

2.11

Feedback for Learning in the Engineering Disciplines

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Keywords: *assessment, diversity, formative feedback, summative feedback*

Effective feedback is a fundamental part of any educational process, enabling reflection, action, and future improvements to be made by the learner. Feedback-literate students are able to recognise different forms of feedback, manage their feelings and emotions when receiving feedback, capable of acting upon feedback, and able to make evaluative judgements on the quality of their own work and that of others. In university settings, assessment and feedback are often presented together; the importance of combining learning, assessment, and feedback in integrated curriculum design is discussed. Guidance for what makes effective feedback is presented for educators grounded in student-centred models of feedback which go beyond task-level comments and grades. Feedback is a learning dialogue where diverse student populations need clear and appropriate feedback to achieve their potential. Having established the features of good feedback, these are expanded into methods to develop feedback skills in students, with specific example interventions highlighted in a manner which supports educators to implement them in their own curriculum.

1 Definition

1.1 Concept

We define feedback as “*a process through which learners make sense of information from various sources and use it to enhance their work or learning strategies*” (Carless & Boud, 2018). This definition centres learners; any feedback strategy should be a student-centred, active process to scaffold learning. Feedback is active working alongside knowledge and understanding, which allows students to connect, redefine, and develop skills, and build further knowledge.

Feedback can be split into two sub-skills: receiving feedback and giving feedback.

- Receiving feedback: “*the understandings, capacities and dispositions needed to make sense of feedback information and use it to enhance work or learning strategies*” (Carless & Boud, 2018, p. 1316).
- Giving feedback: “*the ability to give constructive feedback to improve team members’ performance*” (Leandro Cruz & Saunders-Smiths, 2019, p. 13).

The timing and purpose of feedback within education results in further definitions which are sometimes understood differently. We define the following sub-types of feedback:

- *Formative feedback*. Feedback where the primary function is providing information “*intended to modify ... thinking or behaviour for the purpose of improving learning*” (Shute, 2008). This type of feedback should correct misconceptions and enable learners to plan future actions. Assignments and tasks providing formative feedback are *assessment for learning*. These may contribute to a student’s mark, but care should be taken with providing grades as some studies find that this reduces the effectiveness of feedback for students (Black & Wiliam, 1998; Lipnevich & Smith, 2009; Morris et al., 2021).
- *Summative feedback*. often defined in opposition to formative feedback, this can be attached to an end of unit assessment or high-stakes assignment where feedback is not designed as part of a learning sequence, so it is more challenging for learners to apply to their future development. The primary purpose of summative assessment is benchmarking students against learning objectives and competencies at the time of the test, rather than providing feedback (Ahmed et al., 2019; Harlen, 2005; Ishaq et al., 2020). This is *assessment of learning*.

1.2 Key feedback frameworks

We have selected two frameworks for presentation from the literature which we consider most accessible for engineering education. Both address what makes effective feedback, and mechanisms to provide and act upon it. Students are placed at the centre of feedback processes, acknowledging that feedback demands cognitive and emotional work from students.

The Hattie & Timperley Model

Hattie and Timperley (2007) highlight properties of impactful feedback (Fig. 2.11.1). They identify the purpose of feedback in reducing gaps between current and desired understanding, framing feedback as an active part of the learning process. The three questions posed help students understand their current level, what to do next, and what the goals are. The model is supported by a meta-analysis from Wisniewski et al. (2020), who argue that the most effective feedback provides students with information on their errors, but also an understanding of why these were made and how they can be avoided in future.

