**Do In-Class Active Review Sessions Promote Critical Thinking Skills in a High-Enrollment Human Anatomy and Physiology Course?**

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**Introduction**

- Despite efforts to increase active learning activities in the classroom, students struggle with application-based exam questions.
- Retieative review sessions helped to “back fill” content deficits, but fail to enhance critical thinking.
- Attendance at review sessions held outside of class is low.
- In-class, student centered activities used as review should enhance critical thinking.
  - Think-pair-share
  - POGIL activities
  - Application-style student response questions

**Learning Objectives**

I used performance on past exams to identify concepts that students struggled to understand:
- Cardiovascular: relating tissue perfusion and blood flow to resulting disease.
- Respiratory: relating atmospheric pressure & other compartment pressure differentials to ventilation and disease.
- Endocrine: how disruption of endocrine pathways lead to disease.
- General: making connections between systems.

Specific Learning Objective: Students should be able to apply course content to application-based questions.

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**Approach**

1. Student-centered review modules and assessments for these modules were developed.
2. Modules were deployed in control & experimental sections in Fall 2013.
   - a) Control group had in-class, didactic reviews with some application student response questions.
   - b) Experimental had additional POGIL and small group activities geared towards critical thinking and application of content.
3. Effectiveness of assessment questions were evaluated via difficulty & discrimination analyses.
4. Individual learning gains were compared across sections.

**Active Review Sessions**

**Active Participation in Review Sessions**

- 33% of students report their Professors hold review sessions prior to exams
- 26% able to attend when held outside of normal class time
- 25% held in class

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**Assessment Tool: Pre- & Post-Test**

- Pre- and posttests were vignette-style multiple choice questions delivered through ESI, at the beginning & end of each semester.
- Topics targeted difficult concepts within each unit of course.
- Distractors were common misconceptions.
- Same questions were used on pre- vs. post-tests.
- Exam difficulty & discrimination was used to evaluate assessment tool.
- Gain scores were calculated as averages of individual student learning gains.

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**Active Review Sessions Improve Ability to Apply Content**

<table>
<thead>
<tr>
<th>Student Demographics</th>
<th>% Juniors</th>
<th>% Seniors</th>
<th>% Majors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (n=77)</td>
<td>66</td>
<td>31</td>
<td>35</td>
</tr>
<tr>
<td>Experimental (n=56)</td>
<td>73</td>
<td>29</td>
<td>36</td>
</tr>
</tbody>
</table>

- Relating blood flow to tissue health & correlation to disease:
  - Q1: difficulty 0.19, discrimination 0.41
  - Q2: difficulty 0.56, discrimination 0.74
  - Q3: difficulty 0.27, discrimination 0.38
  - Q4: difficulty 0.36, discrimination 0.69
  - Q5: difficulty 0.22, discrimination 0.28
  - Q6: difficulty 0.65, discrimination 0.44
  - Q7: difficulty 0.53, discrimination 0.25
  - Q8: difficulty 0.23, discrimination 0.25

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**Where do we go from here?**

- Adjust assessment tool and re-administer.
- Use A&P I content as basis for pre-test questions.
- Continued assessment of student learning gains.
- Compare learning gains across student demographic information.
- Compare learning gains across those who attended review sessions.
- Compare performance on application-based exam questions.
- Increase opportunities for students to practice application skills in the classroom.

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