A method of providing engaging formative feedback to large cohort first-year physiology and anatomy students

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Title: A Method of Providing Engaging Formative Feedback to Large Cohort First Year Physiology and Anatomy Students

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Abstract

A growing body of evidence demonstrates a critical role for effective, meaningful feedback to enhance student learning. Effective feedback can become part of the learning cycle that is not only a learning opportunity for the student, but can also be used to inform the teacher and ongoing curriculum development. Feedback is considered particularly important during the first year of university and can even be viewed as a retention strategy that can help attenuate student performance anxieties and solidify perceptions of academic support. Unfortunately, the provision of individualised, timely feedback can be particularly challenging in first year courses as they tend to be large and diverse cohort classes that pose challenges of time and logistics. Various forms of generic feedback can provide rapid and cost-effect feedback to large cohorts but may be of limited benefit to students other than signalling weaknesses in knowledge. This study describes a method that was utilised to provide formative task-related feedback to a large cohort of 1st year physiology and anatomy students. Based on student evaluation presented in this study, this method provided feedback in a manner that engaged students, uncovered underlying misconceptions, facilitated peer discussion and provided opportunity for new instruction, while allowing the lecturer to recognise common gaps in knowledge and inform ongoing curriculum development.
Introduction

A growing body of literature has provided evidence of the potential for feedback to enhance student learning (7-9, 13). Hattie and Timperley (8) describe feedback as ‘one of the most powerful influences on learning and achievement,’ providing both students and teachers with knowledge of academic progress and performance, and allowing both students and teachers to recognise and change gaps. Ramsden (22) suggested that the importance of effective formative feedback on student progress cannot be overstated, particularly when the feedback becomes a learning opportunity. Indeed, feedback can become part of a learning cycle that contributes to the learner, the teacher and even the teaching program (11). Not only is feedback considered a critical part of learning, but it is a pivotal influence on student retention, particularly in the first year of university (15), in part, due to its role in attenuating anxieties relating to assessment expectations and performance, and by instilling a sense of achievement in students (12). In fact, Kift and Moody (12) refer to the ‘strategic promotion of assessment and feedback as a first year learning engagement and retention intervention’. Kerridge (11) discussed the early formation and solidification of students’ perceptions of university, as well as the importance of early academic support to assure the continuation of undergraduate study, while Fisher et al., (4) suggest ‘meaningful, participative, formative assessment’ as a method by which lecturers can support students.

According to Kift and Moody (12), the value of feedback can be enhanced by considering two aspects: timing and method of feedback. On the first aspect of timing, Kift and Moody (12) state that if the task is simple then feedback should be provided within 24 hours as the process will be fresh in the mind of the student; however, for a more complex task delayed
feedback may be beneficial in order to give the student time for reflection. Regarding the second aspect, method of feedback, several authors echo the notion that effective feedback should be task-related and focus on student performance rather than personal attributes of the student (also referred to as feedback directed to the self) (8, 24). Task-related feedback refers to whether the work or product is correct, or how well the task is being performed; therefore, it includes directions on incorporating correct, different or further information. This is also referred to as corrective feedback and provides students with a platform upon which they can process and build information (8). In fact, Craig and Glover (2) suggested that the term ‘feed-forward’ may better describe comments to students about their assessment, as feedback should not be viewed as a final process to student learning, rather a ‘springboard’ towards furthering learning and improve future assessments.

Despite the importance of feedback, the 2009 Australasian Survey of Student Engagement Report by the Australian Council for Educational Research (21) revealed that only 40.2% of Australian first year university students considered that they ‘received timely feedback on academic performance’ and an astonishingly low rate of 9.9% of students reported that they had ‘discussed grades with teaching staff’. These figures appear to be in stark contrast to the response of first year students surveyed in the USA, where 59.7% reported receiving timely performance feedback and 53.4% had discussed their grades with teachers (21).

