

# Technology- Enabled Feedback in the First Year:

A Synthesis of the Literature



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# Introduction

Feedback is one of the most powerful influences on learning and achievement.

*(Hattie and Timperley 2007: 81)*

Improving student transition into Higher Education (HE) has been identified as a key priority for Irish Universities and Institutes of Technology (IoT) (DES 2011, Denny 2015, HEA 2015). Effective feedback can play a critical role in both supporting transitions and in improving retention, due to its potential in relation to fostering student motivation, confidence, and success in the first year (Tinto 2005, Poulos and Mahony 2008, Nicol 2009, Kift 2015). Numerous recent reports and publications have highlighted the potential affordances of technology in relation to supporting feedback practices (Nicol 2009, Jisc 2009, Gilbert, Whitelock and Gale 2011, Hepplestone *et al.* 2011, Ferrell 2014, Jones and Kelly 2014, Jisc 2015).

With reference to the Republic of Ireland, the recent National Forum for the Enhancement of Teaching and Learning publication *Building Digital Capacity in Higher Education* has highlighted that “technology can enable quicker, more customised, more diverse and more inclusive routes to connecting and interacting with students when it comes to giving feedback and conducting assessment” (NFETL 2014: 18).

This publication synthesises contemporary thinking in relation to enhancing feedback practices in HE, with a particular emphasis on the affordances that technology may offer in supporting effective approaches in the context of the first year of study. The document is one of the outputs of the *Supporting Transition: Enhancing Feedback in First Year Using Digital Technologies* (Y1Feedback) project (<http://y1feedback.ie/>).

The Y1Feedback project is funded by Ireland's National Forum for the Enhancement of Teaching and Learning, and aims to identify technology-enabled feedback approaches that might be particularly useful in supporting students in their first year of study.

The current publication will be of interest to those involved in supporting and promoting learning and teaching in HE, both in the Republic of Ireland and elsewhere, including educational developers; learning technologists; academic teaching staff; senior academic managers and leaders; and student representatives.

## Report Overview

The report is organised as follows:

- **Section one** situates the context for the recent growth in interest in feedback in HE, both within and beyond the Republic of Ireland.
- **Section two** presents a synopsis of recent literature in relation to feedback in HE.
- **Section three** reviews the particular importance of feedback in supporting student success and retention in the first year of study, and in scaffolding students towards becoming self-regulating learners.
- **Section four** outlines features of effective feedback in first year and presents some suggested feedback approaches.
- **Section five** explores the affordances that technology might offer in relation to supporting feedback provision.



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# Section One: Context and Challenges

The need to better support student transition into Irish HE has recently been foregrounded by the Higher Education Strategy Group: *Ireland's National Strategy for Higher Education to 2030* (DES 2011); by the Higher Education Authority (HEA): *Supporting a Better Transition from Second Level to Higher Education: Implementation and Next Steps* (HEA 2015); and by the National Forum for the Enhancement of Teaching and Learning: *Transition from Second level and Further Education to Higher Education* (Denny 2015).

**Higher Education institutions should prepare first-year students better for their learning experience, so that they can engage with it more successfully.**  
(DES 2011: 18)

It is well established that the provision of timely and useful feedback has significant potential to support and improve student learning (Hounsell 2003, Hattie and Timperley 2007, Sadler 2010, Carless *et al.* 2011, Merry *et al.* 2013). Moreover, specifically in the context of supporting transition, effective feedback can play a pivotal role in fostering student motivation, confidence, and success in the first year, as well as in improving retention rates (Tinto 2005, Poulos and Mahony 2008, Nicol 2009, Kift 2015).

### **Timely and effective feedback can:**

- **correct errors, and close the gap between current and desired performance;**
- **identify strengths and weaknesses;**
- **build student confidence and motivation; and**
- **foster self-regulated learning.**

(Hounsell 2003, Hattie and Timperley 2007, Sadler 2010, Carless *et al.* 2011, Merry *et al.* 2013)

Yet there would appear to be a disconnect between the potential of feedback, and feedback in practice. The 2014 *Irish Survey of Student Engagement* (ISSE 2014), found that nationally, 23.3% of first year undergraduate students never, and 44.9% only sometimes, received timely written or oral feedback on academic performance. Similar viewpoints are reflected in a study commissioned by the National Forum for the Enhancement of Teaching and Learning into students' experiences of the transition from Secondary and Further Education into HE (Denny 2015). In 2015 the Y1Feedback project team explored feedback practices in four Irish Higher Education Institutions (HEIs): Maynooth University, Athlone Institute of Technology, Dundalk Institute of Technology, and Dublin City University.

Across the four HEIs, first-year class representatives indicated that while students place significant value on feedback, and recognise its importance for future learning, they are dissatisfied with what they perceive to be deficiencies in the timeliness, consistency, clarity, and usefulness of the feedback that they receive (Y1Feedback 2016). Indeed, such problematic student experiences of feedback are not unique to Irish HE, and have been mirrored in research studies and national surveys elsewhere (Carless 2006, James, Krause and Jennings 2010, Price *et al.* 2010, Radloff and Coates 2010, HEFCE. 2014, Jessop, El Hakim and Gibbs 2014, HEFCE 2015, Mulliner and Tucker 2015).

**“It really, really varies, like there’s some modules that they do it fair and consistently and [...] the feedback is given weekly. And some of them we don’t get feedback at all.”**

Student Participant, *Feedback in First Year: A Landscape Snapshot Across Four Irish Higher Education Institutions* (Y1Feedback 2016)

The Y1Feedback review of student experiences of feedback was complemented by a cross-institutional staff survey. In contrast with student perspectives, staff respondents across the four institutions indicated that students *are* being provided with prompt, high-quality feedback (generally within two weeks), and express frustration that students frequently do not engage with, or act on, feedback, with some highlighting that many students do not even collect their feedback. Although teaching staff consider that many students tend to focus solely on their grades at the expense of engagement with the feedback provided, the findings of the Y1Feedback study by contrast indicate that students place significant value on both grades and feedback (Y1Feedback 2016). Again, these sentiments are not particular to the Irish HE sector, and have been widely reported elsewhere (See for example Carless 2006, Nicol 2010, Price *et al.* 2010, Deepwell and Benfield 2013, Mulliner and Tucker 2015).

