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## A COMPARATIVE STUDY ON LEARNING IMPROVEMENTS FROM SCALE-UP PEDAGOGY AND REFORMED LECTURES

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In the past, many large physics lectures have been reformed and supplemented by active learning elements such as Peer Instruction [1]. A different approach consists of breaking up large lectures into smaller classes and shifting to highly interactive flipped learning settings. Studio Physics and SCALE-UP are well-documented implementations of this approach [2]. Running multiple parallel classes, however, implies substantial investment efforts (rooms, faculty) [3] and it is advisable to gain insights on expected learning improvements before deciding on either reformed lectures or small interactive class settings. A comparative study of student achievements between these two different settings is needed in order to guide pedagogical decisions going forward.

For this reason, we have conducted a pilot study within a physics lecture class of 370 students at a major Swiss research university. In a one-year undergraduate physics course, we divided the student cohort into two parallel teaching settings. During one semester, we offered a highly interactive SCALE-UP environment to one group of 52 students and a reformed lecture to the remaining 318 students. In the following semester, all students were taught in the same lecture setting without a SCALE-UP alternative. Within the 14-week parallel teaching period, we compared students' performance in both settings and could draw conclusions on immediate differences. Eight months after the SCALE-UP intervention, all students had to sit the same high-stakes final exam, which consisted of topics throughout the entire year, including topics from the previous intervention. We related the final exam results to the former performance results and gained insights on medium-term effects based on the two teaching settings. We also addressed questions on gender differences. In addition, we analyzed student feedback that included data related to class attendance, out-of-class preparation, level of intellectual challenge, and other items.

In this poster, we present the major results of our study and draw conclusions on implementing SCALE-UP pedagogy compared to a typical reformed lecture setting.

[1] J.M. Fraser et al. (2014) Rep. Prog. Phys. 77, 032401.

[2] R.J. Beichner (2014) New Directions for Teaching and Learning, 137, 9-16.

[3] E. Brewster et al. (2018) Phys. Rev. Phys. Educ. Res. 14, 010109.

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