Evaluating the Effectiveness of Online vs. Face-to-Face Supplemental Instruction in Introductory Biology Courses

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Introduction

Supplemental Instruction (SI) has been proven to be an effective tool for students in challenging first year science courses (Congos and Schoeps 1993; Ning and Downing 2010). In the standard model for SI delivery, upper-year undergraduate students are hired to attend course lectures and develop materials for peer-based study sessions in a face-to-face setting. SI that combines prepared video supplements with live face-to-face facilitation has been extensively used and researched (Martin & Blanc, 2001; Springer Sargent, Borthick & Lederberg 2011). In this study, we evaluated the perceived and real benefits of a blended version of SI with live face-to-face instruction, live online instruction, and recorded SI options for students.

Our specific questions for this project were:
1. How effective is online web-conferencing for SI?
2. How effective are online recorded sessions?
3. How do students perceive online vs. face-to-face SI sessions?

Methods

Study Site

The University of Regina’s Nursing program offers a unique opportunity to determine the benefits of online vs. face-to-face SI. In this Nursing program, the Anatomy and Physiology lectures for BIOL110 and BIOL111 are delivered simultaneously to approximately 200 students in Regina face-to-face, and to another approximately 150 students in Saskatoon via video-conferencing. In winter (BIOL111) and fall 2015 (BIOL110), we offered SI in different formats. For BIOL111, students in Regina received traditional face-to-face sessions, while students in Saskatoon received web-conferenced SI sessions. Both face-to-face and online sessions were instructed by the same SI leader, and online sessions were recorded and available for students to view through UR Courses. In BIOL110, we offered online SI only: students could either attend sessions live from their chosen location, or could watch a recorded version of the online sessions after they were held.

Quantitative Data

Attendance was taken for all students accessing both live and online SI sessions in both semesters. Students who attended face-to-face SI sessions signed in upon arrival, and students who accessed the online SI link via UR Courses were counted through that site. We also accessed the final grades of the students in both BIOL110 and BIOL111 to determine whether frequency of attendance and type of SI accessed affected student success in the courses.

For the quantitative data, student grades were analyzed against the attendance rate at the different SI sessions. This was analyzed as a linear regression using the statistical program R.

Qualitative Data
At the end of each study semester, we surveyed students for their perceptions of the benefits of SI in the different forms. A voluntary survey compiled in Qualtrics was distributed to students with one week to submit answers (see Appendix 1 for survey). In the survey, students were asked to estimate the number of times they attended SI sessions either live face-to-face, live online, or accessed recorded sessions. They were then asked why they did not attend more SI sessions, and what they perceived to be the main benefits of SI in the different formats. They were asked to indicate their agreement with several statements regarding the benefits of SI (such as “SI helped improve my study skills” and “SI helped me learn the course material”), and were also provided the opportunity to give feedback in their own words.

The qualitative data allowed us to bin students into those who didn’t attend SI at all (0 attendance), those that attended infrequently (1-3 times), moderately frequently (4-7 times) or very frequently (>7 times per semester). Agreement with provided statements were binned into these groups.

**Results**

**Quantitative data**

We found a significant positive correlation between students’ final grades and their attendance at SI sessions of all types. In BIOL111, final grades were 5-6% higher for those students who attended more than 3 SI sessions (averaged 73% at both Regina and Saskatoon sites) compared to those who did not attend any SI sessions (67% in Saskatoon and 68% in Regina). Similarly, in BIOL110, students who attended more than 3 online SI sessions received an average of 6% higher final grades (73% at both sites) compared to students who did not attend any SI sessions (67% at both sites). Surprisingly, even those students who only accessed recorded SI sessions received 4% higher final grades than those students who did not, at all sites.

**Qualitative data**

Overall, students were very positive about the benefits of SI, in any format. In the survey data, where “strongly agree” is coded as a 5, and “strongly disagree” is coded as a 1, the average responses to all of the questions ranged from 4.2 to 4.5, indicating high agreement with all statements provided. We did not find any difference in agreement with the statements when the SI was offered online vs. face-to-face, and students found many benefits even from accessing the previously recorded sessions.