**“From my experience, the biggest barrier I face is getting students to look for and engage with feedback, particularly on an individual basis.”**

Staff respondent, Feedback in First Year: A Landscape Snapshot Across Four Irish Higher Education Institutions (Y1Feedback 2016)

**“Main issue for me is that students don’t seem to implement suggestions in future assessment. Seem only concerned with grade.”**

Staff respondent, Feedback in First Year: A Landscape Snapshot Across Four Irish Higher Education Institutions (Y1Feedback 2016)

A number of political, contextual, and practical challenges have contributed to the gap between the rhetoric and the reality of feedback as experienced by students and staff in Irish HEIs. These include:

- the massification of Irish HE against the backdrop of austerity;
- the limiting impacts of modularisation on the timing and frequency of feedback, and on the capacity for students to apply feedback; and
- the multiple –yet potentially conflicting– purposes of assessment.



## Feedback in the Context of Mass HE and Constrained Resources

Like many HE systems worldwide, the Irish context is one of “constrained resources” (HEA 2014b: 4). Irish HEIs have recently experienced significant cuts in their public funding, while simultaneously absorbing a growing, and increasingly diverse, intake of students. Between 2008 and 2014 the Irish HE system accommodated 25,000 extra student places; yet during the same period core expenditure per student reduced by 15%, while staff numbers reduced by 2000 (HEA 2014a). This extra capacity has typically been accommodated via larger teaching workloads and growing class sizes: in comparison with the OECD norm of 1:16, the staff-student ratio in Irish HEIs increased from 1:15 in 2007 to 1:19.5 in 2014, and is projected to rise to 1:20 in 2016 (HEA 2014a). The current climate presents significant challenges in relation to feedback provision. Production of feedback can be a labour-intensive process, and as studies elsewhere have highlighted, resource constraints can detrimentally impact the frequency, timeliness, and quality of feedback provision (Carless, Joughin and Liu 2006, Ackerman and Gross 2010, Nicol 2010). Furthermore, although formal data on the precise composition of Ireland’s academic workforce is not readily available, anecdotal evidence points towards the growing casualisation of the academic profession, with part-time staff, postgraduate students, and graduate teaching assistants increasingly

responsible for much undergraduate teaching in Irish HEIs (Coughlan 2015). The increasing casualisation of the academic workforce presents a further challenge in the context of feedback provision, since adjunct staff tend to be less experienced in, and may also be less invested in, the provision of high quality feedback, than tenured staff (Gibbs 2015).

## Modularisation and Semesterisation

Nearly all Irish Universities and IoTs have introduced modularised and semesterised programme structures (DES 2011). While potentially generating flexibility and choice in relation to student participation (Morris 2000, Hughes and Tan 2012), modularisation presents several challenges to the provision of timely and useful feedback, and in particular can restrict the potential for feedback to act as *feedforward*.

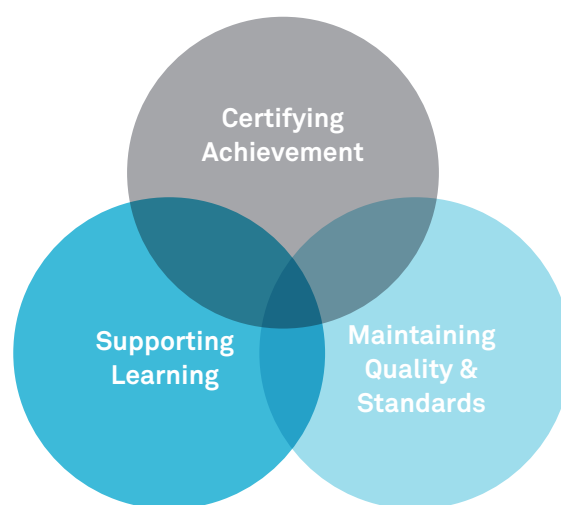
**While feedback focuses on current performance (and may simply justify the grade awarded), feedforward looks ahead to the next assignment. Feedforward offers constructive guidance on how to improve. A combination of feedback and feedforward ensures that assessment has an effective developmental impact on learning.** (Ferrell and Gray 2015: paragraph 8)

First, modularisation tends to increase the volume of summative assessment at short intervals, and to reduce formative feedback opportunities (Yorke 2001, Knight and Yorke 2003, Bloxham 2015). Second, the self-contained nature of modular assessments can narrow student and teacher focus towards individual modules, limiting possibilities for feedback to feedforward into parallel or subsequent modules (Hughes, Smith and Creese 2015). Third, modularisation frequently leads to the ‘bunching’ of examinations and assessment deadlines towards the end of semesters (Carless, Joughin and Liu 2006, Irons 2007, Deepwell and Benfield 2013). As well as discouraging students from spreading their learning efforts throughout the semester, and thus potentially leading to student overload at the end of term, a further detrimental impact of assessment bunching is that students often do not receive feedback until after the module is over. In this context students are unlikely to be motivated to (or at least may find it difficult to) apply feedback received in one module to subsequent pieces of work, further limiting the potential of feedback to act as feedforward (Carless, Joughin and Liu 2006, Irons 2007, Deepwell and Benfield 2013, Gibbs 2015). The aforementioned issues may be exacerbated where teaching staff across a programme or school have differing perspectives and priorities in relation to assessment and feedback (Price *et al.* 2010).

## Conflicting Purposes of Assessment

Discussion in relation to feedback in HE tends to be framed with reference to assessment (Boud and Molloy 2013, O’Donovan, Rust and Price 2015). However assessment in HE typically serves three – potentially conflicting– purposes. First, assessment is employed in order to *Certify achievement*, that is to evaluate the extent to which a student has met the intended learning outcomes of a particular assignment, module, or programme of study, by comparing performance against an established benchmark or set of standards. Second, assessment can play a key role in *Supporting student learning*, both through participation in, or preparation for, the assessment task, and via any feedback that a student receives. Finally, assessment is also employed as a means for *Maintaining quality and standards* (Boud 2014, Carless 2015) (See Figure 1).

**Figure 1:**  
**The Multiple Purposes of Assessment**





Assessment tasks in HE are frequently charged with simultaneously fulfilling all three of the aforesaid purposes (Ramsden 2003, Carless, Joughin and Liu 2006, Boud 2014). For example, students may be required to submit an essay that counts towards their final grade for a module, thus both certifying achievement and contributing to the maintenance of quality and standards. Participating in the production of the essay is also expected to support the students' learning, as is any feedback that they may receive on their work. The multiple purposes of assessment can pose challenges to the provision of timely and useful feedback however. Teaching staff may place more or less emphasis on the various purposes of assessment, depending on their own conceptions and personal experiences of teaching, learning, and assessment, as well as their departmental and institutional context (Bailey and Garner 2010, Carless 2015). Furthermore, and as has already been highlighted, the timing of assessment feedback may present difficulties in relation to the usefulness and usability of feedback.

For certification and quality assurance purposes assessment is typically located towards the end of a module or programme, since it involves summing up a student's achievement at a particular point in time. Yet in order to foster learning, assessment –or at least any feedback on the same– needs to take place at an earlier stage (Boud 2014, Carless 2015).

