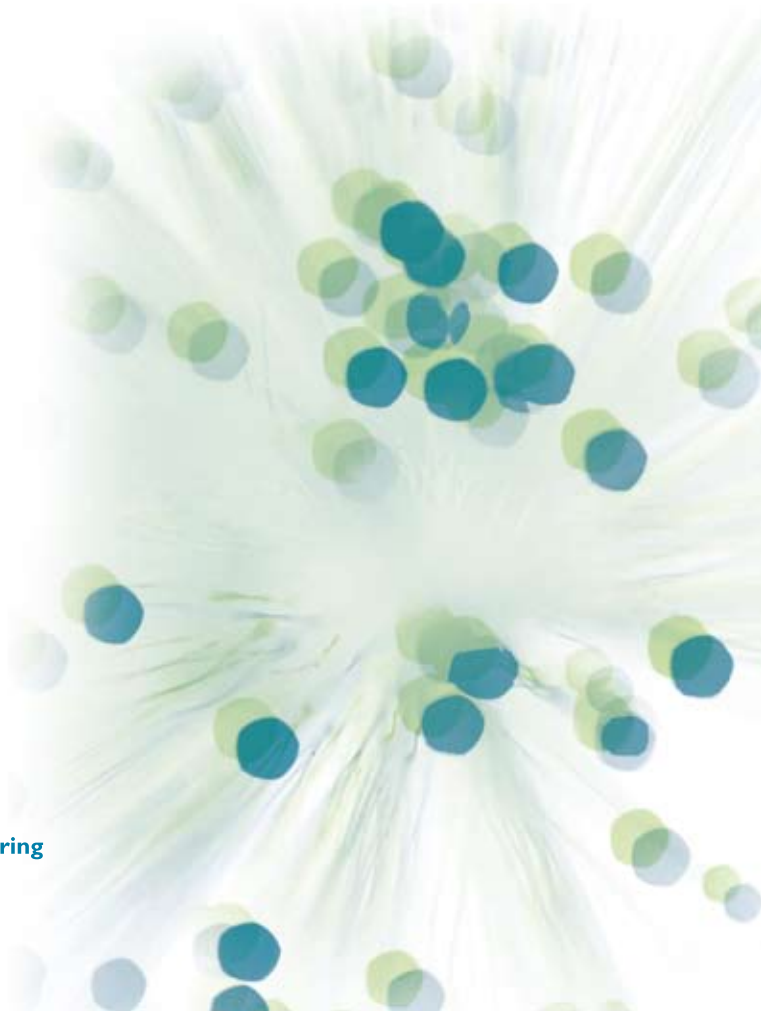


Enhancing Feedback for Engineering Students

an Engineering Subject Centre guide by
Alan Webb and Liz Willis



Engineering
Subject
Centre



Author biographies

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Enhancing Feedback for Engineering Students

Overview

This guide aims to provide a starting point for those tutoring and assessing engineering students. It offers a brief introduction to the topic, including definitions of much of the terminology associated with assessment and feedback processes. It aims, through links to literature and examples from engineering, to support engineering academics in providing more effective feedback to their students and will hopefully act as a catalyst for reflection on current practice and future developments.

Introduction

Feedback is a term commonly used to describe the range of processes in higher education whereby a student or group of students receives information about how well they understand concepts and are progressing with their studies.

Ideally (and to be consistent with engineering systems theory) feedback should be provided in ways that enable outputs to be enhanced. This means that it should enable the student to make adjustments and improvements within the learning cycle and assist them in meeting the learning outcomes (Cowan, 2003).

Formative feedback is intended to inform and enlighten the student. It can include positive or encouraging remarks about their work and also critical statements

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designed to draw attention to deficiencies in ways that clearly signpost paths to improvement in future work. Ideally, the feedback should link clearly to the learning outcomes and, where marks have been awarded, be set in the context of a well-defined marking scheme or set of published marking criteria.

In essence, *formative* feedback provides a message to the student or group of students which gives specific information about what has been done well and where errors have been made, with suggestions on how to consolidate strengths and address weaknesses.

Summative feedback is associated with the academic judgements used in determining a mark or grade. The summative part of the message is therefore factual and essentially quantitative in nature.

Assessment for learning

Assessment for learning aims to change the focus of assessment activity, moving away from being purely a method for grading and towards acknowledging that assessment approaches can, in turn, impact on a student's learning approaches.

