



Determining students' assessment feedback preferences for personal analytics solutions

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Lead institution: The University of Melbourne

Project leader: Associate Professor Linda Corrin

Team member: Dr Paula de Barba

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Location code C50MA7
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<learningandteaching@dese.gov.au>

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List of acronyms used

LMS Learning Management System

Executive summary

In a mass and increasingly expanding higher education system we are seeing more participation of students from diverse backgrounds than ever before. In an education system that is under pressure, however, students have routinely said they do not get enough access to staff and feedback to support their learning. Learning analytics provides new opportunities to use data collected through students' activities and assessments to provide feedback. For these student-facing analytics tools to present the right feedback in ways that students can interpret and use to improve their learning, however, a greater understanding of students' preferences for assessment feedback is required.

This report presents the findings of a study that explored students' assessment feedback preferences and the ways that such feedback can be represented. The findings showed that the form of feedback wanted by students varied based on the type of assessment and students' previous feedback experiences. There was also a desire for more feedback to be provided pre-task and ways to demonstrate progress across assessment tasks. These findings can be used to inform the design of student-facing analytics systems to ensure that the feedback provided is useful and interpretable by students to support their learning strategies. From the findings the following guidelines are presented:

1. The form of feedback should be guided by the type of assessment.
2. The design of feedback needs to acknowledge that students' view of, and reliance on, feedback changes over time.
3. Formative feedback and information that assists task interpretation is highly valued by students.
4. Careful consideration should be given to any standards provided to students to use as a benchmark for monitoring their performance.
5. Feedback should be delivered in ways that enable student help-seeking.

The outcomes of the project have been disseminated via a number of channels including a webinar, seminar, conference paper and presentation, website and future funding application. Further publications of the detailed findings from the study are currently in preparation. This project has been an integral part of the program of work that has been undertaken by the authors at The University of Melbourne in advancing knowledge of how to use learning analytics to provide effective feedback to students using the theoretical lens of self-regulated learning.

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Chapter 1: Project context and objectives

The delivery of feedback for assessment has long been recognised as crucial to improving learning (Hattie & Timperley, 2007). As a result, educational institutions and software vendors are increasingly developing new technological solutions to support the delivery of assessment feedback to students. Recently, this development has been influenced by the emergence of the field of learning analytics, which offers new possibilities to harness data collected about students' online activities and assessments and to represent this data in meaningful ways to students. Often these student-facing analytics present such feedback in the form of a dashboard, although recent innovations have incorporated feedback in many different ways within learning task environments (e.g., within an online writing task [Gibson et al., 2017]) or via direct communication methods (e.g., via email [Pardo et al., 2019]).

At the same time, concern has been expressed about how well students can interpret this feedback in ways that benefit how they approach their learning (Teasley, 2017). Several studies have found that students sometimes struggle to link the feedback given via analytics-based tools, such as dashboards, with the actions necessary to improve their study strategies (e.g., Corrin & de Barba, 2014; Park & Jo, 2015). It was noted by Corrin and de Barba (2014) that students had very diverse ways of defining feedback and considering how it is useful to their learning.

There are many definitions of feedback used in the literature. The definition we started with as a basis for this project was that offered by Hattie and Timperley (2007, p. 81), who defined feedback as 'information provided by an agent (e.g., teacher, peer, book, parent, self, experience) regarding aspects of one's performance or understanding'. This definition acknowledges that feedback can be provided by many different sources, including people and/or resources. Within a complex higher education environment, especially one in which an increasing number of courses are being delivered at scale, it is necessary to consider forms of feedback beyond those given directly by teachers and tutors to enable support for large numbers of students.

Several previous studies have examined students' perceptions of assessment feedback. Students have reported that feedback is useful when:

- it is clear and specific (Murphy & Cornell, 2010; Small & Attree, 2016)
- it can clarify misunderstandings (Pokorny & Pickford, 2010)
- comments relate directly to assessment criteria and grades (Ferguson, 2011)
- it is a critical, but encouraging, opinion of the work (Ferguson, 2011; Lizzio & Wilson, 2008; Small & Attree, 2016)
- it is fair (Lizzio & Wilson, 2008)
- it is timely (Ferguson, 2011; Murphy & Cornell, 2010)

- it is tailored to the competency and year level of the student (Murphy & Cornell, 2010; Poulos & Mahony, 2008)
- it can inform students' preparation for future assessment (Small & Attree, 2016).

However, there are also concerns about students' level of engagement with feedback and how valuable students view the feedback they receive to their learning (Price, Handley, Millar & O'Donovan, 2010; Rowe & Wood, 2008). Consistently, large cross-institutional studies of student experience find low levels of satisfaction with the provision of feedback (e.g., Baik, Naylor & Arkoudis, 2015; Neves & Hillman, 2018). This is sometimes attributed to a lack of feedback literacy among students (Carless & Boud, 2018), but also to the inconsistent provision of feedback in some contexts. Moreover, students often regard the personal nature of feedback from lecturers and tutors as particularly valuable (Pokorny & Pickford, 2010). This personalised feedback is, however, increasingly difficult to provide with growing numbers of students participating in higher education. All of these considerations indicate that there is still work to be done in improving feedback practices in higher education to ensure students are receiving effective feedback for their learning.