Finally, although information about the extent to which a student has met certain criteria may provide evidence of how they have performed, it does not necessarily provide information about the gap between current performance and desired performance, or indeed about how to bridge that gap (Boud 2014). While a number of authors have proposed that carefully-designed *learning-orientated assessment*, or *assessment for learning* can successfully fulfil all three of the aforementioned purposes of assessment (Sambell 2011, Boud 2014, Carless 2015), teaching staff may find it difficult to achieve such a balance in practice (Bailey and Garner 2010, Li and De Luca 2014).

# Section Two: Contemporary Perspectives

This section presents a synopsis of current thinking on feedback in HE, as summarised in *Figure 2*. Feedback has traditionally been conceived of as originating from the teacher, and primarily comprising written commentary on end of module, and in most cases graded, assignments (Nicol 2010, Carless 2013). More contemporary perspectives however consider feedback not only as it relates to assessment, but also highlight the importance of cultivating feedback in settings beyond the formal evaluation of learning (Boud and Associates 2010, Carless *et al.* 2011, McArthur and Huxham 2013, Sambell 2013, Hounsell 2015, Sambell 2015). Recent research also calls for a reconceptualisation of feedback that goes beyond the transmission of information from teacher to student, and instead frames feedback as a dialogic process that ultimately supports learners to become self-regulating (Hounsell 2007, Sadler 2010, Nicol 2010, Carless *et*

*al.* 2011, Price *et al.* 2013). The reframing of feedback as dialogue means that the teacher is no longer the sole provider of feedback. Instead, a student's peers, and ultimately his or her self, become important additional feedback sources (Yang and Carless 2013, Nicol, Thomson and Breslin 2014). Contemporary perspectives also point to the affordances that technology might generate in supporting provision of feedback that goes beyond written commentary (Carless 2015).

**Self-regulated learning refers to learning that occurs largely from the influence of students' self-generated thoughts, feelings, strategies, and behaviours, which are oriented toward the attainment of goals.**  
(Schunk and Zimmerman 1998: viii)

Traditional feedback	Contemporary feedback
Primarily associated with graded assessment	Occurs in a range of formal and informal learning settings
Originates with the teacher	Originates from teachers, peers, and ultimately the self
Occurs at the end of a period of learning	Ongoing and integral to learning activities
One-way transmission of information	Dialogic
Focused on the current task	Feeds forward to future tasks
Written commentary	Multiple auditory and visual formats

**Figure 2: Traditional vs. Contemporary Perspectives on Feedback**

## Models of Good Feedback Practice

Several sets of guiding principles and conceptual frameworks pertaining to effective feedback practices in HE have been proposed over the last decade or so. These include: Gibbs and Simpson's (2004) *Conditions Under Which Assessment Supports Students' Learning* (7 of the 10 conditions are concerned with feedback); Nicol and MacFarlane-Dick's (2006) *Seven Principles of Good Feedback Practice* (which derive from the idea that feedback should scaffold students' self-regulatory abilities), latterly extended and incorporated into the Re-engineering Assessment Practices (REAP) project's *Twelve Principles of Formative Assessment and Feedback* (REAP 2007) (which focuses on the re-design and embedding of technology-enabled assessment practices within large first year cohorts); The *Dialogic Feedback Cycle* (Beaumont, O'Doherty and Shannon 2008); the Assessment Standards Knowledge

exchange's (ASKe) publication *Feedback: an Agenda for Change* (ASKe 2009); the Australian Learning and Teaching Council's *Seven Propositions for Assessment Reform in Higher Education* (much of which is concerned with feedback) (Boud and Associates 2010); Yang and Carless's (2013) *Feedback Triangle* and their *Features of Effective Feedback*; Evans' (2013) six *Principles of Effective Feedback Practice* (which are derived from her thematic analysis of 460 assessment and feedback articles published between 2000 and 2012); and the recommendations of the ASKe *What Makes Good Feedback Good?* project (ASKe 2015). As was highlighted earlier, students have repeatedly raised concerns about the perceived inadequacies of feedback. To that end the UK's National Union of Students (NUS) have published *Ten Principles for Feedback* (2008) and a *Charter on Assessment and Feedback* (2010).

## **Good feedback practice:**

- 1. Helps clarify what good performance is (goals, criteria, expected standards);**
- 2. Facilitates the development of self-assessment (reflection) in learning;**
- 3. Delivers high quality information to students about their learning;**
- 4. Encourages teacher and peer dialogue around learning;**
- 5. Encourages positive motivational beliefs and self-esteem;**
- 6. Provides opportunities to close the gap between current and desired performance;**
- 7. Provides information to teachers that can be used to help shape the teaching.**

Nicol and MacFarlane-Dick (2006)

## **Features of effective feedback:**

- 1. Stimulating student engagement with disciplinary problems through dialogic feedback;**
- 2. Developing student self-regulation through inducting students to the multiple purposes of feedback and their active role in generating, processing and using feedback;**
- 3. Nurturing collaborative and mutually trusting teacher student and peer relationships;**
- 4. Showing sensitivity to students' emotional responses and psychological needs;**
- 5. Being flexible in the provision, timing, forms and sequencing of feedback, to facilitate student uptake;**
- 6. Mobilising disciplinary and non-disciplinary resources for feedback provision, especially new technologies.**

Yang and Carless (2013)

While they vary in their scope and presentation, there is much congruence between the aforementioned frameworks and principles. As well as highlighting the need to attend to practical and procedural issues such as format, timing, clarity, and consistency, recent work has particularly emphasised that feedback should:

- take place in formal and informal learning settings *beyond assessment*;
- *feedforward* to future work; and
- be a *dialogic* process that ultimately supports learners to become *self-regulating*.

## Beyond Assessment Feedback

Until relatively recently, feedback was primarily conceptualised as an adjunct to assessment (McArthur *et al.* 2011, Boud and Molloy 2013, McArthur and Huxham 2013, Hounsell 2015, O'Donovan, Rust and Price 2015). Indeed, formative assessment is often the main locus for much of the feedback received by students in HE, and it is well established that feedback is potentially the most powerful element in enabling learning from an assessment task (Sadler 2013, O'Donovan, Rust and Price 2015). Notwithstanding the ongoing importance of assessment feedback, much contemporary discussion is underpinned by a broader conception of feedback as “all dialogue to support learning in both formal and informal situations” (Askew and Lodge 2000: 1). This more general definition recognises that feedback frequently occurs, and indeed should be supported to take place, in formal and informal learning settings beyond the context of

graded assessment (Boud and Associates 2010, Carless *et al.* 2011, McArthur and Huxham 2013, Sambell 2013, Hounsell 2015, Sambell 2015). Examples of such informal feedback in practice include everyday peer-to-peer discussions about a lecture, or an assigned task; in-class discussion and activities; or participation in a group project (Laurillard 2002, Sambell 2015).

