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COUNCIL FOR OPEN AND
DISTANCE EDUCATION

Technologies for Learner-Centered Feedback

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Abstract

As the number, type, and use of technologies to support learning increases, so do the opportunities for using these technologies for feedback. Learner-centered feedback is a core to the teaching-learning process. It is related to assessment in describing how learners perform in their learning, their gain in knowledge, skills, and attitudes. Feedback, types of feedback, guidelines for effective learner-centered feedback, and feedback's relationship to assessment are presented. Methods of providing feedback, for example, automated, audio scribe pens, digital audio, etc., and the related technologies are described. Technologies that allow instructors to make informed decisions about the use of various methods for feedback are discussed.

Keywords: assessment; feedback; ICTs; learner-centered; technology

Introduction

Nothing that we do to, or for, our students is more important than our assessment of their work and the feedback we give them on it. The results of our assessment influence our students for the rest of their lives and careers—fine if we get it right, but unthinkable if we get it wrong (Race, Brown & Smith, 2005, p. xi).

Feedback is essential in learning. Learners need to know what they do well, where and how they can improve, and be aware of any misconceptions they may have. Feedback is provided to learners through comments or grades on formal assessments, as well as through body language, facial expressions, tone, and comments made during the learning process. Effective feedback aids learners to "progress with confidence and skill as lifelong learners" (HEFCE, 2010, p. 8), while enhancing motivation and self-esteem (Mohr, 2010). Learner-centered feedback is an essential component of quality assessment, which is part of the learning process. Feedback and assessment go hand-in-hand. The use of technologies for learner-centered feedback on assessment is the focus in this paper. It is a starting point when considering the choice of technology for the risk-free environment of electronic learning assessment and feedback.

If Boud (1988) is correct in that "assessment methods and requirements probably have a greater influence on how and what students learn than any other single factor" (p. 35) and higher education is moving steadily toward an increasingly technology-enriched environment, then it behooves educators to understand how these technologies may be used for providing feedback. Assessment "powerfully frames how students learn and what students achieve" (Boud & Associates, 2010, p. 1). This impacts students' quality of learning. Kellough and Kellough (1999) identified seven purposes of assessment: (a) improve learner learning; (b) identify learners' strengths and weaknesses; (c) review, assess, and improve the effectiveness of different teaching strategies; (d) review, assess, and improve the effectiveness of curricular programs; (e) improve teaching effectiveness; (f) provide useful administrative data that may expedite decision making; and (g) to communicate with stakeholders. This is true of feedback as well. Technology for feedback may collapse space and time (Farmer, 2005); learners and instructors perceive that they are closer. Immediate feedback

is a strong motivator for learners and an important part of the learning process as it helps focus learners' efforts.

Learner-centered feedback provides learners with guidance in evaluating their learning while supporting their learning commitments (Schmitt, Hu & Bachrach, 2008). In a learner-centered course the instructors' philosophy will incorporate a strong focus on learner input and needs. Instructors mediate learning experiences by coaching learners to help them improve and by facilitating learner autonomy of learning and assessment (Schmitt *et al*., 2008) while demonstrating content knowledge and respect for the learner (Mohr, 2010). The learning experiences are relevant and motivating to learners and inspiring for instructors. Once an instructor is comfortable with providing feedback electronically, the marking time is reduced thereby speeding up the turnaround time. This enables misconceptions students may have to be addressed before they become more serious issues.

When we consider feedback, we traditionally think of written comments on paper. With the use of technology, and thinking outside the box, we can provide meaningful electronic feedback in innovative ways. As new technologies emerge, the affordances relating to assessment and feedback are realized. Understanding how emerging technologies may be used in feedback combats this refined thinking and opens assessment possibilities. Feedback technologies are context dependent and not discipline specific.

Feedback

Like any form of communication, feedback requires interaction between a sender and a receiver. Cantor (2008) advises that the learner and instructor may take on both roles at different times. Providing feedback benefits the instructor by affording the opportunity for growth of personal, professional, and communication skills. Providing this progress for learners contributes to satisfaction for the instructor (Mohr, 2010).

Connor (1993) notes that feedback should encourage students to reflect, think critically, state a clear argument, and improve communication skills. To be effective, quality feedback, in the form of valuable information, comments, and suggestions given to learners, must be provided on a regular basis (Simonson, Smaldino, Albright & Zvacek, 2006) as it is essential for learner growth (Mohr, 2010).

Electronic feedback (e-feedback) encompasses the process of using technologies and tools such as typed comments, stylus scribing, audio, video, automated or computer-generated comments, and discussion forums. It expedites learner-instructor communication (Denton, Madden, Roberts & Rowe, 2008). Information and communications technology (ICT) and e-learning strategies facilitate effective learning assessment employing alternative, authentic, and traditional methods (Bennett, 2002).