It is a broad concept that recasts assessment as learning rather than end-point testing and advocates a learning environment which:

- *encourages authenticity and complexity rather than only reproduction of knowledge in student learning and assessment*
- *minimises the negative effects of summative assessment as the main driver for learning and teaching and promotes formative assessment*
- *enables students to build confidence and capabilities*

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- promotes both formal and informal effective feedback on learning
- develop students' autonomy as learners and (future) professionals.

(Montgomery and McDowell, 2008.)

The concept of *feed-forward* builds on this focus on assessment for learning, describing information given to students undertaking work (rather than on completion of a task) and aimed at encouraging learning and making a contribution to the success of future activities. It could include timely, high quality formative feedback, enabling the student(s) to reflect on their learning and highlight areas in which further development or study may be appropriate. Feed-forward linked to assessments may help a student to prepare for or improve a piece of work prior to any final summative assessment. Providing information of this type builds upon other learning opportunities and promotes a healthy dialogue between the student and the learning facilitator. Initial feed-forward may not therefore need to depend upon any review of the student's work and may be informed by experience gained from previous student cohorts.

What do students say about feedback?

When the feedback-related responses to the National Student Survey (NSS) are considered, the satisfaction scores on all three feedback questions are typically the lowest scores for all questions and, frequently, the percentages for questions 7-9 each fall below 50%, with some much lower. Based on the student experience in a broad range of UK universities, the NSS data indicates a perceived weakness in feedback practice across the engineering and technology sector. (www.thestudentsurvey.com/)

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Table 1. NSS 2009 – broken down by JACS Subject level 1. As presented in F.A.C.T (www.nus.org.uk/en/Campaigns/Higher-Education/Assessment-feedback/)

	Assessment and feedback	5. The criteria used in marking have been clear in advance	6. Assessment arrangements and marking have been fair	7. Feedback on my work has been prompt	8. I have received detailed comments on my work	9. Feedback on my work has helped me clarify things I did not understand
National Average	64	70	72	58	63	57
Engineering and Technology	59	68	73	51	52	54

As part of its *Feedback assessment campaign toolkit* (F.A.C.T.), the National Union of Students (NUS, 2010) lists five common criticisms of assessment and feedback, including:

- ambiguity
- lateness
- miscommunication
- negativity
- uncertainty

When students receive feedback their reactions can vary considerably. There may be careful and balanced consideration of the comments made, with some revisiting of their work in an effort to understand what the feedback is really saying and to establish what can be learned in order to improve future work. By the same token, there may be a range of other reactions, often involving emotional responses.

Think of an example where you have experienced feedback in the context of your academic work (for example, this might be feedback received on a journal paper submission or a grant proposal):

- Q1. How did you react to any negative comment(s) that may have been made?
- Q2. Was the feedback explicit and understandable or did it raise other questions in your mind?
- Q3. Did anything that was said de-motivate you and, if so, why?
- Q4. Were you fully prepared to receive the comments or were there other factors which affected your sensitivity to them?
- Q5. Do you recall positive/encouraging comments and, if so, how did you react to these?
- Q6. Based on your own experience, how could you minimise the impact of negative feedback on your students?

Why give feedback? Open loop learning

In engineering systems theory, feedback is important when designing stable systems with predictable performance in terms of expected outputs for given inputs. Negative feedback tends to predominate, with positive feedback associated with system instability and oscillation. Student learners represent a set of unique individuals, meaning that simplistic attempts to superimpose such theory on their learning (as though each student had a built-in 'learning amplifier') are unrealistic. Nevertheless, the same principles can generally be applied, with the implication that feedback is necessary for stable learning processes and well ordered knowledge and skills gain, and that negative feedback is more prominent than positive feedback,

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with both having valid roles. A student who never receives any feedback is analogous to a 'learning system' that is running under open-loop conditions.

Critical and corrective comments can be seen as negative feedback, associated with sampling and responding to students' work outputs. On the other hand, positive, encouraging and affirming comments can be seen as positive feedback, also based on sampled output. Feedback that is always positive and affirmative, with no critical content, would be unrealistic and untruthful, with the result that a student would not know where they were going wrong or what aspects they needed to improve upon. Similarly, oppressive and unrelenting negative and critical comments are likely to discourage and de-motivate a student. Achieving an appropriate balance is clearly important.

