Writing in the Natural Sciences

ENHANCING FEEDBACK

Dai Hounsell

pro forma   written comments   **exemplars**
exams   **guidance**   feedforward   *traditional*
collaboration   *on-display learning*   peer   audio
past questions   **screencast**   whole-class
clickers   in-class assignments   *cumulative* **editing**
using feedback well   elective   *self*   co-revision
e-feedback   redrafting   reviewing progress
criteria   **dialogue**   *supervision*   interaction
new   briefing   involvement   *faster feedback*
model answers   training   *video*   online

WHAT IS 'FEEDBACK' IN HIGHER EDUCATION?

- ***Feedback comprises information, processes, activities or experiences which aim to encapsulate, enable, consolidate or boost students' learning***

- Feedback can focus on:

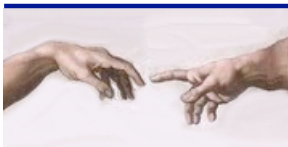|	
attainment	what a student knows, understands or can do at a given point in time
progress	where a student currently stands in relation to a specified goal, target or level
achievement	what a student has achieved as demonstrated in a completed assignment or task

WHY DOES FEEDBACK MATTER?

- **Why feedback matters in higher education**

    – learning without feedback is 'blind archery'

    – effective feedback and effective teaching & learning go hand in glove:
      good feedback enables each student to achieve their best

- **Why feedback is important in students' writing in the natural sciences**

    – interrelations between knowing, understanding, thinking & communicating

    – the central role of communication in scientific advance and public
      understanding of science

FUNDAMENTALS OF FEEDBACK
What forms does / can feedback take?

pro forma   written comments   **exemplars**

exams   **guidance**   feedforward   *traditional*

collaboration   *on-display learning*   peer   audio

past questions   **screencast**   whole-class

clickers   in-class assignments   *cumulative*   **editing**

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Dai Hounsell   WRITING IN THE NATURAL SCIENCES: ENHANCING FEEDBACK
Academic Writing from Bachelor to PhD Conference, Bergen/Solstrand, 7-8 October 2010

THE UNIVERSITY OF EDINBURGH

The who, where and when of feedback
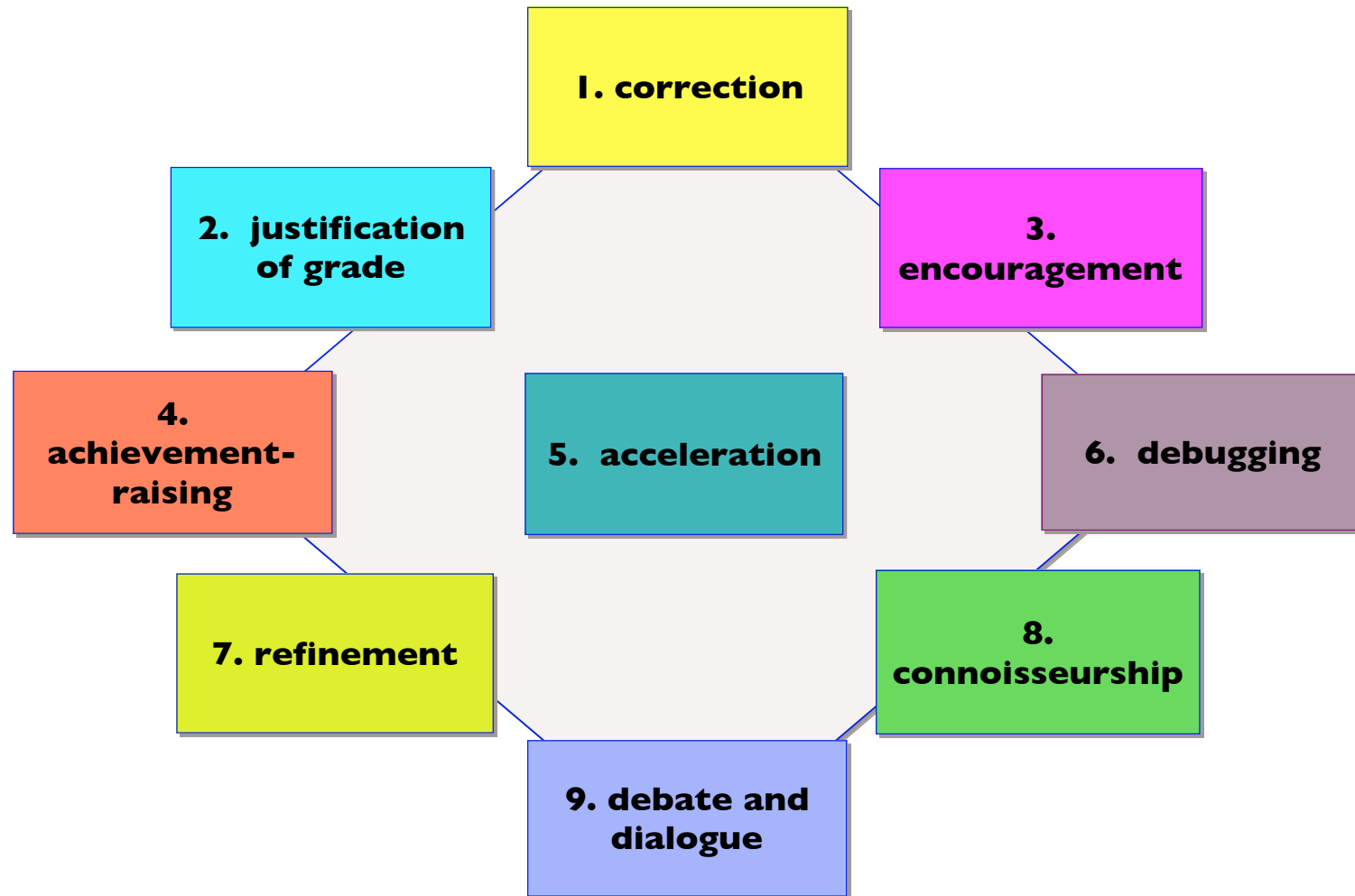
- **Sources of feedback**
  - Lecturers, lab & fieldwork demonstrators, supervisors, mentors
  - Fellow-students / peers, a student's own reflections
  - The audience for a seminar or poster presentation, professional practitioners