In this context, the theoretical lens of self-regulated learning can be used to explore how students use feedback to inform their role in the learning process (Pintrich, 2000). Self-regulated learners are considered to be active agents who 'set goals for their learning and the attempt to monitor, regulate, and control their cognition, motivation and behaviour in the service of those goals, guided and constrained by both personal characteristics and the contextual features in the environment' (Pintrich, 2000, p. 453). It has been observed that high-achieving students use feedback as a catalyst for their self-regulatory processes (Butler & Winne, 1995). That is, these students are able to translate the information they receive in the form of feedback into actions to assist them to learn more effectively, particularly through monitoring their learning progress. These students are also able to create their own opportunities to receive feedback, when they notice feedback is lacking.

Feedback can play an important role in all three phases of the self-regulatory cycle as defined by Zimmerman (1998). In the first phase, *forethought*, previous feedback can be used by students in preparing to engage with a new task, to understand the nature of the task, plan the learning strategies to be used, and to judge the importance of the task. In the second phase, *performance*, feedback enables students to monitor whether their learning strategies are effective, whether they are employing adequate levels of effort, and to help identify any required adaptations to learning approaches. The third phase, *self-reflection*, makes use of feedback to inform the judgements students make about their learning experience that can influence future approaches to learning.

In this third phase, students evaluate whether their learning is progressing in a way that will allow them to achieve their goals. For example, their goal may be to pass the course with a high distinction grade, fully understand the carbon cycle, or perform better than their peers. Feedback allows them to make a judgement about whether they feel they are on the right

track to achieve this goal or not. If not, students can then take action. One possibility is to change the learning strategy they have previously been using, or else they might decide to increase the amount of effort they are putting into their study. Another possibility is for students to seek help. This is particularly important in cases where students do not know how to adapt their strategies to increase their learning. Either way, good self-regulated learners are able to create the most favourable context, with all the appropriate resources to make sure they are achieving their goals.

With this in mind it is important to consider how feedback can be delivered in ways that enable students to use it easily to inform their self-regulation. For feedback to be useful it must be able to be understood and acted upon by the student (Boud & Molloy, 2013). While extensive research exists on ways to deliver feedback to students that are effective for learning, less consideration has been given to how analytics-based technologies can help represent this feedback. By developing a more in-depth understanding of what students value in terms of feedback and how feedback can be represented to help them to self-regulate their learning, recommendations can be made for the design of effective student-facing analytics tools.

It is also important to acknowledge that students' views of feedback can evolve over time and change in relation to different forms of assessment tasks undertaken. This is something often overlooked in feedback studies that tend to collect perspectives at a single point in time or for a single assessment design. To observe how these factors impact students' feedback preferences, this study was conducted with students from different year levels at multiple points over an academic semester during which time students undertook a variety of assessment tasks.

The purpose of this project was to gain a greater understanding of how feedback can be represented in ways that aid student interpretation to inform the development of analytics-based assessment feedback tools. It was guided by these research questions:

1. What type of feedback do students want to receive?
2. At what level of granularity do they want this feedback?
3. What form do they want this feedback to take?
4. When would they like to receive the feedback?
5. How often would they like to receive feedback?

The project approach will be detailed in the next chapter.

Chapter 2: Project approach

A multiple case study approach was adopted for the project to investigate the type and methods of delivery of feedback students want to support their study. The data collection took place in the first and second semesters of the 2016 academic year at The University of Melbourne.

Participants

The study involved 30 undergraduate students. A diverse sample was recruited to represent different year levels (1st to 4th year) and disciplines (including arts, business, science, engineering, and architecture) to examine perspectives on feedback across different types of assessments and different levels of experiences with feedback.

Participants ranged in age from 18 to 23 years old (see Figure 1). Two thirds of participants were female, and the other third were male. Nine of the 30 participants were in their first year of study, 10 were in their second year, 10 were in third year, and one student was considered fourth year, although they were an international student on a study abroad program and therefore completing mainly third-year equivalent subjects. The largest cohort of students were studying in the science discipline (10), followed by arts (7), business (6), engineering (5), and architecture (2) (see Figure 2). The disciplines of education, law and medicine are not represented in the sample as these discipline courses are only offered at postgraduate level at the university.

