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Investigating Instructional Strategies in a Human Anatomy and Physiology Laboratory

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Abstract

Laboratory teaching, an essential component of Human Anatomy and Physiology (A&P) courses, is often delivered using a lecture-based presentation. The application of active learning strategies in teaching has been documented to increase student performances. However, studies on the effectiveness of different instructional strategies in A&P laboratories and the evaluation of students’ preferences have been inadequate. The current study investigated both effectiveness and student acceptance in the context of adoption of a team-based teaching method for the A&P Laboratory. We offered team-based projects in two out of six laboratory sections. The group that engaged in team-based projects in the first half of the laboratory sessions; these active learning projects consisted of near-peer teaching, group discussions, and other activities. Other sections (control group) were taught only in the traditional manner. Both methods were used to assess student performance. Qualitative analyses were performed on the anonymous feedback that was provided by the students that participated in this study. The data indicate that students in the experimental group (team-based projects) outperform those taught using traditional methods. The team-based method according to the survey was better appreciated among students, which improved teacher-student interaction and facilitated peer discussion. This study promotes critical thinking, kept student more engaged in the lab, and helped them develop skills outside academically. We believe that, by optimizing team-based teaching in A&P laboratories, we can create an active learning environment to enhance students’ performances, knowledge, and skills on the subject.

Methodology

Students in the lab participated in traditionally taught labs as well as those that are team-based. Lab sections were randomly assigned as “lab A” or “lab B.” For example, students in lab A were taught material in muscle lab 1 using the traditional method, and the material in muscle lab 2 using a team-based method. Those students in lab B will be taught material in muscle lab 1 using a team-based method, and material in muscle lab 2 using a traditional method. All scores are compared and analyzed (lab A and lab B; traditional and team-based; order of labs).

Data are comprised of regular assignments that students completed through their regular course materials and assignments. No data was collected during class discussions. Students were also asked to provide anonymous feedback regarding their teaching-style preference. At the end of the semester, students were provided with a “paper-and-pencil” survey to fill out. They were advised to make their feedback anonymous by not putting their names or any kind of identification mark on the paper.

Final test scores that are part of the normal classroom assignments are used to compare the “team-based” group with other groups who were taught only in traditional method. The performance based on the test scores of both groups, taught in different ways, were analyzed statistically (quantitative analysis). Also, the anonymous feedback from student survey are analyzed (qualitative analysis). The results from both quantitative and qualitative assessments were taken into consideration, and conclusions are drawn.

Research Overview

Students enrolled in CHIO2204L (Anatomy and Physiology I Laboratory) were taught materials using a “hands-on” method as well as traditional didactic methods. The team-based learning modules were incorporated into the current curriculum to investigate the effectiveness of the various instructional strategies that will be used as a regular part of the course, as well as to investigate students’ perceptions of the efficacy of these strategies. This research may benefit other instructors in higher education by quantifying the effectiveness of different instructional strategies.

(i) Preliminary Class Assessment

Q.1. What is the best way for you to learn in the lab?

<table>
<thead>
<tr>
<th>Total response</th>
<th>46</th>
<th>Response</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>i. Visuals (Models, Posters, Diagrams, PowerPoint, Animation, Movies)</td>
<td>21</td>
<td>45.0</td>
<td></td>
</tr>
<tr>
<td>ii. Discussion/Interaction</td>
<td>14</td>
<td>30.4</td>
<td></td>
</tr>
<tr>
<td>iii. Activity (Hands-on, experiment, dissection)</td>
<td>6</td>
<td>13.0</td>
<td></td>
</tr>
<tr>
<td>iv. Review</td>
<td>4</td>
<td>8.7</td>
<td></td>
</tr>
<tr>
<td>v. Explanation (Story, Example)</td>
<td>3</td>
<td>6.5</td>
<td></td>
</tr>
<tr>
<td>vi. Self Study</td>
<td>3</td>
<td>6.5</td>
<td></td>
</tr>
</tbody>
</table>

The preliminary class assessment was employed as a probe to determine the appropriate tools for effective student learning. Student participation and feedback was voluntary and anonymous. Table A and B are representative of the student views.

(ii) Quantitative Assessment of the Effectiveness of the Teaching Strategies

A: Entire Class

B: Entire Class-Test Lab

C: Test Lab

Comparative graphical representation of the mean student scores in different lab practicals. A total of seven lab practicals (X-axis) was offered during the semester with a maximum of 50 points each (Y-axis). There were 145, 96, and 49 students in A, B, and C respectively. The error bar represents the standard deviation of the student scores in a group.

