

Why multiple heads are better than one: The importance of peer learning in an Introduction to Cell and Molecular Biology course

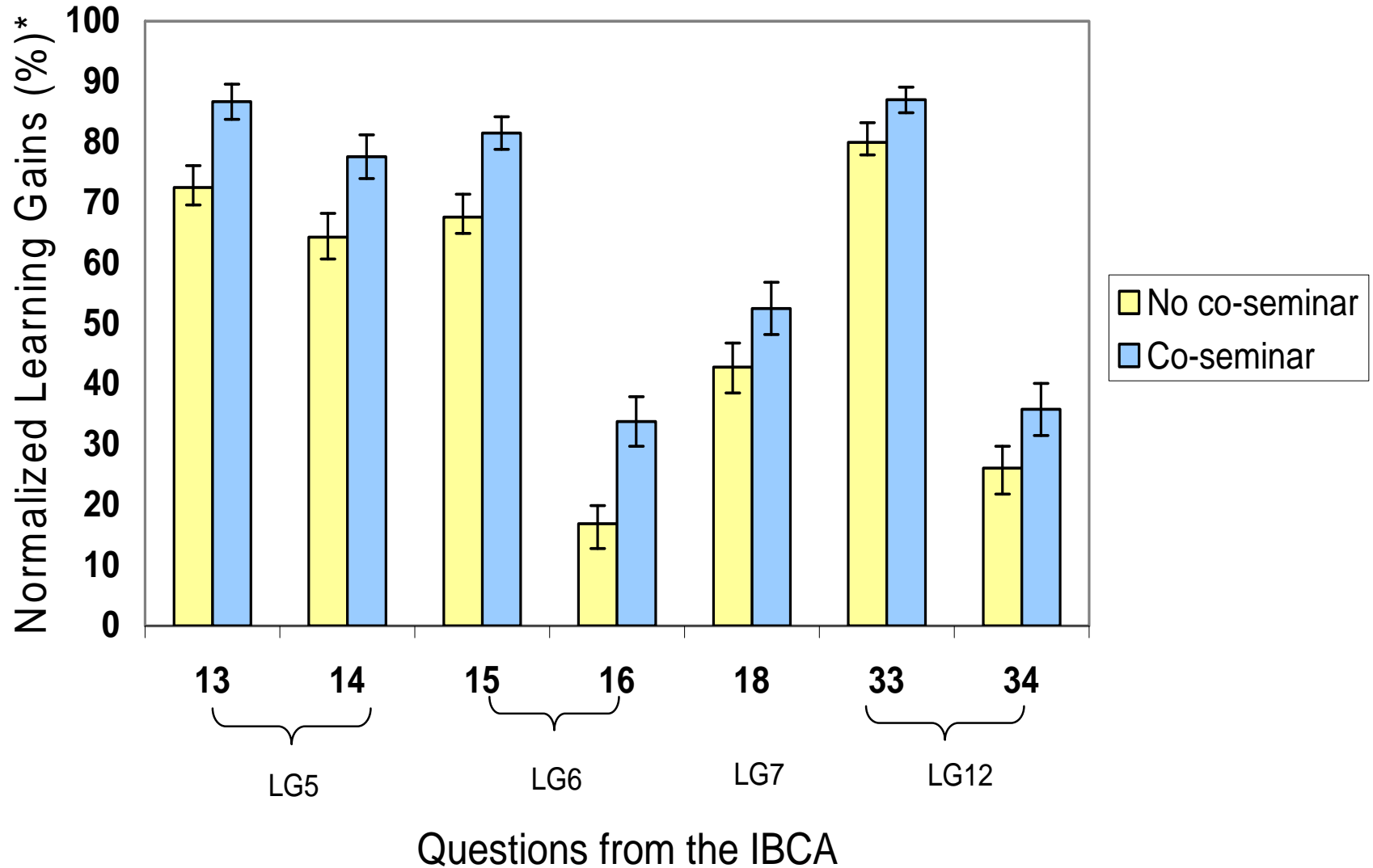
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Introduction

- **In fall 2008 MCDB offered a new optional, 1 credit co-seminar course to accompany the large lecture-based Introduction to Cell and Molecular Biology course.**
- **Characteristics of the co-seminar course:**
 - **About half the Intro biology students signed up for the co-seminar.**
 - **The co-seminar sessions were led by pairs of undergraduate learning assistants (LAs).**
 - **Each co-seminar is composed of about 20-30 students.**
 - **Students were randomly assigned into small groups of 3-4 within each co-seminar.**
 - **Students discussed problem sets and worked on other interactive activities during these sessions.**
- **We report here that Intro co-seminar helped student learn difficult topics and students liked co-seminar course.**

Students in the co-seminar achieved higher learning gains on the Intro Biology Concept Assessment (IBCA) for Learning Goals (LGs) specifically addressed in the co-seminar



