Flip not flop: teaching pharmacological theory using flipped lectures

R. J. Prince. Faculty of Biology, Medicine and Health, University of Manchester, Manchester, United Kingdom.

Background and Aims: BIOL21412 Drugs: Models and Mechanisms is a level 2 unit (30-43 students) that covers drug-receptor theory and introduces a range of pharmacological analytical techniques. The unit was established in 2012 using 11 traditional lectures to deliver the theoretical content and was assessed by a series of data handling exercises, short note questions and oral presentations. Student surveys in 2012-2014 indicated a high level of student satisfaction, with the unit scoring 4.8 ± 0.1 (mean $\pm$ SEM, n=3) for the question "This unit was excellent" (Likert Scale: 1= disagree; 5= agree). However, in 2015 this score dropped to 3.5, with student comments expressing concerns about workload management and lack of support for the data handling exercises. To address these concerns, we implemented a flipped teaching approach. We reasoned that this format would offer students more flexibility about when to learn, and that the increase in active learning implicit in flipped teaching would provide students with additional support.

Summary of work and outcomes: Since 2016, the theoretical content of BIOL21412 has been delivered online using 10 SoftChalk modules, with embedded quizzes and worked examples of data-handling problems. In addition, students attend five small group active sessions. The same data-handling assessments were used both the flipped and traditional formats of the unit. Comparing students' performance in the data-handling assessments in 2016 and 2017 to the two years prior to the format change revealed significant improvements (Table 1: * indicates significant difference from both 2014 and 2015 data $P<0.05$ by 1 way ANOVA with Tukey's test. No differences were seen in students' overall year 2 performance). Student survey excellence scores for 2016 and 2017 also improved to 4.75 and 4.74 respectively.

Discussion: Our results agree with previous studies demonstrating improved performance in STEM subjects when flipped teaching is implemented (1). These gains may be due to students undertaking more active-learning, better managing their workload, or simply due to clearer presentation of information in the online-versus traditional- lectures.

Conclusion: Flipped teaching of pharmacology theory provides significant gains in student performance in data handling tasks.

References
1) Farmer, R (2015) Will flipping my class improve student learning? http://blogs.northampton.ac.uk/learntech/2015/08/27/will-flipping-my-class-improve-student-learning/

Table 1. Student performance in BIOL21412 using traditional (2014,15) or flipped teaching (2016, 17)

	2014 Traditional	2015 Traditional	2016 Flipped	2017 Flipped
BIOL21412 mark % $\pm$ SEM (n)	63.1 ± 2 (30)	63.2 ± 1.4 (39)	73.3 ± 1.2 (32)*	72 ± 0.9 (43)*
Overall year 2 mark % $\pm$ SEM	62.9 ± 1.6 (30)	64 ± 1.3 (39)	66.6 ± 1.3 (32)	65.9 ± 1.4 (43)