Types of feedback

Types of feedback include: summative, formative, formal, informal, intrinsic, extrinsic, internal, instructional, corrective, and appreciative. Feedback may involve activities and strategies such as: participation, interaction in discussion, reflection, collaboration, group, or individual work (Costello & Crane, 2009). Table 1 outlines some types of feedback that could be used in higher education at various stages of learning. A course may incorporate one or multiple types of feedback.

Guidelines for providing feedback

It is important to take sufficient time to plan and execute assessment and quality, meaningful feedback. Instructors should inform learners how feedback will be provided in advance. Detailed

Table 1: Feedback Types

Feedback Type	Description
Formative	Used early in the course to provide learners with an opportunity to adjust their work and increase their potential for success (Nichol, 2007). Providing feedback to assist the learning process (Sclater, Conole, Warburton, & Harvey, 2007).
Summative	Takes place later in a course as learners need time to experiment with the course content in a safe manner (Nichol, 2007).
Formal	Requested or expected feedback provided to improve future work. It is usually associated with submitted assignments and formal online discussions, as well as course and program evaluations (Bull & McKenna, 2004; Nichol, 2007).
Informal	Provided through informal discussions, body language, tone, choice of words, etc. (Bull & McKenna, 2004; Nichol, 2007).
Intrinsic	"Feedback is that which is given as a natural consequence of the action" (Lourillard, 2007, p. 55).
Extrinsic	"Does not occur within the situation but as an external comment on it: right or wrong, approval or disapproval" (Lourillard, 2007, p. 56). It should mimic intrinsic feedback.
Internal	Learners monitor their own work through reflecting and self-assessment (Nichol, 2007).
Instructional	Guides the learner on how to improve their work, understand why their work is exceptional, or discover how to take it further. This may be considered part of formative feedback (Mohr, 2010).
Corrective	Gives information to the learner on what they have done wrong and why is it incorrect (Mohr, 2010).
Appreciative	Is the "good point" or "thanks for sharing" that is important for the learner to hear or read. The learner needs to know that what they do is important and valuable (Mohr, 2010).

comments will let learners know how their learning is progressing. Critical thinking can be promoted by asking questions that encourage learners to take their work to the next level. This can enable the learners to reflect on their work, understand what was great about it, and see how it could have been improved (Costello & Crane, 2009). Learners need opportunities to demonstrate their proficiency as well as to understand the criteria and standards by which they are being assessed. Tuzi (2001) recommends peer feedback as it increases students' participation and critical thinking skills.

Nichol (2007) outlines seven principles of good feedback practice: (a) helps clarify what good performance is (goals, criteria, standards); (b) facilitates the development of self-assessment and reflection in learning; (c) delivers high-quality information to learners about their learning; (d) encourages teacher and peer dialog around learning; (e) encourages positive motivational beliefs and self-esteem; (f) provides opportunities to close the gap between current and desired performance; and (g) provides information to teachers that may be used to help shape teaching. Another approach is outlined by Fink (2003) who promotes FIDeLity feedback, which is "Frequent, Immediate, and Discriminating (bases on clear criteria and standards), and delivered Lovingly" (p. 83).

Feedback should be worded so that the learner does not interpret it as personal criticism, but as a critique of their work (Mohr, 2010). It is important not to overwhelm a learner with feedback but to focus on the most important areas for improvement. It is not an opportunity for instructors to show all they know (Costello & Crane, 2009). Lizzio and Wilson (2008) tell us that learners appreciated feedback that was: developmentally focused, especially with comments related to the course goals; encouraged learners' engagement, for example, when a learner felt that the tutor or instructor had taken time to read and reflect on what was submitted; provided encouragement through acknowledging achievements and effort; used a "considerate tone"; and when comments were fair. It is important to be careful of tone as being too brief may be perceived as brusque or rude (Ko, 2009).

Methods of providing feedback in the digital era

Traditionally, feedback has been provided through oral, meta-verbal, or written communication. Now, with advances in ICTs, there are many suitable technologies that may be used in providing feedback. Bates (2008, p. 222) comments that "the appropriateness of a particular technology will depend on the context in which it is to be used." Many methods are suitable for feedback in multiple contexts: (a) automated tutors; (b) peer feedback; (c) auto-scoring of assignments; (d) reflective networks; (e) written comments; (f) oral comments; (g) meta-verbal; (h) emoticons; (i) self-checks; and (j) ePortfolio (Anderson, 2008; Costello, 2009; Costello & Crane, 2009; Crane, 2010).