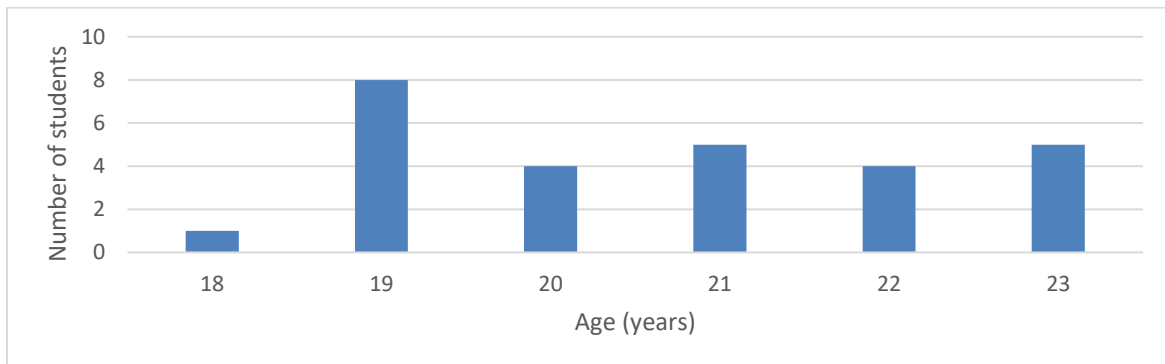


Figure 1. Age distribution of participants

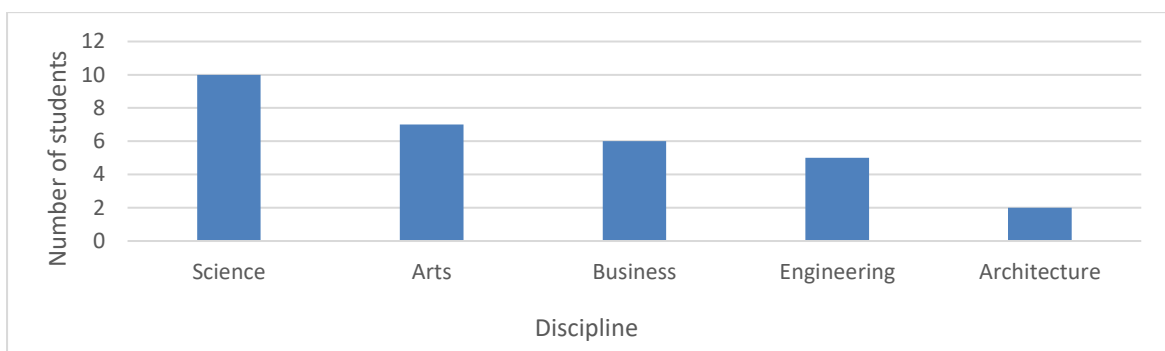


Figure 2. The disciplines in which participants were studying

Procedure

Participants were asked to take part in four semi-structured interviews at different points throughout the semester. The first interview, conducted around the second week, explored how participants defined feedback and their expectations about the types of feedback they would like to receive for the assessment tasks they were required to undertake that semester. They were asked to reflect on their previous experiences with feedback and to describe their ideal view of the feedback they would like to receive, focusing on key issues informed by the research questions, including:

1. The type of feedback
2. The granularity of the feedback
3. The form of the feedback
4. When they would like the feedback
5. How often they would like the feedback.

The second interview took place mid-semester and explored the feedback that participants had received on any assessment tasks they had completed to that point, including what actions they had taken in response to this feedback. As part of this interview participants were asked to complete a palette task where they were given a large, blank piece of paper and asked to draw how they would like their feedback to be represented. The think aloud method of data collection was used to capture participants' thoughts as they were prompted to 'think aloud' as they designed the feedback representations. They were also given visualisation examples that they could incorporate into their palette if they chose.

In the third interview, which took place during weeks 10 or 11 of semester, the same protocol as the second interview was used to explore any further feedback received as well as any changes in participants' perspectives on feedback in response. Participants were given a choice to revisit the palette they created in the second interview, and/or to create a new one.

At the end of semester, after the final results had been released for all subjects, a fourth interview was held. In this final interview the participants were asked to reflect on the feedback they had received throughout the semester and to comment on their feedback expectations in light of their experiences and performance in their subjects.

A thematic analysis was conducted on the interview transcripts and palettes created by the participants to address each of the research questions. The analysis began with a set of codes that had been generated from a review of the literature and then themes that emerged throughout the analysis were added to these. The themes were then used to generate a set of guidelines for the design of effective feedback to students.

Chapter 3: Project findings and outcomes

The data collected in this project provided rich insight into students' perspectives in relation to how they want to receive feedback so that they can use it to monitor and plan their approaches to study. Here we summarise some of the main findings that emerged from the analysis and outline the guidelines for the effective provision of feedback that were developed on the basis of these findings.

Type

There was diversity in the preferences regarding types of feedback due to the different forms of assessment. While it was fairly standard for marks or grades to be allocated in relation to summative assessment items, it was less common for formative comments to be provided, especially in classes with large cohorts. All participants requested greater access to formative feedback on assessments to adjust their study strategies for future assessments.

Granularity

When discussing their ideal preferences for feedback, participants tended to focus on individual assessment tasks. Many participants requested a finer level of granularity of feedback to indicate how they had performed in relation to each assessment criteria, rather than just high-level feedback related to the assessment as a whole. However, when asked to create a visual representation of feedback in the palette task, participants also shifted their focus from the individual task level to representations of progress across all tasks in a subject to support time management and effort regulation.