- **Feedback where and when?**

formally		informally	
in timetabled classes / online		outwith timetabled classes / offline	
intrinsic		extrinsic	
prior to a task or activity	*during* a task or activity	*after* a task or activity

What purposes can feedback have on students' writing in the natural sciences?

1. correction

2. justification of grade

3. encouragement

4. achievement-raising

5. acceleration

6. debugging

7. refinement

8. connoisseurship

9. debate and dialogue

ENHANCING FEEDBACK

A multidisciplinary website

Enhancing Feedback

For Staff

Time-friendly ways to boost feedback

Ideas, strategies and case examples

Feedback in your subject

Feedback FAQs for staff

For Students

Making feedback work for you

Other resources for students

Feedback FAQs for students

Feedback at Edinburgh

How the University is improving its feedback to students

The University of Edinburgh

Enhancing Feedback

- Home
- Staff
- Students
- Feedback at Edinburgh

Students

This section of the website is a brief overview for students of what kinds of feedback they can expect at university and how they can make the best of it. Other sections of the website focus on how staff can improve the feedback they give to students.

- Making feedback work for you
- Other resources for students
- Feedback FAQs for students

Making feedback work for you provides guidance on how to make the most of the feedback given to you by staff.

Under **Other resources for students** you will find links to other websites with information about feedback.

Feedback FAQs focuses on key features of feedback. It tackles fundamental questions such as what's meant by 'feedback'; how, when, where and by whom feedback can be provided; and why feedback plays a vital role in high-quality learning.

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Home
Staff
Students
Feedback at Edinburgh

Staff

This website is concerned with enhancing the feedback that university students get on their progress and performance in undergraduate and taught postgraduate programmes of study. The website aims to help individuals and groups to take a fresh look at feedback of that kind and explore ways in which its provision might be improved.

This part of the website, which is written primarily for academic and teaching staff, is in four sections:

- Time-friendly ways to boost feedback
- Ideas, strategies and case examples
- Feedback in your subject
- Feedback FAQs for staff

The section on **Time-friendly ways to boost feedback** provides some starting points for those who have a limited amount of time but would like to improve the feedback they provide for students.