What closing the loop can achieve

The provision of feedback is recognised as an integral aspect of the very purposes of assessment and is identified as being associated with improving learning, motivating the learner and helping to develop skills of self-assessment (Brown et al., 1997). When feedback is returned to students the learning loop is closed and the comments can be used by the learner to facilitate a continued process of learning by reflecting on what has been said and modifying their current understanding and approach in response. There is a risk that even carefully worded feedback comments can be misunderstood or simply ignored, and the need for meaningful interaction between staff and students, involving debate and even contention, has been highlighted (Mutch, 2003). Dialogue between facilitators and learners is critical for clarity and large groups

(commonly encountered in the current mass market HE environment) pose real challenges. For feedback to be effective under these conditions, new strategies are required which could include whole-programme review of assessment and/or utilising technology to reduce the time spent on feedback (Rust, 2001).

Giving feedback to students

While there is no single answer as to when feedback should be given, research by the Assessment Standards Knowledge exchange (ASKe) Centre for Excellence in Teaching and Learning (CETL) suggests that *'students engage with (and apply) feedback if they can recall the assignment, reflect on feedback comments, and then foresee ways to apply them'*, implying that in order for feedback to be effective it has to be timely.

There is also evidence which highlights the value of early feedback to supporting retention, especially where inexperienced first year students are involved: *'receiving poor feedback on the first piece of assessed work, or maybe even no feedback on the first assessment, does little for students' motivation'* (Wallace, 2003). Initial feedback timing is a challenge for lecturers, as it is ideally needed prior to carrying out subsequent work. With delayed feedback, students are unlikely to learn from mistakes and may display similar weaknesses to those characterising their first submission. They may not have had the opportunity to recognise or address issues, the assessment will have had little impact on their learning and they may lose marks again for the same faults. To be of value during a course of study, feedback must be precisely timed to facilitate reflection and improvement.

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Brown et al. (1997) offer the following main strategies for managing the timing of feedback:

- (i) reducing the overall assessment load
- (ii) streamlining the assessment procedure
- (iii) delegating the marking.

Front-ending approaches

Rust (2001) describes this strategy as focussing on '*putting in an increased effort at the beginning in setting up students for work they are going to do*' in order to improve the quality of the work submitted. Two key components of front-ending are:

- (i) the provision of comprehensive briefing instructions and checklists
- (ii) clarification of the assessment criteria with some classroom dialogue to ensure mutual understanding of what these criteria mean in practice.

Time spent orienting students towards a coursework task can improve overall learning. Effective approaches can involve presenting anonymised samples of previous student work in order to give students greater insight into what criteria actually mean in practice. High motivation, often more prevalent at the start of an assessed task, can be harnessed to increase learning from the outset.

How should feedback be given?

Feedback can be offered in a variety of formats and through a range of activities. Diversity of modes can have value, helping to meet the range of learning styles within a given class, although there are potential compromises attendant to each approach. The next

section of this guide aims to showcase some of the approaches to feedback currently being used by engineering academics. Different approaches will suit different situations and contexts and you and your colleagues will need to reflect on these ideas accordingly in order to decide which to choose.

Written feedback

Written feedback is probably the most common type of formal feedback received by students. It can be particularly important in correcting errors, giving positive encouragement and to communicate detailed, individualised information. Lunsford (1997) comments that *'many teachers write undeveloped, cryptic comments'*, going on to offer four basic principles for responding to student writing:

- *say enough for students to know what you mean*
- *don't say too much*
- *don't spend very much time on matters of correctness*
- *focus your attention on understanding what students mean to say.*

Where group sizes permit, annotated submissions and personalised written feedback sheets can be very effective in communicating targeted and specific feedback which can be both affirming and highly motivational. However, it will often be necessary to consider balancing the level of feedback to the scale of the task and the time available both to the tutor and the student to respond. If time is not on your side, consider focussing specific comments on one or two aspects which could have the biggest impact on the student's learning. Generic written feedback is an efficient way to provide feedback to larger groups so that the main

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issues can be captured and communicated back to the entire group. This helps to avoid having to write very similar feedback comments over and over again and provides a reference document for future front-ending practices. Combinations of the two approaches (e.g. the use of a generic feedback sheet with some personalised annotations) can capture the advantages of both. Timely provision of feedback is often better facilitated by approaches that can easily be fitted into the time available to tutors.

Where next?

