

Peer-Facilitated Metacognitive Tutoring Increases Retention of Physics Concepts

Background

Recognizing that students enrolled in physics courses lacked prior knowledge in Math topics such as geometry, trigonometry, and sinusoidal functions, the Academic Achievement Hub began working with Physics Instructor, Dr. Mark Paddock, to host a pre-course math topic review workshop for students enrolled in his course. Dr. Paddock created math review packets to identify foundational math topics corresponding to Physics 1A, 1B, and 1C to be utilized in these sessions.

The students worked independently on the math packets for the first half of an 80-minute session before receiving assistance with their review from Supplemental Instruction (SI) leaders (peer facilitators who undergo extensive training from the Teaching + Learning Commons).

We identified that students who participated in the math topic review workshops had strong grade changes compared to their peers for the initial quizzes. The challenge in holding these workshops required student attendance in the first week of the term creating scheduling and location difficulty.

Changed Structure

To manage the challenges and to demonstrate the learning skills that would enhance their students' metacognition, the Academic Achievement Hub and Dr. Paddock decided to utilize the math topics as the Supplemental Instruction opening activities. Students would be shown how to look at a problem not for its surface features but for the deeper features (such as foundational math concepts required to manage the problem). This provided an opportunity for students to think about what they know and what they still need to know prior to beginning problem solving. The SI leaders and tutors worked with the instructor to map the relevant math topics to the physics content for the quarter.

Statement from Dr. Paddock:

Supplemental Instruction has had a positive impact on many of the students attending my lectures. The students are pleased to know they have the additional support from their SI Leaders, but also are more open to attending office hours and lectures at the encouragement of the SI Leader. We have found that at UC San Diego students who have attendance SI for more than 3 sessions have earned a half a letter grade higher than those that haven't. I see this as a

significant impact on the students we serve and just in this current quarter the students have scored the highest on any quiz this past year.

In addition to the above-mentioned benefits, because of support by SI, I have been able to hold a special math workshop for my 400 students. The advantage is that students review selected math material at the very beginning of the Physics course allowing me to focus more on the physics than the math during lecture. I have noticed many fewer issues with the basic math needed for the topics so far this quarter.

Statement from a tutor for Physics 1 series:

Students who come in for tutoring are not always asking about the concepts learned in their current class, instead they need help with concepts they learned in past classes.

Student participant:

When asked if the math reviews were helpful the majority of students said “yes” and rated a 5 out of 5 with 5 being extremely helpful.

Students stated they “learned it in the past but forgot” and that it was a “helpful review” and “important to see the connection to the physics problem solving.”