

# Three Weeks of Team-Based Learning Do Not Overload Undergraduate Students

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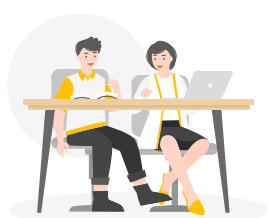
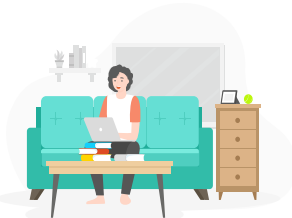
## CONTEXT:

Team-based learning (TBL) is a flipped-classroom approach requiring students to study before class. Fully flipped curricula usually have fewer in-class hours. However, for practical reasons, several programs implement a few weeks of TBL without adjusting the semester timetable. Students fear that they will be overloaded by the individual and collaborative study hours needed to prepare for TBL.



## METHODS:

We implemented three consecutive weeks of TBL in a fifteen-week lecture-based course on the renal system (RS). Simultaneously, students attended a digestive system (DS) lecture-based course, reported as having the greatest potential to overload students. In-class time and assessments were unchanged for all courses. 459 first-year undergraduate medical students (229 in 2018; 230 in 2019) were invited to complete weekly logs of their individual and collaborative study hours during lectures and TBL, along with questionnaires on cognitive load and perception of the course. Our program changed from A to E grading in 2018 to pass-fail grading in 2019.



## RESULTS:

Participants (n=324) spent a similar number of hours studying for TBL vs. lectures with a mean of 3.1 hours/week (figure 1). Collaborative study was minimal outside class (median 0.1 hour/week). Results remained similar with pass-fail grading. If in-class time were reduced, 18% of participants said they would have used freed-up time to study for TBL. Studying for TBL generated similar extraneous cognitive load and lower intrinsic load compared to studying for lectures (figure 2). Students were less stressed, and maintained high levels of motivation and self-perceived learning (figure 3).

Figure 1

Individual and collaborative weekly out-of-class study hours during lectures and team-based learning

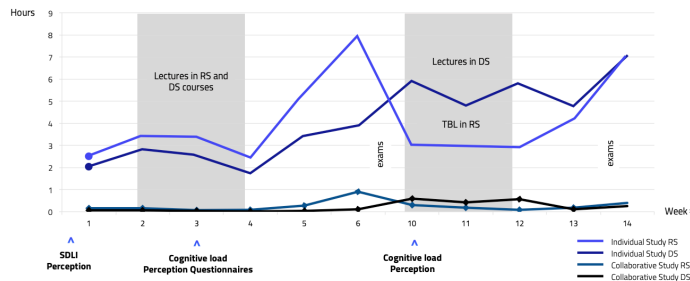


Figure 2

Self-reported intrinsic and extraneous cognitive loads and self-perceived learning during lectures and team-based learning; on an agreement scale from 0 to 10

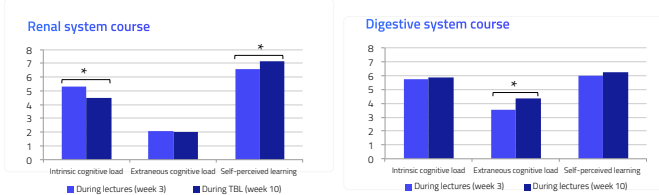
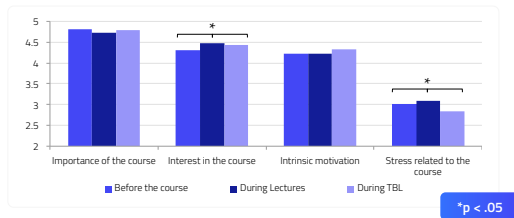


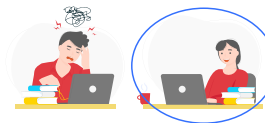
Figure 3

Perception of the renal system course before the course, during lectures, and during team-based learning; on an agreement scale of 1 to 5



## CONCLUSIONS:

Three weeks of lectures were replaced by TBL without reducing in-class time. Students did not report overload in study hours or in cognitive load.



## 5 findings confirm that participants were not overloaded:

1. They did not devote more time to study for TBL, although we know from the pre-exam weeks that they can quadruple this amount of time if needed.
2. We did not observe a difference in the study "binge" before the end-of-semester exam, suggesting that students felt as well prepared as before the mid-semester exams
3. Only 18% stated that they would devote additional study time for TBL were it available.
4. Extraneous cognitive load remained low during TBL, while simultaneously increasing in the DS lecture-based course.
5. Stress was reduced during TBL.