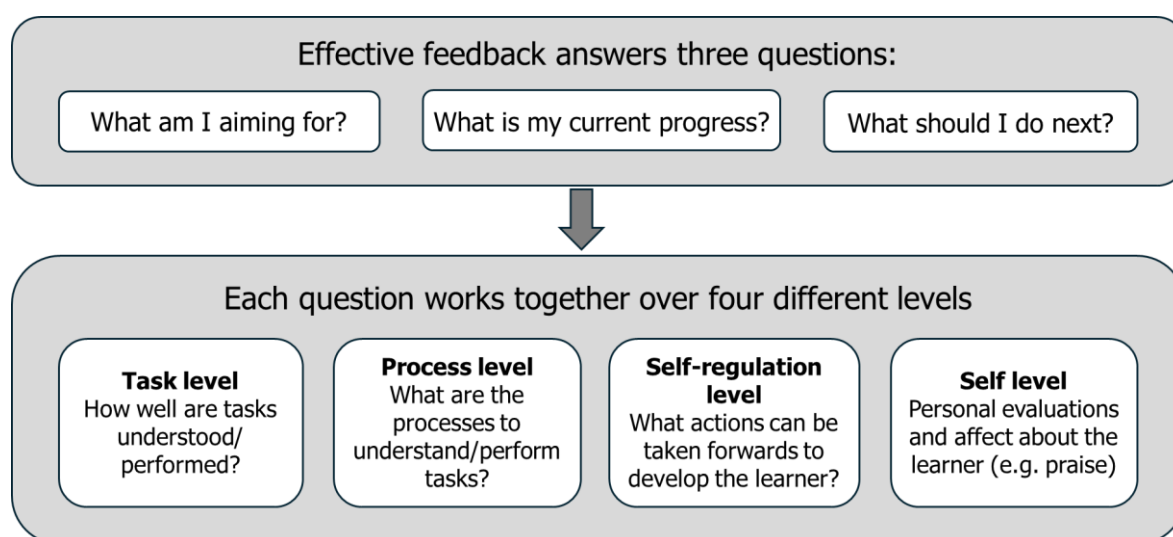


Figure 2.11.1: Effective feedback in the Hattie & Timperley model of feedback.
Adapted from Hattie & Timperley (2007). Copyright SAGE.

The Integrative Model of Feedback Elements (MISCA) Model

The Integrative Model of Feedback Elements (MISCA) (Panadero & Lipnevich, 2022) takes fourteen models, discussed in more detail in Lipnevich and Panadero (2021), combining these into a single model. MISCA stands for Message, Implementation, Student, Context, and Agents, as highlighted in Fig. 2.11.2. The design centres students and their interaction with each aspect.

- *Students.* Students are individuals so respond to feedback differently. This includes prior knowledge, personality traits, and cultural differences amongst others.
- *Message.* The content of feedback should allow students to understand where they made mistakes, why they made them, and how to avoid these in future.
- *Implementation.* The purpose of feedback is to enable students to improve their skills and understanding, not only how to improve on a specific task. When feedback is provided, this requires students to manage their emotions and feelings too.

- *Context.* Feedback must be provided in a setting where it can be acted upon and in an environment which supports learning from feedback. Context also includes the recognition of the variability of feedback practices between disciplines and institutions.
- *Agents.* Feedback can be given by educators, but also via peer and self-assessment. Interactions between the feedback provider and the feedback receiver impacts the effectiveness.

A crucial contribution of the MISCA model is in acknowledging complex interactions between elements and the importance of their alignment.

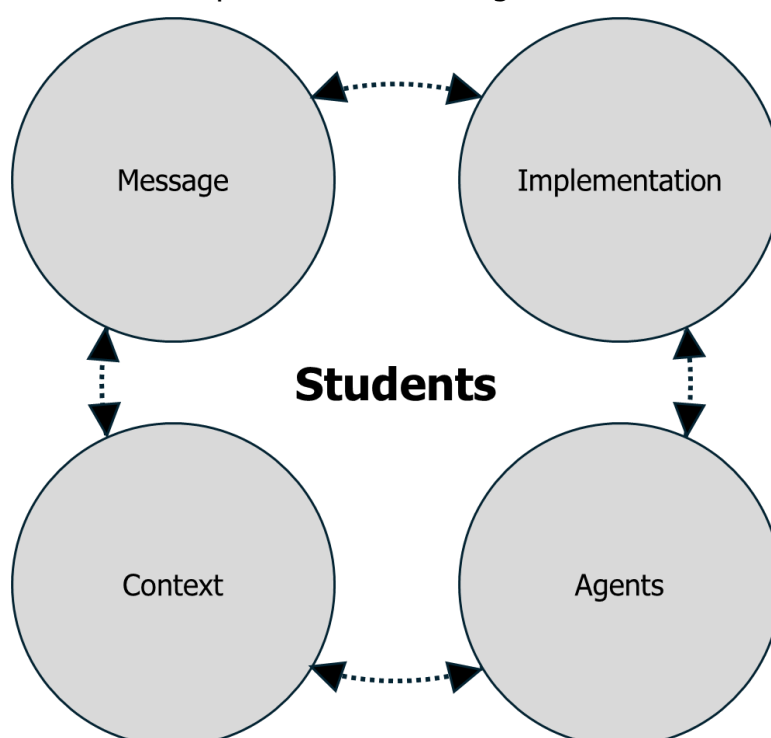


Figure 2.11.2: Simplified version of the MISCA model. Own Work, adapted from Panadero & Lipnevich (2022)

1.3 Feedback as a student-centred process

Both models centre students in feedback processes, moving from historic views that feedback is provided by educators and received by students, to a view that sees learners as active participants. Students need to develop *feedback literacy* to become these active learners. The provision of effective feedback supports students in their development.