The ASKe CETL has launched a series of '1,2,3' leaflets which highlight practical ways in which teaching staff can improve their students' learning. Each leaflet focuses on a piece of assessment-related research and titles include: *How to make your feedback work in three easy steps!*; *Using generic feedback effectively* and *Feedback - make it work for you!* All eight leaflets are available to download from www.brookes.ac.uk/aske/resources.html.

Linking to statement banks can provide access to high quality pre-prepared comments, meaning that individual students can receive fairly comprehensive remarks on their work. These could be particularly useful for first year assignments where a number of common errors are observed. The Subject Centre for Information and Computer Sciences has a statement bank of sample comments commonly used by academic staff during their marking of dissertations, see www.ics.heacademy.ac.uk/resources/comment_bank/.

Designing a front cover feedback form

Elaine Smith, Glasgow Caledonian University

Conscious of the reality that students often only read the first few sentences of their feedback, a new front cover for use with the submission of all student coursework was developed for the School of Engineering and Computing at Glasgow Caledonian University.

The front cover provides space for the students to include the usual information about the name of the lecturer, module and coursework before stapling it onto their work. The rest is broken down into two areas. The first is a rectangle only large enough to contain one sentence. The beginning of the sentence is written at the top of this rectangle and it reads “*You could have gained a higher mark if...*” The sentence is completed by the marker who has been asked to extract from their general comments about the coursework the single most important thing the student would need to have done to improve their mark.

To finish, the second area is a larger rectangle headed ‘general marker comments’ where lecturers can add information and additional comments.

Oral feedback

Oral feedback is another valuable approach and one which can be used instantly within scheduled sessions. While it is possible to give oral feedback to large groups (e.g. generic feedback to a group after a coursework submission has been assessed), more detail can be provided in a small group setting where there is potential for interaction. The *Student Enhanced Learning through Effective Feedback* (SENLEF) project highlighted the principles of good feedback practices, including feedback which:

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‘encourages teacher and peer dialogue around learning. ... One way of increasing the effectiveness of external feedback and the likelihood that the information provided is understood is to conceptualise feedback more as a dialogue rather than as information transmission’

(Juwah et al., 2004)

Dialogue, however it is achieved, enhances the quality and effectiveness of feedback, and small group tutorial interactions help to clarify it properly.

The Sounds Good project (www.soundsgood.org.uk) received funding to consider whether digital audio could be used to give students quicker, better feedback on their work. Students involved with the initial evaluations were overwhelmingly positive about receiving audio feedback on their coursework and remarked on its personal nature and the detail it provided (Rotheram, 2008). Examples of how audio feedback has been incorporated into engineering modules are available from www.engsc.ac.uk/an/mini_projects/jisc-audio-project-overview.asp.

Utilising learning technology

Virtual learning environments (VLEs) provide numerous opportunities to give feedback to students (for example through discussion boards, access to worked solutions or examples of previous submissions). Feedback can be personalised with ease: uploaded coursework can be annotated and cut and paste facilities used to reduce repetition of common statements. However, caution should be exercised so as not to swamp a student with excessive feedback which may lead to overall discouragement rather than the motivation to improve and progress.

Using audio technology for student feedback

Dr Rhoda Trimmingham and Pete Simmons, Department of Design and Technology at Loughborough University

During two pilot studies audio feedback was given to undergraduate students on an individual essay describing the differences between industrial design and engineering and on a group drawing folio which contained research and analysis for a product semantic/form investigation exercise. Tutors recorded the audio files using handheld MP3 recorders and the files were emailed to students in MP3 format to be listened to through Windows Media Player or iTunes via their computers.

Feedback from students

Given the choice, all six students said they would like to receive all their feedback via audio files in the future. They stated that the audio feedback was easier to understand and that they got more in-depth feedback, '*better feedback*' and that '*it is nice to hear the feedback from your tutor directly as it is more personal*'. Students stated that they felt the audio feedback was more individual and made them feel as though the marker had taken more time over their work.

Students also went back and listened to the audio feedback again when starting subsequent work for the module. They said that having the feedback on file, on their computer, made this easy to do.

Feedback from staff

Tutors found that the time taken to give feedback varied according to the format of the student's work. For example, giving audio feedback on an essay took a similar time to written feedback, whereas audio feedback on design folios was seen to save time because of the capacity to record feedback continuously whilst looking through the folio. The ability to go into more detail than in written feedback, use in-depth examples and articulate suggestions for improvement were felt to be extremely positive attributes of the audio feedback format.

