

## Improving Student Learning in a Math Bridge Course through Computer Algebra Systems

**Authors :** Alejandro Adorjan

**Abstract :** Universities are motivated to understand the factor contributing to low retention of engineering undergraduates. While precollege students for engineering increases, the number of engineering graduates continues to decrease and attrition rates for engineering undergraduates remains high. Calculus 1 (C1) is the entry point of most undergraduate Engineering Science and often a prerequisite for Computing Curricula courses. Mathematics continues to be a major hurdle for engineering students and many students who drop out from engineering cite specifically Calculus as one of the most influential factors in that decision. In this context, creating course activities that increase retention and motivate students to obtain better final results is a challenge. In order to develop several competencies in our students of Software Engineering courses, Calculus 1 at Universidad ORT Uruguay focuses on developing several competencies such as capacity of synthesis, abstraction, and problem solving (based on the ACM/AIS/IEEE). Every semester we try to reflect on our practice and try to answer the following research question: What kind of teaching approach in Calculus 1 can we design to retain students and obtain better results? Since 2010, Universidad ORT Uruguay offers a six-week summer noncompulsory bridge course of preparatory math (to bridge the math gap between high school and university). Last semester was the first time the Department of Mathematics offered the course while students were enrolled in C1. Traditional lectures in this bridge course lead to just transcribe notes from blackboard. Last semester we proposed a Hands On Lab course using Geogebra (interactive geometry and Computer Algebra System (CAS) software) as a Math Driven Development Tool. Students worked in a computer laboratory class and developed most of the tasks and topics in Geogebra. As a result of this approach, several pros and cons were found. It was an excessive amount of weekly hours of mathematics for students and, as the course was non-compulsory; the attendance decreased with time. Nevertheless, this activity succeeds in improving final test results and most students expressed the pleasure of working with this methodology. This teaching technology oriented approach strengthens student math competencies needed for Calculus 1 and improves student performance, engagement, and self-confidence. It is important as a teacher to reflect on our practice, including innovative proposals with the objective of engaging students, increasing retention and obtaining better results. The high degree of motivation and engagement of participants with this methodology exceeded our initial expectations, so we plan to experiment with more groups during the summer so as to validate preliminary results.

**Keywords :** calculus, engineering education, PreCalculus, Summer Program

**Conference Title :** ICSRD 2020 : International Conference on Scientific Research and Development

**Conference Location :** Chicago, United States

**Conference Dates :** December 12-13, 2020