

Gender and engagement in automated online test feedback in first year human biology



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This study reports on the differential use and benefits for males and females of the provision of automated feedback for online MCQ tests in first year Human Biology. The study was conducted across three Western Australian universities offering first year Human Biology units to approximately 2000 students per year. We found that immediate feedback benefits the learning of both sexes, but greater male engagement is obtained through shorter feedback tasks.

Keywords: feedback, gender, engagement, test length

Introduction

Continuous formative and/or summative assessment and the provision of timely feedback are major challenges in the teaching of large classes; yet the value of these tasks in maintaining student engagement and enhancing learning is accepted (Orsmond, Merry & Reiling, 2005). Online technologies offer possible strategies to overcome the administrative burden of large marking loads, while also providing the opportunity for increased flexibility of delivery and provision of feedback. Although online assessment with contextually relevant automated feedback has been shown to enhance topic learning (Nguyen, Hsieh & Allen, 2006; Wade-Stein & Kintsch, 2004), factors such as age, gender, motivation, confidence and prior experience are likely to influence the way students use online technologies and the value they place on the feedback provided (Fyfe et al. 2006; Hoskins & van Hoof, 2005; Ziman et al. 2007). This study reports on the differential use and benefits for males and females of the provision of automated feedback for online multiple choice question (MCQ) tests in first year Human Biology at three universities in Western Australia.

The University of Western Australia (UWA), Curtin University of Technology (Curtin) and Edith Cowen University (ECU) all provide first year Human Biology units catering in all, to approximately 2000 students per year. Each unit has in place as one component of their assessment strategies, successful and well-used online assessment systems. Until recently, however, these systems were based almost entirely on MCQ tests and provided no feedback beyond the overall test result and an indication of whether a particular answer was correct or incorrect. With support of a Carrick Institute Grant, we surveyed the feedback needs of students and used this understanding to build individualised feedback into our online assessments. Initially feedback was written for one subject area MCQ test at each institution. In constructing the feedback we sought to emphasise the underlying concept being tested and to provide simple explanations of key terminology. We then set out to gauge students' experience of the feedback, to evaluate its impact upon their overall performance in the unit, and to optimise its mode of delivery to facilitate student engagement.

The feedback exercises were delivered via WebCT (UWA and Curtin) and Blackboard (ECU). At UWA and Curtin the initial tests comprised 30 items drawn randomly from subsets within a bank of MCQ

questions; at ECU the test comprised 50 items. At UWA and ECU the tests were delivered in formative mode and the students could attempt them as many times as they desired; the Curtin the test was in summative mode. Feedback, provided at the end of the test gave explanations as to why the student's answer was correct or incorrect and, where the answer was incorrect an explanation of the correct response. To gauge students' experience of the feedback they were asked to complete an online reflective practice exercise after the test.

Method

Data (test scores, number of times attempted, time spent) were obtained from the respective learning platforms student tracking system and linked to final exam results at the conclusion of the unit by linking student ID codes to test logon names. Initial analyses were based on 1161 students (345 male, 816 females) for whom gender was recorded and were carried out using the statistical package Genstat 8.1 (2006). Chi-square tests were used to assess differences in frequency of test use between males and females. Differences between males and females in the effect of test use on performance in the feedback subject area of the final exam were examined by unbalanced ANOVA, with final unit grade entered as a covariate.

Results

Participation in the test with feedback did not differ for males (65%) and females (63%). However, a significantly higher proportion of males (20%) than females (14%) failed to complete the feedback enriched test ($\chi^2 = 7.68$, $df = 2$, $p = 0.021$). Completion of the feedback enriched tests were shown to improve both males and females performance in the feedback topic area of the final exam (Figure 1). Males who completed the feedback enriched tests scored on average 13.5% better on the section of the final MCQ exam than those who did not attempt them, and 20% better than those who started but failed to complete the exercise. Females who completed the feedback test scored on average 8% and 14% better than those who did not attempt or did not complete the exercise respectively.

