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Evaluation of a flipped classroom redesign of a large introductory biology class

Innovative teaching methods can increase learning efficiency by addressing learners' prior knowledge and by actively engaging students, e.g. through discussions, peer instruction or problem-solving. In the "flipped" classroom, students engage with the course material outside the class, providing time during in-class sessions for interactive learning activities and feedback. However, although various studies showed the benefits of instructional approaches fostering collaborative and active learning, e.g., increasing learner's motivation and engagement, the traditional lecture still remains the prevailing method for university science teaching. University introductory courses are often attended by a large number of students with a heterogeneous background knowledge; thus, frontal lectures are often the format of choice, leaving limited room for interactivity and student engagement. Here, we describe the design of a flipped course, including formative assessments and group work, for a large biology introductory class at ETH. The effects of this implementation were analyzed regarding student learning gains, exam performance, and student satisfaction. Students in the flipped classroom reached higher learning gains than students in the frontal lecture, and students reported a higher conceptual understanding after following the flipped course compared to a traditional course. Furthermore, student evaluations revealed that students were generally more satisfied with the course in the flipped format, and student engagement with the content as well as interaction with the teacher were rated higher in the flipped course. Thus, our report exemplifies how active student engagement can be fostered in large introductory courses and might stimulate further developments in this direction.

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