Under **Ideas, strategies and case examples** you will find more than thirty strategies for improving feedback. These are grouped under eight headings ranging from Involving Students in Feedback, through Feedback-rich Assignments, to Reshaping Curricula and Assessment. Wherever possible, each strategy is illustrated by relevant research and case-examples from across the range of disciplines and subject areas commonly found in higher education. These case-examples draw on the published literature, resources available on other websites, and our own network of contacts within and beyond the University of Edinburgh.

Feedback in your subject offers an alternative entry-route to the case-examples and relevant research referred to in the other parts of the website. Choose a discipline or subject area from those listed, and find out what materials the website can link you to.

Feedback FAQs focuses on key features of feedback. It tackles fundamental questions such as what's meant by 'feedback'; how, when, where and by whom feedback can be provided; and why feedback plays a vital role in high-quality learning.

There is no preferred sequence for exploring the website. You can start, and finish, in whichever part of the website you wish. The website is less a finished product than a work-in-progress. We welcome

Enhancing Feedback

Enhancing feedback: Ideas, strategies and case examples

Eight broad directions for feedback, leading to 34 strategies with a wealth of links to subject-focused cased examples.

- Briefing and training of students
- Involving students in feedback
- Interacting with students
- Refining traditional feedback
- Plugging gaps in feedback
- Feedback rich assignments
- New ways of giving feedback
- Reshaping curricula and assessment

How can FEEDBACK be Improved?

- interacting with students
  - reviewing progress with students
  - assessment dialogues
  - optimising feedback in postgraduate supervision
  - feedback loops in undergraduate projects
  - engaging with criteria

- refining traditional feedback
  - refocusing written comments
  - faster feedback
  - pro forma feedback

- plugging gaps in feedback
  - guidance to staff on giving feedback
  - exemplars, model answers and past questions
  - giving feedback on exams
  - feedback on feedback
  - pre-submission guidance and feedback

- feedback-rich assignments
  - collaboration as a source of feedback
  - feedforward assignments
  - on-display learning as a proxy for feedback

- new ways of giving feedback
  - recycling written comments
  - whole-class feedback
  - online and e-feedback
  - using personal response systems
  - audio and video feedback
  - screencasts

- reshaping curricula and assessment
  - cumulative assignments
  - policies on feedback
  - variety, challenge and feedback
  - in-class assignments
  - closing the feedback loop

- briefing and training of students
  - informing students about feedback
  - elective feedback
  - helping students use feedback well

- involving students in feedback
  - peer feedback
  - self-generated feedback
  - co-revising assignments
  - editing and redrafting

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Enhancing Feedback

Home
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Involving students in feedback

• Peer feedback
• Self-generated feedback
• Co-revising assignments
• Editing and redrafting

The last two decades have brought a seismic shift in the provision of feedback. Traditionally, feedback was seen as a 'gift' (Askew and Lodge, 2000) — something presented by the teacher to the student, with students cast in the role of relatively passive recipients or even bystanders. But there is now widespread recognition that students must play a more direct and active part in feedback, if it is to make a real difference to the quality of their learning.

For the Quality Assurance Agency (2006), encouraging students to reflect on their own performance as well as get feedback from others is seen as worthwhile, and especially so "when opportunities for self-assessment are integrated in a module or programme" (QAA, 2006). Skills in giving and receiving feedback are also prized by employers (see e.g. Jaques, 2000) and seen as an indispensable 'graduate attribute', helping to prepare students for learning in everyday life and work beyond university (Boud and Falchikov, 2006) . And in contemporary research and scholarship on assessment, student engagement in the interchange of feedback goes hand in glove with excellence in learning (see for example, Nicol, 2007, 2009; Black et al. 2003). As Royce Sadler, one of the most influential thinkers in this field, put it two decades ago, students have to be able to judge the quality of what they are producing, by coming to hold "a concept of quality roughly similar to that held by the teacher" (Sadler, 1989, p. 121).

This section of the website explores various pathways to greater student involvement, the two most direct of which are peer feedback, where students give feedback to (and get it from) their fellow-students, and self-generated feedback. Two other options, where the feedback itself may be less visibly interwoven, entail students working collaboratively, by co-revising assignments and through editing and redrafting.

For further possibilities for enhancing students' engagement with feedback, see the section Interacting with students.