For a more detailed discussion of feedback literacy, see Chapter 2.12, Building Feedback Literacy: Essential Skills for Engineering Education and Professional Practice.

Assessment design should incorporate feedback design. This leads to overlap between *feedback literacy* and *assessment literacy*; both are key to supporting learning.

Elkington and Evans (2017) discuss that students require the following knowledge for assessment literacy:

- Appreciation of the relationship between assessment and learning;
- Conceptual and theoretical understanding of assessment;
- Understanding of the nature and meaning of assessment criteria and standards;
- Skills in self- and peer-assessment;
- Familiarity with assessment techniques.

1.4 Positive feedback

Feedback should be focused on the process of, or engagement with, improving understanding (Hattie & Timperley, 2007). Hattie and Timperley argue that feedback at the 'self level' is the least effective. However, by providing positive feedback about the self which can be acted upon (rather than praise), it can be made more effective. Positive feedback where students are congratulated on their work and highlighting success can be part of effective feedback. Positive feedback is effective when it helps learners develop self-regulation (Wisniewski et al., 2020), thus acting within the implementation domain of the MISCA model.

2 Why teach feedback skills?

2.1 Importance for engineers and engineering education

In engineering control systems, we understand the importance of feedback with closed loops which allow past states to impact behaviour in the present. Feedback in an educational sense is as critical to engineering students and professionals; we see it as how and essential way for students to learn, self-correct, and improve future performance.

Feedback within engineering programmes

In Carless and Boud's (2018) definition of feedback, the aim is to "*enhance work and learning strategies*", highlighting the value of *future-proof* feedback; it is transferable to other contexts and other assignments, so that mistakes can be avoided in future (Hattie & Timperley, 2007; Wisniewski et al., 2020).

Within engineering, there are objectively right and wrong technical answers due to the nature of the discipline. Effective feedback should, however, allow clarification of *why* mistakes are made, so these can be avoided in future.

Many engineering accreditation processes implicitly require students to receive and provide feedback within communication and interpersonal skills (for example criterion 3: Student Outcomes within the ABET framework). Both receiving and giving feedback are competencies which draw upon a range of other transferable skills; interpersonal communication skills (see Chapter 2.10); adaptability (see Chapter 2.14); and resilience (see Chapter 2.15). This is because when receiving feedback on skills and understanding, learners must still manage their emotions and feelings (Panadero & Lipnevich, 2022).

Feedback as an engineering management skill

Professional engineers often have significant management roles and are responsible for providing feedback to their teams. Developing feedback literacy in students prepares them for this role through experience of receiving and giving feedback during their studies. Commitment to lifelong learning is part of professional standards (ENAAE, 2021). The self-regulation skills (see Chapter 2.13) and self-evaluation skills developed within feedback literacy (see Chapter 2.12) support lifelong learning, enabling individuals to identify areas for personal development.

2.2 The power of peer feedback

Peer feedback is “*a communication process through which learners enter into dialogues related to performance and standards*” (Liu & Carless, 2006, p. 280). This dialogue provides skill development in feedback literacy; students are required to be active participants, providing opportunities to judge the work of others, allowing for development of self-assessment skills.

Some students prioritise feedback from educators (Coppens et al., 2023), while others find peer feedback more useful (Søndergaard & Thomas, 2004). Selwyn et al. (2025) recommend highlighting the benefit to learning in providing peer feedback — this can help address student perceptions that peer feedback is of lower quality than educator feedback (Hamer et al., 2015). Peer feedback can be a powerful tool, however, in recognition of the diversity of students and curricula; it is one method within a larger toolbox.

Peer assessment is when “*individuals consider the amount, level, value, worth, quality, or success of the products or outcomes of learning of peers of similar status*” (Topping, 1998, p.250). This can provide assessment of disciplinary content and transferable skills. In engineering, peer assessment can be used during group work to distinguish contributions from individuals (Fry et al., 2002). This provides opportunities for students to give and receive feedback on their transferable skills (teamworking, communication etc.). We suggest that this is most effective when feedback is used formatively, supporting the group to function and correct their course during a module — rather than as summative peer assessment; allocating marks after assessments are complete.

