IMPLEMENTATION OF A FIRST YEAR BIOLOGY LEARNING GROUP PILOT STUDY

Karen M. Smith[1], Tamara L.J. Kelly[2*], Gülnur Birol[3], George B. Spiegelman[1, 2]
[1]Department of Microbiology and Immunology, [2]Carl Wieman Science Education Initiative, [3]Science Centre for Teaching and Learning, University of British Columbia, Vancouver, BC, Canada,
*current address: York University, Toronto, ON, Canada

Carl Wieman Science Education Initiative
UBC Life Sciences
LS CWSEI

Skylight
The Science Centre for Learning and Teaching

PURPOSE

To facilitate first year biology students' conceptual understanding, we conducted a pilot study to investigate the effects of learning groups (LGs) in Biology 112, an introductory majors biology course.

Why Learning Groups?

Our primary goals were to improve students' ability to problem solve and perform better on exams. In addition, guided small group discussions can:

- make large classes small
- engage students in course material
- engage students in biological "world"
- facilitate learning from peers.

METHODS

The Course

BIOL 112 Unicellular Life: The principles of cellular and molecular biology using mainly bacterial examples.

- Offered twice during winter session – September and January.
- 3 sections offered per term; each with ~ 250 students and 3 hrs of lecture per week.
- Taught by 3 course instructors in a large lecture theatre.
- All students completed pre & post-term biology attitudinal survey.

LG Structure

Weekly learning group sessions where students worked in a small group on problems related to the lecture material.

- 50 minutes, once per week, for 8 weeks of 13 week term.
- Problems were designed to reflect the open-ended nature of biological principles and aligned with course problem sets.
- Each LG facilitated by a teaching assistant or departmental lecturer.

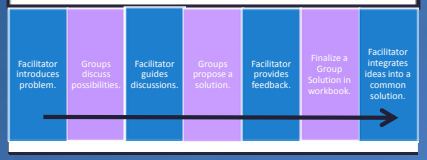
LG Students

- 43% of BIOL 112 students volunteered of which 30% were randomly chosen for a LG.
- Student population in any one LG was independent of lecture section.
- Participation in the LG was completely voluntary and required a commitment to the entire process.
- As incentive, students were guaranteed 3% of a 10% grade component. Non-LG students completed other assignments as part of the 10% grade component.
- Assigned groups of 4 – 6 students met in a small classroom of ~30.
- Provided with a workbook in which to record all ideas, discussions, concepts and solutions; the completed workbook was submitted at the end of term.
- Completed an end-of-term student LG survey.

LG Process

The LG process was designed to promote discussions with peers and instructors [see Figure 1].

Figure 1: LG Process



RESULTS

1. Biology Attitudinal Survey* "pre and post"

Pre & post attitudinal survey responses were compared. We found that:

- LG students have demonstrated an increased ability to make links between concepts at the end of the course ($p<0.05$). Note the shift towards agreement between pre and post surveys within LG students [see Figure 2a].
- LG students have continued to relate their personal experiences to what they learn in class ($p>0.05$) as opposed to non-LG students ($p<0.05$). Note the shift towards disagreement between pre and post surveys within non-LG students[see Figure 2b].
- LG students have become cognizant of their limitations in their ability to explain biology ($p<0.05$). Note the shift towards agreement between pre and post surveys within LG students [see Figure 2c].

2. End-of-Term Student LG Survey

Students reported that their experience with LGs were positive (see Table 1). Results indicated:

- Very high agreement across LG sessions, students valued group work [see Figure 3a].
- Very high agreement across LG sessions (except LG 2) on discussions helped them understand BIOL 112 concepts [see Figure 3b].
- Students were active participants within their group [see Table 1, q.2].
- LG problems helped their understanding of the course material [see Table 1, q.6].
- Approximately 50% of LG students felt they were better able to solve problems on their own, and explain biological concepts to others [see Table 1, q.3, 9].

3. Exam Performance

- LG students midterm marks and final exam marks were slightly higher than non-LG students [3% and 0.5% respectively - see Figure 4].

*see poster Birol et al. *"Findings of the Impact of a Non-majors First Year Biology Course on Students' Attitudes Towards Biological Sciences."*

Biology Attitudinal Survey

Figure 2a: Attitudinal Survey
"When I learn something new about an organism or a cell, I try to think about how it relates to natural selection."

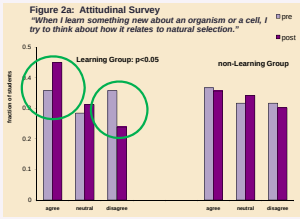


Figure 2b: Attitudinal Survey
"To understand ideas presented in biology, I sometimes think about my personal experiences outside of class and relate them to what has been presented."