### **Formative assessment**

provides feedback on a learner's current performance. As such, it typically takes place during a module or course, rather than at the end. Formative assessment may or may not be used for grading purposes.

### **Summative assessment**

is an assessment undertaken at the end of a programme of learning, and is typically used to make judgements about a student's overall performance in relation to the stated learning objectives of the module or course.

**Everyday learning activities as well as special tasks and tests provide opportunities for the provision of feedback.**

(Boud and Associates 2010: 2)

## Feedback and Feedforward

Contemporary approaches emphasise the importance of providing students with opportunities for both *feedback* and *feedforward*. In general, feedback is focused on *current performance* and is typically employed in order to justify the grade awarded. Feedforward looks beyond the context of the current piece of work towards future assessments, modules, and courses, and provides guidance on how to improve *future performance* (Evans 2013, Walker 2013, Ferrell and Gray 2015). Examples of feedforward in practice include multi-stage assignments comprised of two or more related stages interleaved with feedforward comments, or via programme level strategies that encourage feedforward between modules.

## From Feedback as Transmission Towards Feedback as Dialogue

Contemporary thinking proposes that we move away from the prevailing behaviourist and cognitivist discourses of feedback as a product (Nicol 2010), towards a socio-constructivist model of learning that views feedback as *dialogue* (Nicol 2010, Beaumont, O’Doherty and Shannon 2011, Carless *et al.* 2011, Boud and Molloy 2013, Merry *et al.* 2013, Carless 2015). For Carless (2015: 196) “dialogic feedback involves iterative processes in which interpretations are shared, meanings negotiated and expectations clarified in order to promote student uptake of feedback”. Dialogic feedback can be encouraged in the first year by fostering opportunities for student-teacher and peer-to-peer dialogue about, for example, a piece of work in progress, or issues pertaining to quality and standards.

## Behaviourism, Cognitivism, and Social Constructivism

### Behaviourist pedagogy

aims to promote and measure observable changes in behaviour. It considers learning to be a behaviour that demonstrates acquisition of knowledge or skills.

### Cognitivist pedagogy

focuses on the thought processes behind behaviour. It emphasises the need to make knowledge meaningful by encouraging learners to not only acquire, but also to relate to, and to reorganise, information.

### Social constructivist pedagogy

claims that knowledge is mutually constructed and emphasises the social contexts of learning.



**Dialogic feedback involves iterative processes in which interpretations are shared, meanings negotiated and expectations clarified in order to promote student uptake of feedback.**

(Carless 2015: 196)

The framing of feedback as dialogue contrasts with the traditional portrayal of feedback as a “one-way flow of information from a knowledgeable person to a less knowledgeable person” (Boud and Molloy 2013: 7). The predominance of this uni-directional, and teacher-driven perspective can be partly attributed to the tendency for feedback to be largely conceived of as written commentary on end of module, and in most cases graded, assignments (Nicol 2010, Carless 2013). Indeed, this perception of feedback as a “delivered message” (Nicol 2010: 503) is reflected in the findings of the Y1Feedback study *Feedback in First Year: A Landscape Snapshot*. Teaching staff across the four partner institutions repeatedly refer to *giving* feedback, while students persistently refer to *getting* feedback (Y1Feedback 2016). Yet the framing of feedback as one-way transmission of “hopefully useful” information from teacher to student is at odds with recent research on learning and cognition (Boud and Molloy 2013: 25). In the same way that students do not necessarily learn by passively absorbing information conveyed to them, mere transmission of feedback does not automatically lead to learning, or to changes in behaviour. In order for feedback

information to become meaningful and productive students need to decode it, to internalise it, and then to compare with their own work in order to determine how to make future improvements (Nicol 2010, Sadler 2010, Carless 2015).

**Information only becomes feedback when it is used productively.**

(Carless 2015: 192)

Dialogic feedback transcends simple conversation or exchange of ideas (Carless 2013, McArthur and Huxham 2013). Thus, as McArthur and Huxham (2013) highlight, verbal exchanges are not always dialogical, while written feedback is not necessarily monological. For example a student and a teacher may engage in a face-to-face discussion about a piece of work, but dialogic feedback has only occurred if that discussion leads the student to re-evaluate the work on the basis of the conversation.

**Educational dialogue is more than conversation or exchange of ideas. In essence it involves a respectful relationship, in which the participants (teacher and students) think and reason together.**

(Gravett and Petersen 2002: 282)

The recasting of feedback as dialogue is consistent with research that emphasises the need to promote and support student engagement with feedback (Price *et al.* 2010, Handley, Price and Millar 2011). In this context feedback becomes “a two-way process that involves coordinated teacher-student and peer-to-peer interaction as well as active learner engagement” (Nicol 2010: 503). Furthermore, rather than being viewed as a once-off-event, feedback becomes “a complex system that needs to permeate the curriculum, rather than an activity that appears within it from time to time” (Boud and Molloy 2013: 25).

## Towards Sustainable Feedback and Self-regulation

The reconceptualisation of feedback as dialogue means that the teacher is no longer the sole provider of feedback. Instead, a student’s peers, and ultimately his or her self, become important additional feedback sources (Liu and Carless 2006, Carless 2015). This dialogue with the self is fundamental to what is referred to in much of the contemporary literature as *sustainable feedback*. In this context sustainability refers to the idea that students should ultimately become capable of critically evaluating and monitoring their work independently of the teacher, that is, they should become *self-regulating* (Zimmerman 2002, Hounsell 2007, Sadler 2010, Carless 2013, Carless 2015, Ajjawi and Boud 2015).

**Self-regulation of learning involves the selective use of specific processes that must be personally adapted to each learning task.**

**The component skills include:**

- **setting specific proximal goals for oneself;**
- **adopting powerful strategies for attaining the goals;**
- **monitoring one’s performance selectively for signs of progress;**
- **restructuring one’s physical and social context to make it compatible with one’s goals;**
- **managing one’s time use efficiently;**
- **self-evaluating one’s methods;**
- **attributing causation to results; and**
- **adapting future methods.**

(Zimmerman 2002: 66)

**[Sustainable feedback is] active participation in dialogic activities in which students generate and use feedback from peers, self or others as part of an ongoing process of developing capacities as autonomous self-regulating learners.**

(Carless 2013: 113)

The concept of sustainable feedback has its roots in Boud's (2000) idea of *sustainable assessment*, and proposes that assessment tasks should meet both immediate learning and grading needs, while supporting students beyond the task at hand towards becoming lifelong learners. For Carless (2013: 113) then, "our work as educators is sustainable when students have learnt with us, and are able to continue learning without us".

