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Effective feedback in digital learning environments

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Feedback is known to be one of the most important factors influencing learning and achievement (Hattie & Timperley, 2007). However, ensuring that feedback positively influences student learning requires careful curriculum and assessment design by academic staff. This can be challenging in higher education when subjects are delivered in digital learning environments (DLEs), as there are generally fewer opportunities for spontaneous feedback through informal dialogue or social interaction in class. Fortunately, there are a range of digital tools to assist with the design and delivery of feedback information in DLEs. This short paper identifies the benefits, challenges, and design considerations of using these digital tools to provide feedback information from a range of sources, including academic staff, peers, and the student themselves.

Effective feedback: a learner-centred perspective

Before discussing how to do digital feedback well, it is first important to define what effective feedback is. Feedback information has commonly been described as being 'high quality' when it is clear, specific, detailed, personalised, actionable and timely. For feedback to be *effective*, however, it requires more than just the provision of constructive or timely information in the hope that students will do something with it. Rather, it requires students to *engage* with feedback information and then actively *use* it to advance their learning. In other words, effective feedback is a learner-centred process, in which students "make sense of information about their performance and use it to enhance the quality of their work or learning strategies" (Henderson et al., 2019b, p. 1402).

A growing body of research highlights three broad principles of effective learner-centred feedback: *sensemaking, impact* and *agency*. These principles are explained below.

Three principles of learner-centred feedback

1. **Sensemaking:** Students actively seek dialogues with various sources (e.g., academic staff, peers) to enhance meaning-making. Feedback information provided by these sources is carefully designed to help students understand the key messages (Nicol, 2010).

2. **Impact:** Feedback information is designed to be actionable and to have a beneficial impact for students. While this impact can be cognitive, metacognitive, affective, motivational, or relational, the underlying assumption is that it will improve students' future learning or performances (Henderson, Ajjawi, Boud, & Molloy, 2019a).

3. **Agency:** Students have the volition to seek, use and evaluate feedback information from a range of sources for their own benefit (Carless & Boud, 2018; Nicol, 2010). They also have sound evaluative judgement skills, which is "the capability to make decisions about the quality of work of oneself and others" (Tai, Ajjawi, Boud, Dawson & Panadero, 2017, p. 467).

Academic staff have a critical contribution to make in designing and guiding effective learner-centred feedback processes. In particular, they play a vital role in supporting:

- **Sensemaking,** by engaging in feedback dialogues with students to co-construct meaning, and ensuring that any feedback information they provide is clear and easy to understand (for more about the role of dialogue in learning and feedback see Laurillard, 1999; Nicol, 2010)
- **Impact,** by delivering actionable feedback information aimed at various types of impact (e.g., cognitive, metacognitive, and affective), and by enabling students to demonstrate improvement through the design of iterative or nested assessment and feedback cycles (for more on designs for impactful feedback, see Boud & Molloy, 2013)
- **Agency,** by helping students understand that feedback is a valuable process in which they are the central actor, and encouraging them to seek feedback from various sources (see Carless & Boud, 2018 for a more detailed explanation of feedback agency).

Designing for learner-centred feedback in DLEs

The three key principles of learner-centred feedback outlined above – sensemaking, impact, and agency – can be attained in DLEs using a range of digital tools. Table 1 provides practical examples of how academic staff can shape assessment and feedback design to align with these principles.

Table 1. Achieving the three principles of learner-centred feedback in DLEs

Principle: Sensemaking	
Goal	**Practical examples**
Encourage students to participate in informal or structured feedback dialogues with others.	• Support private and individualised task-related feedback interactions with peers or academic staff through the use of collaborative writing programs, such as Word Online or Google Docs. • Facilitate asynchronous feedback interactions with peers or academic staff through discussion boards, such as Canvas Discussions.
Enhance the clarity and detail of feedback information on assessment tasks.	• Use casual and informal language to explain and reiterate complex ideas via audio recordings, which can be posted on Canvas Discussions, Pages, or Announcements (for generalised feedback) or embedded into group or individual assessment tasks using Turnitin Feedback Studio, or Canvas SpeedGrader. • Allow students to more easily connect actionable information to the relevant sections of their written work by adding detailed and specific feedback comments directly into the task. This can be achieved using text-based comment boxes (available in Word, Google Docs, Adobe Acrobat, or DocViewer in Canvas SpeedGrader), or by creating and embedding short audio recordings via Turnitin Feedback Studio.

Table 1. Achieving the three principles of learner-centred feedback in DLEs continued...