3 Forms of implementation

Educators spend much time providing feedback; it therefore important to focus on design and methods which enable students to act upon feedback. Educators need to provide learning environments that motivate learners to acquire, use, and demonstrate competences within real-life contexts (CAST, 2024). Within active learning environments, learners both receive and provide feedback, allowing development of these skills.

3.1 Programme level

Based on the arguments provided in this chapter, feedback is inseparable from assessment and is an important part of making assessments valuable for the learner

(CAST, 2024). Designing feedback into any curriculum unit should aim to close the feedback loop, allowing learners to progress and improve.

Programme level planning should ensure students' learning experience builds throughout the programme, with assessment methods aligned to learning activities and outcomes. In a coherent programmatic approach to assessment, all elements of assessment and feedback are strategically related with purposeful intent to achieve programme learning outcomes. Students are provided with information on their learning outcomes and how assessment is designed for them to use feedback. We therefore recommend:

- Ensure students understand how assessment works and what level they should evidence in work. Students need to understand what marks represent and how to interpret feedback comments;
- Test understanding and skills in formative tasks. Provide guidance on how feedback can be used to improve;
- Demonstrate linkage between formative and summative assessments, making clear the purpose of using different types;
- Plan the student journey, weaving formative and summative assessments with feedback both within, across and outside modules;
- Ensure the development of feedback literacy skills, rather than providing feedback alone.

At programme level, feedback should be embedded in assessment design and considered as *process*, not product (Carless, 2016). In this way, programme-level assessment includes consideration of programmatic feedback. These approaches help in deciding how and when students will create or receive feedback.

From our practical experience, a feedback strategy for programmes should consider:

- The number of opportunities where students receive formative and summative feedback;
- When feedback is available and feedback activities are undertaken;
- How students create, receive, and use feedback. What support mechanisms are available to ensure students can close the feedback loop?

3.2 Module level

At a modular level, based on our practical experience, you should consider:

- The assessment type that best fits with module learning outcomes, and in turn how this matches the programme approach to assessment already developed;
- The combination of approaches to assessment, ensuring programmes do not repeatedly assess the same learning outcomes and preventing assessment bunching;
- Allowing space for formative assessments and the feedback arising from these to be incorporated into student preparation for summative tasks.

Within the module, explore and develop exercises and initiatives that are designed to improve student assessment and feedback literacy; make sure to communicate

academic standards to students. Consider how feedback will be generated, disseminated, and utilised by students.

Example 1. Academic feedback process

All students will be provided with information at the start of the academic year about the feedback they will receive. This will set out what, when, and how students will receive feedback, in summative assessments and on an ongoing basis, e.g. through tutorials, from supervisors, on formative assessments etc.

What?

As a minimum, it is recommended that students be provided for each assessment task:

- *The name and a brief description of the assessment;*
- *Percentage contribution of the task to the module's outcome;*
- *Format(s) for the submission of the assessment;*
- *Whether it is a summative and/or formative task and the pass mark;*
- *Duration of the assessment and/or its length/volume;*
- *Assessment criteria;*
- *Assessment release and deadline dates;*
- *Deadline for return of feedback comments;*
- *What feedback follow-up opportunities exist.*

It is also good practice to follow up through in-class discussion. Talking with students about feedback presents an opportunity to make students more aware of the benefits and responsibilities they have to utilise feedback to improve their learning.

Provide information on the format of feedback, any differences between feedback given on formative and summative assessments, and any opportunities for additional feedback.

When?

Information about feedback should be provided to students at the start of each year.

How?

Make clear to students where information about feedback can be found, and whether additional supports are available.

3.3 Engaging with feedback and assessment

Section 1.2 introduced two models for feedback. Here we present some forms of implementation from practical experience, where assessment is designed by educators to facilitate engagement with feedback and assessment.