**Sustainable assessment encompasses the knowledge, skills and predispositions required to underpin lifelong learning activities. If assessment tasks within courses at any level act to undermine lifelong learning, then they cannot be regarded as making a contribution to sustainable assessment.**

(Boud 2000: 151)

Contemporary thinking highlights the need for a reconceptualisation of feedback practices in HE. Whereas feedback has traditionally been portrayed as a one-way, and often once-off event that is shackled to assessment, recent research proposes that feedback should instead be a dialogic, and ultimately sustainable process that occurs both within and beyond the context of assessment, and that empowers students to become self-regulating lifelong learners. Further to this, there are a number of issues particularly relevant to feedback in the context of the first year of undergraduate study: these are the focus of the next section.



# Section Three:

# Feedback

# and First year

It is well established that the initial transition to college or university can be difficult for many students (Tinto 1988, Yorke and Longden 2004, Thomas 2012, Kift 2015). A recent study commissioned by the National Forum for the Enhancement of Teaching and Learning explored students' experiences of the transition to HE, and found that time management was the most significant challenge for students. This was followed by difficulties associated with the increased focus on written assessments, along with challenges derived from the shift from rote learning towards critical thinking and independent research (Denny 2015). This section first reviews the importance of feedback in relation to the first year of undergraduate study. Effective feedback can play a critical role in both supporting transitions and in improving retention, due to its potential in relation to promoting *competence, motivation, and a sense of*

*belonging*. It is also necessary to scaffold the development of students' *assessment and feedback literacies* as they adjust to the challenges of learning in HE. In addition, technology-supported feedback provision can play an important role in supporting the development of students' *digital literacies*.

## Competence, Motivation, and Belonging

Ryan and Deci (2000: 61) point out that “feeling competent” is essential to fostering students' intrinsic motivation. Timely and focused feedback can play an important role in this regard, by highlighting what students have done well, and identifying areas for improvement (Zepke 2013).

**Timely and focused feedback builds competence in first year students when it tells them what they have done well and where they have to improve.**

(Zepke 2013: 6)

The final report of the *What works? Facilitating an Effective Transition into Higher Education* programme presents a synthesis of seven studies on transition across 22 UK universities. The report stresses that developing a strong sense of belonging is central to student retention, and proposes that this can be achieved by fostering

supportive peer relations; supporting meaningful interaction between staff and students; developing knowledge, confidence, and identity; and through provision of a HE experience that is relevant to students' interests and future goals (Thomas 2012). Along similar lines, the *Transition Pedagogy* framework (Kift, Nelson and Clarke 2010, 2015) focuses on a foundational first year curriculum that scaffolds and mediates the first year learning experience and fosters belonging. Well-designed feedback has significant potential to promote a student's sense of belonging and success, particularly where it incorporates a dialogic approach that includes peer to peer interactions (Bird and Yucel 2015).



## Assessment and Feedback Literacies

Supporting the development of students' assessment and feedback literacies as they adjust to the challenges of learning at college or university is also crucial to student success and retention (Thomas 2012, Zepke 2013, Bird and Yucel 2015). As was discussed in *Section one*, students persistently express dissatisfaction in relation to what they perceive as deficiencies in the timeliness, consistency, clarity, and usefulness of feedback. Studies have also indicated that students often struggle to make sense of, and to apply feedback. For example, this may be because they do not understand it (Sadler 2010); because they do not have an opportunity to apply it (Carless, Joughin and Liu 2006, Irons 2007, Price *et al.* 2010, Deepwell and Benfield 2013, Gibbs 2015); or because they do not recognise when feedback is being provided (O'Donovan, Rust and Price 2015, Sambell 2015). Students can also find it difficult to grapple with the feedback that they receive at college or university because it can be quite different to the highly personalised feedback that they have become accustomed to within the secondary school system (Hyland 2011, Bird and Yucel 2015). Furthermore, a lack of preparedness for, or an absence of understanding of, the type of learning required in HE can be a barrier to success in the first year, particularly if there is a disparity between students' expectations and their lived experiences (Pike and Kuh 2005, Fitzgibbon and Prior 2006, Schrader and Brown 2008).

**Students who have a clear understanding about the assessment process and expectations have higher confidence levels and are less likely to think about leaving early.**

(Thomas 2012: 36)

## Digital Literacies

Further to the above, mediating feedback through the use of digital technologies may also support the development of the digital literacies deemed to be an essential 21st Century graduate attribute (Hager and Holland 2007, Killen 2015, All Aboard! 2015, NFETL 2015).

# Section Four: Features of Effective Feedback in First Year

Contemporary thinking highlights that feedback should: take place in formal and informal learning settings *beyond assessment*; *feedforward* to future work; and be a *dialogic* process that ultimately supports learners to become *self-regulating*. Furthermore, in the context of the first year, fostering *competence*, *motivation*, and a *sense of belonging* is key to student success and retention. It is also essential to scaffold the development of students' *assessment*

*and feedback literacies* as they adjust to the challenges of learning at university or college. Moreover, technology-supported feedback provision can also play an important role in supporting the development of students' *digital literacies*. Based on a synthesis of the literature on feedback and transitions, we have identified eight features of effective feedback in the first year. These features are suggested as a starting point for considering feedback processes for first year.

## Features of effective feedback in first-year:



- promotes feedback both within and beyond assessed work;
- supports the embedding of student assessment and feedback literacies;
- fosters student competence, motivation, and belonging;
- provides opportunities for dialogic feedback among teachers and peers;
- feeds forward to future work;
- supports the development of digital literacies;
- employs consistent and co-ordinated approaches to feedback across programmes of study; and
- fosters sustainable feedback practices that encourage self-regulated learning.

The remainder of this section demonstrates how these principles can be implemented in practice. A number of specific strategies are discussed including:

- Informal feedback
- Peer feedback
- Marking guides, rubrics and exemplars
- In class dialogue and feedback
- Separating grades and feedback
- Feedforward strategies
- Generic feedback
- Anticipatory feedback
- Programmatic approaches

## Informal Feedback

Contemporary understanding expands the definition of feedback beyond assessment feedback into dialogue that occurs in informal learning contexts. Informal feedback forms part of students' ongoing engagement with various aspects of student life. It can take place in a range of settings, and can originate from a variety of sources, and can occur either organically, or can be fostered by the teacher. Examples include peer-to-peer discussions about a lecture, or an assigned task; in-class discussion and activities; or participation in a group project (Laurillard 2002, Sambell 2015).