One barrier to providing individualised meaningful, timely feedback to students may be that courses can have large and diverse student cohorts, particularly 1st year classes (5, 14);
therefore, teachers can face a challenge of time and logistics. Kift and Moody (12) make reference to the logistic difficulties of providing feedback to large cohorts of students on an individual level and suggest that feedback can be given as an overview of the performance of the cohort. Race (20) suggested the use of a one-page post-submission handout detailing expectations per question, features of a high-scoring answer and examples of common mistakes as feedback mechanisms for large classes. The use of online generic responses to provide rapid exam feedback to large cohorts of first year students has also been described (5, 12). This method of feedback has its advantages, such as the provision of timely and constructive feedback to students in a manner that is cost and time effective for the lecturer (3), but this delivery method may not engage the student or facilitate peer and student-teacher dialogue, nor does it seek to understand and correct common misconceptions. Indeed, Craig and Glover (2) noted that feedback approaches often omit strategies for testing the usefulness and effectiveness of the feedback method. Craig and Glover (2) state that standard online feedback tools are ‘...not written for students’ and although they may signal weaknesses to the student they do not provide guidance on how to correct for future work, ie, feed-forward. A large-scale study by Hounsell et al., (9) examined data obtained from undergraduate bioscience students regarding their experience and perceptions of feedback, with results identifying a need for useful and timely feedback for exams, rather than the usual focus on coursework. Therefore, the aim of this article was to present a method that was used to provide task-related (mid-session exam) feedback to a large cohort of first year anatomy and physiology students in a manner that engaged students, endeavoured to discover underlying misconceptions, facilitated peer support and discussion, and considered continuation between feedback and instruction where the two
aspects intertwined to become new instruction. Student perceptions of the usefulness of the feedback intervention are presented.

Background:

The Course and its Students

Introduction to Anatomy and Physiology II (MEDI 112) is a first year course that gives students knowledge of the structure and function of integrated systems within the human body. Learning takes place in a large lecture theatre, with three 1-hour lectures per week for 13 weeks, and theoretical learning is supported by weekly 2-hour ‘wet’ laboratory classes held either in the physiology or anatomy laboratories over alternating weeks, as well as 1-hour ‘dry’ tutorial classes interspersed throughout the session.

As an open course with no pre-requisites, Introduction to Anatomy and Physiology II enjoyed a cohort of 417 students in 2014 and included students enrolled in medical science, science, biotechnology, nutrition, exercise science and medicinal chemistry degrees, as well as non-health science students from diverse degrees such as engineering, creative arts, management, business and economics. As students came from a range of backgrounds, this cohort included a population of students with minimal prior knowledge of physiology and no scientific background.

The Assessment
Feedback was provided on the multiple choice mid-session exam (30 questions, 20% of the final grade, conducted in week 7 of the 13 week academic session). In 2014, the class achieved a high average grade of 68%. Small low-risk assessments (e.g., pre- and post-laboratory quizzes) had been conducted early in the academic session to provide students with summative feedback that could be used to improve performance on major tasks.

Over the past few years, feedback on the mid-session exam in this course had been provided through several approaches, including a workshop scheduled outside of lecture time, which had poor student attendance despite an opportunity for one-on-one time with the lecturer. Another approach was to show students the questions and answers to the mid-session exam within the first 10 minutes of a standard lecture time. This would typically occur two weeks after the exam date and, due to logistical difficulties, students were not provided with copies of their answers. Further instruction to enhance student understanding of the content was limited due to time constraints to avoid impinging on lecture content. A student course evaluation in 2012 revealed that students identified a deficit in feedback in this course, with the statement: ‘Feedback on my work was provided to me in time to prepare for other assessment tasks’ receiving a mean grade of 1.39 (a mean above zero indicates that student perceptions are more positive about the course, with a mean of three being the highest; and a mean below zero indicates negative perceptions with negative three being the lowest). This question was rated by students as the lowest of 8 questions regarding the course, which is a trend also observed nation-wide in universities in the UK (17). Overall, there was a highlighted necessity for a new approach to providing feedback to students to support the learning and teaching cycle.
Method:

The Feedback

This project complied with the Human Ethics Committee, University of Wollongong (approval number HE15/395). Feedback was conducted prior to the ‘last date to withdraw without academic penalty’, which is recommended by Kift and Moody (12) to relieve anxieties students may have about their progress and commitment to the course, and to allow students to experience a sense of achievement. The feedback lecture was scheduled into the normal lecture time and published in the course timetable of topics made available to students at the start of the academic session.

In lectures prior to the exam, students were instructed about the format of the mid-session exam feedback lecture, which would be conducted during the normal lecture time in the week after the exam and would require students to discuss their answers with the class. At that time, students were advised that answers to the exam questions would be revealed only after interactive class discussions of the answers. The feedback lecture was to be a safe environment where students could share their understanding of the content; therefore, respect for other’s views was expected and would be paramount to the success of the session. Assurance was provided that, unlike the regular scheduled lectures, this class would not be digitally recorded for dissemination through the online student management system for this course in an attempt to encourage more students to engage.
Immediately after the exam, general purpose scannable multiple choice exam answer sheets were marked by a computerised scanning system and each student’s individual mark was released to them via the university’s student management system. Analysis was performed on student results and the top 10 most difficult questions were identified.

