Engaging Students in Authentic Research in Introductory Chemistry and Biology Laboratories

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Background

- One major issue in higher education is retention of science majors.
- Course-based undergraduate research experiences (CUREs) emerging new trend to show gains in retention.¹
- One major gap in understanding CUREs is the variability in course-based undergraduate research experiences (CUREs) emerging new trend to show gains in retention.¹

Courses

Chemistry 125/126
- 2 credit lab course
- Taken primarily by 1st year students
- No prerequisite required
- ~ 1700 students enroll per year

Biology 173
- 2 credit lab course
- Taken primarily by 2nd year students
- Bio 171 or 172 or AP credit required
- ~1800 students enroll per year

Pre/Post Survey Factors

<table>
<thead>
<tr>
<th>Factor Number</th>
<th>Factor Name</th>
<th>Survey Source</th>
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</thead>
<tbody>
<tr>
<td>F1</td>
<td>Interest: Initial &amp; Maintained</td>
<td>Harackiewicz et al.²</td>
</tr>
<tr>
<td>F2</td>
<td>Self-Perceived Ability (Persistence)</td>
<td>Ferrell &amp; Barbera³</td>
</tr>
<tr>
<td>F3</td>
<td>Intellectual Accessibility</td>
<td>Bauer⁴</td>
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<tr>
<td>F4</td>
<td>Importance &amp; Use</td>
<td>Bauer⁴</td>
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<tr>
<td>F5</td>
<td>Lab Confidence</td>
<td>Brownell et al.⁵</td>
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CHEMISTRY 125/126 Fall 2015

<table>
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<tr>
<th>Sections</th>
<th>Students Enrolled</th>
<th>Students Participated in Pre/Post Survey</th>
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<tr>
<td>Research</td>
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<td>58</td>
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BIOLOGY 173 Fall 2015

<table>
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<tr>
<th>Sections</th>
<th>Students Enrolled</th>
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</thead>
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<tr>
<td>Research</td>
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<td>80</td>
</tr>
<tr>
<td>Non-Research</td>
<td>32</td>
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</table>

Conclusions

- Research sections maintained students’ interest in chemistry or biology over the semester, while interest declined in the regular sections.
- Student confidence in their laboratory skills was significantly higher in Biology research sections than regular sections at the end of the semester.
- Student perception of the importance and usefulness of Chemistry was significantly higher in Chemistry research sections than regular sections at the end of the semester.

Objectives

1. Create and implement a model to incorporate faculty-led research projects into introductory Chemistry and Biology laboratories.
2. Determine whether authentic research in introductory laboratory classes has an impact on students’ attitude, interests, confidence and self-efficacy in STEM and ultimately on graduation rates of STEM majors.

Future Work

- Increase the number of faculty led research projects in both Chemistry 125/126 and Biology 173
- Conduct one on one student interviews to understand students perception of the research sections

Acknowledgments

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References