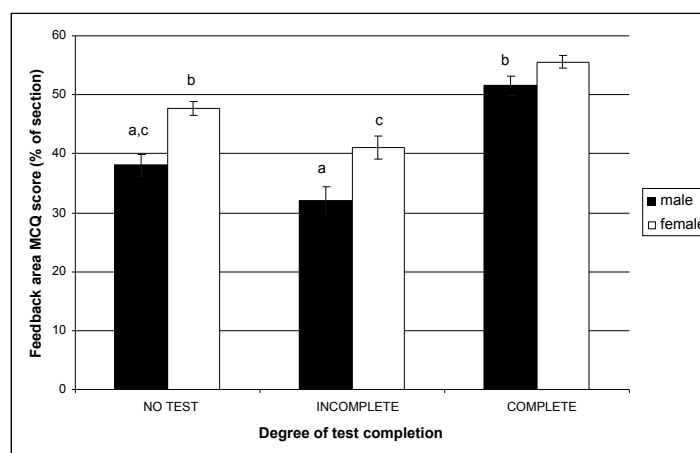


Figure 1: Performance on the feedback area in the final exam

Note that the performance on the feedback area in the final exam is shown on the graph by sex and degree of feedback test completion (ANOVA with final unit grade as covariate, Completion $F_{[2, 1133]} = 50.85$, $p < 0.001$; Sex $F_{[1, 1133]} = 34.27$, $p < 0.001$, Interaction $F_{[2, 1133]} = 2.08$, $p = 0.125$). Values without common lettering differ significantly ($p < 0.05$, LSD).

Given the measurable benefits of the feedback exercise, we sought to understand students' reasons for not completing it. Students gave favourable comments towards the feedback in the post-test survey, but many also remarked that the tests were too long. Given the relatively high level of test incompletion, particularly amongst males, test length might have been a factor in their limited engagement with the formative exercise.

Subsequently, we trialled a 10 item feedback enriched test in a second cohort of first year students at UWA (females = 328; males = 123). Decreasing the feedback enriched tests to 10 items significantly improved participation rates and decreased incompletion rates for both sexes (Figure 2), and particularly so in males (completion rate 45% to 72%; $\chi^2 = 7.46$, $df = 1$, $p = 0.006$). Completion of the 10 item test

provided similar benefits to final exam performance in this cohort of students as those observed in the first cohort with the longer tests. On average males and females who completed the test achieved 8-9% better in the feedback subject area of the final exam than those who did not attempt or did not complete the test (Completion $F_{[2, 496]} = 5.02$, $p = 0.007$). It should be noted that due to different unit content the feedback topic area for the 10 item test differed from that of the longer test, demonstrating the utility of the feedback enriched task across subject areas.

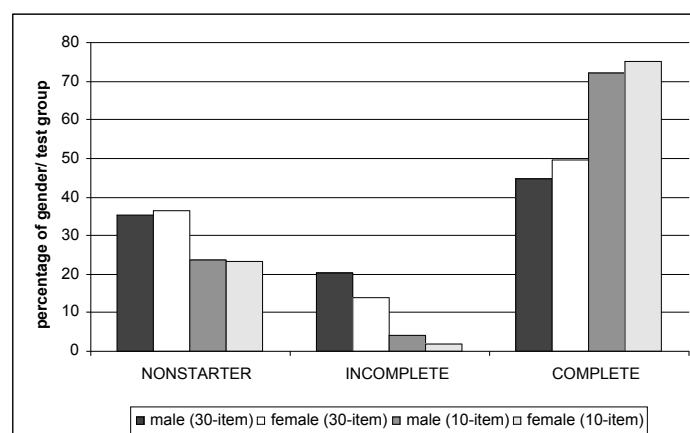


Figure 2: Degree of test completion for males and females according to length of test

Discussion and Conclusion

We found that the use of online formative assessment with automated feedback enhances student learning as measured by end of semester exam performance. However, some students, particularly males, were less likely to make use of the formative task. Gunn et al. (2002), in their discussion of gender issues in computer supported learning, assert that males are less likely to recognise the need to participate in formative assessment tasks and thus lose the benefit of ongoing feedback. This is not unique to online assessment (Woodfield, Earl-Novell & Solomon, 2005) but potentially, where formative tasks are online and self-directed, less motivated and less organised students are more likely to “slip through the net” than if tasks and associated feedback are administered face-to-face.

One of the aims of providing feedback on formative assessment is to empower students to become self-regulated learners (Ziman et al. 2007), but if the feedback task is perceived as too burdensome less motivated students may give up easily. In our study shorter test length improved student engagement with the feedback task, particularly amongst males. This is consistent with Smallwood et al (2004) who have shown that greater task disengagement is found during longer tasks.

In conclusion, the provision of immediate feedback via an automated online system benefits the learning of both sexes, with greater male engagement generated by shorter feedback tasks. The challenge remains to reach the ~20% of students, both male and female who fail to engage at all with the activity.

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