An evaluation of a flipped approach to teaching biomechanics

Sarah Churchill[1,2] & M. Polly McGuigan[2]

[1] Sheffield Hallam University, [2] University of Bath

Context

- Traditional lectures often involve the transmission of new “fact-based” knowledge to students
- Higher level skills such as discussion, critical analysis, calculations and problem solving are often conducted in students’ own time, without tutor guidance, despite these being activities that are more likely to require tutor support[1]
- ‘Flipping’ involves turning the traditional paradigm of university teaching on its head; students undertake pre-lecture directed work to acquire new knowledge, and this knowledge is built upon in lecture time with the guidance of the tutor[1]

The Flipped module

- The University of Bath’s Level 4 2013/14 Introduction to Human Biomechanics module (82 students) was flipped
- The module consisted of two main topic areas: mechanics and kinesiology, delivered by two tutors. Lectures were supported with lab practicals. Each topic area was introduced with a traditional lecture. Additionally, the eighth lecture was delivered traditionally, so that the students could be given the data/instructions for completing the coursework
- Flipped lectures were introduced in the preceding lecture and directed preparatory work (online lectures/directed reading) was set. As an incentive to complete the pre-lecture work, weekly online tests (total of 10) were set, each contributing 1% (total 10%) of the module mark
- Efficacy of the flipped approach was evaluated using informal feedback, module evaluation, focus groups, and monitoring of attendance and online access.
- Engagement was also assessed using the National Survey of Student Engagement (NSSE[2]) which was completed by the same cohort for this and a concurrently run, non-flipped, Functional Anatomy module.

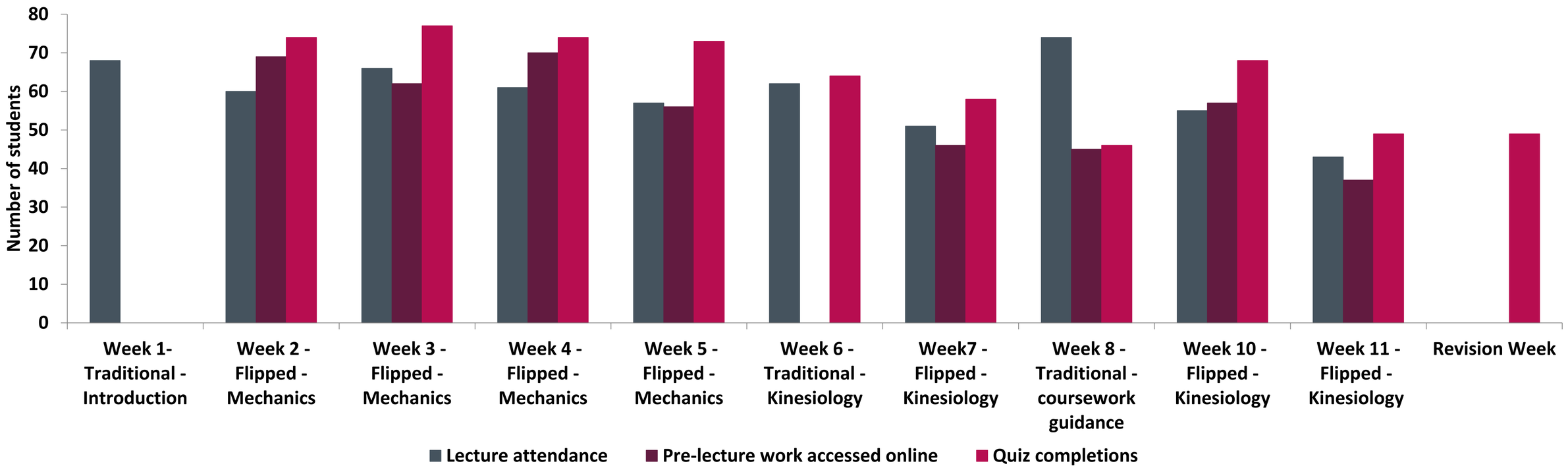

Figure 1. Number of students (of 82) attending lectures, accessing preparation resources and completing weekly online quizzes.

Note that there was no pre-lecture work for weeks 1, 6, 9 and revision week, there was no lecture in week 9, and no quiz in weeks 1 and 9.

Evaluation

Student achievement

- No evidence of higher (or lower) marks in summative assessment compared to previous years
- However, students generally agreed that they felt they had met the learning outcomes of the module

Student engagement

- Trend of decreased attendance and completion of preparatory work and quizzes as module progressed (Figure 1)
- Students felt similarly engaged and challenged by flipped and non flipped units (NSSE data), but were more likely to prepare for the lectures in the flipped module that than the traditionally taught module

Student satisfaction

- Students generally enjoyed the flipped approach
- Students valued more applied and interactive lectures
- Student enjoyed the self-paced nature of online lectures and the ability to review them, but found they were often too long.

Tutor satisfaction

- Tutors enjoyed the more applied and interactive nature of the approach
- Flipping dramatically increased workload (at least in the first year)
- Students arriving unprepared for lectures often caused content which should have been covered prior to the lecture to have to be revisited, which was demotivating for students and the tutor
- Tutors perceived that students developed quiz and flipping "fatigue” and disengaged as the module progressed

Recommendations

- Continuation of flipped approach but with greater balance of flipped and traditional lectures
- Shorter online lectures (~10 minutes)
- Fewer quizzes

1. Bates, S. & Galloway R. (2012) Online: http://www.heacademy.ac.uk/assets/documents/stem-conference/PhysicalSciences/Simon_Bates_Ross_Galloway.pdf
2. NSSE Online: http://nsse.iub.edu/

Sheffield Hallam University

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