Tablets: A New Prescription to Strengthen Student Engagement in the Sciences/STEM Disciplines

Eckerd College, Natural Sciences Collegium, St. Petersburg, Florida, USA
Holger Mauch (PI), Kelly Debure, Bill Junkin, Steve Weppner, Anne Cox
http://natsci.eckerd.edu/HPtabletProject/

**PROJECT ABSTRACT:** We use HP mobile technology to address a major concern of college educators: lack of “student engagement” in course work. Maintaining students’ interest in in-class activities is essential because research demonstrates that engaged learners learn more. Tablet-based in-class activities have been successfully established in a variety of computer science courses, and recently this concept has been extended to the courses Fundamentals of Physics I & II, Neuroscience and Introduction to Computer Art.

### Impact on Student Learning

**One Year Ago** – We already demonstrated a successful course redesign integrating tablet computers into the Theory of Computation course from 2006-2008.

**Today** - In a Physics laboratory class we assessed the role of the tablet in learning some fundamental concepts involving Newtonian mechanics. We gave a test to 49 students before a laboratory (pre-test) and the same test after the laboratory was over (post-test). We let 26 students of the student use tablets in the evening laboratory. In it they copied their work to the tablet and were then able, using Ubiquitous Presenter, to compare their answers with their peers (the entire classroom) and discuss differences. We had another group of 23 students who were not using the tablets, they wrote their answers on paper only and then compared them to nearest neighbors. The instructor in both classes was the same.

In both the non-tablet and tablet group only 5 out of 23 and 5 out of 26 students, respectively, showed significant changes. The minority of students that showed significant changes were interesting however: In the tablet group the 5 students all showed positive gains of at least 3 points. In the non-tablet group 3 students actually had 2 point losses and the remaining 2 students had 2 point gains.

**One Year From Now** – we hope to see a statistically significant pattern showing improved student learning in Physics I & II, similar to the one we already observed in the Theory of Computing course assessment from 2006-2008. We plan to collect similar evidence from courses in biology (Neuroscience) and the visual arts (Introduction to Computer Art).

### Impact on Teaching

Introductory Physics I & II used the tablets during every lecture and laboratory (3 sections, a total of 70 students). In each lecture we used Ubiquitous Presenter to present, let the students interact with, and archive the class notes.

To enhance student learning through a new classroom/lab experience instruction was modified to take advantage of the tablet's graphical capabilities. Students, no longer limited to text responses via non-tablet computers, respond with graphs, e.g., P-V diagrams, drawings, e.g., force diagrams, and equations.

To measure the effectiveness of the new teaching approach through whole class discussion of tablet-based drawings and diagrams, each student completes a pre- and post-questionnaire using test questions from standardized tests to evaluate learning gains for entire course and for redesigned labs.

### Technology Implementation

A localized, customized version of Ubiquitous Presenter (UP) software was used in the Theory of Computing and the Physics courses. From student surveys we observed that the increase in performance and response time was well received with students who initially complained about the system being “slow”. To simplify the setup process, we recently have added a feature that automatically signs up students with UP, so that they can login with their usual Eckerd College user ID and password.

**Keywords:** computer science, physics, biology, Ubiquitous Presenter (UP)

**Keywords:** visual arts