(iii) Qualitative Assessment of the Students’ Perception of the Teaching Strategies

A: Traditional Teaching Method using PowerPoint and lecture

B: Team based Teaching Method using games and other group-based activities

C: No preference

Q: Which teaching style did you find most interesting?

A: 42
B: 12
C: 2

Q: Which teaching style do you think helped you learn the laboratory material best?

A: 30
B: 12
C: 4

Q: Which teaching style helped you the most to keep you engaged in the lab?

A: 30
B: 12
C: 4

Q: Which teaching style facilitated more interaction with the lab TAs?

A: 28
B: 12
C: 4

Q: Which teaching style do you think is the best for peer interaction in lab?

A: 26
B: 12
C: 4

Q: Which teaching style do you think helped you develop skills outside of academics?

A: 20
B: 12
C: 4

Q: Which teaching style did you like in terms of learning anatomy?

A: 18
B: 12
C: 4

Q: Which teaching style do you think is the best for peer interaction in lab?

A: 26
B: 12
C: 4

Q: Which teaching style do you think is the best for peer interaction in lab?

A: 26
B: 12
C: 4

Q: Which teaching style would you like to adopt in future labs?

A: 25
B: 12
C: 4

(iii) Survey Questionnaire and Student Responses. The survey questionnaire encompasses multiple aspects of student cognitive outputs to evaluate the traditional as well as the team based teaching methodology. "No preference" option enabled the students to express their mental views for a given question. The students provided the feedback anonymously. Numbers under A, B, and C represents the number of students who took the survey. (b) Teaching Methodology Preference (Pie Chart). Student preference for different teaching methodology was expressed in percent derived from the cumulative responses.

Discussion

The Human Anatomy and Physiology (A&P) labs are aimed at improving student understanding of the anatomy and complementing the lecture classes. However, the laboratory sessions are not very often well designed to fulfill these basic objectives. Lecture based teaching is still in practice in the lab and the focus on the use of team based active learning strategies has been undermined. We studied the effectiveness of team-based instructional strategies in A&P laboratories. Preliminary class assessment revealed that students prefer visual learning of the anatomical concepts. We optimized the use of available visual aids alongside educational games, role playing, concept mapping, group discussion, near-peer teaching, and simulations in experimental labs to evaluate the effectiveness of the team based method over the traditional method. Both quantitative and qualitative assessment was performed to derive the conclusions. The quantitative assessment based on test scores indicated that the groups taught by team based method scored better in 4 out of 7 sessions. This could be attributed to the team based teaching strategy. The student survey suggests that as many as 52% of the students preferred the team based method of teaching. The team based method of teaching also found to be more engaging and interactive which is essential for optimal learning. Also, students agreed that team based teaching method promotes critical thinking skills among students. Based on these information we believe that team based teaching methodology is more appropriate in the A&P labs because of the fact that it has extra advantages over traditional method of teaching.

Conclusion

• Most students expressed that visuals are the best means for them to learn in the Human Anatomy and Physiology Lab.

• Students expected that the laboratory sessions will improve their learning level in Anatomy and Physiology and supplement the lecture classes.

• Students in the lab that were taught by team based teaching strategy outperformed the class average of 57% of the (14 out of 7) laboratory sessions.

• The team based teaching method was appreciated by 52% of the students surveyed where as 31% students preferred the traditional method of teaching and 17% students did not have a preference.

Acknowledgements

Sincere thanks to Dr. DeLoris Wess for generously supporting the teaching project under close supervision. Thanks to the Institutional Review Board (IRB) at UGA for reviewing and approving the proposal.

Many thanks to the students who voluntarily participated in the study and facilitated the success of the project.

I also thank my advisor Dr. Kojo Mensa-Wilmot for the support towards my teaching, related research, and conference presentation.

Project Summary

Title of the Study: Investigating instructional strategies in a Human Anatomy and Physiology Laboratory.

Principal Investigator: Dr. DeLoris Wenzel Hesse, Cell. Bio. & Anatomy, UGA

The above-titled proposal was reviewed and approved by “The University of Georgia Institutional Review Board (IRB)” through the exempt (administrative) review procedure authorized by 45 CFR 46.101 (b)(2).