Form

For the students in earlier years of their studies, there was a strong preference for face-to-face conversations to accompany any feedback given on assessment. Students in later years, however, had become more proactive in seeking out feedback for themselves from peers and other sources as they did not always receive the type of feedback they wanted from their teachers. Participants in disciplines where written feedback was the norm were generally satisfied with the feedback they received, but those from disciplines where mid-semester and final exams were the most common form of assessment wanted more detailed explanations of why answers were correct or incorrect and suggestions for improvement.

Timing/Frequency

All participants expressed a desire to receive timely feedback on their assessments to be able to use the feedback for future tasks. There was a strong demand for feedback to be given prior to assessment deadlines in the form of clarification about task requirements and expectations. This type of feedback can help students with the self-regulatory process of

task interpretation and was often represented on participants' palettes as support videos, rubrics or live chat tools with tutors/lecturers. Requests for bigger assessments to be broken into smaller parts were also made by participants, especially those in large subjects, to allow for more frequent formative feedback on progress and proficiency.

Visualising feedback

Participants produced a wide range of visualisations to represent their ideal feedback while constructing their palettes during the second and third interviews (see Figure 3). The design and purpose of each visualisation was also varied. These visualisations provide insight into what formats of data representation and tools participants considered useful and for what purpose. It is interesting to note that participants not only provided visualisations about the format of feedback they would like to receive, but also tools that would assist them to get additional feedback and to act upon received feedback. Examples of the palettes created by students include:

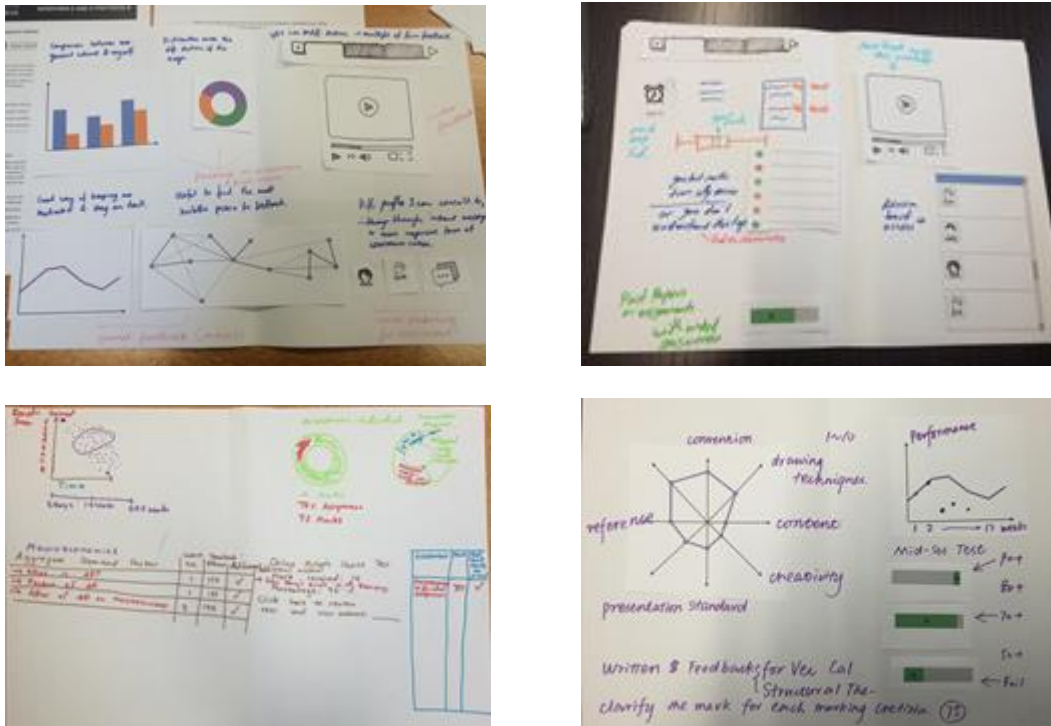


Figure 3: Examples of student palette

In the following subsections, we provide an overview of the main visualisations participants used in this project.

Alarm, calendar and badges

Several students incorporated visualisations that related to planning, monitoring and managing their time, such as reminding students about assignments deadlines (Figure 4a and 4b), and providing praise when a task is accomplished (Figure 4c).