One challenge was providing students with their answers as university privacy policies prohibit collated student marks being made available for the class to view, even if identification by student number replaced student names. The current student management system, although accessed by students through individual log-in security, did not enable the direct upload of individual student answers. In addition, a university records management policy dictated that the computerised answer sheets were kept by the Faculty for a period of one year; therefore, the original answer sheets could not be returned to students. To overcome this logistical obstacle, individual answer sheets were copied and provided to each student during the lecturer’s standard consult time and over 2-days leading up to the feedback lecture once photo identification had been sighted. Remaining copies of answer sheets were returned during the smaller laboratory classes. This process provided the lecturer with opportunity to briefly discuss student feelings about the exam with individuals or in small groups. Approximately half of the student cohort claimed a copy of their answer sheet for use in the feedback session.

On commencement of the feedback lecture, students were requested to sit towards the front of the theatre in order to aid facilitation of peer-peer and peer-lecturer discussion in
the large lecture theatre setting. A presentation posed each of the ten most difficult questions along with a chart showing the percentage of students who responded to the answers A, B, C, D and E. By raising their hand, students indicated whether they were willing to discuss an answer or make comment on a question. Through the use of a roving radio microphone, students could engage in whole of class discussion and debate. At first the discussion included several students, but as the feedback session continued student participation became wide-spread as students engaged with the discussion and with their peers. Other students joined the discussion and debated the answer until a consensus had been reached. Through student explanation of their answers, underlying misconceptions were identified. The relevant lecture slides were then revised with a focus on the common misconceptions and new instruction and learning could occur. The answer was then confirmed and the next difficult question was posed.

The overall cost of the feedback session was 5 hours administration for 417 students.

Results:

What the Students Thought

Approximately two-thirds of the student cohort attended the exam review session, which was greater than the general lecture attendance throughout the academic session. The attendance of two thirds of the student cohort at the exam review session was unexpected given that only half the cohort obtained a copy of their answer sheets for use during the review. This may demonstrate a requirement to improve communication about the
processes of the review session; find ways of improving the accessibility of student answer sheets; to refine balance in timing, i.e. providing students with sufficient time to obtain their answer sheets from the academic staff versus the importance of providing timely feedback soon after an assessment. Scheduling the mid-session exam review session into the lecture topic timetable and not digitally recording the feedback session for dissemination through the online student management system site may have contributed to the successful attendance rate.

An online questionnaire entitled ‘Feedback on the Feedback Session’ was posted on the student management system after the feedback lecture. In the instructions, students were asked to inform the mid-session exam review process for future years by commenting about whether they thought the feedback lecture was useful. Fifty one students completed the survey, with the following responses to the statement, ‘I found the feedback session useful’:

- Strongly agree: 41%
- Agree: 50%
- Neutral: 4%
- Disagree: 2%
- Strongly disagree: 2%

Samples of student comments are detailed in Table 1. Overall, there were 41 positive comments (including 25 comments expressing thanks for the feedback session) and 11 comments containing suggestions for improvement mainly pertaining to requests for all of the exam questions to be revealed rather than a focus only on the top 10 difficult questions.
Common misconceptions identified during the analysis of student results and the discussions during the feedback session were used to inform the ongoing curriculum development of the course.

**Discussion:**

The present study outlined a method of providing formative feedback to a large cohort class of 1st year anatomy and physiology students in a manner that was timely, engaged the students, facilitated peer and student-teacher dialogue, and sought to identify and correct common misconceptions. Using this method, students were provided feedback within 7 days of the assessment. This timing is in line with Kift and Moody (12), who state that timing is an important contributor to the value of the feedback and suggest that a simple task requires feedback within 24-hours, while a complex task would benefit from delayed feedback to ensure sufficient reflection time. In addition, a number of authors suggest that feedback should be task-related corrective feedback, i.e. whether the work is correct or performed well, and incorporate further information to enhance knowledge and build skills to allow improvement in future tasks (8, 18, 24). The methods of the present study used the knowledge of student misconceptions to reiterate the content in a manner that was targeted at addressing the underlying misconceptions, thus assisting students to build knowledge through feedback. In this manner, the feedback mechanism informed both the students and the teacher; indeed, common misconceptions can be used to inform the ongoing curriculum development of the course. In addition, this method allowed correction
of faulty interpretations as well as providing knowledge to students who have a complete lack of understanding; therefore, entangling instruction with feedback.