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Some types of assessment lend themselves to the automated generation of feedback, based on the nature of the errors exhibited in the submitted work (Russell, 2005). Such approaches, once properly developed and configured, often enable extremely rapid feedback and provide a more efficient system for the tutor. Automated systems, depending on configuration, may make it harder to provide personalised feedback, but automated use of the student's name within generated feedback, for example, can help.

As mentioned earlier, there is a need to balance systems so they are not over-used to the detriment of students' morale. Individual students may be more motivated to engage with the process if they sense that comments have been carefully crafted to speak directly to their needs and if critical aspects are accompanied by positive statements.

Automatic classroom response systems that use technology to promote an interactive learning environment can provide immediate feedback, even in large lecture-based scenarios (Cranston and Lock, 2010). When used with engineering students at the University of Strathclyde (Boyle, 2004), tutors found that students got immediate feedback as to whether they had understood the material and at the University of Hertfordshire tutors noted the value of being able to adapt teaching to better support student learning (Russell, 2008). Tools such as these provide immediate feedback which quickly clears up potential misunderstanding and confusion and promotes good learner esteem, in turn encouraging increased engagement and participation.

Using an MLE to challenge students' learning, encourage interaction with lecture materials and assess their knowledge

Mark Russell, Aerospace, Automotive and Design Engineering, University of Hertfordshire

Fluid Mechanics and Thermodynamics is a compulsory first year module. Approximately 150 students attend weekly lectures and tutorials and two lab sessions. Support materials for the module are provided through the University of Hertfordshire's Managed Learning Environment - StudyNet - which actively seeks to integrate teaching materials, notes and module news, as well as online class discussions to enhance opportunities for personalised and collaborative learning. For this particular module a range of automated facilities have been developed, in addition to lecture notes, to support the teaching, learning and assessment processes. The module is assessed through a final examination and coursework which comprises two lab reports and weekly assessed tutorial sheets (WATS). A set of 'student unique' tutorial sheets has been developed to actively encourage and improve student engagement throughout the duration of the module. Students access tutorial questions (generated from unique datasets) on a weekly basis through StudyNet and submit answers to a bespoke computer programme. Following the deadline an email with marks and feedback is sent to each student and worked examples are posted on StudyNet.

Students think WATS is '*excellent*'. The weekly feedback provided '*more confidence*' and '*highlighted weaknesses*'. Students appreciated the speed at which feedback and results were delivered ('*always within a week*') and that they were not left '*waiting months [before] you've got an idea of how you are doing*'.

Mark spent a lot of time setting up and writing the questions: '*I think there is a need to think differently, if the computer is doing all of the marking, taking you out of that marking loop then... clearly you need questions which can discriminate a good student from a bad student.*'

This type of activity can help to reinforce to students that studying regularly is useful. Whilst it may only tackle lower levels of learning skills (which may be more appropriate at first year level), Mark hopes that this will develop students' confidence and understanding of problem solving.

www.engsc.ac.uk/downloads/awards/mle.pdf

Where next?

A critical analysis of computer generated marking and student feedback (Beggs et al., 2005) reports on the early implementation of a tool called ELF (*electronic lecturers' feedback*) in the School of Engineering, Science and Design at Glasgow Caledonian University.

Effective assessment in a digital age (www.jisc.ac.uk/digiassess) offers an introduction to the characteristics of effective assessment and feedback with established and emerging technologies and includes a series of illustrative case studies from across UK HEIs.

Phil Race's *Make learning happen* (2005) provides tips to help the lecturer to efficiently deliver feedback that has a high learning payoff.

Dr Phil Denton (LJMU School of Pharmacy and Chemistry) has developed an MS Office application that can be used by tutors to generate and email feedback to students. *Electronic feedback* is an MS Office marking assistant that can generate and email MS Word processed reports to students. The software can return considerably more feedback to students, in a shorter space of time, than traditional approaches would normally allow. More information can be found at: www.ljmu.ac.uk/cis/software/feedback.asp

Who should provide the feedback?

Those providing feedback need to be knowledgeable enough to make an informed judgement (Race, 2001) and there are elements of the curriculum where this will fall to the module or activity leader. Where learning facilitators have gained the respect of their students the comments are likely to be considered carefully and seriously.