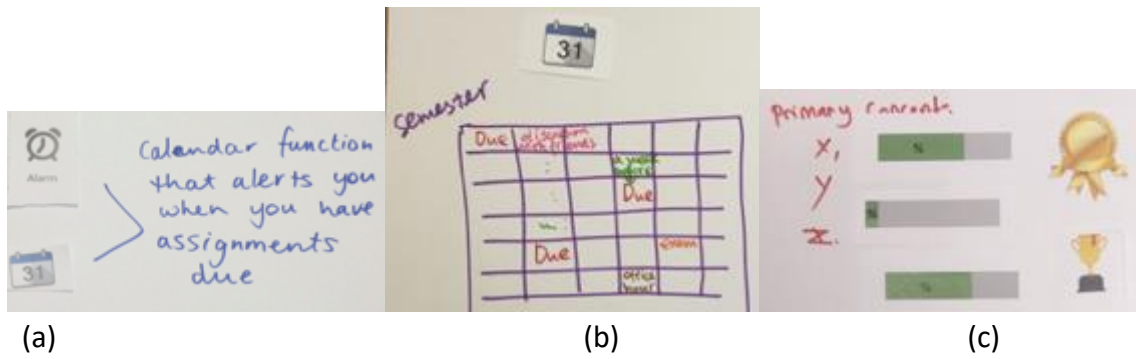


Figure 4. Alarm, calendar and badges visualisations

Checklist

Checklist was another element that participants indicated that they would use to help planning and monitoring their studies. For example, having a to-do list based on the calendar (Figure 5a) or having feedback provided in the format of a to-do list with ‘things to improve’ (Figure 5b).

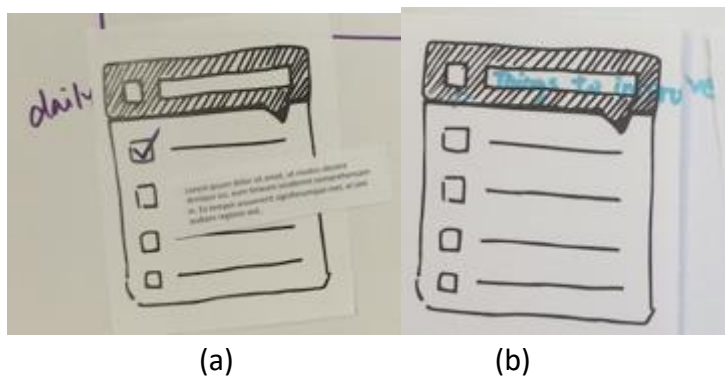


Figure 5. Checklist visualisations

Progress bar

Progress bar visualisations were mainly chosen by participants to provide information on their progress in relation to assessments. This was either broken down by topics (Figure 6a) or a general bar for the assignment as a whole (Figure 6b).

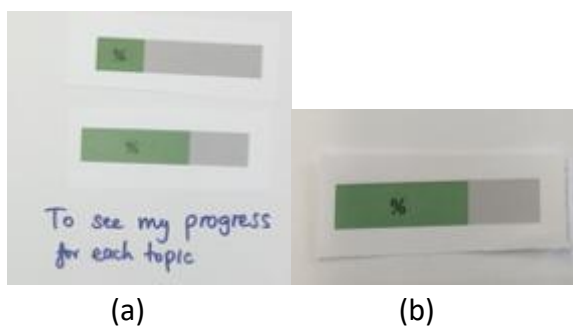


Figure 6. Progress bar visualisations

Chat box

The chat box visualisation was included in some students' palettes to represent a function to allow students to have public and private conversations, such as instant messaging, with peers, tutors and lecturers (Figure 7). Chat box was cited as a tool to assist with help-seeking behaviour.

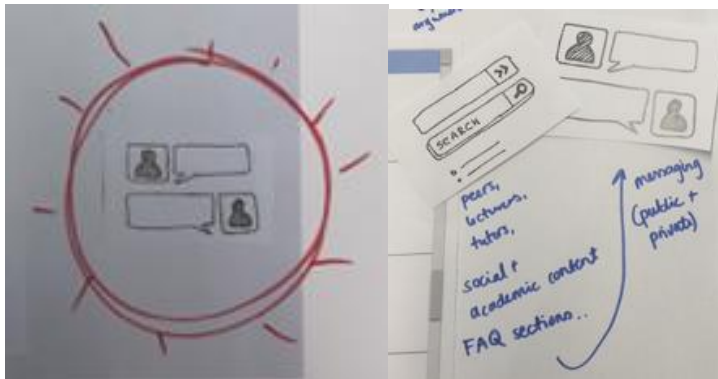


Figure 7. Chat box visualisations

Discussion board/news feed

Participants often chose discussion board and news feed elements to support help-seeking behaviour. Discussion boards were shown as similar to the ones currently available on most Learning Management Systems, but with additional features, such as flagging when teaching staff have answered a question, division of messages by topics, and flagging of read posts (Figure 8a). News feeds were portrayed as being more informal and media rich (Figure 8b).