Task related feedback can be diminished when combined with feedback directed to the self; Bennett and Kell (1) cite an example: ‘Good boy, that is correct’. This is an interesting point to consider when attempting to achieve class engagement in a large lecture theatre, as traditional theory suggests that the teachers should create an environment where students feel that they are respected and safe to ask, answer and discuss questions with minimal risk of embarrassment. The First Level Assessment and Feedback Project (FLAP) suggests that assessment can deeply affect students, therefore feedback needs to be provided in a manner that ‘..encourages positive motivational beliefs and self-esteem’ (19). Students can feel encouraged and nurtured by the teacher; indeed, simple communication from the teacher such as body language and tone of voice may enhance the discussion. Therefore, there are important relationship aspects to the provision of interactive feedback and if an environment of trust and safety is not created by the educator, then the same successful peer-peer and peer-lecturer interactions described in the present study may not be achieved. In the present study, students described the feedback session as ‘relaxed’, ‘interactive’ and ‘conversation-like’. These student descriptors coincide with recommendations by Craig and Glover (2) that feedback should be interactive, ‘…a dialogue, not a monologue’.’, personalised and presented in an easy-to-understand language. Kerridge (11) suggests encouraging student-student discussion can allow classmates to explain information in a language that is accessible and readily understood, which may be achieved using the method described in the present study.
As suggested by Craig and Glover (2), feedback should not be the final process to student learning during a task. Instead feedback should springboard towards improving future assessments, aptly referred to as ‘feed-forward’ (2). Based on the comments of the students in the present study it seems that providing feedback that is engaging and enhances learning is appreciated and perceived as useful to the students; however, an important indicator of the success of the feedback would be to assess whether the knowledge and tools were provided to feed-forward into future assessments. A study by Price et al., (16) identified difficulties of accurately measuring the aspects of feedback that truly influence the learner and the learning process in a meaningful and lasting manner, describing such an undertaking as ‘…perhaps impossible’. Indeed, data show an increase in student retention and overall trending improvement in student final grades in this course compared to 2013; however, pinpointing the role of feedback in these positive student outcomes is not possible with the design of this study and further research is required. Despite the difficulties of measuring actual benefits of feedback, it can only be denoted as such if feedback is utilised by the learner to change a gap between current performance and the performance aspired to by the student, anything outside of this could only be referred to as ‘dangling data’ (23).

The method of feedback described in the present study has several other limitations. It addressed the top 10 difficult questions and several student comments demonstrate that this may not be applicable to every student involved in the feedback lecture. This issue was addressed by offering to meet with students during usual consultation hours to provide individualised feedback on questions that were not covered during the feedback session. By addressing the top 10 difficult questions, only 2 individual students took up the offer to
meet in consultation hours indicating that this method permits more efficient use of staff
(and presumably student) time. This method aligns with Craig and Glover (2), who
recommended a focus on several aspects of the assessment that would make a difference to
student learning rather than delivering a large amount of poor feedback quickly. A 3-year
study by Price et al., (16) on the perceptions of feedback by students in several UK business
schools reported that students ‘...often very keenly felt (perhaps wrongly) that staff did not
care enough to spend time on the feedback, particularly where tick box feedback sheets had
been used which students regarded as ‘an insult’.’ The feedback method of the present
study did aim to provide more personalised feedback to a large cohort of students, but this
should be balanced against the time cost of administration to the lecturer, which may not
be feasible in some institutions. The question of how the feedback method described in this
study can be made scalable and sustainable still remains. Utilising technology to upload the
student’s answers to the questions to a platform that would allow viewing through
individual password access, or gaining assistance through existing faculty administrative
infrastructure may lessen the administrative load of returning copied answer sheets.
However, this would diminish the lecturer’s face-to-face opportunity to discuss grades with
students during collection of their answer sheet, albeit brief but valuable and, as mentioned
previously, rarely performed in the Australian context (21). Another limitation to the
present study is that the number of student responses to the questionnaire was low;
therefore, responses that were obtained may provide an inaccurate view of the class’s real
opinion of the feedback lecture. An improved response rate may be achieved through the
use of a paper-based questionnaire during the feedback session, rather than a post-session
on-line format; however, it would be necessary to consider the impact of time and the
logistics of such a task when working with large student cohorts and large theatre settings in the confines of the lecture time.