There is a normal expectation that feedback will emanate from those who are facilitating the learning and students are a valuable resource in the facilitation of both their own and others' learning. Peer feedback has long been an operational feature of learning environments, particularly where groups of students are involved. Specific students may prefer to receive, or indeed actively seek, feedback from trusted or respected friends on the same course, while in other cases students who are unfamiliar with peer feedback may only acknowledge that which comes directly from the teaching team. When dealing with large groups, peer feedback is a potentially powerful resource which can be easily and effectively harnessed and reduce the need for, and/or intensity of, tutor feedback. Peer marking and associated peer feedback can also be a valuable learning experience for the students themselves. Critically reviewing and applying assessment criteria to others' work offers students an opportunity to

██████████ *'learn a great deal about their own attempt at a task'* and even more *'by comparing their own judgements about it with those of fellow-students'* ██████████

(Race, 2001).

Where students have been encouraged to engage positively with the peer process, and are given clear guidance regarding the task, peer feedback can be a valuable experience and an efficient way for all students to receive detailed feedback. Encouraging greater engagement with peer feedback tends to reduce the burden on academic staff whilst simultaneously encouraging cohesion and interaction within the cohorts involved. In stimulating dialogue around learning issues within a group, the prospects for better-engaged learning and greater reflection are both improved.

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Introducing peer support and assessment for learning approaches into individual projects

Jenna Tudor, CETL AfL, Northumbria University

Final year Mechanical Engineering students on the BEng (Hons) programme at Northumbria University are required to complete an individual investigative project, with supervision from a member of staff. Supervisors are allocated a limited time to provide regular supervision meetings and it can be difficult to give focused technical support on an individual project as well as dealing with generic module concerns. Small groups were established and facilitated by a different member of staff and this provided students with the opportunity to discuss their projects with their peers, share their expertise, receive informal peer feedback and reflect on the feedback given by their supervisors. Students were required to attend the sessions once a fortnight, in groups of approximately five. Between sessions, students would meet individually with their supervisors to discuss the technical aspects of their project. The issues discussed at the sessions were considered a method of 'feedforward' for students as they were able to take the comments on board and feed them into both their project planning and their individual discussions with supervisors. If several students raised the same issues the facilitator would then feed this back to the supervisory team and ask them to respond to the common issue, rather than each individual student following it up with his/her own supervisor.

Students were asked to give a five minute presentation six months into their project as a practice for their final viva examination, with the other four members of the group asking questions on the presentation. Students said that they found this useful, both in terms of the feedback they received and the fact that they could build on the material they had prepared for this interim presentation for use in their end of project viva assessment.

Students were asked to give some feedback at the end of the academic year by reflecting on how they felt about the sessions. As a catalyst for this the students were asked to complete the following statement: 'the project mentoring sessions have...'. Some of the responses are:

'been very useful to me. If I have a problem I can share it with four or five people to get better advice. It is also good as it is someone else other than the supervisor. Very valuable sessions.'

'been useful to see how other students have been progressing with their projects. Provided motivation throughout project.'

www.engsc.ac.uk/downloads/scholarart/tudor-case-study.pdf

Further examples

A case study entitled *A blended module design to engage new students* (Barker, 2007), highlights a blend of approaches used in teaching a first year, first semester module on systems modelling, including online assessments and the peer review of two assignments. The students were positive about the approaches which helped them to monitor their own progress and over 70% agreed or strongly agreed that

‘marking an essay had helped them reflect on how they should write essays in the future’.

Engineering the “peers” system: the development of a computer-assisted approach to peer assessment (Ngu et al., 1995) reports on the Master of Information Science course at the University of New South Wales. In response to a survey, 80% of the respondents said that the peer assessors’ feedback was either ‘very useful’, ‘useful’ or ‘of some use’. When asked if they would like peer assessment to remain a formal assessment task, 80% responded positively.

For more information on assessing the contribution of individuals within groups, the WebPA project website (<http://webpaproject.lboro.ac.uk/>) has a number of resources available, including case studies and a literature review on peer assessment. WebPA is an open-source online peer moderated marking system designed for teams of students undertaking group work. The tool allows each student in a group to grade their team-mates’ (and their own) performance and these grades are then used (in conjunction with the overall group mark) to provide each student with an individual grade.

Reflecting on current practice

Sources such as the NSS provide evidence that students frequently experience disappointment with feedback, not rating it as highly as many other aspects of their learning experience. The issue is not specific to engineering, tending to straddle many subject areas. While it is sometimes the case that students fail to recognise feedback when it is provided, there are situations where feedback practice does not support learning as well as it should. The value of feedback to students gives a sound case for more reflection on, and collegial discussion about, our feedback strategies. The following questions aim to support you in reflecting upon and reviewing institutional and departmental approaches to teaching, learning and assessment and considering how well feedback practice is embedded in your learning culture.

