

Exploring students' interpretation of feedback delivered through learning analytics dashboards

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The delivery of feedback to students through learning analytics dashboards is becoming more common in higher education. However, it is not clear what ability students have to interpret this feedback in ways that will benefit their learning. This paper presents the preliminary results of a mixed methods study into students' interpretation of feedback delivered through learning analytics dashboards and the influence this feedback has on students' self-regulated learning. The findings from a preliminary analysis of the data from the first two phases will be discussed and the future phases of the research outlined. The outcomes of this research provide new insights into how dashboards can be designed to provide effective feedback in blended learning environments.

Keywords: learning analytics, feedback, self-regulated learning, motivation

Introduction

The emerging field of learning analytics involves the analysis of data about learners and their activities to inform the enhancement of teaching and learning practices and environments (Long & Siemens, 2011). Initial learning analytics research has primarily focused on providing data to academic staff on student engagement and performance, most commonly for the purpose of student retention (Bichsel, 2012; Campbell & Oblinger, 2007). Recently this focus has expanded to include ways to deliver feedback directly to students (Verbert, Duval, Klerkx, Govaerts & Santos, 2013); however there is still a gap in our understanding of the usefulness of learning analytics feedback from the student perspective (Wilson, 2012). The value of feedback in student learning has long been acknowledged (Black & William, 1998; Hattie & Timperley, 2007). Feedback is a key element in students' self-regulation of learning as it enables students to monitor their progress towards their learning goals and to adjust their strategies to attain these goals (Butler & Winne, 1995).

One way that feedback can be delivered to students using learning analytics is in the form of a dashboard through which multiple sources of data can be visualised in a consolidated view. Feedback delivered through learning analytics dashboards can provide students with data on their performance as well as their engagement with learning activities and assessment. The exact content and design of these dashboards will vary depending on the learning design of the subject. Currently there is very limited research into the effectiveness of providing feedback to students in this format. A study of the Course Signals system at Purdue University found that students who had access to a learning analytics dashboard saw an improvement in grades and demonstrated better retention behavior (Arnold & Pistilli, 2012). However, this study did not consider the detail of how students interpreted and responded to the feedback and its impact on their learning strategies and motivation.

Some researchers have questioned the ability of feedback developed via dashboards to provide useful information to learners (Elias, 2011). Such representations of student activity are often incomplete due to the fact that not all aspects of the learning process can be captured by such means. There is also concern about the heavy reliance on quantitative representations of student activity through dashboards. Research on effective feedback to support self-regulated learning suggests that feedback needs to deliver high quality information to students that encourages dialogue with teachers and peers around learning (Nicol & Macfarlane-Dick, 2006). The extent to which students are able to use dashboards to facilitate such dialogue is an area that requires further exploration.

Method

The aim of this project is to develop a greater understanding of how students interpret and act upon feedback delivered via learning analytics dashboards. The research was guided by the following research questions:

1. How do students interpret feedback delivered through learning analytics dashboards?
2. What actions do students take in response to dashboard feedback?
3. How does access to dashboard feedback influence students' motivation and performance in their course?

The study was conducted in the first semester of the 2014 academic year. A multi-phase mixed methods design was used incorporating survey and interview methods. Participants were recruited from three large undergraduate subjects at the University of Melbourne, including a first-year Biology subject, a first-year Environments subject, and a second-year Japanese subject. Each of these subjects used a blended learning approach with a combination of online activities and face-to-face lectures, tutorials, labs and/or workshops. The curriculum designs of these subjects were analysed in order to inform the design of the content and layout of the feedback dashboards (see Figure 1), which were slightly different for each subject. The data used to populate the dashboards was extracted from the learning management system (LMS) and represented students' assessment data (both formative and summative) as well as their engagement with the LMS site in terms of frequency of access. Where possible, students were presented with their own data as well as a class average.



Figure 1: Example of the student dashboard for a Biology student

At the beginning of the semester, participants were asked to complete a survey to establish their motivations relating to the subject as well as their personal learning goals. The design of the survey was influenced by the Motivated Strategies for Learning Questionnaire (Pintrich, Smith, Garcia & McKeachie, 1991). In week seven of semester the participants took part in an interview during which they were presented with a dashboard of their engagement and performance data. Using the 'think aloud' interview method, the participants were asked to talk about how they interpreted this feedback and to articulate the actions that they would take in response. The next section of this paper presents a discussion of the broad findings from an initial analysis of the survey and interview data.

Results and discussion

The sample for this study included a total of 28 participants recruited from the Biology (n=14), Environments (n=4), and Japanese (n=10) subjects. As the University's degree structure allows students to undertake a variety of core and breadth subjects as part of their degree, the sample included students from across six undergraduate degrees including Science (57.1%), Environments (17.9%), Biomedicine (10.7%), Arts (7.1%), Commerce (3.6%) and Music (3.6%). The majority of participants (71.4%) were in their first year of study.

Five major themes were identified from a preliminary analysis of the first interview. The first theme was the impact of dashboard on participants' reflection on their learning. This relates to the reflection phase of self-regulated learning which involves cognitive judgments, affective reactions, choice behavior, and evaluation of tasks and the context itself (Pintrich, 2004). When reflecting on their dashboard feedback one Biology student demonstrated both cognitive judgment and choice behavior:

I don't work well reading things and memorizing them, I work better with a lecturer telling me, and writing it down, that connection works better for me... I don't personally find the [online quizzes] super helpful, I find the lectures and my tutorials more helpful. I kind of breeze through the [online quizzes].