Example 2. Interventions to improve feedback engagement

Recognise and appreciate feedback:

- *Give an example of previous feedback, explaining or identifying how students could use this feedback, and discussing their responses;*
- *Students outline examples of feedback they have already received;*
- *Students present their own definitions of feedback, then discuss and deconstruct their responses to help with understanding (e.g. marks are not feedback; that comments only become feedback when they are acted upon).*

Managing affect (emotional impact):

- *Students discuss in pairs the feedback they have received. Ask each pair to discuss how did negative comments make them feel. How can negative comments be reframed and used to improve? Why it is important for feedback to include negative comments?*
- *Signpost students to information, support, and advice, should you feel that feedback poses well-being risks;*
- *Ensure feedback comments balance constructive criticism, positive comments, and directions to improve;*
- *Give students permission to fail, by ensuring initial developmental tasks carry little (if any) weight to module marks.*

Taking action:

- *Include links to useful resources in feedback, directing students to utilise these;*
- *Ensure feedback is acted upon, e.g., by asking students to set out how they have used previous feedback on the coversheet of their next assignment, or by awarding marks for explaining how they have used previous feedback;*
- *Allow students to get and implement feedback on drafts prior to the final assignment submission.*

Making evaluative judgements:

- *Provide exemplars alongside assessment criteria. Ask students in small groups to grade the exemplars, applying the assessment criteria. Then discuss different marks and responses, thus making students more aware of the complexity involved in grading and providing feedback;*
- *Ask students to self-assess their own work, submitting a cover sheet that includes their own predicted mark based on the criteria. Then provide students with feedback that comments on their marking, helping to hone their evaluative judgement;*
- *Ask students to work with a peer assessment prior to submission, providing feedback on work in progress against grading criteria;*
- *Help students to better understand assessment criteria by using generic criteria to then develop assignment-specific criteria. Then ask students to work in groups, discussing the meaning of criteria and articulating the features of work at each level.*

3.4 Codesigning assessment and feedback

Agreeing an approach to feedback with your students can have positive impact. For example, introducing formative assessments that are awarded an indicative mark and clearly linked to summative assessment performance, can reduce marking workload. It can also allow the assessment focus to be placed on the feedback. Furthermore, students can be involved in peer feedback. Time spent providing this feedback is more valuable to students than comments at the end of a module that are unlikely to be used elsewhere.

Example 3. Collaborating on assessment criteria

Involving students in assessment criteria design improves feedback literacy. This could include discussions where you collaboratively:

- *Adapt existing criteria;*
- *Review alignment of assessment criteria with learning outcomes;*
- *Discuss what educators look for in assignments;*
- *Share and discuss different types of criteria that can be applied to different tasks.*

Staff can also support the development of feedback skills by demonstrating their own feedback literacy as part of standard university processes. Universities typically request from and provide feedback to students outside of assessments (e.g., module questionnaires, learning community forums, student representatives). Explicitly labelling this feedback alongside educators, demonstrating feedback literacy by engaging with these processes and acting as role models, provides clarity and guidance to students.

3.5 Project supervision

Individual projects are central to many engineering programmes and provide opportunity to implement personalised formative feedback dialogues using a range of methods. Signposting feedback mechanisms within projects at the start can help build feedback awareness, enabling students to take greater ownership of project work alongside developing professional skills. Due to the highly specialised nature of projects within different disciplines and challenges of assessing such work, the fundamentals of good feedback should form part of assessment design processes.

3.6 Self- and peer feedback

While some students may not initially be keen on self- or peer assessment, either finding it uncomfortable to participate in, or believing that assessment should come from educators. However, there is extensive research showing that skills development through these exercises is valuable to future assignments and to practicing engineers.

Self- and peer assessment can provide timely and effective feedback in larger classes but providing adequate time and training for students is an important design consideration (Henderikx et al., 2025).

Supporting students to develop their evaluative judgement enables them to self-assess their work, generating highly personalised feedback. A useful resource for helping students develop this skill is Nicol (2022)'s Active Feedback Toolkit. The process of generating inner feedback begins when students first complete a task, then compare it with an external resource, and then make explicit outputs of those comparisons. You can utilise reflective feedback coversheets or give students the chance to ask for feedback on a specific area when assignments are submitted. These help in generating dialogue in assessment feedback (Bloxham & Campell, 2010), while also demonstrating how students engage with feedback.

Peer feedback can be split into two delivery categories: synchronous and asynchronous, each with opportunities and challenges.

