

# Integrated Case-Based Learning Sessions in Anatomy are an Effective Teaching Method for Pre-matriculating Medical Students

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## Introduction

- Medical students are frequently introduced to the fast-paced, high-volume curriculum of medical school through anatomy coursework, which often includes histology and embryology content.
- The LEAD Scholars pre-matriculation program introduces medical students to anatomy content and study skills to facilitate adjustments to medical school and reduce the existing achievement gaps<sup>1</sup> for under-represented students.
- Recent changes in medical education emphasize integration of content areas<sup>2</sup>, resulting in greater use of activities such as case-based learning (CBL) sessions.
- These provide opportunities for problem-solving, integration, and practice of material, all of which have been shown to promote content mastery<sup>3</sup> and retention<sup>4</sup>.
- Little work has demonstrated the effectiveness of CBL sessions in integrating gross anatomy, embryology, and histology on first-year medical students' ability to problem solve and improve content mastery
- Therefore, the goal of this research was to assess the effectiveness and value of CBL sessions in promoting study techniques for integrated anatomy content.

## Materials & Methods

### Study Setting:

- Three fully integrated CBL sessions
  - Anatomy, embryology, and histology
  - Cases covered one or more clinical scenarios
- CBL activities
  - Image interpretation, matching exercises, tables, diagrams, and flow charts
- 6 students per group

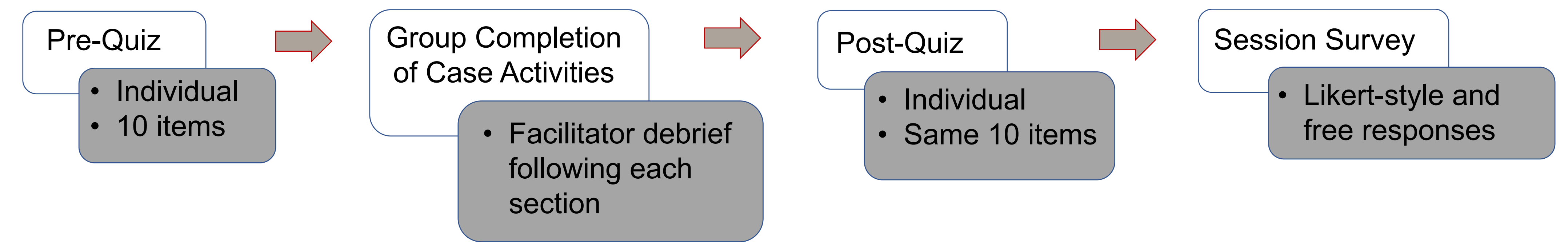
### Data Collection:

- Pre- and post-session quizzes
- Post-session survey

### Data Analysis:

- Pre- and post-session quiz scores were compared using Wilcoxon signed rank tests
- Free responses were analyzed using thematic analysis

Figure 1. Session Agenda



## Results

## Conclusions

<b>Watching and Reviewing Lecture</b>	<p>"I haven't done enough review and self-test, have focused too much time on note-taking"</p> <p>"...very effective... takes me a significant, almost excessive amount of time..."</p> <p>"...need to either spend more time beforehand, self-test more, or find a better approach"</p>
<b>Making and Reviewing Diagrams and Charts</b>	<p>"The most effective strategies were to watch the lecture AND make notes/charts/diagrams. The lectures that I only watched I didn't remember as well"</p> <p>"Making the table was very effective and is something that I plan to implement heavily into my studies throughout human structure"</p>
<b>Self-Testing, Practice Questions</b>	<p>"My approach could be improved by incorporating self-testing of material"</p> <p>"Practicing memory retrieval was very effective..."</p>
<b>Pre-Reading</b>	<p>"... was lacking a "review and self-test portion... familiar with the material... but was unable to recall exact information"</p> <p>"...not very effective... likely because I didn't get much time to self-test"</p>

Table 1. Commonly used study strategies with exemplary comments from each strategy

