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

Jia Shi, Jenny Knight, Bill Wood, Jennifer Martin, and Nancy Guild

Department of Molecular, Cellular and Developmental Biology, CU-Boulder
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:
  o About half the Intro biology students signed up for the co-seminar.
  o The co-seminar sessions were led by pairs of undergraduate learning assistants (LAs).
  o Each co-seminar is composed of about 20-30 students.
  o Students were randomly assigned into small groups of 3-4 within each co-seminar.
  o 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

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<th>(^1\text{NLG} (%))</th>
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<tr>
<td>co-seminar students (134)</td>
<td>50 +/- 1.5</td>
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<tr>
<td>no co-seminar students (153)</td>
<td>51 +/- 1.8</td>
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\(^1\text{Mean +/- SE; number of students (N) in parentheses.}\)
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 unfavorably 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.

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