

# Human Anatomy and Physiology (BIOL 2451K) Course Redesign at Georgia Gwinnett College

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Problem-based learning (PBL) is used in healthcare professional programs because educators recognize students separate theoretical knowledge from practical knowledge. PBL equips pre-nursing students with active learning and scientific literacy competencies. In the current study, pilot sessions occurred in Spring 2020 with 2 PBL tutors and 10-15 students/session. Sessions included review, PBL activity, wrap up, and assessment. Participants (100%) felt the session length was just right. Most (89%) felt the PBL session increased their interest/skill level. All (100%) felt they studied more effectively and were more independent learners due to PBL sessions.

## STATEMENT OF THE PROBLEM

Problem-based learning (PBL) pedagogy focuses on students identifying and resolving problems from a real-case scenario, usually in small groups through self-directed learning facilitated by peer tutors (Li et al., 2019). PBL is often used in healthcare professional programs because healthcare professional educators recognize that students often separate theoretical knowledge (the knowing that) from practical knowledge (the knowing how) (Benner, 1984; Craddock, 1993, Ehrenberg & Haggblom, 2007) leading to a theory-practice gap. Researchers (Sockalingam & Schmidt, 2011; Li et al., 2019) suggested that contrasted to traditional curriculum that separates theory and practice and emphasizes memorization, PBL encourages students to develop critical and active learning skills. Zhang (2014) suggested that additional years of practice and consistency in tutoring could affect the outcome of students' problem-based learning experience. Thus, the earlier the introduction of PBL pedagogy, potentially the more successful pre-nursing students will be within their pre-nursing science classes as well as long-term in nursing school. Georgia Gwinnett College (GGC) has almost 1500 pre-nursing students. Many of these students struggle in BIOL 2451K and do not achieve the grades necessary to progress in their chosen career path. The DFW rate over the last 7 years is 36+5% representing over 100 students a semester (15 sections/semester of BIOL 2451K, 24 students/section) who cannot continue. BIOL 2451K is usually taken in the 2nd semester of a 4-semester sequence of pre-nursing science classes. Students performing poorly in this class risk obtaining admission to nursing schools and/or other allied health profession programs. Anecdotally, course faculty suggest that unsuccessful attempts in BIOL 2451K result from students utilizing rote memorization to learn the vast amount of material required

in this course. A PBL pedagogy may assist these potentially unsuccessful students to develop scientific literacy and active learning skills, which are critical to success in pre-nursing courses and ultimately in nursing school.

## METHODS

This program was designed to equip pre-nursing students with active learning and scientific literacy competencies. Senior level Chemistry, Biology, and/or Exercise Science students served as peer tutors (PBL leaders). Subject matter expert faculty developed modules that addressed specific topics related to BIOL 2451K, such as study skills, homeostasis, data graphing, histology, bony landmarks, joint movement analysis, muscular anatomy, muscle mechanics, action potentials, neural system functional losses, and somatosensory functions. These modules reflected topics within BIOL 2451K with which students often struggle. Each PBL session included a topic review portion (15 minutes), PBL activity (30 minutes), wrap-up activity (15 minutes), and assessment (15 minutes) for a total of 75 minutes. For example, in the bony landmark module, the topic review portion involved discussion of specific bony landmark definitions. The PBL activity involved small groups of students discussing a case study related to clinical issues of skeletal anatomy (e.g., fracture or dislocation). Within the PBL activity, students were to determine the bony landmarks associated with the skeletal anatomy within the case study. The wrap-up activity involved the PBL leader reviewing and answering questions. The assessment activity involved 5 opinion questions related to the PBL session structure and material. Each module was presented multiple times within a week to allow for BIOL 2451K students to go to a session that worked within their schedules. Peer tutors met with the subject matter expert faculty prior to the PBL sessions so that the peer tutors were ready to present the material for each session.

## OUTCOMES

Pilot sessions were started during the first part of Spring 2020 with 2 PBL leaders and approximately 10-15 students per session (total of 51 students participated in three modules). The modules that were presented were 1) bony landmarks, 2) joint movement analysis, and 3) muscle anatomy. Due to the campus closure caused by the COVID-19 virus, no further modules were able to be presented. In evaluating the session critique information, students (100% of respondents) felt that the length of the session was just right (75 minutes per session). Most (89% of respondents) felt that the PBL session increased their interest and skill level in the subject matter presented. All (100% of respondents) students felt that they were able to study more effectively and were more independent learners in the subject matter presented as a result of the PBL session. Further, the students who served as PBL leaders enhanced their academic and personal development through the development of leadership skills and scientific literacy.

## PLANS FOR CONTINUATION AND EXPANSION

Ultimately, the goal of this program is to demonstrate its effectiveness to expand it to all five pre-nursing science classes. Funding for the PBL leaders was obtained through an internal grant from the Provost's office which ended this semester (Spring 2020). Ultimately, for sustainability and expansion of the program, the development of a specific 4000 level course in which students who wish to be peer tutors will enroll for course credit is necessary, similarly to other campus programs like Peer Supplemental Instruction (PSI) peer leaders. This type of upper level course would be in consultation with our college's Academic Enhancement Center. Additionally, the PBL program enables students to focus on practical applications of the knowledge learned in class. Given that healthcare education programs (e.g., nursing,

medicine, physical therapy) often focus on integrated learning experiences, PBL program will enhance students' abilities to function in these types of environments. The GGC Nursing Program reported in the campus communication, *The Pulse*, that the GGC nursing program has used a "flipped classroom" model since its inception. The flipped classroom model "flips" the traditional relationship between class time and homework. Students learn at home via online coursework and lectures, and teachers use class time for teacher-guided practice or projects. Thus, the earlier the introduction of PBL pedagogy, potentially the more successful pre-nursing students will be within their pre-nursing science classes as well as long-term in nursing school.

## LESSONS LEARNED AND POTENTIAL IMPLICATIONS

First, hiring student workers is a very difficult AND time-consuming process so offering a 4000-level course for credit may be better. It took over 4 months to hire the students, which put our project over a semester behind. Next, finding and training PBL leaders is critical to the success of the program. While ideally, senior level Chemistry, Biology, and/or Exercise Science students would serve as PBL leaders, finding students who were successful in BIOL 2451K provided only a small sample. Students who were pre-nursing represented even a smaller number of students because these students were only available for 1-2 semesters following BIOL 2451K due to the demands of nursing schools. In our experience, advertisement and encouragement from faculty for attendance (potentially offering extra credit). Attendance for the sessions was mixed. With only 3 modules in the pilot study, it is not clear if a particular time is better for BIOL 2451K students. We had sessions during a campus class free time on Tuesdays as well as twice on Fridays (day with fewest classes). Some faculty offered extra credit to attend. Potentially, offering these modules within classes instead of separate sessions would reach more people but need buy-in from faculty to move toward a "flipped" class model. In order to provide the material to the greatest number of students, it may be more beneficial to get faculty to provide the sessions within their classes. This will require buy-in from BIOL 2451K who may not be familiar with the flipped class and/or resistant to alternative types of pedagogy.

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