- Synchronous peer feedback can be used for discipline-specific work and evaluation of competencies (presentations, teamwork etc.). Synchronous methods are most beneficial when feedback value is given in dialogue between learners (Bartholomew et al., 2019), and which allows clarification and further discussion.
- Asynchronous peer feedback allows students to review others' work and compose feedback at their own pace (Jongsma et al., 2023). This format is suited to assignments where clear suggestions to improve work can be made (e.g. reports). Online tools can help coordination and allow for anonymisation. Anonymisation can produce more direct feedback in how to improve work but may need to be balanced with greater educator oversight to ensure that feedback is constructive.

Example 4. Examples of supporting self- and peer assessment

Require students to complete a self-assessment sheet with submitted assignments, structured around the criteria, so they are obliged to reflect upon their own work against assessment criteria before receiving feedback.

Use peer feedback forms for formative assessments, requiring students to give targeted feedback mapped to the assessment criteria. It may be useful for individual students to focus on one criterion each, such as content, structure, delivery, or visuals.

Consider encouraging students to use generative AI to create feedback on their own written assignments, providing them with guidance on effective prompts related to assessment criteria (however it is important to discuss with students how AI can make mistakes).

Run exercises in which students mark assignments and then discuss their critiques and marks with other students.

3.7 Written feedback

Written feedback (open-ended comments) is asynchronous feedback and should align with the best practice principles within this chapter. Written comments enable the

provision of detailed, personalised feedback, which is inherently flexible. Written feedback can be delivered quickly and efficiently, especially if using a common set of annotations for common feedback points for students on the same assignment, allowing students to engage at their own pace (McCarthy, 2015). When positioned directly alongside relevant sections of text, written comments create a clear and immediate link between feedback and students' work (Brookhart, 2017).

The limitations of written feedback are often due to its asynchronous nature. Additionally, written feedback lacks non-verbal cues present in synchronous feedback processes, so tone must be considered. Using encouraging and constructive language positioning students as active participants in learning is essential, while avoiding phrasing that could be perceived as overly critical or discouraging (Brookhart, 2017).

3.8 Rubrics

A rubric is an assessment tool outlining criteria and performance levels for a task. It has the potential to guide consistent, transparent grading by specifying expectations and standards. It can provide with greater confidence and reassurance that grading is objective, unbiased, and "*educationally more defensible*" (Sadler, 2009) because of this increased transparency. Rubrics can assist students with understanding how their work will be evaluated and support constructive feedback for improvement. Cockett and Jackson (2018) found that "*there are some advantages to be gained by using rubrics to enhance feedback to students*", but that they cannot be viewed as a panacea for all feedback-related issues.

A well-designed and well-implemented rubric can be a useful feedback tool for both teachers and students. From the educator's perspective, rubrics provide clear, measurable criteria which connect directly to learning outcomes. This gives a point of reference to measure the student's distance from a given learning outcome, thereby helping to shape feedback. From the perspective of the student, there is evidence rubrics can have a positive impact on student learning, as long as the design and application are aligned (Panadero & Jönsson, 2020).

The role of a rubric depends on whether it aims to provide formative or summative feedback. Much of the original research on rubrics focused on the latter. However, recent research highlights formative usage of rubrics becoming more prevalent, which can improve performance in several ways, including incorporating feedback processes (Panadero & Jönsson, 2013). Academic consensus supports the use of rubrics (Rust et al., 2003, 2005) within a community of practice, but with the caveat that they should be one of many feedback methods. Due to the diversity of engineering disciplines, settings, and tasks, there is no single ideal text for their design, although Stevens (2023) and Brookhart (2013) provide useful guidance.

For a fuller account of rubrics, see Chapter 3.4 Rubrics: Design, Development and Implementation.

3.9 Audio and video feedback

Recorded audio and video feedback (where educators record their feedback messages) overcomes limitations of written or verbal feedback, providing a comprehensive and personalised learning experience which can be repeatedly reviewed (Bahula & Kay, 2021; Máñez et al., 2025). Through integration of visual and verbal cues, video offers rich and nuanced feedback, resulting in enhanced clarity and increased engagement (Davies, 2023).

Delivery methods may include recordings, use of specific software or in-person meetings (ideally allowing recording of verbal feedback to support diverse learners). Video feedback can also support cohort-level feedback, providing summaries, recorded screen shares, or physical demonstrations.

Example 5. Case study using video feedback at Cardiff University (Davies, 2023)

To tackle the challenge of students not engaging with feedback, thus overlooking an important part of their learning, alternative feedback mechanisms were explored over five years on a final-year structural engineering problem-based design module (approximately 140 students).