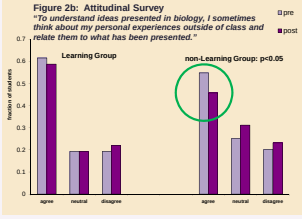
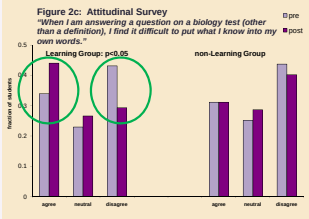
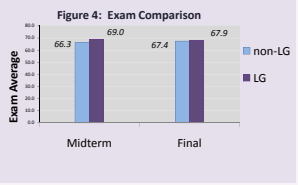


Figure 2c: Attitudinal Survey
"When I am answering a question on a biology test (other than a definition), I find it difficult to put what I know into my own words."



Exam Performance

Figure 4: Exam Comparison



End-of-Term Student LG Survey

Table 1: Survey Questions	% Disagree	% Neutral	% Agree
1. Now that I have experienced LG's, I see the value of working in groups	12	17	71
2. Within the LG, I was an active participant in group discussions.	13	23	64
3. By working in the LG I im proved my ability to explain biological concepts (e.g. to others).	17	29	54
4. I enjoyed the group environment of LGs.	15	23	62
5. I learned more by working in a group than I would working on my own.	17	19	64
6. Questions presented in the LGs were usef ul to my understanding of the BIOL 112 material.	13	14	73
7. In my LG, I met people from other BIOL 112 sections.	9	8	83
8. I had a clear idea of what was expected of me in the LGs.	18	19	63
9. Because of the LGs, I am now better able to solve biology problems on my own.	22	31	47
10. Participation in the LGs made me more interested in biology.	28	40	32
11. The LG discussions help me to understand the concepts in BIOL 112.	14	22	64
12. Participation in the LGs made BIOL 112 classes seem smaller.	27	29	44
13. Because of my participation in the LGs, my approach to studying changed.	41	33	26
14. Participation in the LGs made me feel more comfortable going to the Learning Centre.	23	41	36
15. Because of this experience I now study more in groups.	42	31	27
16. The facilitator (TA, etc.) was motivating.	24	27	49
17. The facilitator ensured that all students participated in discussions (i.e., problem solving).	35	19	46

Figure 3a: End of Term Student LG Survey
"Now that I have experienced the LG's, I see the value of working in groups."

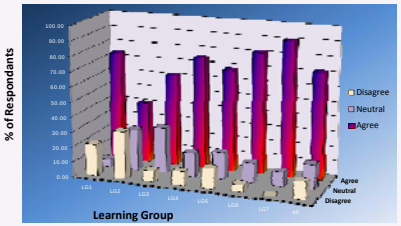
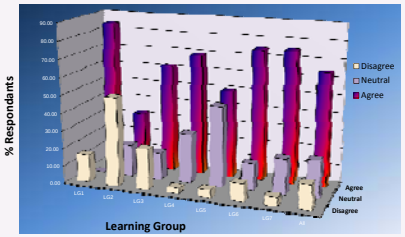


Figure 3b: End of Term Student LG Survey
"The LG discussions helped me to understand the concepts in BIOL 112."



Student Suggestions

The survey included written comments or suggestions from students. Consensus appeared among all groups [84% +ve comments] except for LG 2 [13% +ve comments].

Emerging Themes

- 48% of students surveyed commented that LG's were helpful.
- 30% wanted a solution posted after each LG session.
- 20% commented that LG session was too short.
- 11% suggested that LG should not be mandatory.
- 6% felt that LG were "a waste of time".

CONCLUSIONS

Did we achieve our project goals?

- Small vs large classes (Table 1 – q.12) √
- Engage in course material (Table 1 – q.2, q.6) √
- Engage in biological principles (Table 1 – q.3, q.11) √
- Learn from peers (Table 1 – q.1, q.3, q.4, q.5, q.7) √

In Summary

- Students in LGs demonstrated shifts in some areas in their attitudes towards biology.
- Students valued the learning groups.
- 1 of the 7 LGs had consistently negative feedback (>77% of comments) which may suggest further TA training.
- There were no statistically significant difference in their final course grade between LG and non-LG students.

Lessons Learned

Results of this pilot project informed instructors about the learning groups and thus enabled us to develop effective sessions starting in the fall of 2008.

Decrease size of each LG session

- Limit session enrolment to 1:24, TA:student ratio (6 groups of 4 students).

Increase each LG session time

- LG students suggested to permit more time for group discussions. This is an issue due to scheduling - classes at UBC are usually 50 minutes.

More TA training

- Reduce variability among TA's .
- Improve TA:student interaction.

Make explicit links of LG problems to:

- Lecture material.
- Exam content.

ACKNOWLEDGEMENTS

Support was provided by University of British Columbia, Faculty of Science Dean's Office, Carl Wieman Science Education Initiative for the Life Sciences, Science Centre for Teaching and Learning, Dept. of Microbiology & Immunology.

Special thanks to instructors; Julyet Benbasat, Erin Gaynor, Tracy Kion, Lecturer; Jennifer Sibley and Teaching Assistants; Costanza Casiraghi, Gerry Greco, Jacqueline Lai, Mei Mei Tian as well as Biology 112 students!