Principle: Impact	
Goal	**Practical examples**
Design feedback information to lead to cognitive and metacognitive impact for students.	• Ask students to provide self-feedback by video recording themselves completing a performance-based task and then assessing themselves using a digital self-assessment tool such as FeedbackFruits. • Develop student's metacognitive self-regulation skills by offering ePortfolio-based assessment over the course of a subject. This allows students to plan, monitor and reflect on their progress over a series of tasks or performances.
Deliver feedback information that leads to positive affective, motivational, and relational impacts for students.	• Use personalised video recordings to provide task-based feedback information to students while conveying care, support, and encouragement using tone of voice, pace of speech, facial expressions and body language / gestures.
Principle: Agency	
Goal	**Practical examples**
Encourage students to be feedback seekers.	• Design tasks that prompt students to use one-to-many asynchronous communication tools, such as discussion boards, to seek feedback information from peers. • Set tasks that allow students to use social media (e.g., Twitter, LinkedIn, Facebook, or Slack) to seek feedback information from friends, family members, clients, or industry partners.
Facilitate the development of evaluative judgement skills.	• Post exemplars of low, moderate and good quality work on the discussion board and then lead the entire class in an asynchronous discussion focused on evaluating and articulating differences in quality. • Design tasks that provide opportunities for peer- or self-feedback using wikis (such as Canvas Pages), collaborative writing programs, and ePortfolios.

Sources of feedback information in DLEs

In higher education, academic staff are the most common source of feedback information to students. This makes sense, as they have detailed knowledge of the learning, assessment, and feedback design within the subject. However, to develop feedback agency, it is important that students learn how to seek advice and information from other sources as well. The following subsections explain how digital tools enable provision of effective feedback information from academic staff, peers, and student themselves.

Academic staff

The provision of asynchronous text-based comments is arguably the most convenient mode of feedback delivery for academic staff, as it can be typed and edited quickly from virtually any location. Text is also accessible for students, as comments can be easily stored, organised and retrieved on students' personal devices or hosted via Learning Management Systems, such as Canvas. One of the most common and user-friendly ways for academic staff to deliver text-based feedback in DLEs is by typing comments directly onto assessment tasks (e.g., using comment boxes, sticky notes, annotations). An alternative - suitable for more informal feedback interactions - is engaging in feedback dialogues via discussion boards. The advantages, disadvantages and design considerations for various text-based feedback methods are discussed further in Appendix A.

Another way academic staff can provide feedback information to students in DLEs is via asynchronous audio-visual recordings (e.g., audio, video or screencast recordings). This can be an expedient process, as it is often faster to explain complex details verbally than it is to write or type them. As such, audio-visual recordings often end up being more detailed and easier for students to understand than text-based comments (Mahoney, Macfarlane, & Ajjawi, 2018). Recordings are also able to convey additional information to students through facial expressions, body language, pace, and tone. These additional cues may also help create a sense of social presence in DLEs (Ice, Curtis, Phillips, & Wells, 2007). As a result, students who receive audio-visual feedback recordings may feel more connected to, supported, or valued by their instructors. Such outcomes are critical in DLEs, where there is often a lack of social interaction and synchronous conversation. More specific details about the advantages, disadvantages and design considerations for audio-visual recordings are provided in Appendix B.

Peers

Peer feedback (also known as peer review) occurs when students appraise and assess each other's work and provide feedback information. Nicol (2010, 2014) argues that peer feedback processes are highly beneficial for students, as:

- They expose students to a range of views other than those of academic staff
- Peer feedback information may be more detailed and easier to understand than comments from academic staff, which can often be written in complex academic language and less detailed (because of time constraints)
- Providing feedback information to peers can allow students to uncover critical insights about the quality of their own work, and may help students develop vital skills in the areas of evaluative judgement and self-regulated learning.

Before students engage in peer feedback activities, it is important for academic staff to clearly explain the key learning outcomes and assessment criteria for the task, as well as how to construct effective feedback comments. For example, it is useful to provide an assessment rubric for students prior to the assessment due date, as well as high- and low-quality peer feedback exemplars. Using an online discussion forum that focuses on these feedback examples, students could be led through the explicit aims and purpose of the assessment task, the expected quality of peer feedback comments, and the interpretation and use of assessment rubrics.

The following digital tools are able to facilitate peer feedback on assessment tasks:

- **Email and instant messaging systems**, as they simplify the logistics of sharing work and feedback comments between parties, regardless of their physical location
- **Wikis (e.g., Canvas Pages) and collaborative writing programs (e.g., Google Docs)**, as they enable peer feedback to occur naturally during collaborative learning activities, such as group assessments (see Er, Dimitriadis & Gašević, 2020 for a useful theoretical framework on collaborative peer feedback)
- **Blogs, social media and collaborative writing programs**, as they allow academic staff to monitor and control the quality of peer feedback.