Ideally, one-to-one feedback sessions provide an authentic learning experience, but limited educator resources and time constraints made this unviable. The evaluation of video feedback shows students can be provided with personalised, authentic, and effective feedback, mimicking real-world design contexts. In this instance, 3-to-5-minute recorded video feedback was provided for each student submission.

Student comments were wholly positive, commenting on how engaging and pertinent feedback was in short video format. Over 90% engaged, compared to typically 45% engaging with previous written feedback. Student survey scores for the module incorporating video feedback improved over the period, increasing from 74% to 97% satisfaction. Students particularly valued the comprehensive reasoning provided and guidance on how to improve.

Whereas students may have previously challenged their marks, videos provided comprehensive reasoning and advice on how to improve in future. Over time, educator feedback evolved from simply talking to students into asking for responses and further thoughts on their work. This promoted two-way dialogue, helping close the feedback loop. Feedback morphed into emphasizing effort and practice rather than inherent ability as important, essential when designing inclusive learning.

The following advice should be kept in mind for creating effective video feedback:

- *Keep videos short and pertinent, between 3-5 minutes;*
- *Plan videos as if you were explaining feedback in person;*
- *Highlight and clarify feedback comments on the assessment, ensuring understanding;*
- *Provide simple and clear feedback, explaining ways to improve in future.*

4 Recommendations for implementation and learning

Feedback is important for student learning, but the combination of feedback with grades or marks can impede the effectiveness of feedback (Lipnevich & Smith, 2009; Winstone & Boud, 2020). Disentangling marks and feedback may not always be possible, but providing feedback may be one of the most important ways to improve learning.

4.1 Feedback for learning

Assessment for learning principles (Winstone & Boud, 2020) highlight feedback through formative assessment as an effective way to disentangle assessment and feedback, focusing on learning and improvement, rather than marks. Feedback after a submission is too late for students to make changes and is viewed by students as mostly unrelated to future development. Providing opportunities for students to practice an assessment and to receive formal or informal formative feedback before summative evaluation. This has been shown to be an effective strategy to improve performance through identifying deficiencies in understanding and how to rectify these. Formative feedback does not need to involve a full draft of the final submission but could focus on sections or key questions to benefit student learning, while managing educator workload.

Therefore, we recommend that educators should check with students whether they understand what is expected of them in assessments, how to evidence their learning, and, through co-creation, map and highlight feedback opportunities throughout their studies. Feedback to students should support learning and not only justify grades.

It can be helpful to read through feedback you have provided on an assessment, considering it from the student perspective. How would this feedback make you feel? Would you have a clear idea of the action you could take to improve your work in future assessments? When feedback is asynchronous, does it still provide interaction for the student, or is it a supportive narrative accompanying a mark?

Working with assessment criteria

In our experience, many students report finding assessment criteria unclear and the application confusing or inconsistent. Where students are introduced to criteria as broad guidance, rather than a detailed marking scheme, they are more likely to be satisfied with their use.

Therefore, it is important to clarify the pass mark for assignments and what it represents; is an assignment pass or fail with no other grade, or is the pass mark a threshold to be achieved or exceeded? This is particularly helpful for students coming from different educational systems and studying at different levels, where pass marks for first cycle (bachelor) or second cycle (master) degrees may differ. Students who enter university may be used to achieving high marks in secondary education, and the transition to higher education can produce challenges when they suddenly do not do very well. Therefore, you should provide students with support to manage the feedback they receive.

Providing structured class time can support students to develop self- and peer feedback skills. Asking students to apply assessment criteria to exemplars assists them internalising how to achieve them in their own work.

Example 6. Applying assessment criteria to exemplars

- *Provide students with a short piece of work (e.g. abstract from a draft paper, section of a report, elements from a proposal).*
- *Ask them to discuss applying the assessment criteria to the work and agree a mark.*
- *Groups share their marks with explanations.*
- *Groups review their awarded mark, applying learning from the group discussions.*

Enhancing feedback through closing the loop

Ensure feedback on formative submissions specifies criteria for improvement and ensures that students are given opportunities to clarify how feedback can be actioned.

Example 7. A two-stage assignment

Introduce a two-stage assignment, where the first formative submission is given an indicative mark only, with feedback that illustrates specific criteria for improvement. This helps students to better understand the criteria and provides an opportunity to immediately use the feedback to improve their work for the second submission.

To help manage workloads, discuss with students in advance that feedback will be provided on the first submission only, and that the final submission should comment on the ways feedback been acted upon.