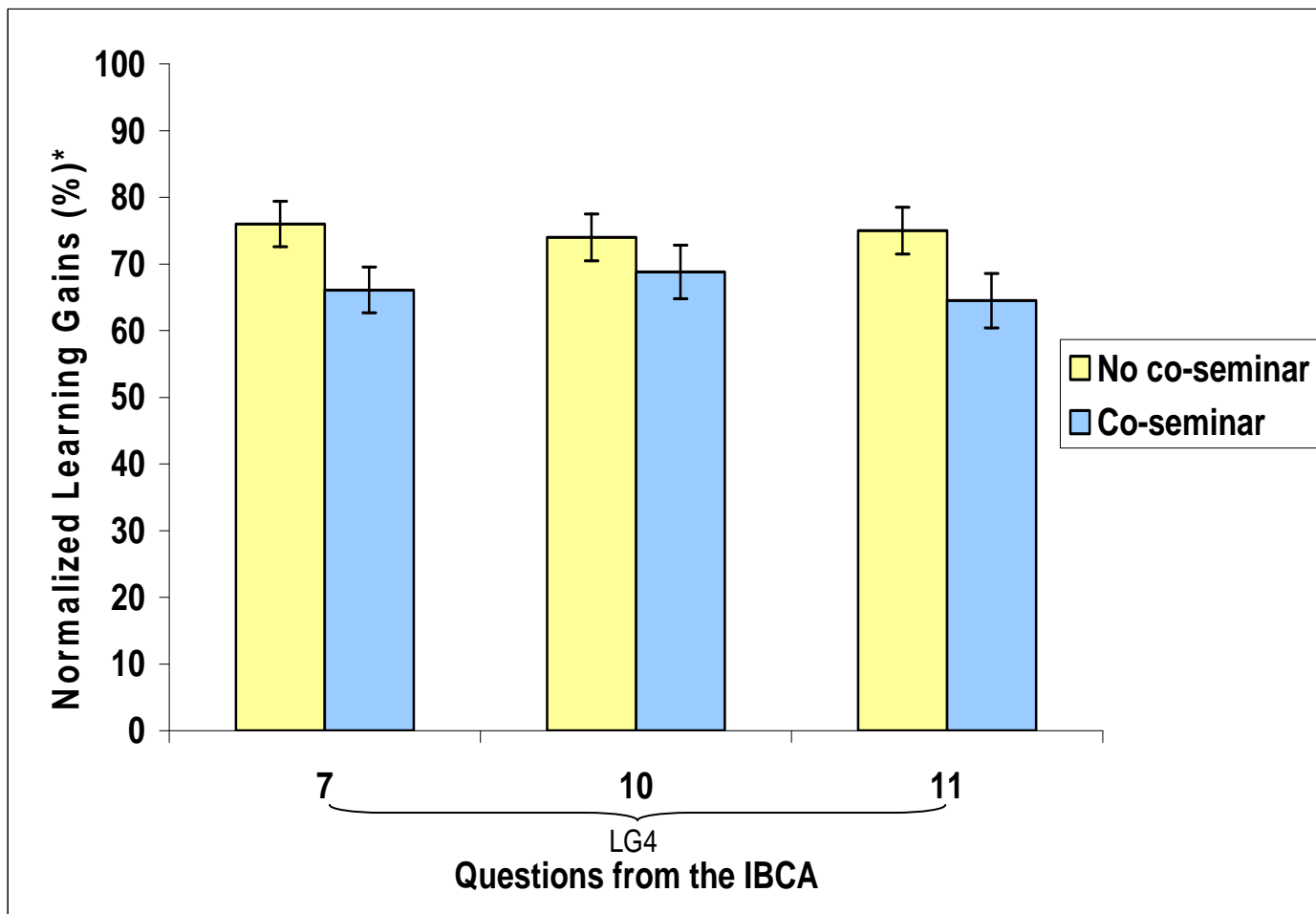
* % improvement from pre-test to post-test on indicated questions. $p < .05$ for all questions except #33.

Students in the co-seminar had a similar average normalized learning gain (NLG) on the IBCA as students who did not participate in the co-seminar

	¹ NLG (%)
co-seminar students (134)	50 +/- 1.5
no co-seminar students (153)	51 +/- 1.8

¹Mean +/- SE; number of students (N) in parentheses.

However, students in the co-seminar achieved lower learning gains for questions involving recognition of molecular structures



* % improvement from pre-test to post-test on indicated questions. $p < .05$ for #7 and #11.

Learning Goals specifically addressed in co-seminar

LG4: Recognize structures of the four major classes of building-block molecules (monomers) that make up cellular macromolecules and membranes.

LG5: Describe how the properties of water affect the three-dimensional structures and stabilities of macromolecules, macromolecular assemblies, and lipid membranes.

LG6: Identify the energetic characteristics of a biochemical reaction that determine whether it will proceed spontaneously and the rate at which it will proceed.

LG7: Explain how coupled reactions can be used to drive an energetically unfavorable biochemical process.

LG12: Describe in general terms how the information in a gene directs expression of a specific protein.

Students liked the co-seminar

- **High participation:**
 - **Intro fall 08: 44%; Genetics spring 09: 45%**
- **High retention:**
 - **93% of co-seminar students vs. 83% of no co-seminar students completed the Intro course.**
 - **86% of students who took the Intro co-seminar fall 08 signed up for Genetics co-seminar this term.**
- **Student attitude survey:**
 - **87% of students were satisfied with their decision to take the Intro co-seminar.**
 - **78% of students thought that co-seminar was useful for their learning the course materials in Intro biology course.**
 - **Rate (1-5) MCDB 1150 for importance to your future (1 being the most important):**
 - Co-seminar participants choosing choice 1: 76%**
 - Non-participants choosing choice 1: 45%.**

Summary and Conclusions

Students in the co-seminar:

- **achieved significantly higher learning gains in areas previously identified to be difficult.**
- **under-performed in questions that involved recognition of molecular structures. We will emphasize the importance of this LG in future co-seminar.**
- **liked co-seminar: had a high course retention and most of these students continued to attend Genetics co-seminar.**

Acknowledgments

Marjorie Frankel - for student attitudes data processing used in the study

All MCDB faculty - for your approval to add the Intro and Genetics co-seminar courses