The student themselves

Self-feedback has been defined as "the implementation of self-assessment in ways that generate feedback information and processes for students' own purposes (e.g., achieving educational gains)" (Panadero, Lipnevich, & Broadbent, 2019, p. 148). Self-assessment and feedback can be highly beneficial for students, particularly in disciplines where professional practice requires individuals to deal with complex and sometimes unpredictable scenarios (Soemantri, McColl, & Dodds, 2018), such as medicine, clinical psychology, and teaching. In these contexts, the ability to self-regulate and engage in critical self-reflections are seen as requirements for success. However, it is advantageous for all students to engage in self-feedback processes throughout their learning experience, as doing so will contribute to feedback agency.

Audio-visual recordings are a useful digital tool for self-assessment and feedback, as they allow students to critically evaluate themselves after completing a performance-based task, such as role playing a clinician-patient interaction, giving an oral presentation, or rehearsing for a musical recital (LeFebvre, LeFebvre, Blackburn, & Boyd, 2015). To maximise student impact, self-feedback of this kind may be best supported by an iterative assessment design, featuring standards that have been clearly articulated by academic staff. For example, academic staff could design an assessment task where students:

a) Record themselves completing an initial no-stakes or low-stakes performance

b) View the recording while using a structured rubric to assess performance according to clear assessment criteria

c) Using the rubric as a guide, identify key areas for improvement and devise a plan to achieve this improvement

d) Undertake a repeat performance of the same task, which they would record again

e) View the recording and subsequently complete a graded reflective activity to evaluate whether the self-feedback led to improvement.

ePortfolios - digital repositories where students can complete, showcase, and evaluate various types of work (e.g., written work, recorded performances, artwork, design-based products, etc) - are another digital tool that can support self-feedback. For example, students can create or upload a variety of learning products to an ePortfolio, and then reflect on how their learning has developed over that period of time, and where it needs to go in the future. To ensure that students engage with these self-feedback opportunities, academic staff could design low-stakes reflective writing tasks near the end of a subject, or at multiple points across a program. As ePortfolios are generally hosted online and viewable by different users, they are also useful for seeking, storing and reviewing feedback from various sources, including academic staff, peers, and industry professionals.

Summary and conclusion

Effective learner-centred feedback processes enable students to *make sense* of the information they receive, experience beneficial *impacts* as a result of feedback information, and have *agency* in the feedback process. As highlighted by the examples presented in this paper, these principles can be achieved in DLEs using a range of digital tools.

Some of these tools enable academic staff to offer students different modes of feedback, such as holistic comments provided via video recording or asynchronous text-based dialogues via a discussion board. Offering feedback information via diverse modes may enhance student sensemaking, and support cognitive, metacognitive, affective, motivational or relational impact. Other digital tools facilitate the provision of feedback information from a range of sources, including peers and the student themselves, and this can help develop feedback agency.

However, it is important to note that digital tools are insufficient on their own to support effective learner-centred feedback. Purposeful design is essential, and this is the critical role of academic staff. To this end, staff should aim to:

- Offer students opportunities for sustainable feedback dialogues (e.g., discussion boards, peer feedback)
- Foster a sense of social presence and social connectedness by using digital tools and feedback designs that support these elements (e.g., audio-visual feedback, peer feedback)
- Use a combination of modes to provide feedback information on a single assessment task to enhance student sensemaking and impact
- Ensure that all feedback comments are specific, appropriately detailed, and clear, regardless of the mode
- Design feedback processes using digital tools that are cost-effective, accessible and user-friendly for all.

By following these general guidelines, academic staff will be setting a strong foundation for supporting learner-centred feedback processes in DLEs.

