

Flipping the Practical

Encouraging self-regulated learning and improving student engagement in second year science courses

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Introduction

The student attitude towards practical classes in level II core courses was: "We just have to attend the practicals because they are compulsory." Lack of student preparedness and understanding of practical tasks made it difficult for students to make the link between theory and application and therefore relevance of the practical activities to their degree. We designed interactive, online pre-class activities to "Flip the Practical" to encourage students to prepare for practical classes.

Objective

To enhance student preparedness, understanding and engagement in practical classes for second year Agriculture and Viticulture and Oenology students.

The Flipped Design

To enhance student understanding and therefore engagement in practical classes we designed online, pre-practical activities using Articulate Storyline¹ (Fig. 1).



Figure 1: Example of online pre-practical exercises in Articulate Storyline for Microbiology (left) and Biochemistry (right).

Information is presented in a multi-media format including YouTube clips and videos of academic staff demonstrating key laboratory techniques. The pre-practical activities include check points so students can test their knowledge and practice calculations. These quizzes were designed to allow unlimited attempts, the ability to review activities and obtain immediate feedback. We also present important safety information, connecting students to Chemwatch Gold.

A weighting (1%) was applied to the pre-practical activities to encourage motivation and participation. Students were required to apply the concepts learnt in the pre-practical activity in class, where they could ask for help from teaching staff when face-to-face. Students then used the data collected in class to write a summative practical report linking the pre-practical activities to the in-class laboratory and post-class assessment task.



Figure 2: The flipped classroom² model for flipped practicals. Online pre-practical activities are completed before the practical class, students use knowledge gained in the pre-practical activity in class and then produce a summative practical report including data collected in class.

Outcomes

Students were surveyed after completing the online pre-practical activities and feedback was extremely positive (Fig. 3): "The practicals helped my understanding of concepts better." "Pre-practical activities are good and makes me perform more confidently in the prac session." The overall impact for students was that the pre-practical activities encouraged their independent learning, they felt better prepared for the practicals and this increased their engagement in class.

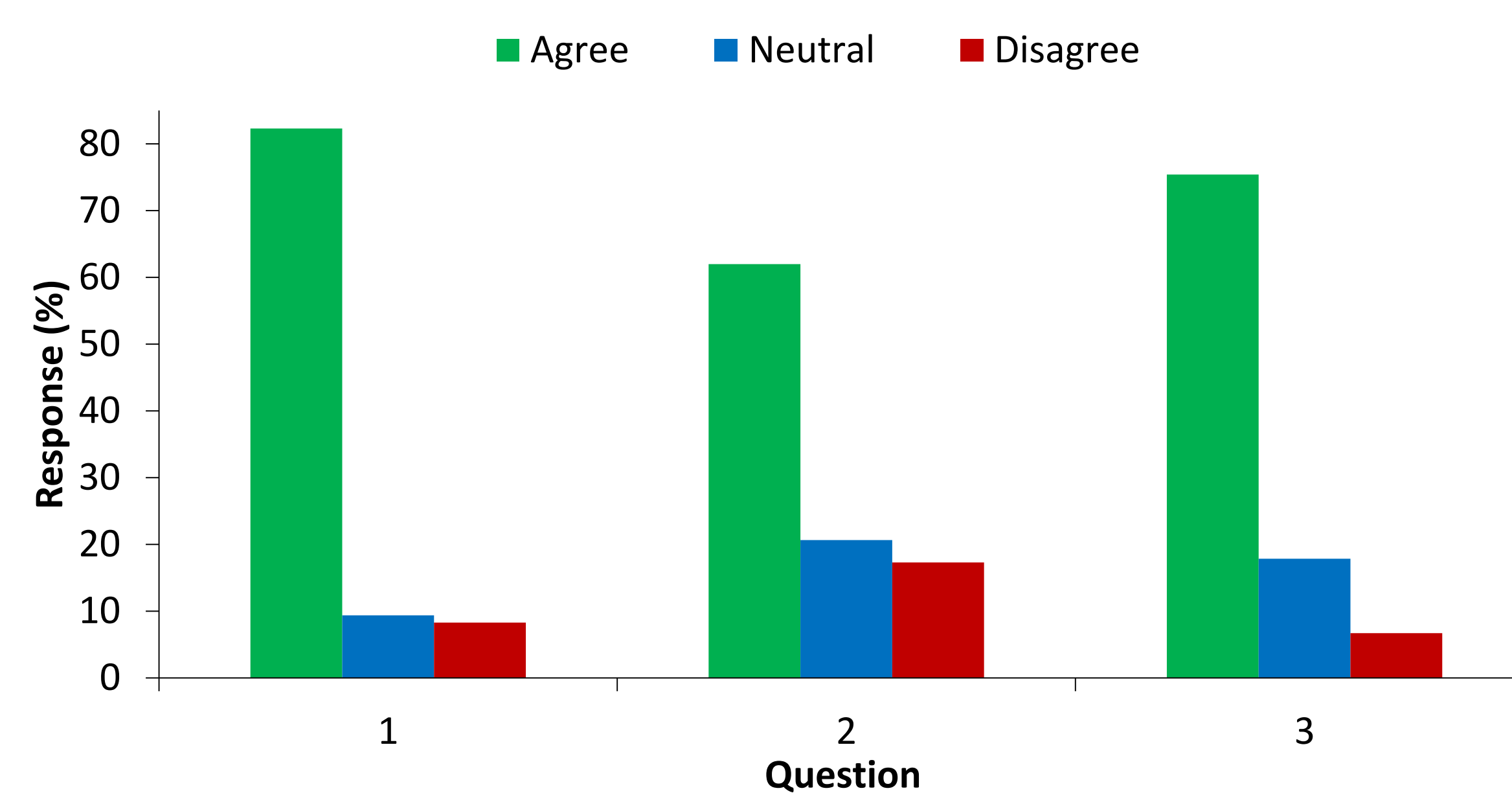


Figure 3: Likert survey results for pre-practical activities in Biochemistry and Microbiology (n=539) (Ethics approval H-2012-045). Questions are indicated by number: 1) Students felt better prepared for practicals; 2) Encouraged students to review the laboratory manual; 3) Interactivity enhanced my engagement.