Table 2. Reflecting on feedback practices

	Question	Answer
1.	Does a feedback ethos begin in your teaching sessions?	Yes/no/ not sure
2.	Do you make the most of the times students are truly motivated to act on feedback received?	Yes/no/ not sure
3.	Have you introduced feed-forward opportunities into your courses?	Yes/no/ not sure
4.	Do you motivate students to read and act upon feedback?	Yes/no/ not sure
5.	Can students really understand how to improve as a result of feedback comments received?	Yes/no/ not sure
6.	Can students cope with the volume of feedback given?	Yes/no/ not sure
7.	Do you provide opportunities to discuss feedback?	Yes/no/ not sure
8.	Do you utilise strategies which enable more prompt and timely feedback?	Yes/no/ not sure
9.	Do you reflect on your own teaching in light of what your students have learnt?	Yes/no/ not sure
10.	Do you reflect on your own teaching in light of student feedback?	Yes/no/ not sure

Strategies for enhancement

For enhancement to impact upon student learning experiences there is a need for tangible changes in feedback practice and it is reasonable to assume that changes in approach will need to be planned carefully and implemented in a structured way. The case has also been made for explicit departmental guidelines on feedback (Rust, 2002) and a simple enhancement might involve the tighter specification of feedback dates/windows for specific coursework assignments in year one.

Enhancement can also be approached at a personal level, where any improvements will start to impact upon those areas where we teach or contribute to teaching. The involvement of peers and other members of subject teaching teams has merit, facilitating coordinated approaches that have the potential to enhance the practice for specific modules or subjects. The gathering of key literature on feedback practice is a good starting point, together with the encouragement of reading, discussion and collegial debate around the issues.

Feedback has been part of the QAA's *Scottish enhancement themes*. More information and links to outcomes of the work on this theme, including case studies and resources, can be found at www.enhancementthemes.ac.uk/

References and resources

- ASKe (2007) *How to make your feedback work in three easy steps!* Available from www.brookes.ac.uk/aske/documents/Make%20FeedbackWork.pdf [accessed 16 November 2010].
- ASKe (2007) *Feedback – make it work for you!* Available from www.brookes.ac.uk/aske/documents/StudentFeedback_makeitwork.pdf [accessed 16 November 2010].
- Barker, P. (2007) *A blended module design to engage new students*. Available from www.engsc.ac.uk/downloads/teaching-awards/rossiter-web.pdf [accessed 16 November 2010].
- Beggs, B.J., Smith, E. M., Pellow, A. and McNaughton, A. (2005) A critical analysis of computer generated marking and student feedback. *Association for Learning Technology Conference*, 6-8 September 2005, Manchester, UK.
- Boyle, J. (2004) Case study 5 - using immediate feedback in class. In: Juwah, C., Macfarlane-Dick, D., Matthew, B., Nicol, D., Ross, D and Smith, B. (eds.) *Enhancing student learning through effective formative feedback*. York: Higher Education Academy Generic Centre.
- Brown, G., Bull, J. and Pendlebury, M. (1997) *Assessing student learning in higher education*. London: Routledge.
- Bryan, C. and Clegg, K. (eds.) (2006) *Innovative assessment in higher education*. Abingdon: Routledge.

enhancing feedback for engineering students

Cowan, J. (2003) Assessment for learning – giving timely and effective feedback. *Exchange*, Spring 2003, issue 4, 21-22.

Cranston, G. and Lock, G. (2010) Who wants to be an aerospace engineer? Use of an audience response system to stimulate student learning in engineering lectures. *Engineering Education: Journal of the Higher Education Academy Engineering Subject Centre*, 5 (1), 23-29.

Denton, P. (2009) *Electronic feedback*. Available from <http://www.ljmu.ac.uk/cis/software/feedback.asp> [accessed 16 November 2010].

Higher Education Academy Engineering Subject Centre (2009) *JISC audio projects overview*. Available from <http://www.engsc.ac.uk/mini-projects/jisc-audio-projects> [accessed 16 November 2010].

JISC (2010) *Effective assessment in a digital age*. Available from <http://www.jisc.ac.uk/digiassess> [accessed 16 November 2010].

