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Launching a Peer Supplemental Instruction Program for an Introductory Biology Course



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ABSTRACT

For the first time at Georgia Gwinnett College, a supplemental instruction (PSI) program was designed to provide peer-led instruction on a) principles of biology, chemistry, mathematics and b) academic skills e.g. self-regulated learning, strategies in studying and test-taking. PSI for Principles of Biology (BIOL1107K) was carried out by PSI leaders who previously earned a grade of 'A' or 'B' in BIOL1107K, received training on tutoring practices and worked with faculty to develop active learning exercises/worksheets for PSI sessions. PSI was open only to students who earned a grade of $\leq 75\%$ on the first exam across four BIOL1107K sections. Comparison of exam grades revealed that PSI student performance was not significantly different from control (students who earned a grade of $\leq 75\%$ on the first exam but did not enroll in PSI). The challenges at an institution lacking a PSI culture and strategies to encourage student commitment will be discussed.

Enhancing Student Engagement and Student Learning in STEM fields at GGC Through Course-Embedded Research and Service

INTRODUCTION

- Principles of Biology (BIOL 1107K) is an introductory biology course that **applies fundamentals in chemistry and mathematics to support biology concepts.**
- Our assessment data for BIOL 1107K have revealed that some course goals have been consistently unmet for at least the past 4 consecutive semesters. Specifically, the goal to describe structure and function of biological molecules averaged $65 \pm 0.8\%$ achievement and the goal to describe molecular mechanisms in DNA, RNA and protein averaged $66 \pm 1.3\%$. These data reflect the performance of 818 students and suggest that supplemental instruction may be helpful in improving student performance in these particular course goals.
- Since BIOL 1107K is frequently taken by freshmen transitioning into college, it is possible that **supplemental instruction in academic skills could assist students in meeting the higher demands of tertiary education.** Academic skills include self-regulated learning, self-motivation, creating study guides and test-taking strategies.

Thus, the purpose of this project was to:

- Develop a Peer Supplemental Instruction (PSI) Program to support students who are at-risk of not successfully completing BIOL 1107K.
- Improve student understanding of:
 - Principles of chemistry and mathematics that underlie biology concepts
 - academic skills that promote success in college.
- Foster an enriched academic culture among STEM students through PSI.

METHODS

- Lesson plans for PSI BIOL 1107K included both 1107K course content and academic support skills.
- Instruction on course content was tailored to the student's current place in the course and highlighted the underlying principles of chemistry and mathematics that should help students understand complex biology concepts e.g. cell energetics, enzyme specificity.
- To help students develop academic skills, PSI was conducted using specific learning tools e.g. students learned through creating concept maps, writing their own exam questions. They were also trained to be more conscious of time management in and out of the classroom in order to become more effective learners.

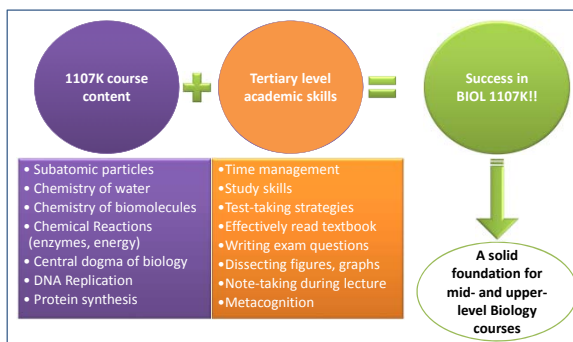


Figure 1. Schematic of the pedagogical elements of PSI 1107K

- Peer supplemental instruction involves a student-led collaborative learning environment that is entirely novel at Georgia Gwinnett College. As such, the program was first piloted in Fall 2014 before a full-scale launch in Spring 2015.

	Fall 2014 pilot	Spring 2015
PSI students	<ul style="list-style-type: none"> Opened to only 4 BIOL 1107K sections Invited 'C' students only following results of first exam Introduced by peer instructor Students in two sections administered pre-PSI assessment Did not receive extra credit for PSI attendance 	<ul style="list-style-type: none"> Opened to all sections of BIOL 1107K Opened to all students at the start of the semester Introduced by course instructor All students administered pre-PSI assessment; these data will be compared with a post PSI assessment Received extra credit for participation
PSI leaders	<ul style="list-style-type: none"> New to PSI; trained during the first month of semester Two leaders; one per session One replaced mid-semester 	<ul style="list-style-type: none"> Prior experience; second semester of PSI Two leaders at each session Consistent throughout the semester
PSI sessions	<ul style="list-style-type: none"> 60-minute sessions held twice per week Conducted in free student spaces in Science building Predetermined curriculum to address a combination of academic skills and course content 	<ul style="list-style-type: none"> 75-minute sessions held twice per week Conducted in a reserved room Primary instruction on coursework at student's request Academic skills embedded in course review

Table 1. Comparison of program design in subsequent semesters.

RESULTS

- Compared to Fall 2014, **student participation and retention** was markedly increased in Spring 2015. In Fall 2014, 9 students attended PSI with 2 students attending more than 50% sessions offered, whereas in Spring 2015 thus far, 26 students are on record with 7 attending more than 50% sessions.

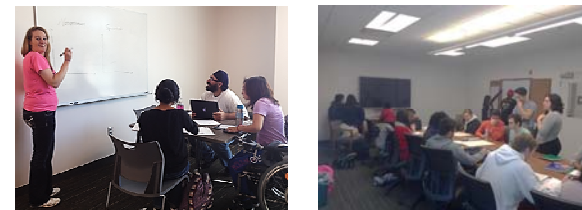


Figure 2. Snapshots of PSI sessions typical of Fall 2014 and Spring 2015, respectively

- Analysis of **student performance in BIOL 1107K** in Fall 2014 revealed that students who attended at least 25% PSI sessions were more likely to earn a C or above in BIOL 1107K.
- In Spring 2015 thus far, at least 20% PSI attendance coincided with grades above 70% for two exams.

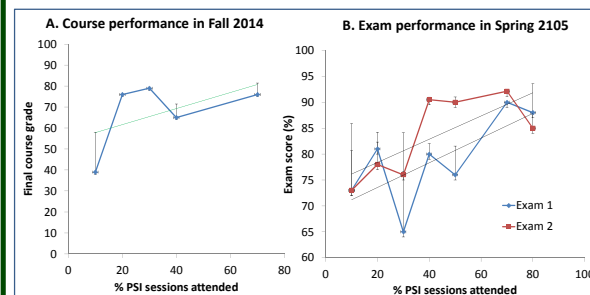


Figure 3 A and B. Correlation between PSI attendance and course performance in Fall 2014 and Spring 2015 semesters respectively

DISCUSSION

- Pilot data for Fall 2014 suggested that PSI sessions were marginally correlated with improving student performance. This minimal effect may have been due to inconsistent attendance as only one fifth of students attended at least half of the sessions offered.
- The changes made to the program in the second semester generated a robust increase in the number of PSI student participants as well as student retention. This effect is most likely attributed to introduction of the PSI program by course instructors, offering extra-credit for participation and embedding academic skills exercises into course review. Simply increasing the number of invited sections increased numbers as well.
- Spring 2015 preliminary data showed that students who were frequent PSI attendees (more than 20% sessions) performed better on the second exam compared to the first.
- Currently, students earn extra credit for participation. Alternative incentives are necessary to encourage student retention and promote a culture of collaborative learning.