Automated tutors are computer-generated comments based on background coding. Peer feedback involves learners critically thinking about their work and the work of others in order to make suggestions on ways to improve. Auto-scoring of assignments is often used in educational games, or computer marked tests. This format also requires background programming. Reflective networks are ways in which learners share their learning with others or oneself in order to gain deeper understanding. Written comments are texted based comments placed on student's work that tells the learner what is good about their work as well as how the work may be improved. Oral comments are spoken words, such as those used in group discussions. These may be synchronous or asynchronous comments. Meta-verbal feedback is provided using body language, tone, etc., that provide more information that words alone. Emoticons are word stamps, thumbs up, smiley faces or frowns that are quick and let the learner know what the grader feels about a component of the work. Self-checks involve the learner reviewing the objectives to ensure they know what they are expected to know. Self-checks may also be self-quizzes such as the ones found at the end of a chapter. These self-quizzes help the learner gage their level of understanding. Finally, ePortfolio involves learners providing examples of their work to demonstrate their knowledge, abilities, or attitudes. Evidence of work and accomplishments may include: pictures of three-dimensional work such as a sculpture; a paper written in a course or program; and a first-aid or computer certificate.

Denton *et al.*, (2008) reported that emailing feedback expedites its return. They also suggest the use of pre-written comments that would be common across multiple assignments to aid in providing feedback. Buzzetto-More and Alade (2006) noted that learners perceived that the electronic feedback was: clearer, easier to read and understand, fairer, and had more relevance to the learners' work. Technologies not only augment the teaching and learning process but also provide data and/or artifacts that may help to satisfy assessment objectives. Other researchers, such as Steinweg, Williams, and Warren (2006) reported that learners' preferences for e-feedback ranked from typed in document, handwritten digital file, handwritten mailed, phone feedback, annotated rubrics, to face-to-face. Their study did not take into account more recent feedback methods such as audio and video, these areas requiring further investigation.

Electronic feedback technologies

There are several technologies that may aid in providing quality, electronic feedback: (a) word processors; (b) pen technology (tablet); (c) audio scribe pen; (d) digital audio; (e) digital video; (f) automated; and (g) personal response systems (clickers). These methods and example uses are discussed below.

(a) Word processing, or typed feedback, provides the learner with information on their work, clarifies the marking scheme, while being easier to read than handwritten comments. It also reduces marking time and expedites its return (Denton *et al.*, 2008). Typing comments on a document is a quick and convenient means of seeing feedback relating to specific parts of the assignment. This can be achieved by using track changes, comment bubbles, notes and text boxes or by placing document contents in tables and placing feedback in adjoining columns. Annotated files could be converted to a portable document format (pdf) before returning to learners for security purposes (Costello, 2009; Costello & Crane, 2009).

Related to word processing is the use of tools in Adobe pdf files. Users may avail of tools such as the typewriter, highlighter, call out box, sticky, free style pen, or text boxes to record feedback. Both audio and video files may be embedded in the pdf files: though this often dramatically increases the document's file size.

(b) Pen technology (tablet), or pen top computing (stylus), allows instructors to review, comment, or add to learners' work, by writing their comments on the learner's paper on screen and save these comments to the file. The script may also be converted to typed text with some applications. This provides flexibility in terms of being able to jot notes in the paper's column, as was typically done with paper-based assignments. The instructor is not daunted with having to type feedback but simply "write" it (Costello, 2009; Costello & Crane, 2009).

Steinweg, Williams, and Warren (2006) reported that tablet computer feedback allows "efficient, specific, and detailed feedback on assignments" (p. 11). Numerous benefits noted include: (a) instructors may more effectively respond to assignments; (b) less instructor time required; (c) employ a variety of visual effect using coloured ink, highlighter, or line width; (d) ease comment correction and erasure; and (e) personalized interactions between instructor and learners. The "written" text can be saved to the learner's assignment, having been automatically converted to electronic text font. Using a tablet computer to provide feedback may increase efficiency and details in feedback. Instructors are able to make comments in the margins using a stylus and return the work to learners. Learners appreciate seeing exactly where the improvements can be made and see this as a "personal touch."

(c) Audio scribe pens are a combination of pen and audio technologies. They allow the user to write notes on paper and record audio at the same time. These files are imported into the computer and synchronized so that the audio is aligned with the text.

