Structured supplemental instruction leads to increased student learning in Introductory Biology

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Introduction

Supplemental Instruction (SI) has been implemented on campuses across the globe, helping students not only pass, but excel in historically difficult classes. As of 2016, Mercer University has held SI sessions for classes including Calculus, Physics, General Chemistry, and Organic Chemistry. No SI sessions were offered for Introductory Biology classes, despite many students struggling to pass the courses. SI sessions have proven to be powerful learning tools in areas such as mathematics and chemistry, but are implemented less often in biology courses. In response to the need for an SI program for Introductory Biology students, we created Biology Educational Achievement Resources: Peer-Assisted Workshops (BEAR PAWs) as a resource for students to seek further instruction from a student who has previously mastered the biology course. During the course, students were offered two types of BEAR PAWS sessions.

We assessed the effectiveness of both types of SI. We hypothesized that SI sessions would need to assess their own understanding in order to formulate questions and that exam review sessions, because students are more likely to answer a question correctly on the post-course concept inventory compared to the pre-course.

Methods

We assessed the effect of both type of SI. We hypothesized that student attendance at regular BEAR PAWS sessions will have a greater effect on student learning than exam review sessions, because student will need to assess their own understanding in order to formulate questions for the TA, thereby promoting metacognition.

Table 1. Description of the two types of BEAR PAWS Sessions

<table>
<thead>
<tr>
<th>Regular Sessions</th>
<th>Exam Review Sessions</th>
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<tbody>
<tr>
<td>Held several times per week by TA: times and locations vary each day</td>
<td>Held a few days prior to each scheduled exam in the course (4 times in the semester)</td>
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<tr>
<td>“Drop in” style sessions, similar to faculty office hours</td>
<td>Scheduled on a specific date and time for 2 hours</td>
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<tr>
<td>No set agenda; students responsible for bringing questions related to material</td>
<td>TA’s set the agenda by creating an exam review “game” that aligns with the LO’s and prompts retrieval practice in students.</td>
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Discussion

- Students learning gains were affected by attending BEAR PAWS review sessions, but not regular BEAR PAWS sessions. This indicates that structured SI sessions are more effective at increasing student learning.
- Our original hypothesis, that students who came to BEAR PAWS sessions would have higher NLG than students who attended just exam review sessions, was rejected.
- This may be caused by students inability to incorporate retrieval practice in their own study plans. Structured SI sessions can be an opportunity for students to perform retrieval practice.
- Students did not connect their learning gains with attendance at BEAR PAWS review sessions.

Table 2. Summary of student responses

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<tr>
<th></th>
<th>Percentage</th>
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<tr>
<td>of the students attended at least one BEAR-PAWS session</td>
<td>56%</td>
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<tr>
<td>of total BEAR PAW’s attendance was at regular (office hours) sessions</td>
<td>61%</td>
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<tr>
<td>students rated Teaching Assistants outside of class as helpful or very helpful</td>
<td>30%</td>
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Recommendations

- SI sessions should be structured for students to perform retrieval practice, in order to make sessions more effective.
- SI sessions should include opportunities for student metacognitive reflection.
- SI sessions should be offered multiple times a week so that they are accessible by all students.

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References