The literature provides evidence that feedback comes in many different forms and that a single method cannot be standardised (2, 6, 10, 18). On the contrary to a ‘one-size fits all’ approach, effective feedback methods should be adapted to suit student’s present requirements. In line with the Australian Learning and Teaching Council’s mission statement, that is to ‘promote and support strategic change in higher education institutions for the enhancement of learning and teaching, including curriculum development and assessment’ (12), this article proposed a method of providing timely formative task-related feedback to a large cohort 1st year anatomy and physiology class in a manner that achieved student engagement, facilitated peer-to-peer and student-lecturer discussion, and sought to discover and respond to underlying misconceptions through a close entanglement of feedback and instruction.

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References


Table 1: Excerpts of comments from 1st year physiology and anatomy students regarding an interactive feedback session on the mid-semester exam.

<table>
<thead>
<tr>
<th>Positive Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘I thought it was highly beneficial. Most (courses) don’t offer feedback in that format. Despite performing well, it showed me where I could improve, or where common mistakes were made to keep in mind for next time. This should style of feedback should be implemented in all (course).’</td>
</tr>
<tr>
<td>‘The conversation-like feedback session was extremely helpful and corrected mistakes through group interactions, in an interesting way.’</td>
</tr>
<tr>
<td>‘The feedback session was a great opportunity to review the most poorly answered questions and find out where the answers were found in lecture notes. It was an interactive session with conversation within the group and the lecturer.’</td>
</tr>
<tr>
<td>‘Feedback session was very useful, never know what I got wrong in other exams so it’s nice to know where I went wrong.’</td>
</tr>
<tr>
<td>‘It was useful revision.’</td>
</tr>
<tr>
<td>‘It was interactive and was helpful to know what slides related to which questions.’</td>
</tr>
<tr>
<td>‘I think it’s important to go over exam questions. It helps a lot. Thanks.’</td>
</tr>
<tr>
<td>‘It was informative of the areas that need studying more effectively for the final examination.’</td>
</tr>
<tr>
<td>‘It was run perfectly and answered the questions that needed to be answered.’</td>
</tr>
<tr>
<td>‘Helpful to know which questions we got wrong etc. to help with future tests.’</td>
</tr>
<tr>
<td>‘Relaxed, useful to see mistakes and understand the whole cohort had difficulties in certain areas.’</td>
</tr>
<tr>
<td>‘Providing overall results allowed me to understand the level of my mark in comparison with the (course) class. Was helpful in seeing my mistakes and reinforcing the correct concepts. It was good being able to see our question papers unlike last semester where we were left in the dark about what we knew and what we got wrong.’</td>
</tr>
<tr>
<td>‘The feedback session is a good concept, especially when you have a class that is over 100 students. Any type of feedback is always good. I also find this a benefit as this is my first semester at university … that you know what to expect in the end of semester exam and in terms of study, how in-depth one has to go to be prepared for the exam. …to know what needs to be revised and whether or not I need to change my method of study, and/or gain further help in understanding the concepts in the (course). Only issue with the feedback is the size of the class, if a person is shy, it is hard to put your hand up to ask a question. However, that is up to (the) individual…’</td>
</tr>
<tr>
<td>‘Very helpful - good to know common errors and where I went wrong in exams.’</td>
</tr>
<tr>
<td>‘Being able to know which questions I answered incorrectly was very useful. Also, knowing the questions that were poorly answered by the entire cohort was helpful.’</td>
</tr>
<tr>
<td>‘The feedback session was helpful and dynamic. Thank you.’</td>
</tr>
<tr>
<td>(The remainder of the 41 positive student comments contained similar notes of thanks for the feedback session).</td>
</tr>
</tbody>
</table>
Comments with Suggestions for Improvement

- ‘If feedback could be given back on all questions in the quiz it would be even more helpful.’
- ‘It would’ve been better if the lecturer put a copy of the (remaining) exam questions on the screen after the top ten.’
- ‘Maybe we could have gone through more questions or at least seen the questions to know what we got wrong.’
- ‘Getting the actual question sheet would be more beneficial as we could ask further questions regarding unsure questions.’
- ‘I thought it was helpful, but I think it would be beneficial if the answers came out about all the questions, because questions that I had trouble with weren’t just the questions that were gone over in the feedback session. So there were other questions that I got wrong but wasn’t sure because not all questions were available.’
- ‘It was awesome! Can we have the question sheets as well!’
- ‘Could have moved a little quicker to get more review in, but overall good. Wish more classes would do the same.’
- ‘Go through more questions in further detail.’
- ‘The questions that I got wrong were not talked about in the lecture.’
- ‘It would be good if we could get through even more questions.’
- ‘If I didn’t get (full marks) it would have been very useful.’