FURTHER READING

Askew, S. and Lodge, C. (2000) **Gifts, ping-pong and loops - linking feedback and learning.**
In: Askew, S. (ed.) *Feedback for Learning.* London: RoutledgeFalmer, pp.1-18

Editing and redrafting

The key difference between co-revising and editing and redrafting is that in the latter case, the students work individually on the assigned draft rather than in a peer group. It may therefore be easier than co-revising to implement where contact time or space for groupwork is limited. And although the feedback that arises from editing-and-redrafting is therefore self-generated rather than benefiting from peer interaction, the resulting redrafts could nonetheless become the focus for subsequent peer discussion (and thus peer feedback) in, say, a tutorial or practical class.

It would also be feasible to divide the activity into two stages (each involving individual work followed by peer feedback in groups) by focusing first on what needed revising, and then on the revisions actually attempted.

CASE EXAMPLES

Covic, T., and Jones, M. K. (2008) **Is the essay resubmission option a formative or a summative assessment and does it matter as long as the grades improve?** *Assessment and Evaluation in Higher Education*, 33.1, pp. 75-85.
26 out of 54 third-year Psychology students were provided detailed formative feedback on their essay and an opportunity to resubmit their essay.
http://www.tandf.co.uk/journals/carfax/02602938.html

Handley, K. Szwelnik, A., Ujma, D., Lawrence, L., Millar, J. & Price, M. (2007). **When less is more: students' experiences of assessment feedback**. Paper presented at the Higher Education Academy Annual Conference, July 2007.
This paper describes two case studies in Business Studies, where students are given the opportunity to receive feedback on drafts of assignments and to resubmit and assignment.
http://www.heacademy.ac.uk/assets/York/documents/events/conference/E5.doc

Harvey, J. **How am I doing? Using peer reviews to improve assessment.** *Signpost Leaflet 10*. Northumbria University: CETL in Assessment for Learning.
A short example of Business Studies students giving each other feedback on drafts of essays.
http://www.northumbria.ac.uk/cetl_afl/resources/signposts/

Montgomery, C. **Practice makes perfect: working towards a summative essay through drafts and edits.** *Signpost Leaflet 8*. Northumbria University: CETL in Assessment for Learning.
A short example of giving English Language students feedback on drafts of essays.
http://www.northumbria.ac.uk/cetl_afl/resources/signposts/

Prowse, S., Duncan, N., Hughes, J., and Burke, D. (2007) **'…do that and I'll raise your grade'. Innovative module design and recursive feedback.** *Teaching in Higher Education*, 12(4), 437-445.
This paper discusses an innovative feedback process which involved recursive feedback,

Enhancing Feedback

- Home
- Staff
- Students
- Feedback at Edinburgh

Feedback in your subject

An alternative entry-route to the case-examples and relevant research referred to in the other parts of the website. Choose a discipline or subject area from those listed, and find out what materials the website can link you to. The subject groupings follow Edinburgh's structure of Colleges and Schools.

Science and Engineering
- Biological Sciences
- Chemistry
- Engineering
- Geosciences
- Informatics
- Mathematics
- Physics and Astronomy

Medicine and Veterinary Medicine
- Medicine
- Veterinary Medicine

Humanities and Social Science
- Arts, Culture and Environment
- Business Studies
- Divinity
- Economics
- Education
- Health in Social Science
- History, Classics and Archaeology
- Law
- Literature, Languages and Cultures
- Philosophy, Psychology and Language Sciences
- Social and Political Studies

Biological Sciences

General

Enhancing Assessment in the Biological Sciences (Bioassess). The bioassess website is the result of a national project by the Centre for the Study of Higher Education (University of Melbourne), in partnership with leaders in teaching and learning in the biological sciences from The University of Sydney and The University of Melbourne. Drawing upon the combined expertise of the project team and the experience of university staff and students across Australia, the bioassess website highlights contemporary issues and presents effective and innovative approaches to enhancing assessment in higher education.
http://bioassess.edu.au

Higher Education Academy Centre for Bioscience Bulletin No. 22, Autumn 2007. Themed edition on Feedback and feed-forward.

