Neuroscience Course
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Abstract
Neuroscience 101: The College Brain is designed as a bridge course to help students transition between high-school and college. The course has no prerequisites and is intended for 1st year college students. The course serves students majoring in Neuroscience (approximately 20% in the fall 2015 offering), other science majors (~14%), and non-science majors seeking to fulfill their lab requirement (~67%). The latter group typically consists of students from all academic levels (1st year – senior). Students completing earlier iterations of the course at Thiel College (2014) and Centenary College of Louisiana (2011-13); both taught by the author) demonstrated difficulty understanding readings and linking concepts from the readings to other course materials. To address this concern, in the fall 2015 a new team-based learning approach was integrated into the class. Here I report on this technique and present data from the pilot year.

Background
In the spring of 2015, Senior Associate Director of Northeastern University's Center for Advancing Teaching and Learning Through Research, Michael Sweet, Ph.D., lead a faculty workshop in which he presented material on the instructional strategy Team-Based Learning (TBL). As defined by the Team-Based Learning Collaborative (http://www.TeamBasedLearning.org), TBL is a collaborative learning strategy organized around modules of instruction. The typical TBL structure requires students to read, watch, or complete materials related to the module before the start of instruction of that module. Students then complete an in-class Readiness Assurance Test/Quiz (RAT or RAQ), first individually then as a team (see details on my method below). Finally, the team completes an in-class activity related to the material.

TBL is typically organized around four foundational principles (Michaelson & Richards 2005):

• Individual talent, experience, and other relevant student characteristics are equally distributed among groups, which are fixed for the duration of the course.
• Students are held accountable for individual (pre-learning) and team work.
• Assignments are designed to promote learning and team development.
• Immediate feedback is frequently given in all stages of the module.

Following Dr. Sweet’s presentation, I chose to implement TBL in my Neuroscience 101 course to address the concerns mentioned in the abstract above. Specifically, TBL was chosen to help students better understand how pre-lab/lecture readings relate to other course materials. This class was selected as it serves a diverse group of students that frequently struggle with introductory level science courses. For example, all neuroscience majors begin their curriculum with this course. The class is also taken by a varied of other science majors; typically, those interested in health-careers. This group tends to consist of highly motivated 1st-year and sophomore students. Non-science majors can use the class to fulfill Thiel’s lab-core requirement. This group is more diverse in terms of their motivation and academic rank and frequently consists of students from all levels (1st-year through seniors). Demographics on for this iteration of the class are presented in Table 1.

Table 1: Student demographics for the fall 2015 offering of Neuroscience 101 (n=15).

<table>
<thead>
<tr>
<th>Type of Subject</th>
<th>Academic Rank</th>
<th>Self-Reported Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Science</td>
<td>First Year 27%</td>
<td>Male 60% Female 40%</td>
</tr>
<tr>
<td>Neuroscience</td>
<td>Sophomore 7%</td>
<td>Male 33% Female 33%</td>
</tr>
<tr>
<td>Biology</td>
<td>Junior 33%</td>
<td></td>
</tr>
<tr>
<td>Comp. Sci</td>
<td>Seniors 33%</td>
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</tbody>
</table>

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Timeline
Prior to the start of the semester
I assigned students to teams based on academic rank and prior coursework. Each team consisted of at least one science major and one 1st-year, junior, and senior student.

1st Lab Period: Pre-Readiness Assurance Quiz (RAQ)
• Students were introduced to the TBL format and given their team assignments. Their first task as a team was to decide on the grade weights for the three components of each RAQ (Figure 1). They then completed an individual and group pre-RAQ on the course syllabus.
• Group RAQs were completed using IF AT ® scratch cards (Figure 2).

Approximately every three weeks: RAQ 1-4
• The RAQs will follow a team-based learning model, in which you will first complete the quiz by yourself, then as a team. Your grade for each RAQ will be based on three factors:
  - Your individual performance on the RAQ (IF AT ® card)
  - Your team performance on the RAQ (IF AT ® cards)
  - Your team performance on the RAQ (IF AT ® cards)

Figure 1: A correlational analysis was performed to examine the relationship between RAQ and exam performance. Although limited in power, this analysis indicated that the relationship might be different for science and non-science majors and for lower and upper academic ranks. In all cases, a negative correlation was found between RAQ and exam grades for science majors and upper-class peers on both RAQs and Exams, specifically on questions related to RAQ readings.

Conclusions
• Science majors and newer students generally performed better than their non-science major and upper-class peers on both RAQs and Exams, specifically on questions related to RAQ readings.
• A correlational analysis was performed to examine the relationship between RAQ and exam performance. Although limited in power, this analysis indicated that the relationship might be different for science and non-science majors and for lower and upper academic ranks. In all cases, a negative correlation was found between RAQ and exam grades for science majors and upper-class peers on both RAQs and Exams, specifically on questions related to RAQ readings.

Future Directions
As a pilot attempt at TBL, I believe the project had some success. For the one group that was able to work together, TBL appeared to successfully accomplish its goals. These students regularly discussed material outside of class, were more engaged with the course, and earned higher grades. Interpretation of the other groups was difficult as each had members that stopped coming to class and/or participating in any group work. The limited data collected in this pilot may indicate that TBL is an effective approach for students that are already motivated to preform well in a course – namely students that are taking a course because it relates to their major or intended career.