(d) Recording digital audio feedback provides a means for instructors to "say" what they would like regarding the assignment. The audio file is either attached to the electronic assignment or returned to the learner as an audio feedback file (Costello, 2009; Costello & Crane, 2009). Audio feedback's portability and ease requires minimal training for users. It allows for quick creation, downloading, and playing of files in multiple formats on numerous devices, which maybe listened to at the learner's convenience. Reportedly, being able to attune to instructors' nuances in messages also has a positive impact on learners' cognition and engagement (Oomen-Early, Bold, Wiginton, Gallien & Anderson, 2008). Audio feedback reportedly is preferred to text-based feedback as it facilitates conveyance of nuances while enabling retention and application of content. This method also helps depict instructors as positive influences for learners who felt more engaged, often replaying the audio, and felt that the instructor cared about them as individuals. They noted that learners

claimed to retain the information obtained in the audio feedback more than information received via text. Instructors reported shorter marking time while increasing the number of comments or suggestions provided; creating a win-win situation (Ice, Curtis, Phillips, & Wells, 2007). Brown Wessling (2013) reports that personalized audio feedback affords the grader to "speak writer to writer, reader to reader, and thinker to thinker" (n.p.).

(e) Digital video feedback affords multiple communication benefits not otherwise possible (Denton *et al*., 2008) such as body language, facial expressions, objects, demonstrations, etc. Increasing the teaching presence through video feedback was shown to have a positive impact on the learners (Parton, Crain-Dorough, & Hancock, 2010). A one-minute video may take upwards of 1MG of storage space, making video less portable than audio.

Digital video/audio lecture capturing that is synchronized with tablet computer presentations and activities provide an archived record of teaching effectiveness for assessment demonstration (Costello, 2009). According to the HEFCE 2010 report, learners believe that video or audio feedback is a more personal approach and provides more helpful detail than written feedback.

(f) Automated feedback is provided by the computer. When a learner completes a task, such as a drag and drop exercise or a multiple-choice question, the learner can be provided with immediate feedback. This may require some programming, but if carefully done, the program or code may be reused for other activities. Another advantage of these programmed exercises is that learners may repeat them multiple times. It is important when designing the automated feedback to allow learners a way to advance to the next stage.

According to Flatla *et al*. (2011), games that provide instant feedback with pleasant sounds, scores, quests, levels, etc. are motivational. For example, Sporcle's "*Can you name the elements of the periodic table?*" game, (http://www.sporcle.com/games/g/elements) where players are asked to list all the elements in 20 minutes motivates players to beat their best score. There are educational, motivational, and entertaining games for many topics which employ some form of automated or computer-generated feedback.

Another form of automated feedback is implicit feedback, or feedback provided as the result of an individual's action. For example, in a branching story or scenario, learners are presented with a mini case dilemma and options from which to choose to resolve the dilemma. Based on their response, they are provided with more information and options (Riedl & Young, 2006). This enables learners to see consequences for their choices.

(g) Personal response systems, or integrated student response keypads, (clickers) allow for real time whole class questioning and data collection and analysis (Costello & Crane, 2009). Clickers can be provided to learners with course packs, or in many cases, learners may use their handheld devices (smart phones or itouch) to submit responses. Immediate feedback enables learners to see both the correct response to instructor's questions and compare their own responses to that of the rest of the class. This gives learners a good indication of their own learning and an indication to the instructor of how the class is progressing.

The above technologies are suitable for different feedback methods. Some technologies are more suitable for certain methods. Table 2 outlines a summary of these relationships that allow instructors to make informed decisions about the use of various methods for feedback. As instructors better recognize technologies' affordances, they may be able to employ them in more innovative ways.

Conclusion

Learner-centered feedback is an important component of the learning process. Therefore, anything that instructors can do to increase the impact of feedback in a positive, efficient manner is worth doing. Technology and planning may reduce the time and energy required. Initially, some methods

Table 2: Technologies Suitable for Feedback Methods

Feedback Methods	Technologies						
	(a) word processors	(b) pen technology (tablet)	(c) audio scribe pen	(d) digital audio	(e) digital video	(f) automated	(g) personal response systems (clickers)
automated tutors						✓	
peer feedback	✓	✓	✓	✓	✓		✓
auto-scoring						✓	
reflective networks	✓	✓	✓	✓	✓		
written comments	✓	✓	✓			✓	
oral comments				✓	✓		
meta-verbal				✓	✓	✓	
emoticons	✓				✓	✓	
self-checks						✓	✓
ePortfolio	✓	✓	✓	✓	✓		

may require additional time, but once an instructor is comfortable, time may be saved. Friesen (2009) suggests "*learning* something about these technologies, about their educational contextualization" (p. 39) so as to employ them best.

Feedback and assessment are intricately related. The feedback discussed here has been in response to assessment and is not discipline dependent. Feedback is not just the comments on a written assignment, or the grade on a test, but also includes the class discussions, questions, and many of the interactions within the class group. Many strategies and technologies may be used in creating and disseminating this feedback. E-feedback increases teaching presence while decreasing social distance. Technology can mediate human relationships, affording a sense of presence, cognizance, and connection (Oomen-Early *et al*., 2008). Russell said: "[g]ood assessment is the right of all our students" (HEFCE, 2010, p. 7); taking this a step further: quality feedback is the right of all learners.

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