**Students can learn a considerable amount from informal feedback which they derive from active and ongoing participation in everyday tasks and activities as they study their courses. Informal feedback can emanate from a range of sources and methods and does not depend solely on conventional lecturer-to-student feedback. It thrives, for example, in lecture halls and classrooms where teaching and learning methods engage students and teachers in meaningful and interactive discussions, tasks and activities.**

(Sambell 2015: 1)

This broader conception of feedback may present some challenges to be addressed in relation to assessment and feedback literacies in the first year. Many students have come to expect that all learning tasks that they engage with will be graded (Boud 2014). Expectations in relation to participation and engagement may therefore need to be clarified at the outset, and reinforced frequently. Furthermore, students do not always recognise such informal interactions as a source of feedback, therefore information about how, when, and where feedback will be provided during the course of a module may need to be made explicit (O'Donovan, Rust and Price 2015, Sambell 2015).

By definition, dialogic feedback approaches necessitate interaction and discussion between students, their teachers, and their peers. Such informal dialogue is common in practical learning environments, for example laboratories and some tutorial-based classes. In such contexts students typically work together in pairs or in groups, or work individually in close proximity to each other on similar tasks, and tend to both seek out immediate feedback from tutors or demonstrators, and to provide and receive peer feedback (Sambell 2015). In contrast, the large lecture-based classes that characterise first-year teaching in Ireland (Denny 2015) and elsewhere (Prosser and Trigwell 2014) are not typically considered to be conducive to active engagement, dialogue, or feedback. However, as the following sections will demonstrate, if appropriate structures and support are implemented, then informal feedback opportunities that foster dialogue, and that promote student confidence, motivation, belonging, and self-regulation can be cultivated in large classes (Sambell 2011, O'Donovan, Rust and Price 2015).

## Peer Feedback

Peer feedback involves students reviewing and providing constructive feedback on each other's work, and is integral to many of the approaches discussed in the sections that follow. The extensive literature on the use of peer assessment and feedback in HE spans from the 1970s to the present day (See for

example Boud 1979, Boud and Holmes 1981, Falchikov 1995, Falchikov 2004, Liu and Carless 2006, Nicol, Thomson and Breslin 2014). Peer assessment and feedback may offer a number of potential benefits for student learning and motivation, particularly in relation to the development of self-regulation (Figure 3).

**Figure 3:**  
**Potential benefits of peer assessment and feedback**

### Potential benefits of peer assessment and feedback:

- Students are exposed to a greater quantity and variety of timely feedback (Carless, Joughin and Liu 2006, Nicol, Thomson and Breslin 2014).
- Feedback provided by peers may be more accessible and understandable than that provided by teachers (Falchikov 2004).
- Both constructing and receiving peer feedback can support and improve learning (Falchikov 2001, Falchikov 2004, Cho and MacArthur 2011, Nicol, Thomson and Breslin 2014).
- Extends learning from the private and individual domain to the public domain (Liu and Carless 2006).
- Closes the gap between the receipt of feedback and its application (Nicol, Thomson and Breslin 2014).
- Engages students with issues in relation to quality and standards, thus scaffolding the transition towards self-regulation (Falchikov 2004, Liu and Carless 2006, Nicol and Macfarlane-Dick 2006, Nicol, Thomson and Breslin 2014).
- Can foster the development of learning networks in the first year (Bird and Yucel 2015).

Despite their potential benefits, peer assessment and feedback approaches have been associated with complications, particularly in relation to the reliability and perceived expertise of student graders; the potential disruption of power relations between teachers, students, and peers; and the time-consuming nature of peer assessment and feedback for both students and teachers (Liu and Carless 2006). Indeed, resistance to peer assessment, from both staff and students, is a persistent theme across the literature (Liu and Carless 2006, Biggs and Tang 2007, Cartney 2010, Kaufman and Schunn 2011, Mohideen and Karunaratne 2015). Low levels of awareness and use of peer feedback, as well as staff and student apprehension towards peer feedback are also evident in the *Y1Feedback review of feedback practices* (Y1Feedback 2016). Liu and Carless (2006:280) contend that the aforementioned difficulties derive from an emphasis on assessment and grading at the expense of feedback. They point out that *peer feedback* is “primarily about rich detailed comments but without formal grades” whereas *peer assessment* “denotes grading (irrespective of whether comments are also included)”. They go on to argue that the emphasis should therefore be on peer feedback as an end to itself, or as a precursor to peer assessment that involves the allocation of grades. This perspective is echoed by Falchikov (2004), one of the most prominent writers on peer assessment, and has also more recently been promoted by Nicol *et al.* (2014).

## Marking Guides, Rubrics, and Exemplars

Embedding assessment and feedback literacies is essential to supporting students as they adjust to the challenges of learning at college or university (Hattie and Timperley 2007, Poulos and Mahony 2008, Thomas 2012, Zepke 2013).

**Assessment dialogues can help students to clarify ‘the rules of the game’, the assumptions known to lecturers but less transparent to students.**

(Carless 2006: 24)

Marking guides and rubrics can help students to understand the expectations and standards associated both with a particular assessment, and with their subject discipline in general (Panadero and Jonsson 2013, Carless 2015). They can also promote transparency, consistency, and efficiency in provision of feedback (Reddy and Andrade 2010, Carless 2015). Beginning students can find such written descriptions of assessment criteria and standards difficult to comprehend however (O’Donovan, Price and Rust 2004, Carless 2006, Panadero and Jonsson 2013). Class and peer-to-peer discussions focused around the review of examples of student work, has been proposed as one way to support students to engage with criteria and standards (Hendry and Anderson 2013,

Carless 2015, O'Donovan, Rust and Price 2015). Modelling the application of feedback, that is demonstrating how feedback on a previously marked assignment was later utilised to improve a subsequent piece of work, can also support the development of assessment and feedback literacies (Price *et al.* 2010, O'Donovan, Rust and Price 2015).

## In-class Dialogue and Feedback

Many first-year students can feel uncomfortable contributing to the 'bear pit' of a large class (McArthur *et al.* 2011). Approaches such as the muddiest point (Angelo and Cross 1993) and boot grit feedback (McArthur *et al.* 2011, Hounsell 2015) have been proposed as less intimidating ways to encourage discussion and feedback both within, and beyond, the classroom, and thus may be particularly useful in the context of the first year. Such approaches are typically implemented during a lecture or class. Students are asked to identify areas that they would like clarification or guidance on, which they confidentially submit to the teacher either on paper, or electronically (for example via Classroom Response Systems (CRS) or their mobile device, see *Section five*). Feedback can then be provided immediately (for example by way of a class discussion), or soon thereafter (for example via an online discussion forum, or through a screencast or podcast). As well as going some way to addressing barriers to dialogue and feedback in the context of large classes, by fostering provision of timely feedback these approaches

can serve to address problems or questions that could adversely impact on learning if left unresolved (Goldstein 2007, McArthur *et al.* 2011, Tang 2013, Wang *et al.* 2013).