### Student Ratings Regarding Session Effectiveness

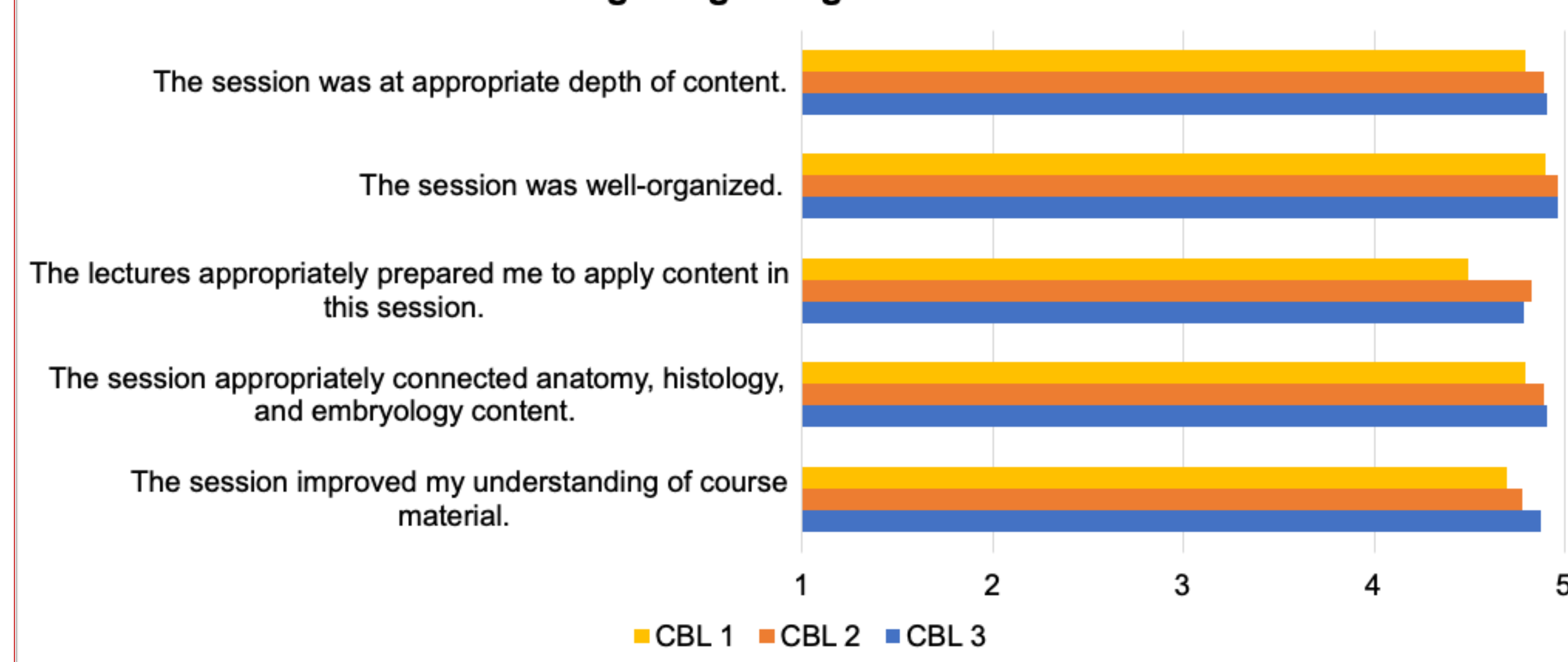


Figure 2. Post-survey responses; 1 = strongly disagree, 5 = strongly agree

- "This session really highlighted the holes in my study approach... should have been looking more closely at the bigger picture..."
- "Really made those connections... that I would not have made on my own."
- "...really like the case studies and understanding how to connect different aspects of your studies such as embryology and anatomy"

Figure 3. Representative student comments regarding overall session effectiveness

### Pre- and Post-Quiz Scores

	Pre-Quiz	Post-Quiz
CBL 1	60	68.3
CBL 2	49.3	65
CBL 3	48.5	63.8
Overall	51.4	65.2

Table 2. Average percentage correct on pre- and post-quizzes; difference was significant ( $p < 0.05$ ) for all CBLs and overall except for CBL 1 ( $p = 0.066$ )

- CBL sessions are a viable means of providing opportunities to incoming first-year medical students to practice, adapt, and evaluate study techniques while delivering integrated anatomy, embryology, and histology content.
- Implementation of these sessions into programs targeting under-represented students in medicine is a valuable way to introduce curriculum and teach study skills to facilitate success in medical school.
- Students enjoyed the real-life application of clinical cases and found them useful for making connections between content areas and evaluating the effectiveness of their study techniques.
- CBL sessions can be tailored to an individual medical school's curriculum to provide opportunities to incoming first-year medical students to practice, adapt, and evaluate study techniques while delivering integrated content.

## References

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