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Activating students through a tutorial-based approach: the case of the 'Virtual Prototyping' course

The main objective of this paper is to describe best practices for active learning from the course Virtual Prototyping at the School of Industrial and Information Engineering, Politecnico of Milano in Italy. The course provides knowledge on methods to create virtual prototypes of industrial products, teaching students how computer graphics, virtual/augmented/mixed reality technologies, and multisensory interaction can support the design, validation and maintenance of products during their life cycle.
The course is designed with a strong orientation towards problem-based learning. Teaching activities include both theoretical lectures and exercises. The exercises are performed individually or in groups in a laboratory setting and follow a tutorial-based approach. In these sessions, students are initially presented with the basic principles and theoretical foundations for a given prototyping technology. This is followed up by ad-hoc tutorials where students are given a problem statement and a set of guidelines to independently solve a given task, under the supervision of the professor.
The tutorial-based approach has shown to be very effective in activating students in their learning. Course participants have been observed to become more aware of the use of virtual prototypes to validate aesthetic, functional and ergonomic aspects of products. Furthermore, by proposing problems of increased complexity throughout the course, students have been found to be more engaged in proactively searching for innovative solutions. Students were also observed to become more interested in continuing their work and developing it into a Master thesis project.
Further developments of this tutorial-based approach will aim at coping with the issue of 'polarization' with regards to student satisfaction in the course. While most of the students have been observed to be 'satisfied' or 'very satisfied' with the proposed teaching method, a few have expressed a feeling of frustration due to the high intensity of the workload associated with the laboratory tasks.