

Harnessing feedback analytics to improve feedback provision, student engagement with feedback and academic performance

Value/need for the project

Feedback is one of the most potent teaching strategies known to produce student learning gains (Hattie 2009), yet the provision of feedback has been identified as one of the weakest elements of university practices (Graduate Careers Australia 2012). The emergence of online feedback tools has greatly enhanced the opportunity for delivering timely, expressive, digital feedback to large cohorts of students, and for evidencing the learning impacts of this feedback (Ellis 2013). We have developed an innovative online system to collect large-scale data on digital feedback provision, student accessing of feedback and changes in performance on assessment items submitted electronically. However, our previous ALTC-supported work has shown that currently, the primary challenge in learning analytics is interpreting these data readily and accurately, and translating these findings into improved teaching practice and student outcomes (Dawson & McWilliam 2008; Dawson et al. 2011). This project will tackle the challenge of harnessing feedback analytics, to develop guidelines and interactive feedback analytics visualisations that support the tailoring of feedback practices to increase students' effective use of digital feedback and improve academic performance.

Rationale and aims

There are many well-evidenced and theoretically sound guides on how to improve feedback provision (eg Sadler 1998, Nicol & Macfarlane-Dick 2006, Hattie & Timperley 2007). However, the meta-analysis of Kluger and DeNisi (1996) found over 38% of the effects of feedback reported in the last 100 years reduced performance compared with no-feedback controls. Boud (ALTC Senior Fellow) argues that to address this prevalent misuse of well-intentioned feedback, academics need to shift their focus away from how feedback is provided, toward understanding how students use feedback to improve performance in related assessment tasks, and then use this evidence to drive changes in feedback provision (Boud & Molloy 2013). Similarly, Hattie (2009) has shown that it is the feedback educators receive on student progress toward learning goals that promotes learning. To address these challenges with rising class sizes, it is necessary to develop the tools **to understand how large cohorts of students use feedback to improve across related assessment tasks.**

In the context of multi-modal digital feedback on electronic assessment items, students report that the provision of audio feedback increases their engagement with, and usefulness of feedback (Turnitin 2013; Ice et al. 2007). Furthermore, students report that a combination of typed and audio feedback is more useful than providing either typed or audio feedback alone (Still 2006). However, how students actually use feedback, and the relationship between student use of feedback and changes in assessment performance are poorly understood (for review see Jonsson 2012). Studies commonly indicate that students do not collect or read written formative feedback (Sinclair & Cleland 2007; McDonald 1991), and when students do attempt to use feedback, they lack the necessary strategies to do so effectively (Furnborough & Truman 2009). Indeed, a recent, small-scale but detailed study provided evidence that students get frustrated and ignore feedback when they do not understand what to do with it (Still & Koerber 2010). The increasingly widespread adoption of online marking and feedback tools makes it easier for students to collect their feedback, but until now there has been no systematic way to characterise the patterns of student access of this feedback, nor how this impacts on their subsequent performance (Ellis 2013; personal communications with Prof Colbran (ReMarksPDF creator, Carrick and ALTC Priority projects 2007, 2009, 2010) and TurnItIn representatives). This project aims to understand the factors that impact on student engagement with, and effective use of, digital feedback on their electronic assessment items. Furthermore, we aim to use this information to provide academics with access to the quantitative and qualitative evidence they need to facilitate students' effective engagement with feedback through guidelines and interactive feedback analytics visualisations.

Approach

We have developed, implemented and evaluated an open-source, online feedback and marking tool (Feedback Analytics Capture System (FACS) previously known as “UQMarkUp”) which collects, and then visually represents, data on when and how long students access each item of feedback, what modalities and amounts of feedback are provided, and how students perform longitudinally across their electronic assessment items. Using FACS, we have conducted proof of concept studies in 2012-2013 across 10 large undergraduate courses at first, second and third year levels in biomedical science involving 63 markers, marking over 8,000 written assignments (literature reviews, research proposals and laboratory reports) for 3,000 students and 21 oral presentations for 76 students. Our system provides data on feedback provision that is both quantitative (on average, markers provide 7 ± 1 (mean \pm SEM) audio comments of 30 ± 2 seconds, and six typed annotations of 9 ± 1 words each per assignment) and can be qualitatively analysed to determine what markers are commenting on, and how they phrase these comments. We have also demonstrated the value of our system in relating feedback provision, student access to feedback and longitudinal changes in student assessment performance. For example, in a recent workshop, we provided markers with confidential, individualised reports on the digital feedback they provided and the extent to which students accessed the feedback. This prompted measurable changes in feedback provision behaviour, student accessing of digital feedback, and improvements in student performance in subsequent related electronic assessment tasks.