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Appendix A. Considerations for using asynchronous digital text to provide feedback information to students

Method	Digital tools	Advantages	Disadvantages	Advice for use
Annotations and comment boxes	• Word • Google Docs • Adobe Acrobat • Turnitin Feedback Studio • Perusall • Canvas Speed Grader	• Intuitive and convenient, as written assessment tasks are often submitted, graded and returned electronically. • Aligns with students' previous experiences and expectation of feedback.	• Can be laborious for academic staff to provide detailed text-based feedback information, particularly in larger classes.	• Ensure that feedback information delivered via annotations and comment boxes is clear, understandable, and neither vague nor overly detailed (for more on the creation of effective text-based feedback see Nicol, 2010). • Tailor the method of delivery to the desired student impact: - For minor mechanical errors (e.g., spelling or grammar), edit the text using a different coloured font or a tracked-changes style mark-up function - For actionable comments, aid sensemaking by using a comment box connected to the relevant section of the task - For comments designed to have affective, relational or metacognitive impacts, use a medium-length holistic summary positioned in a comment box at the beginning or end of the document, or in a rubric or feedback box (such as those available on Turnitin Feedback Studio).
Statement banks	• QuickMarks (a feature of Turnitin Feedback Studio)	• Saves time for academic staff by allowing them to create sets of common actionable statements that can be dragged from a communal bank onto the relevant section of the assessment task.	• Are sometimes perceived by students to be generic and lacking in personalisation (Dawson et al., 2018).	• Statement banks may be most appropriate for disciplines where the same feedback comment would be useful and relevant for multiple students within a class. For example, in mathematics or chemistry, there is often a single correct answer or solution to a problem.
Discussion boards	• Canvas Discussions	• Supports dialogical feedback interactions, which are important for sensemaking. • Students who would not normally approach academic staff or speak up in class may feel more comfortable interacting via discussion boards.	• Some students may lack motivation to engage in discussion board interactions if they are not incentivised or see a clear benefit to engaging (for a deeper discussion on this topic see Suler, 2004).	• Encourage students to participate in discussion board feedback dialogues by targeting the focus of the conversations to an upcoming assessment task. For example: - Post a high-quality exemplar of the upcoming task (with detailed feedback included) on the discussion board - Invite students to query aspects of the exemplar and/or feedback that they are uncertain about - Encourage dialogue by responding in a timely fashion to students' questions and thoughts.

Appendix B. Considerations for using asynchronous audio-visual recordings to provide feedback information to students

Method	Digital tools	Advantages	Disadvantages	Advice for use
Audio recordings	• Turnitin Feedback Studio • Canvas Discussions	• May enhance sensemaking and motivational / relational impact by allowing students to hear tone and pace of voice. • Can be recorded almost anywhere using laptops or smartphones, provided that there is minimal background noise. • Small audio files can be easily shared and stored, or even embedded within an assessment task (using Turnitin Feedback Studio) or a discussion board thread (using Canvas Discussions).	• It may be difficult and tedious for students to scan through audio recordings to review a specific piece of feedback information.	• Embed short audio clips with specific actionable comments directly into an assessment task to enhance sensemaking. • To avoid monotony or confusion, speak clearly, use a lively tone and a moderate pace of voice. • For longer recordings, using a pre-defined structure may avoid longwinded or off-topic comments (for ideas on structure, see Henderson & Phillips, 2015).
Video recordings	• Webcam software • Smartphone apps • Windows MovieMaker • iMovie	• Enables academic staff to communicate verbally and non-verbally, thereby offering additional cues to communicate affect, care, and support to the student. • May be useful when a student has performed poorly due to a lack of effort or understanding, as video feedback can have positive affective and motivational impact for students. • Tends to focus less on mechanical or superficial errors (e.g., spelling and grammar) and more on high-level aspects of the work, such as argument and ideas. This may enhance cognitive impact.	• Seen as less useful than audio for short specific comments because video files are too large to embed within the assessment task itself. • Requires academic staff to have access to a quiet and appropriate place to record where they will not have any distractions or background noise, which can be difficult in open-plan offices.	• To ensure that student engagement is sustained, it is generally recommended to keep video recordings short (e.g. 3-5 minutes) and structured (see Henderson & Phillips, 2015). • To effectively convey non-verbal cues, ensure that the camera is focused on the head and shoulders, leaving enough room to display hand gestures as well. • Be mindful of body language, expression and tone of voice, so as not to unintentionally convey information that could be interpreted in a negative or discouraging way by the student.
Screencast recordings	• Adobe Presenter • Open Broadcaster Software (OBS)	• May aid sensemaking and affective / motivational / relational impact, as it allows academic staff to present the student's assessment task on the screen (to help them understand context of the comments) along with the rich cues offered by voice (and their face/body if a 'dual screen' approach is used).	• May take more time to produce than text, audio or video, as it is helpful for students if text-based feedback comments are added to the task first and then the educator explains these text comments verbally in the recording.	• Use the mouse cursor to point to and / or highlight relevant sections of the task while expanding or elaborating on any text-based feedback comments. • Try to avoid any editing or post-production of the final recording so as not to increase labour.