Jawah, C., Macfarlane-Dick, D., Matthew, B., Nicol, D., Ross, D. and Smith, B. (2004) *Enhancing student learning through effective formative feedback*. York: Higher Education Academy Generic Centre.

Lunsford, R.F. (1997) When less is more: principles for responding in the disciplines. *New Directions for Teaching and Learning*, 1997 (69), 91-104.

enhancing feedback for engineering students

- Montgomery, C. and McDowell, L. (2008) *Investigating theory and practice in assessment for learning: four case studies (volume one)*. Available from http://www.northumbria.ac.uk/sd/central/ar/academy/cetl_afl/pubandpres/intpub/casestudies/ [accessed 16 November 2010].
- Mutch, A. (2003) Exploring the practice of feedback to students. *Active Learning in Higher Education*, **4** (1), 24-38.
- National Union of Students (2010) *Feedback assessment campaign toolkit (F.A.C.T folder): improving the student learning experience*. Sections to be made available online at <http://www.nusconnect.org.uk/campaigns/highereducation/learning-and-teaching-hub/> [accessed 16 November 2010].
- Ngu, A. H. H., Shepherd, J. and Magin, D. (1995). Engineering the 'peers' system: the development of a computer-assisted approach to peer assessment. *Research and Development in Higher Education*, **18**, 582-587.
- QAA (2004) *Scottish higher education enhancement themes*. Available from <http://www.enhancementthemes.ac.uk/> [accessed 16 November 2010].
- Race, P. (2001) *A briefing on self, peer and group assessment*. York: LTSN Generic Centre.

enhancing feedback for engineering students

- Race, P. (2005) *Making learning happen: a guide for post-compulsory education*. London: Sage Publications Ltd.
- Rotheram, B. (2008) *Sounds Good Evaluation 10*. Available from <http://sites.google.com/site/soundsgooduk/downloads> [accessed 16 November 2010].
- Russell, M. (2005) *Mini-project report: improving student success and retention through greater participation and tackling student-unique tutorial sheets*. Loughborough: Higher Education Academy Engineering Subject Centre.
- Russell, M. (2008) Using an electronic voting system to enhance learning and teaching. *Engineering Education: Journal of the Higher Education Academy Engineering Subject Centre*, **3** (2), 58-65.
- Rust, C. (2001) *A briefing on assessment of large groups*. York: LTSN Generic Centre.
- Rust, C. (2002) The impact of assessment on student learning – how can the research literature practically help to inform the development of departmental assessment strategies and learner-centred assessment practices. *Active Learning in Higher Education*, **3** (2), 145-158.
- Tudor, J. (2010) *Case study: introducing peer support and assessment for learning approaches into individual projects*. Available from <http://www.engsc.ac.uk/downloads/scholarart/tudor-case-study.pdf> [accessed 16 November 2010].

Wallace, J. (2003) *Supporting the first year experience: LTSN continuing professional development series no. 4*. York: LTSN Generic Centre.

Willis, E.J. (2004) *Using an MLE to challenge students' learning, encourage interaction with lecture materials, and to assess their knowledge*. Available from <http://www.engsc.ac.uk/downloads/awards/mle.pdf> [accessed 16 November 2010].

Interaction

We would like to hear your views and feedback on this publication to help keep the guide up to date.

There is an interactive version of the Guide, where you can comment on each paragraph individually, or on sections as a whole, this can be found at www.engsc.ac.uk/teaching-guides

How does it work?

To view a section, click the section name in the Table of Contents on the left. The paragraphs within the section are shown in one column, with a box on the right showing the comments which have been submitted by other readers. Next to each paragraph, there's a small grey speech bubble. Click on this to bring up the comment form. Please abide by our moderation policy or your comment will not be published.

What happens next?

The feedback and discussion received will be reviewed by the Centre and the authors, and views and suggestions will be incorporated into new editions of the guide.

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About the series:

This is one of a series of peer reviewed booklets looking at various aspects of teaching and learning aimed at all those involved in engineering education. The complete series is also available on our website.

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The Engineering Subject Centre is one of the 24 subject centres that form the subject network of the Higher Education Academy. It provides subject based learning and teaching support for all engineering academics in the UK.

The Centre's Mission is:

to work in partnership with the UK engineering community to provide the best possible higher education learning experience for all students and to contribute to the long term health of the engineering profession.

It achieves this through its strategic aims: sharing effective practice in teaching and learning amongst engineering academics; supporting curriculum change and innovation within their departments and informing and influencing policy in relation to engineering education.

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