A Japanese student said of their evaluation of tasks: "I don't see a lot into the lecture quizzes, cause I don't feel they are that important. Often they seem a bit too simple... But with the supplementary quizzes, they were pretty good". Contrary to previous research that reported academics' concerns that students would not be able to interpret the feedback received (Corrin, Kennedy & Mulder, 2013), it was found that the majority of students were able to interpret the data in a way that promoted reflection on their performance and engagement.

The second theme related to students ability to plan new or amended study strategies for the subject. This relates to the self-regulated learning phase of planning (Pintrich, 2004), which involves setting goals, time management, effort regulation, and activating motivational constructs such as value beliefs and interest. The level of detail students gave about their intended actions varied from general statements, such as "I will work harder in general" (Japanese student) to very specific actions such as "I'm gonna revise [practicals] at least half an hour every night" (Biology student). Other common actions were to prepare for assessments earlier, complete activities they had missed, and revisit assessments with unsatisfactory performance. Several participants said they intended to use the LMS more. However, when asked why they would do this, they were not able to explain how this action would improve their learning. For example, one Environments student who was able to explain why they didn't access the LMS a lot: "I write down notes, like assessments and deadlines, so I don't really refer back to [the LMS]... as often", still felt that accessing the LMS more often would help improve their performance in the subject. One Biology participant mentioned they did not know what actions to take in response to the feedback, so wanted to seek help from the subject tutors. A small number of participants said they would not implement any actions, as they were satisfied with their performance.

The third theme related to how the dashboard affected participants' motivation towards the subject. The majority of participants reported an increase in their motivation towards the subject after seeing the dashboard feedback. These statements were usually also related to other parts of self-regulation. For example, when asked about how the feedback affected their motivation, students mentioned motivation associated to effort regulation such as "I'll definitely try harder" (Japanese student), and "It makes me want to do more" (Biology student); or awareness of progress: "It improves motivation, cause I can see where I am at and I know how I'm going so far" (Biology student). However, a small proportion of students reported that the dashboard feedback did not affect their motivation. These students tended to be above the class average, or were currently meeting their own performance expectations for the subject. As one Japanese student stated: "If I were doing worse I would have more motivation".

The fourth theme related to the inclusion of a class average for assessments, online quizzes and access to the LMS site. Throughout the interviews it was clear that this information had a significant impact on students' view of their performance and engagement. When shown the dashboard for the first time, the ability to compare themselves with their peers was the first thing many students commented upon, with statements like "So the first thing I notice is I'm below the class average" (Japanese student) and "First off, the class average is helpful..." (Biology student). However, it also was apparent that, for many students, the comparison of their data to that of their peers was obscuring their view of progress towards their overall goal in the subject. For example, although several students indicated that they were aiming for an H1 (the highest grade possible), they were satisfied when they saw that they were performing slightly above class average. This was despite the fact that performing just above the class average might not result in a total mark for the subject that would qualify for an H1 grade.

The fifth theme that emerged from the interviews was the benefit students identified in being able to see all the assessment and online learning activities in one consolidated view. Although students had access to all the elements of the feedback in other forms (with the exception of their LMS access statistics), students commented on the usefulness of being able to view different tasks in comparison to each other. Currently students have access to a 'My Grades' tool within the LMS (Blackboard) which presents a summary of marks for quizzes and assessments, but this representation is text based – displaying the grades only as numbers. All the participants indicated that they like the visual representation of the feedback. Referring to the use of graphs throughout the dashboard, one Biology student commented that: "if you gave me a comparison of a [numeric] mark versus class average then I wouldn't see the difference as vividly as I do here". The design of the dashboards incorporated a space for all activities across the semester. This meant that, in addition to the results and frequencies for the activities they had already completed, students could also see a blank space representing what was ahead and/or what they had missed. This layout helped several students to identify assessment items

that they didn't know existed or had forgotten to attempt within the set deadlines. For example, some Biology students said they were unaware of the existence of the supplementary activities designed to provide an extra introduction to general science principles. Once they discovered the existence of such formative activities, a number of students expressed an intention to complete these as part of their revision for the final exam. These findings suggest that the design of dashboards can act as a form of 'study guide' for students in planning their engagement with tasks. The challenge for teachers in providing such a 'guide' is to design a dashboard that incorporates as many activities and assessments as possible, without compromising clarity and design. This approach also requires that the data to support these items is available in the LMS, which is not always possible for the complete range of learning activities.

Conclusion and future research

These initial findings of this work-in-progress study have provided important insights into how students interpret and plan actions in response to feedback delivered through learning analytics dashboards. Contrary to concerns expressed in the literature about whether students have the ability to interpret this kind of feedback (Corrin, Kennedy & Mulder, 2013; Elias, 2011), the majority of students in this study demonstrated a strong ability to reflect and plan. The ability to view their feedback in this format was found to have an impact on students' motivation towards the subject and helped to guide them in their progress and performance in learning activities and assessments. However, the extent to which the actions they identified from the initial viewing of the dashboard feedback translate into impact on their engagement and performance is yet to be seen. This aspect of impact is what Verbert et al. (2013) observe is often missing from studies of learning analytics dashboards.

This paper presents the preliminary findings of the first two stages of the study. In addition to the initial survey and first interview, the students took part in a second interview and final survey at the end of the semester. The second interview was designed to follow up on the actions that students said they would take in response to the feedback given in the first interview. An updated dashboard was also presented to the students so they could see the impact these activities had on their progress, and so they could identify further actions to take in the lead up to final exams. At the end of the semester, after students had received their final results for the subject, they will be asked to fill in final survey which will ask them to reflect on the role of the dashboard feedback in their approach to study throughout the whole subject. The outcomes of full study will contribute to a greater understanding of students' interpretation of feedback and the impact that this has on their self-regulated learning, motivation and goals. In practical terms, the outcomes of this research will inform more effective design of dashboards to provide feedback in a format that can be most beneficial to student learning.

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