>
<td>1.25</td>
</tr>
<tr>
<td>2011</td>
<td>2.90</td>
<td>1.52</td>
</tr>
</tbody>
</table>

Average of HS GPA: 
- 2002: 3.18
- 2003: 3.22
- 2004: 3.19
- 2005: 3.28
- 2006: 3.23
- 2007: 3.23
- 2008: 3.24
- 2009: 3.24
- 2010: 3.24
- 2011: 3.25

Average of Grade:
- 2002: 1.53
- 2003: 1.69
- 2004: 1.60
- 2005: 2.03
- 2006: 2.07
- 2007: 1.75
- 2008: 1.55
- 2009: 1.42
- 2010: 1.37
- 2011: 1.75

Average of Transfer GPA: 
- 2002: 2.87
- 2003: 2.86
- 2004: 2.98
- 2005: 2.99
- 2006: 2.96
- 2007: 2.93
- 2008: 3.14
- 2009: 2.97
- 2010: 2.90
- 2011: 2.83
Effects of Supplemental Instruction on Two STEM Gateway Courses:

BIOL171 (Evolution & Biodiversity)  
MATH150A (Calculus I)
# of SI Participants and Non-Participants in BIOL171 & MATH150A

**BIOL171**
- **CSUF Natives**
  - Number Participants: 508
  - Number Non-Participant: 728
- **Transfers**
  - Number Participants: 162
  - Number Non-Participant: 103

**MATH150A**
- **CSUF Natives**
  - Number Participants: 282
  - Number Non-Participant: 273
- **Transfers**
  - Number Participants: 34
  - Number Non-Participant: 40

**Courses**
- **BIOL171**: Fall 2007 - Spring 2011
- **MATH150A**: Fall 2008 - Spring 2011
## Course Grades of BIOL171 & MATH150A Between SI Participants and Non-Participants

<table>
<thead>
<tr>
<th>Course</th>
<th>BIOL171 Fall 2007 - Spring 2011</th>
<th>MATH150A Fall 2008 - Spring 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSUF Natives</td>
<td>1.91</td>
<td>1.52</td>
</tr>
<tr>
<td>Transfers</td>
<td>2.77</td>
<td>2.28</td>
</tr>
<tr>
<td>CSUF Natives</td>
<td>2.90</td>
<td>2.40</td>
</tr>
<tr>
<td>Transfers</td>
<td>2.30</td>
<td>1.43</td>
</tr>
</tbody>
</table>

- **BIOL171**: Fall 2007 - Spring 2011
- **MATH150A**: Fall 2008 - Spring 2011

- **Course Grade Non-Participant**
- **Course Grade Participants**
Success Rates BIOL171 & MATH150A Between SI Participants and Non-Participants

**BIOL171** :
- Fall 2007 - Spring 2011

<table>
<thead>
<tr>
<th>Course</th>
<th>CSUF Natives</th>
<th>Transfers</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL171</td>
<td>0.53</td>
<td>0.54</td>
</tr>
<tr>
<td></td>
<td>0.82</td>
<td>0.84</td>
</tr>
</tbody>
</table>

**MATH150A** :
- Fall 2008 - Spring 2011

<table>
<thead>
<tr>
<th>Course</th>
<th>CSUF Natives</th>
<th>Transfers</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL171</td>
<td>0.48</td>
<td>0.45</td>
</tr>
<tr>
<td></td>
<td>0.77</td>
<td>0.79</td>
</tr>
</tbody>
</table>

- Blue shaded bars represent Success Rate Non-Participant.
- Red shaded bars represent Success Rate Participants.
URM vs. Non-URM: BIOL171 (CSUF Natives)

Course Grades

- URM: 1.66, 2.13, 2.57, 2.90
- Non-URM: 2.00, 2.50, 3.00

Success Rates

- URM: 0.46, 0.60, 0.86, 1.00
- Non-URM: 0.40, 0.60, 0.80
URM vs. Non-URM : BIOL171 (Transfers)

**Course Grades**
- URM: 1.89
- Non-URM: 2.95
- Participant: 2.96
- Not Participant: 2.49

**Success Rates**
- URM: 0.52
- Non-URM: 0.69
- Participant: 0.87
- Not Participant: 0.52
URM vs. Non-URM: MATH150A (CSUF Natives)

Course Grades

Success Rates

<table>
<thead>
<tr>
<th>NOT PARTICIPANT</th>
<th>PARTICIPANT</th>
</tr>
</thead>
<tbody>
<tr>
<td>URM</td>
<td>1.26</td>
</tr>
<tr>
<td>Non-URM</td>
<td>2.41</td>
</tr>
<tr>
<td>URM</td>
<td>1.74</td>
</tr>
<tr>
<td>Non-URM</td>
<td>2.17</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NOT PARTICIPANT</th>
<th>PARTICIPANT</th>
</tr>
</thead>
<tbody>
<tr>
<td>URM</td>
<td>0.38</td>
</tr>
<tr>
<td>Non-URM</td>
<td>0.73</td>
</tr>
<tr>
<td>URM</td>
<td>0.58</td>
</tr>
<tr>
<td>Non-URM</td>
<td>0.81</td>
</tr>
</tbody>
</table>
URM vs. Non-URM: MATH150A (Transfers)

Course Grades
- NOT PARTICIPANT: 0.66
- PARTICIPANT: 2.40
- URM: 1.82
- Non-URM: 2.30

Success Rates
- NOT PARTICIPANT: 0.20
- PARTICIPANT: 0.70
- URM: 0.58
- Non-URM: 0.89
MATH150A Course Grade / Success Rates of SI vs. Non-SI by Ethnicity (CSUF Natives)
MATH150A Course Grade / Success Rates of SI vs. Non-SI by Ethnicity (Transfers)

Course Grades

<table>
<thead>
<tr>
<th>NOT PARTICIPANT</th>
<th>PARTICIPANT</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASIAN - Total</td>
<td>1.49</td>
</tr>
<tr>
<td>Black - Total</td>
<td>2.30</td>
</tr>
<tr>
<td>HISPANIC - Total</td>
<td>2.63</td>
</tr>
<tr>
<td>WHITE - Total</td>
<td>2.18</td>
</tr>
</tbody>
</table>

Success Rates

<table>
<thead>
<tr>
<th>NOT PARTICIPANT</th>
<th>PARTICIPANT</th>
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<tr>
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<td>2.63</td>
</tr>
<tr>
<td>WHITE - Total</td>
<td>2.00</td>
</tr>
</tbody>
</table>
Next Steps

- Institutionalize Supplementary Instruction
  - SI efforts in Biology and Mathematics are currently supported by grant resources
  - Campus is looking at funding models for the instruction
    - Non-degree course section eligible for funding based on FTES generated (Math model)
    - Voluntary meeting (no course section) funded through defined revenue stream for student support (Biology Model)
Next Steps

- Clarify Roles and Responsibilities for SI program
- Potentially expand the scope of SI
  - Inclusion of other lower division gateway science courses
  - Inclusion of upper division gateway business courses
Questions?

Presentation available on our website at:

www.fullerton.edu/analyticalstudies/planning/avp/cair2011_SI.pdf