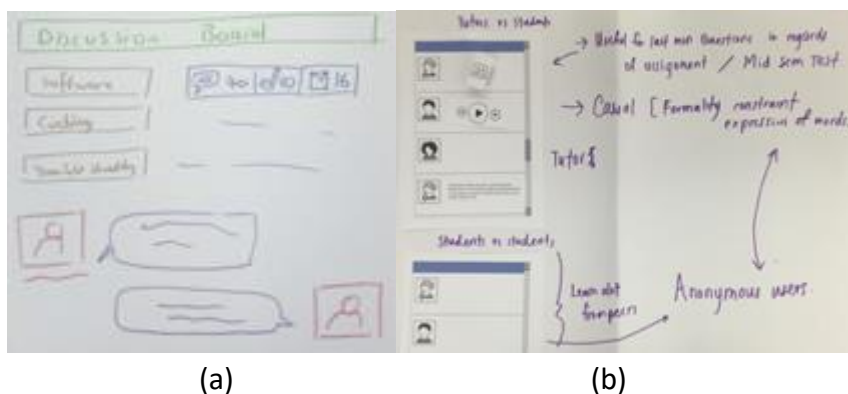


Figure 8. Discussion board and news feed visualisations

Line chart and pie chart

Line chart and pie chart visualisations were included by students in their palettes for a wide variety of purposes, including the provision of feedback on participants' progress throughout the semester (Figure 9a), a distribution of type of answers to assessment questions (Figure 9b), and performance progress of attempts in formative online quizzes (Figure 9c).

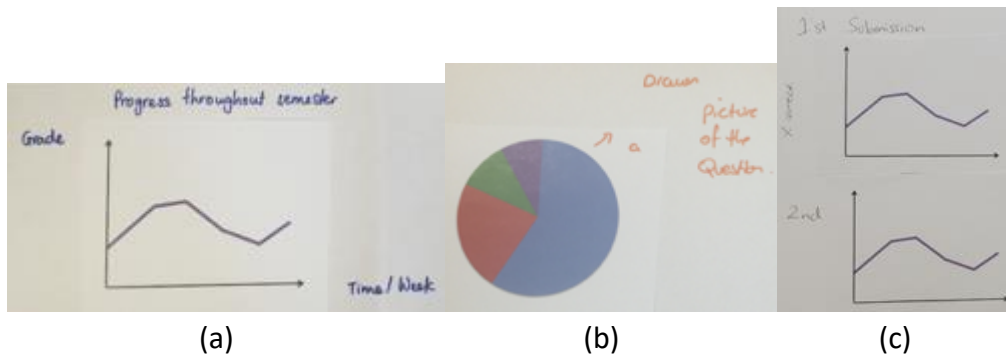


Figure 9. Line and pie charts visualisations

Radar diagram

Radar diagrams can be used to visual elements at the same time. This was mainly chosen by students to provide feedback on different criteria or topics of an assessment (Figure 10).

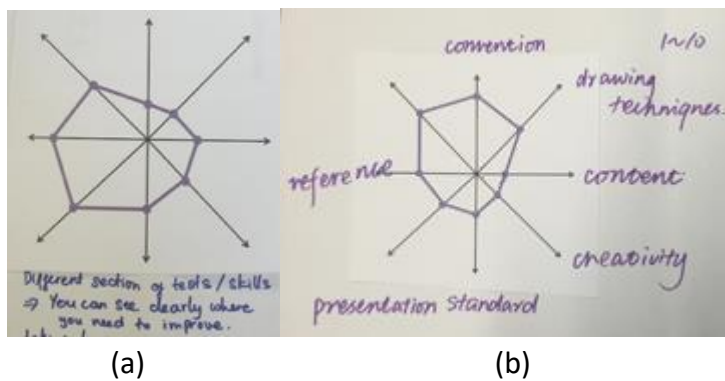


Figure 10. Radar diagram visualisations

Text boxes

Text areas were mainly incorporated so students could engage directly with written feedback. Examples of this visualisation include receiving feedback on an essay (Figure 11a) and on a field notebook (Figure 11b).

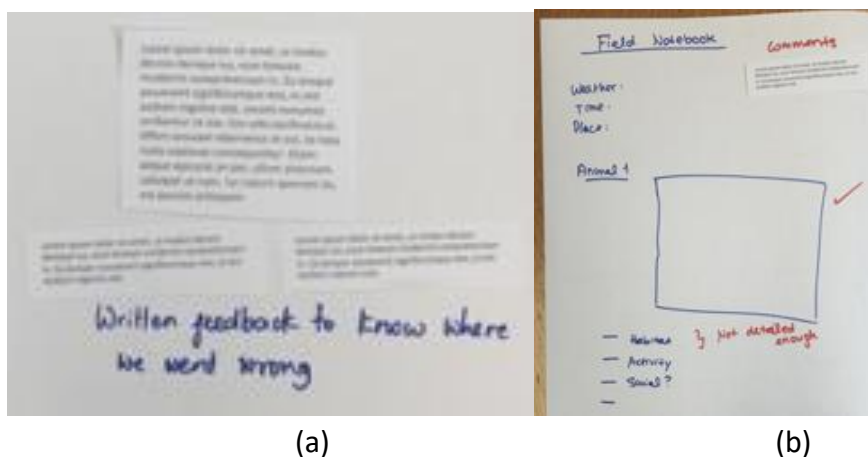


Figure 11. Text box visualisations

Traffic lights

Traffic lights are visualisation that use colours (green, yellow, red) to help users to easily identify problematic areas (yellow and red) and areas in which their performance is satisfactory (green). Participants incorporated traffic lights visualisations as a form of receiving feedback on individual assessment criteria (Figure 12a), as a grid to display formative activities by difficulty (Figure 12b), and as a way to monitor their progress on different topics of the course (Figure 12c).