## Separating Grades and Feedback

**The grade is the prism through which feedback is read.**

(Sutton 2012: 34)

Grades and feedback are typically simultaneously issued to students (Gibbs 2015). However several authors have argued that grades can obscure, or act as a distraction from feedback, with students tending to focus on their grade at the expense of engaging with any feedback provided (Carless 2002, Sutton and Gill 2010, Gibbs 2015). A number of recent studies have explored the technology-enabled adaptive release of grades. In this approach feedback is provided in advance of grades. Grades can then be automatically released after a specific time has elapsed, or students can be required to submit a reflection on their feedback in order to allow their grade to be released to them. Such approaches can encourage student engagement with feedback, and have been demonstrated to increase the perceived value of feedback by students (Hepplestone *et al.* 2010, Irwin *et al.* 2013, Jackson and Marks 2015).

## Feedforward Strategies

Feedback on student work tends to be provided after the final assessment has been submitted, with the result that feedback is often received too late to encourage student engagement with, or application of the feedback (Beaumont, O'Doherty and Shannon 2011, Vardi 2013, Hounsell 2015).

Ensuring that links between assessment tasks are explicit is essential to supporting feedforward between assessment tasks (Price *et al.* 2010). A number of strategies for promoting feedforward can be employed, including flipping feedback, multi-stage assignments, and linked assignments.

### Feedforward strategies

- **Flipping feedback:** teacher or peer feedback is provided in-task, rather than at the end of a task.
- **Multi-stage assignments:** an assignment comprises two or more related stages interleaved with feedforward comments.
- **Linked assignments:** two or more assignments are designed such that each piece of work builds on the next.

### Flipping feedback

One way to promote feedforward is by 'flipping' the emphasis of feedback, that is, by focusing the majority of the feedback that a student receives on a pre-submission plan, outline, or draft of their work, or on a subset of a larger work in progress, rather than on the 'finished product' (McArthur *et al.* 2011, Carless 2015, Hounsell 2015, O'Donovan, Rust and Price 2015). Shifting the locus of feedback from end of task to in-task means that feedback becomes "prospective rather than retrospective" (Hounsell 2015: 2).

It can therefore be an effective way to promote engagement with feedback, as well as generating an opportunity for students to utilise it (Price *et al.* 2012, Carless 2015, O'Donovan, Rust and Price 2015). Students do not always avail of the opportunity for feedback on drafts however (Fisher, Cavanagh and Bowles 2011, McArthur *et al.* 2011). Thus this approach tends to be most successful where students are required to submit an initial draft of their work and to redraft it in light of the feedback provided in order to pass the task (Price *et al.* 2012).

Peer feedback can be incorporated into this approach, for example where students verbally present a summary of their work to date to the class, or where peers provide feedback on written drafts (Carless 2015, Hounsell 2015). Flipping feedback also allows for the possibility to build in opportunities for students to specify what kind of feedback they wish to receive, or to allow students to pose specific questions about their work (Bloxham and Campbell 2010). It is important to point out that flipping feedback should not be more labour intensive than traditional approaches: it simply shifts the timing in provision of feedback from the end of the task to during the task. Feedback on the final submission might constitute grade only, or could be provided as generic whole class feedback (see the next section). A variation to this approach is where detailed feedback only is provided on earlier pieces of work, with later pieces of work being awarded a grade only (Tan and Munro 2012). Flipping feedback is likely to be particularly useful in the context of the first year, and might be reduced or withdrawn in later years (Carless 2015).



## Multistage Assignments

In a similar vein, facilitating feedforward between pieces of work within a module can support engagement with feedback (Carless 2015, O'Donovan, Rust and Price 2015). In the multi-stage assignment approach, the assessment for a module comprises two or more related stages interleaved with feedforward comments (Carless *et al.* 2011, Hounsell 2015).

## Linked Assignments

In this approach two or more assignments within a module are designed such that each piece of work builds on the next (Vardi 2013). In such approaches feedforward can be further promoted by explicitly requiring that students demonstrate how they have incorporated feedback on an earlier assignment into a subsequent piece of work (O'Donovan, Rust and Price 2015, Hounsell 2015). As will be discussed later, this approach can be extended into a programmatic feedback strategy.

## Generic Feedback

Provision of generic, whole-class feedback on draft work in progress can be an effective way to provide timely feedback, particularly in the context of large classes. In very large classes feedback can be provided on a sample of the whole cohort's work.

This approach can be more effective than individualised feedback that comes too late for students to engage with or apply (Gibbs 2015, O'Donovan, Rust and Price 2015). As Gibbs (2015: 1) points out, while generic feedback could be regarded as “quick and dirty”, it can nevertheless “work much better than slow and perfect feedback as it has to be fast enough that students are still interested”. Generic feedback can also reduce repetition in the provision of individual feedback, by dealing with recurring issues such as grammar and referencing (Hounsell 2015).

## Anticipatory Feedback

End of semester examinations continue to play a major role in the assessment of student learning in Irish Universities and IoTs (Y1Feedback 2016). With the exception of approaches such as post-examination consultation days, in many programmes the mark or grade that students receive is the only indication provided to them as to how they have performed in an examination. Provision of generic whole class feedback on the approaches taken by students on a paper (as detailed above), is one way that feedback on examinations might be provided. Another method is to provide ‘anticipatory feedback on an examination, by facilitating class and peer discussion around how past papers were, and could, be tackled (Carless 2007, Hounsell 2007). This approach has potential to enable students to identify gaps between their current level of performance and the required level. However, as Carless (2010:

41), points out, “in order to become more than ‘examination tips’ this kind of anticipatory feedback needs to engage students in developing learning capabilities, mastering material and self-monitoring performance”.