General

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Higher Education Academy Centre for Bioscience Bulletin No. 22, Autumn 2007. Themed edition on Feedback and feed-forward.
http://www.bioscience.heacademy.ac.uk/resources/bulletin.aspx

Higher Education Academy Centre for Bioscience (2009) **Assessment Briefing**.
This Briefing provides introductions, resources and references on topics such as Feedback and Feed-forward, and Formative and Summative Assessment.
http://www.bioscience.heacademy.ac.uk/resources/briefings/assessment.aspx

Briefing and training of students: helping students use feedback well

Orsmond, P., Merry, S. & Reiling, K. (2005) **Biology students' utilization of tutors' formative feedback: a qualitative interview study**. *Assessment & Evaluation in Higher Education*, 30(4), 369-386.
This study reports the findings of interviews with third year Biology students on their utilization of tutor feedback. The students mostly used feedback in the following ways: (a) to enhance motivation; (b) to enhance and enrich learning; (c) to encourage reflection; and (d) to clarify understanding. Two further forms of usage were, firstly, to enrich their learning environment and, secondly, to engage in mechanistic enquiries into their study.
http://www.tandf.co.uk/journals/carfax/02602938.html

Involving students in feedback: peer feedback

Falchikov, N. (2002) **Unpacking' peer assessment**. In Schwartz, P. and Webb, G. *Assessment* (Case Studies of Teaching in Higher Education Series): Case Studies, Experience and Practice from Higher Education.pp. 70-77 London: Kogan Page Stylus Publishing.
This case study looks at problems encountered during implementation of peer assessment and the attempts made to solve them in Bioscience and Psychology.

Hughes, I. (2006) **Peer assessment: what's it all about?** Open University: Challenging Perspectives on Assessment.
A short video, with examples of using peer feedback with Biology and Medical students, and discussion of the pros and cons.
http://stadium.open.ac.uk/perspectives/assessment/

Ljungman, A. and Silén, C. (2008) **Examination involving students as peer examiners**. *Assessment &*

Chemistry

Involving students in feedback: peer feedback

Chin, P. (2007) Peer Assessment. New Directions in the Teaching of Physical Sciences 3, 13-18.
A short guide to the benefits and issues faced in introducing peer assessment, particularly in the sciences.
http://www.heacademy.ac.uk/physsci/publications/newdirections

Miller, V. (2008) **The incorporation of peer assisted study sessions (PASS) into the core curriculum of a first year Chemistry module**. In Irons, A. *Enhancing Learning through Formative Assessment and Feedback*. London: Routledge.
This case study illustrates the benefits of peer assessment in formative assessment and feedback through PASS in large first year Chemistry cohorts.

Refining traditional feedback: refocusing written comments

Glover, C. and Brown, E. (2006) **Written feedback for students: too much, too detailed or too incomprehensible to be effective?** *Bioscience Education* 7
This article discusses the findings from a research project on the effectiveness of written feedback in Biosciences and Physical Sciences. It identifies some key qualities and some examples of inappropriate feedback.
http://www.bioscience.heacademy.ac.uk/journal/vol7/beej-7-3.aspx

New ways of giving feedback: online and e-feedback

Price, G. (2006) **Computer aided assessment and feedback - can we enhance students' early experience at University?** *New Directions* 2. Higher Education Academy Subject Centre for Physical Sciences.
A case study describing how students in first-year Chemistry were given online quizzes. Feedback was instantly available, with constructive suggestions as to how to improve performance if necessary.
http://www.heacademy.ac.uk/physsci/publications/newdirections

Reshaping curricula and assessment: policies on feedback

Dawson, M. and Cullen R. (2007) **A departmental policy for providing feedback to students.** *Centre for Bioscience Bulletin* 22, p.3.
Following the merger of Biology and Chemistry departments to create a new School, a project team was established to look at practice and to develop pro formas for giving feedback to students through a VLE.
http://www.bioscience.heacademy.ac.uk/resources/bulletin.aspx

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Geosciences

General

Hughes, P. and Boyle, A. (2005) **Assessment in the Earth Sciences, Environmental Sciences and Environmental Studies**. Higher Education Academy Subject Centre for Geography, Earth and Environmental Sciences (GEES).
http://www.gees.ac.uk/pubs/guides/eesguides.htm#assess

Roberts, C. (2010) **Giving Feedback**. Higher Education Academy Subject Centre for Geography, Earth and Environmental Sciences (GEES): GEES Briefing 1.
http://www.gees.ac.uk/pubs/briefings/briefings.htm