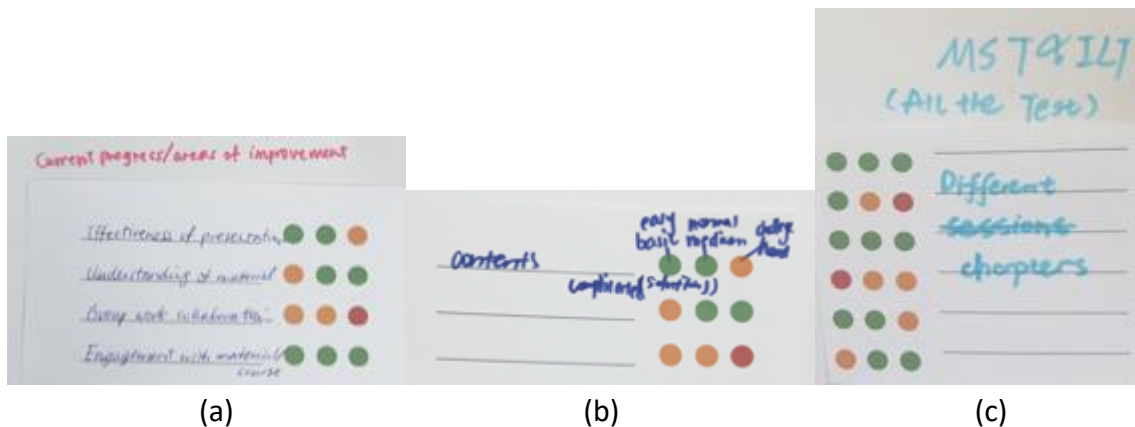


Figure 12. Traffic lights visualisations

Video

Videos providing feedback for assessments, either as a general feedback for the whole class (Figure 13a) or as a tool to provide instructions for oral presentations (Figure 13b) were also requested by some students.

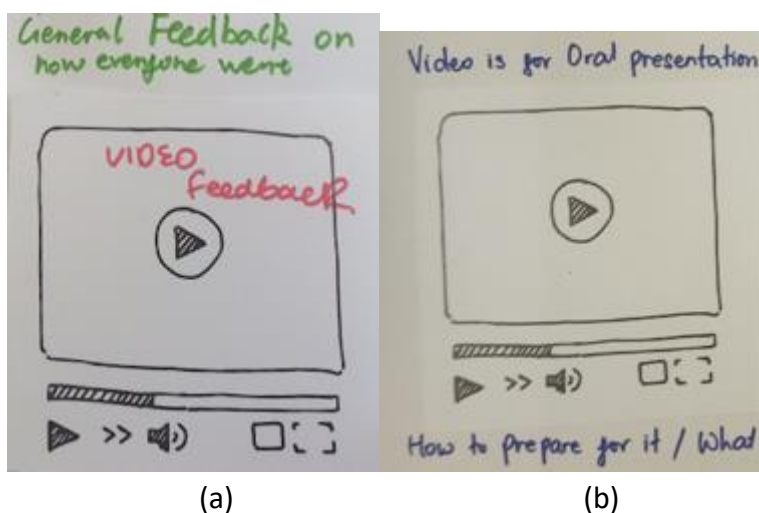


Figure 13. Video visualisations

Discussion

These findings provide useful insights into the ways that feedback can be represented through student-facing analytics to support student learning. While previous studies have found student satisfaction to be higher with dashboard representations of summative marks (Corrin & de Barba, 2014) than representations of only online activity (Park & Jo, 2015), the current study would indicate that a combination of these approaches may help with students' ability to self-regulate their learning. The wide range of assessment types and related forms of feedback that can be given challenge the idea that tools can provide a 'one-size-fits-all' solution. Building tools that allow students to choose what they see and customise how the data is represented would help to address some of these issues. This should also include options to provide support for students in interpretation of the task prior to submission of the assessment. A strong theme throughout all the student case studies was a call for information about assessment criteria/expectations and formative feedback prior to the task to enable success. This was considered by many students as a form of 'feedback' that is as important to their learning as the feedback received after the assessment has been evaluated.

It is important to note, however, that while this study has focused on collecting students' preferences for feedback, what students want should not be the only consideration in the design of these tools. Teachers also play an important role in identifying feedback that can support learning and can ensure alignment between assessment design and feedback provided. Designing and delivering analytics-based feedback to improve student learning is a complex task, but increasing our understanding of how students interpret and act upon feedback can help to ensure the effective design of such feedback tools.

While we started the study using Hattie and Timperley's (2007) definition of feedback which, to some extent, implies a one-way provision of information, through our discussions with students and the ways in which they represented how they wanted to receive feedback we acknowledged the importance of the student being proactive in an ongoing communication process around feedback. This is encapsulated in Boud and Molloy's (2013, p. 703) definition of feedback as: 'a process whereby learners obtain information about their work in order to appreciate the similarities and differences between the appropriate standards for any given work, and the qualities of the work itself, in order to generate improved work'. In designing analysis-based tools for feedback, careful consideration needs to be given to the roles of the teacher and student in how the feedback is given and received, so that the tool is a catalyst for ongoing engagement and feedback conversations.