4.2 Individual feedback

Wiggins (2012) provides an accessible model detailing seven hallmarks of effective feedback, providing a template for structuring feedback.

Goal-orientated. Feedback comments have more impact when related to both the learning outcomes and assessment criteria for the task. Provide a short feedback summary that identifies key areas for improvement and resources to achieve this, rather than providing feedback only on specific sections, or annotated text comments.

Focused on key points. Keep feedback concise and focused on two or three points, covering areas of strength and growth, as well as areas to improve. Concise feedback is easier for students to understand and is more likely to be acted upon.

Actionable. In addition to signposting resources for students to follow up on within feedback comments, discuss more broadly how students should action and utilise feedback. Where assessments are designed to support and build on each other, use feedback to signal what you want to see next time.

Student-friendly. Provide comments using first- or second-person language to help students engage. Content should be critical but constructive, where possible adopting an encouraging tone.

On-going. Feedback must be ongoing, consistent, and timely. This means students need opportunities to use feedback which is accurate and trustworthy. Build regular feedback loops into curriculum design. Where marking is completed by others, the management of the workload, deadlines, and consistency all need management. Encourage continuous discussions to develop feedback skills.

Consistent. Follow agreed standards, and provide trustworthy, fair, and accurate feedback.

Timely. Ensure agreed timelines are met, building trust and reliability in the feedback process. When feedback is not timely, students are disengaged and demotivated.

Group and cohort feedback

While some aspects of feedback skills development are highly individualised, group and cohort level feedback provides an efficient means of providing guidance and can be particularly helpful at the start of a module, allowing students to learn from previous groups. Cohort feedback can complement individual feedback, giving students awareness of common areas of weakness, and examples of successful performance. In large classes, cohort feedback can provide more timely feedback.

Example 8. Communicating cohort level feedback

Consider including information and a narrative on:

- *What did the highest-achieving students do well?*
- *What were the misunderstandings held by weaker students?*
- *Were there any common significant omissions?*
- *Were questions answered well? Were there specific questions that the cohort found challenging?*
- *How can this feedback be used by the cohort to improve their own work?*

4.3 Providing feedback to diverse cohorts

Meeting diverse needs of students and providing equity in assessment (Elkington & Evans, 2017) is crucial in a diverse higher education landscape. Ensuring all students can benefit from feedback requires consideration of the Universal Design for Learning Guidance (CAST, 2024), which is an international framework for inclusive education design which is widely used in the US, Ireland, and the UK. More details on this can be found in Chapter 3.7. Providing feedback using a range of methods is essential to ensure that multiple means of representation and engagement are explored, maximising the learning of all students.

Using multiple means of giving feedback involves provision of feedback in different modes, including written, audio, and video feedback. This could include a combination

of methods when giving feedback, such as feedback to a whole group, to an individual in person, or small groups exercising in interpreting feedback.

Students with diverse needs should be supported in developing feedback literacy, ensuring students can understand the importance of, respond to, and enact feedback from peers and others. Students from different backgrounds may not have received opportunities to develop an understanding of the applicable assessment and feedback processes, underlying values, and cultural norms. Curriculum design should include opportunities for all students to gain this understanding.

Offering a range of feedback methods is an inclusive act ensuring that students are not unfairly disadvantaged or advantaged by a specific format. All should follow the principles of effective feedback discussed in this chapter.

4.4 Using AI for creating feedback

Artificial intelligence (AI) can assist and improve the quality of feedback created for and by students within a more continuous assessment cycle learning environment. The models for providing feedback effective still apply and are technology agnostic. The Joint Information Systems Committee (2020) and Knight and Ferrell (2022) noted that thoughtful development and delivery of ethical AI practices can create autonomous learners by encouraging self-generated feedback and fostering self-regulation and reflection skills.

AI can enhance formative assessments by generating immediate feedback opportunities and mapping against learning outcomes. However, the variability of AI-generated feedback needs careful proctoring, to ensure alignment with pedagogic goals. Students and educators need to be guided on developing effective AI-generated feedback, through the iterative refinement of prompts and outputs.

With properly curated AI, feedback can become faster, personalised, and more meaningful for learning.

For a fuller account of AI practices, see Chapter 2.12: Building Feedback Literacy: Essential Skills for Engineering Education and Professional Practice.

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AI statement

During the preparation of this work the authors did not make use of any AI tools.

Contributor statement

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