Roberts, C. (2010) **Modes of Feedback**. Higher Education Academy Subject Centre for Geography, Earth and Environmental Sciences (GEES): GEES Briefing 2.
http://www.gees.ac.uk/pubs/briefings/briefings.htm

Involving students in feedback: self-generated feedback

Pain, R. & Mowl, G. (1996) **Improving geography essay writing using innovative assessment**. *Journal of Geography in Higher Education*, 20(1), 19-31.
Self and peer assessment is used to improve students' essay writing skills in Geography.
http://www.tandf.co.uk/journals/carfax/03098265.html

Feedback-rich assignments: feedforward assignments

Jenkins, J.O. (2010) **A multi-faceted formative assessment approach: better recognising the learning needs of students**. *Assessment & Evaluation in Higher Education* 35(5), 565-576
An Environmental Studies course was changed to give students one summatively-assessed assignment. Alongside this more formative guidance and feedback was provided, including a tutorial on writing the assignment and feedback on assignment outlines.
http://www.tandf.co.uk/journals/carfax/02602938.html

New ways of giving feedback: audio and video feedback

France, D. and Wheeler, A. (2007) **Reflections on using podcasting for student feedback.** *Planet*, 18. Higher Education Academy Subject Centre for Geography, Earth and Environmental Sciences.
Geoscience students were given feedback on their assignments using podcasting. The students completed pre- and post-podcasting questionnaires.
http://www.gees.ac.uk/pubs/planet/index.htm#P18

Rodway-Dyer, S., Dunne, E. and Newcombe, M. (2009) **Audio and screen visual feedback to support student learning.** Paper given at ALT-C Conference, September 2009, Manchester.
This paper contains case studies of evaluating the use of audio feedback in Geography and of feedback in Biosciences labs. It also gives an example of videoing verbal feedback during labs to use for training demonstrators.
http://repository.alt.ac.uk/641/

Reshaping curricula and assessment: closing the feedback loop

Physics and Astronomy

Involving students in feedback: peer feedback

Chin, P. (2007) Peer Assessment. New Directions in the Teaching of Physical Sciences 3, 13-18.
A short guide to the benefits and issues faced in introducing peer assessment, particularly in the sciences.
http://www.heacademy.ac.uk/physsci/publications/newdirections

Refining traditional feedback: pro forma feedback

Freake, S. **Reformatting feedback on assignments to enhance effectiveness**. FAST Case Study (Formative Assessment in Science Teaching).
Tutors assessing Physics assignments were given a pro forma to use to encourage them to comment positively and on areas for improvement in the future.
http://www.open.ac.uk/fast/

Refining traditional feedback: refocusing written comments

Glover, C. and Brown, E. (2006) **Written feedback for students: too much, too detailed or too incomprehensible to be effective?** *Bioscience Education* 7
This article discusses the findings from a research project on the effectiveness of written feedback in Biosciences and Physical Sciences. It identifies some key qualities and some examples of inappropriate feedback.
http://www.bioscience.heacademy.ac.uk/journal/vol7/beej-7-3.aspx

New ways of giving feedback: using clickers (PRS)

Bates, S., Howie, K. and Murphy, A. (2006) **The use of electronic voting systems in large group lectures: challenges and opportunities**. *New Directions* Issue 2, 1-8. Higher Education Academy Subject Centre for Physical Sciences journal.
A case study, discussing pedagogical, technical and operational issues associated with the introduction of PRS into first-year lectures in Physics and Biological Sciences.
http://www.heacademy.ac.uk/physsci/publications/newdirections

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FEEDBACK FUTURES
IN THE NATURAL SCIENCES

Low-cost, high-value feedback

- Elective feedback

- Peer and self-generated feedback

- Exemplars

- Generic or 'whole-class' feedback

Proxies

- Collaborative tasks and 'on-display' learning

Hi[gher]-tech feedback

- Audio / podcast and video feedback

- Online and e-feedback

- Using clickers (PRS)

- Recycling written comments

Alan J Cann (2007) Podcasting is Dead. Long live Video!, Bioscience Education E-journal, 10-c1 available at http://www.bioscience.heacademy.ac.uk/journal/vol10/beej-10-c1.aspx

Reconfiguring curricula and assessment

- Greater student involvement in assessment and feedback

- From feedback to feedforward

- Feedback-rich assignments