Guidelines

The findings of this study have been used to develop a set of guidelines for the effective delivery of feedback to students to inform the development of analytics-based learning systems. These include:

1. *The form of feedback should be guided by the type of assessment.* Generic ways of presenting the same data for multiple types of assessment (as often observed in some student dashboards) may not deliver the level of detail students require to be able to determine actions to improve their learning. Feedback tools need to provide the ability to choose and adapt representations to align with assessment design.
2. *The design of feedback needs to acknowledge that students' view and reliance on feedback changes over time.* It became clear that students' literacy with and views on feedback change as they move through their studies. This does not necessarily mean that final year students need less feedback—but how they interact with feedback at this level may be more sophisticated than it was in first year and this should be factored into what is provided. Perhaps the system can be designed to allow students to customise what they receive so they can focus on feedback they find most useful.
3. *Formative feedback and information that assists task interpretation is highly valued by students.* Students do not want to have to wait until an assessment has been submitted before feedback is received. In designing feedback systems and processes for students, consideration should be given to how clear information about expectations can be given and formative tasks incorporated, where appropriate.
4. *Careful consideration should be given to any standards given to students to use as a benchmark for monitoring their performance.* The default of many analytics-based feedback systems is on providing a class average, however, the efficacy of this has been questioned in the research. Instead, consideration in the design of feedback systems should be given to other ways of providing students with a standard to which they can compare their own performance. Students could be given the option to set their own standards or systems could incorporate measures around the difficulty of assessments/questions to help students to interpret their competency.
5. *Feedback should be delivered in ways that enable student help-seeking.* To encourage students' active engagement with feedback it is necessary to give them enough information for them to be able to identify what they need to do next. This may be that they need to seek further resources or talk to the teacher or their peers. When designing feedback systems it is important to balance the provision of feedback. Too much feedback should not be provided such that students are not encouraged to think through their understanding, but there also needs to be enough feedback so that students can identify how they need to respond and what actions they need to take to improve their performance.

Chapter 4: Project impact and dissemination

This project has been an integral part of the program of work that has been undertaken by the authors at The University of Melbourne in advancing knowledge of how to use learning analytics to provide effective feedback to students using the theoretical lens of self-regulated learning. The outcomes of the project have been disseminated in a number of ways as described below.

Webinar

On 17 November 2017 the project team was invited to give a presentation as part of a webinar series hosted by the Transforming Assessment Special Interest Group, sponsored by the Australasian Society for Computers in Learning Tertiary Education (ASCILITE). This webinar was attended by over 20 participants and the recording of the session and related materials (e.g. slides) are available at:

https://transformingassessment.com/events_1_november_2017.php. As of May 2019 the YouTube recording of this webinar has over 180 views.

The University of Melbourne seminar

On 16 April 2018 a seminar was given at The University of Melbourne within the Faculty of Business and Economics as part of the 'brown bag series' of research seminars.

Conference paper and presentation

The project team submitted a concise paper to the 2017 ASCILITE conference held at the University of Central Queensland in Toowoomba.

Corrin, L. & de Barba, P.G. (2017). Understanding students' views on feedback to inform the development of technology-supported feedback systems. In H. Partridge, K. Davis, & J. Thomas. (Eds.), *Me, Us, IT! Proceedings ASCILITE2017: 34th International Conference on Innovation, Practice and Research in the Use of Educational Technologies in Tertiary Education* (pp. 47-51).

The presentation of the paper was well attended and prompted conversations after the event and on Twitter with people from many different higher education institutions.

Publications

The outcomes of the project have been discussed briefly in the book chapter:

Corrin, L. (2018). Evaluating students' interpretation of feedback in interactive dashboards. In D. Zapata-Rivera (Ed.), *Score reporting: Research and applications* (Chapter 10). New York, Routledge.

The project team are currently in the process of drafting a series of journal articles reporting on the findings of the study in more depth, to be submitted for review by the end of 2019.

Website

Information about the project and its outcomes are available on the Melbourne Centre for the Study of Higher Education's website at: <https://melbourne-cshe.unimelb.edu.au/research/research-projects/edutech/student-feedback-analytics>.

OLT Grant proposal

In the proposal for this seed grant it was specified that a project deliverable would be an application for funding for a 2017 OLT Innovations and Development Grant in collaboration with other Australian universities to build on the findings of the seed project. An application entitled 'Analytics for Success: Smart feedback to support students' approaches to learning' was completed and submitted, involving researchers from The University of Melbourne, the University of Wollongong, Charles Sturt University, Macquarie University, and the University of Canberra. Unfortunately, the application was unsuccessful in that round. As this was the last round of funding offered by the OLT we have been unable to resubmit this grant for consideration.

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