Our preliminary data has also revealed that, on average, students access their digital feedback for ~3hr and are playing the majority of the audio completely, often multiple times. Against this backdrop, students who made large improvements in assessment performance between successive assessment tasks (>10% mark improvement), appear to access their marked assignments for significantly longer (4 hours 27 minutes \pm 28 minutes), and played audio comments more times than students who either made small gains or performed more poorly ($p < 0.05$). We are currently analysing student clickstreams in more depth to understand how patterns in student movement through their marked assessment items relate to changes in academic performance and feedback provision, e.g. whether students scroll to the mark first, whether they scroll back and forward accessing feedback annotations in relation to the criteria sheets, whether they access certain annotations in order or for different periods of time, how many times students access the marked assessment item and the timing of this in relation to subsequent assessment task due dates. In this project we will use these types of feedback analytics data, and student responses to surveys on their feedback use, to guide the stratified sampling of students for more in depth qualitative studies (interviews, screen capture with think aloud protocols) to characterise what successful and unsuccessful students are doing when they access digital feedback embedded in their electronic assessment tasks.

Presentations of preliminary findings by UQ team members illustrating the capabilities and simplicity of the system (e.g. Zimbardi et al. 2013) have engaged change agents at University of Sydney, Curtin University and University of Auckland eager to collaborate on the adaption and adoption of this tool at their institutions.

Project outline

1. Project leaders from each collaborating institution will champion the implementation and embedding of the FACS. Feasibility analyses have identified the key processes and approvals necessary to this dissemination. These include gaining ethical approval to collect and analyse student and marker data, identifying intellectual property issues in accessing and using student and marker data, and ensuring IT and equipment requirements for implementation. Project leaders at each university have contacted the necessary gatekeepers, these approval processes have begun, and it will be feasible to implement FACS in large courses in biological, biomedical and chemical sciences at all undergraduate year levels by Semester 1, 2015.

Targeting multiple related electronic assessment items in 2015-2016 will allow longitudinal tracking of student performance across related assessment tasks for up to four semesters.

2. Quantitative data on changes in student performance for particular learning outcomes will be related to patterns in student access of digital feedback and digital feedback provision. Co-variables identified in previous ALTC/OLT projects (e.g. Meyer et al. 2007, Dawson et al. 2011) such as age, experience, prior academic achievement, confidence, gender, language, engagement in classes, and involvement in paid employment, will be investigated to determine their influence on feedback provision, student engagement with feedback and changes in academic performance. Surveys embedded in some electronic assessment submissions will gather student reflections on their strategies for using feedback and provide students with specific opportunities to seek feedback (Boud & Molloy 2013). Students' self-regulation strategies for using feedback will also be analysed based on methods developed by project team members Zimbardi and Colthorpe (e.g. Ogiji et al. 2013).

3. These findings will guide the stratified sampling of students for (i) qualitative analysis of the digital feedback based on established theoretical frameworks and typologies (Hattie & Timperley 2007; Still & Koerber 2006; Stern & Solomon 2006); (ii) participation in interviews; and (iii) think aloud protocols utilising screen capture (e.g. Camtasia) while engaging with and using feedback.

4. Factors found to contribute substantially to longitudinal changes in student assessment performance, student use of feedback and feedback provision, will inform the design of interactive feedback analytics visualisations, based on the methods of project team member Dawson in prior ALTC funded projects on learning analytics (e.g. Dawson et al. 2011).

5. Throughout the project, Ms Drury will guide and assess the dissemination of ALTC-funded writing reports in science and engineering (WRiSE) resources to project participants, and the qualitative analysis of changes in student writing. OLT-funded Transforming Assessment leaders Prof Crisp and Dr Hillier, and ALTC-funded ReMarksPDF creator, Prof Colbran, will advise on utility of project findings for assessment innovators and users of digital feedback tools across the secondary and tertiary education sectors, as well as issues of how feedback analytics capabilities may be integrated into existing Web 2.0 and digital feedback tools.

Project outcomes

This project will deliver guidelines and interactive visualisations that assist academics in the design of student-centred feedback interventions based on evidence of relationships between:

- (i) feedback provision within different electronic assessment submissions,
- (ii) student engagement with digital feedback,
- (iii) longitudinal changes in student academic performance.
- (iv) key co-variables

The success of the project in achieving these outcomes will be evaluated formatively at the end of each semester. The data collected during the preceding semester will be summarised and used to develop schematic representations of the relationships between each of the outcomes, and the influence of co-variables on these relationships. The internal and external validity of these relationships, and the clarity and usability of the visualisations will be evaluated each semester by the Project Team and Reference Group. Preliminary reports drawing together these schematic representations and evidence needed to guide feedback interventions will direct the collection and analysis of data for subsequent semesters, and used to design interactive feedback analytics visualisations to be piloted by the Project Team. Upon project completion, the preliminary reports and piloted interactive feedback analytics visualisations will be drawn together to form the final guidelines and analytics tools to support academics in the effective design, implementation and evaluation of feedback interventions.