Interestingly, the biggest difference in perception of students of SI arose when students perceived a difference in access at the different sites. For BIOL111, when face-to-face SI was offered for students in Regina only, and Saskatoon students could only access online SI, the Saskatoon students said they would be more likely to attend SI if it was offered face-to-face. When the same question was asked for the BIOL110 students the following semester, when no face-to-face SI was offered for either site, students did not indicate an increased likelihood of attending more frequently. In fact, most students suggested that face-to-face would be more inconvenient, as they would have to travel to the school, and find parking and child
care, and instead indicated they were happy with the online only offerings, owing to the flexibility of this system.

Conclusions

Our study found very little difference in the real and perceived differences when SI was offered live face-to-face, live online, and recorded online. Student grades improved 4-6% with high attendance, regardless of the format of offering. Students enjoyed the flexibility of online and recorded SI options, as they were able to access the support material from the comfort of their homes, and could access them on their own schedule. Thus we conclude that online SI is a valuable resource for students in large courses, and should not be discounted for breaking from the traditional SI model.

The results of our study may also have applications for other science courses offered off-campus through Flexible Learning. In addition, research suggests that some students do not attend SI sessions because of comfort levels in participating or because of difficulty being on-campus at the times that SI is offered (Arendale, 1994, Van der Meer & Scott. 2009). It may be that for some students, the option to participate virtually from their own computers may increase participation (Painter, Bailey, Gilbert, & Prior, 2006). Hence, there are potential implications for enhancing uptake of SI with regular on-campus students who traditionally do not regularly attend SI.

References


Appendix 1
Supplemental Instruction End of Semester Survey

We are collecting data to evaluate the usage and perceived benefits of SI in both face-to-face and online formats. Your responses are anonymous and will be collated with others’ responses. Participation is voluntary. Questions about the research project may be directed to Dr. Kerri Finlay at 585 4236 or by email at kerri.finlay@uregina.ca

1. How many SI sessions did you attend?
   - None
   - 1-3
   - 4-7
   - 8-11
   - all 12

2. If you attended fewer than three SI sessions, why did you not attend more? (Check all that apply)
   - The timing of the sessions did not fit into my schedule
   - I didn’t need the type of help offered by SI
   - I prefer to study on my own
   - The sessions I attended were not helpful
   - Other (please specify in the space below)

3. What would have made it more likely you would have attended more SI sessions? Please describe in the space below.

If you attended one or more SI sessions, please answer questions 4-14 below.
Please indicate your responses using a scale of 1 to 5 (1 = strongly disagree, 3 = neutral, 5 = strongly agree).

4. SI helped me learn the course material
   [ ] 1  [ ] 2  [ ] 3  [ ] 4  [ ] 5

5. SI clarified concepts that I did not understand in lecture alone
   [ ] 1  [ ] 2  [ ] 3  [ ] 4  [ ] 5

6. SI helped me develop effective study skills
   [ ] 1  [ ] 2  [ ] 3  [ ] 4  [ ] 5

7. My grades in this course were higher than if I had not attended SI
   [ ] 1  [ ] 2  [ ] 3  [ ] 4  [ ] 5

8. The skills I learned in SI were applicable to other courses I am taking
   [ ] 1  [ ] 2  [ ] 3  [ ] 4  [ ] 5

9. SI was a fun learning environment
   [ ] 1  [ ] 2  [ ] 3  [ ] 4  [ ] 5

10. I would recommend SI to others
    [ ] 1  [ ] 2  [ ] 3  [ ] 4  [ ] 5

For students who attended sessions virtually:

11. If the SI sessions had been offered face-to-face, I would have been:
    o More likely to attend
    o Less likely to attend
    o It wouldn’t have made any difference to me
    o I am not sure

12. From your perspective, what are the benefits of having online (versus face-to-face) SI sessions?
13. From your perspective, what are the drawbacks of having online (versus face-to-face) SI sessions?

For students who attended sessions face to face:

11. If the SI sessions had been offered online, I would have been:
   o More likely to attend
   o Less likely to attend
   o It wouldn’t have made any difference to me
   o I am not sure

12. From your perspective, what were the benefits of having face-to-face (versus online) SI sessions?

13. From your perspective, what are the drawbacks of having face-to-face (versus online) SI sessions?

14. Please write down any comments on the sessions and/or suggestions for improving future sessions.