We have also seen a sustained improvement in practical grades in several of our courses since the implementation of the flipped practical (Fig. 4). Students were able to ask questions which indicated higher level thinking and metacognition because they arrived to class prepared.

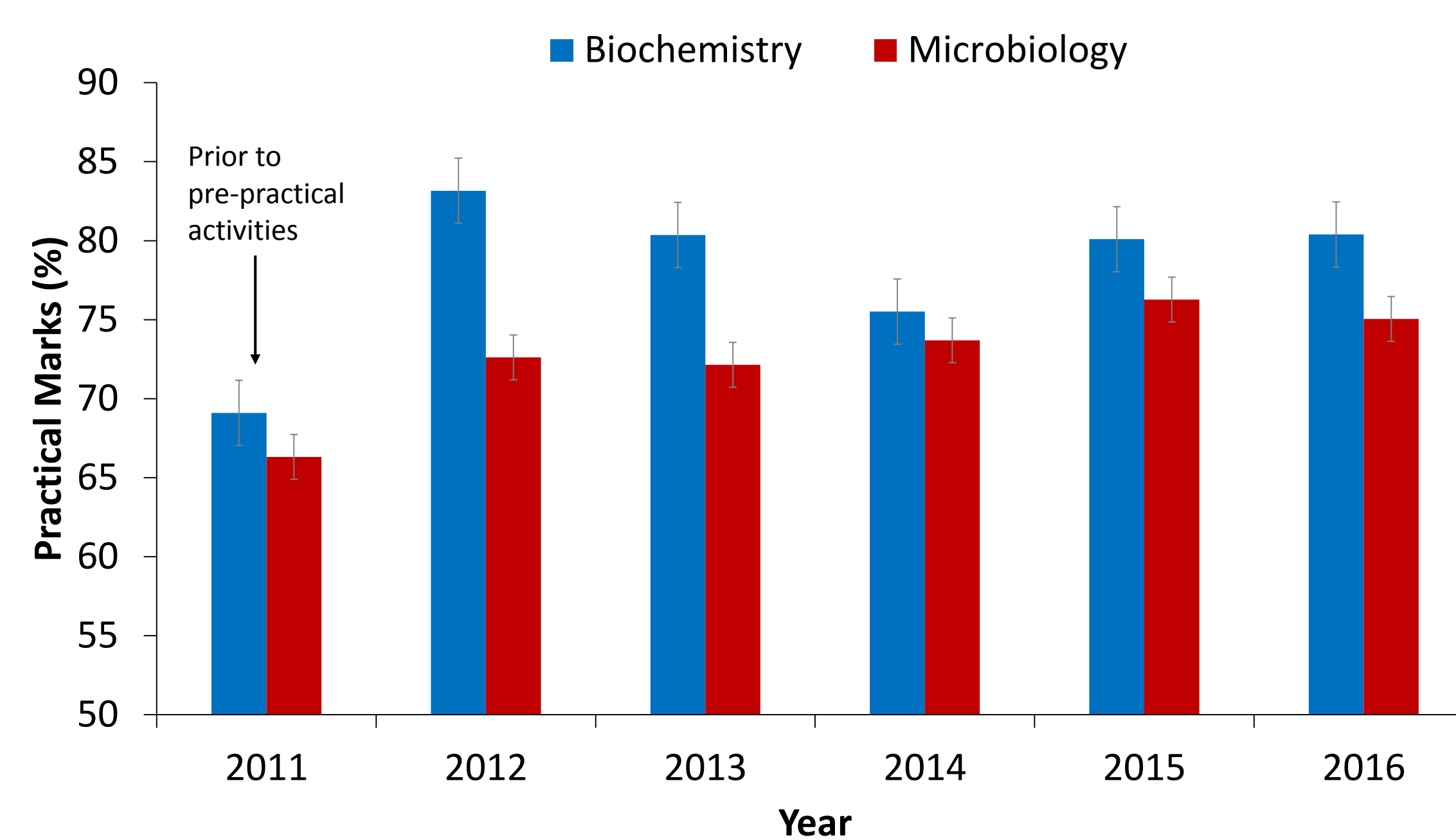


Figure 4: Change in practical grades for Biochemistry and Microbiology students (n=698) since the introduction of pre-practical activities in 2012. Practical grades increased by 9-14% in 2012 and this increase in grades has been sustained over the last five years. NOTE: In 2011, no changes were implemented in our courses. Improvement in grades was aided by revitalisation of course structure and implementation of innovative teaching pedagogies.

Implementation of the online pre-practical activities led to more effective use of practical class time. This was noted by academic staff: "...These activities have greatly improved preparedness and allowed students to focus on hands-on activities" (Prof. Eileen Scott, Deputy Head of School, Agriculture, Food and Wine).

Conclusion

Flipping the practical with the inclusion of online pre-class activities has increased student preparedness for class. Students ask more thoughtful questions which indicate higher level thinking and metacognition. They have a better idea of what they need to do in the practical and can begin with limited instruction, removing the need for lengthy pre-practical talks by supervising staff.

References

1. <https://www.articulate.com>
2. Bergmann, J. and Sams, A. (2014) Flipped Learning-Gateway to student engagement. International Society for Technology in Education, USA.