## Programmatic Approaches

There has recently been a growth in interest in programmatic assessment strategies. Specific approaches include synoptic assessments, capstone modules, and integrative projects, and student portfolios; these are typically implemented at the end of a study year, or at the culmination of a programme (Hartley and Whitfield 2012). Such strategies are inclined to be primarily concerned with assessing programme learning outcomes, and while they are certainly useful as mechanisms for promoting coherence and synergy across programmes, they have not tended to place sufficient emphasis on feedback. Programme-wide approaches to feedback could complement programme assessment strategies by promoting feedforward between assessment tasks across a programme, thus potentially mitigating some of the negative impacts of modularisation (Boud and Molloy 2013, Russell, Bygate and Barefoot 2013, Hughes, Smith and Creese 2015, Carless 2015, O'Donovan, Rust and Price 2015). While a number of ways in which programmatic approaches to feedback might be actualised have been proposed, there is scant evidence of the implementation of such approaches in practice. Both Gibbs (2015) and Jessop *et al.*

(2014) point to the need for programme teams to work together to develop a shared culture in relation to issues such as consistency and timing of feedback. The development of such a collegial culture might be supported

via programme team discussions around feedback criteria; marking workshops; mentoring structures for new staff; and by promoting greater visibility of feedback (Jessop, El Hakim and Gibbs 2014).

## Synoptic assessments, Capstone modules, and Integrative projects

- **A synoptic assessment** combines assessment of the learning outcomes for two or more modules of undergraduate study into a single piece of work.
- **A capstone module** typically brings together all the various elements of the learning throughout the programme.
- **Integrative projects** are project based assessments that can help students to synthesise learning across a programme.

Mapping assessment patterns across the modules in a programme can identify bunching of assessments, and can allow opportunities for cross-module feedforward to be identified (Russell, Bygate and Barefoot 2013, Jessop, El Hakim and Gibbs 2014). Feedforward can be difficult to develop, however, since it requires assessors to have knowledge both about the modules that will be studied next, and about how they will be assessed. Hughes *et al.* (2015) therefore propose that feed forward should be articulated in terms of the programme-level learning outcomes that students are ultimately working towards.

Another mechanism for supporting provision of useful feedback and for promoting feedforward might be to employ a targeted approach to feedback provision in assessments across core modules, with each module providing detailed feedback on a specific focus. For example the assessment feedback in one module might provide detailed feedback on writing style, another might provide feedback on argument construction, while another might focus its emphasis on citing and referencing.



# Section Five: Feedback and Technology

The potential affordances of technology in relation to supporting feedback practices have been highlighted in various recent reports and publications (Nicol 2009, Jisc 2009, Gilbert, Whitelock and Gale 2011, Hepplestone *et al.* 2011, Ferrell 2014, Jones and Kelly 2014, Jisc 2015). Perhaps the most comprehensive work conducted concerning the deployment of digital technologies in

relation to assessment and feedback is the *Jisc Assessment and Feedback programme*. The programme ran from 2011 to 2013 and focused on supporting large-scale changes in assessment and feedback practice, supported by technology, with the aim of enhancing the learning and teaching process and delivering efficiencies and quality improvements.

## Key Jisc Assessment and Feedback Publications

- Effective Assessment in a Digital Age: A Guide to Technology- Enhanced Assessment and Feedback (Jisc 2009) (<http://goo.gl/SMYtsV>).
- Assessment and Feedback Practice with Technology: From Tinkering to Transformation (Ferrell 2013) (<http://goo.gl/6UCPu5>).
- A view of the Assessment and Feedback Landscape: Baseline Analysis of Policy and Practice from the JISC Assessment & Feedback Programme (Ferrell 2012) (<http://goo.gl/7okErn>).
- Electronic Management of Assessment (EMA): A Landscape Review (Ferrell 2014) ([http://repository.jisc.ac.uk/5599/1/EMA\\_REPORT.pdf](http://repository.jisc.ac.uk/5599/1/EMA_REPORT.pdf)).

## Key projects

- **REAP: Re-engineering Assessment Practices in Higher Education** (<http://www.reap.ac.uk/>) was funded by the Scottish Funding Council. The project piloted the redesign of formative assessment and feedback practices in large-enrolment first-year modules, and developed strategies for embedding new thinking about assessment into institutional policies and quality enhancement processes across the University of Strathclyde (lead), the University of Glasgow, and Glasgow Caledonian University.
- **e-AFFECT: e-Assessment and Feedback for Effective Course Transformation** (<http://goo.gl/ZX99eD>) aimed to transform staff and student experiences of assessment and feedback across Queen's University Belfast through the effective use of technology.
- **interACT: Interactive Assessment and Collaboration via Technology** (<http://goo.gl/bKnmFH>) aimed to strengthen feedback dialogue in a postgraduate online distance learning programme in Medical Education at the Centre for Medical Education at the University of Dundee.
- **FASTECH: Feedback and Assessment for Students with Technology** (<http://goo.gl/3Y7PUD>) worked within 15 undergraduate degree programmes at Bath Spa University and the University of Winchester to address assessment and feedback challenges using technology.



## Technology-Supported Feedback: Key Affordances and Benefits

Technology-based provision of feedback may generate a number of key affordances, including: support for the provision of a greater volume of timely feedback; improved student understanding of, and engagement with, feedback; greater variety in feedback formats and approaches; support for dialogic feedback opportunities; and greater flexibility and accessibility in relation to feedback access and use.

### More Feedback, Faster

Technology-supported feedback approaches may have potential to enable provision of a greater volume of timely feedback to the large classes that characterise first year groups (Gilbert, Whitelock and Gale 2011, Ferrell 2014, Jones and Kelly 2014). The administrative workload associated with the collection of student work and return of feedback on the same can be significantly streamlined via the use of an institutional VLE such as Moodle or Blackboard (Gilbert, Whitelock and Gale 2011, Carless 2015, Jisc 2015). In addition, technology-enabled feedback tools such as online rubrics and banks of predetermined tutor comments have potential to reduce the 'unproductive' (Krieg, Sharp and Campbell 2004) manual work associated with feedback production and dissemination (Hepplestone *et al.* 2011, Jisc 2015).

### Technology-supported Feedback can:

- help to support provision of a greater volume of timely feedback;
- lead to improved student understanding of, and engagement with, feedback;
- support a greater variety in feedback formats and approaches;
- help to generate opportunities for dialogic feedback; and
- offer greater flexibility and accessibility in relation to feedback access and use.

Tools for the automated provision of feedback, such as online quizzes may generate particular affordances in relation to provision of a greater volume of timely feedback (Jones and Kelly 2014). Similarly, technologies such as Classroom Response systems (CRS) can be an effective way to provide immediate feedback to students in large class settings (Beatty 2004, Fredericksen and Ames 2009).

### **Improved Student Understanding of, and Engagement with, Feedback**

Technology may offer scope for increased understanding of, and engagement with, feedback. For example, as will be elaborated on later, audio and audio-visual formats may support students' comprehension of, and engagement with feedback (Jisc 2009), while CRS systems can support increased student engagement in relation to feedback, particularly with large groups. Technology-enabled adaptive release of grades and feedback can also encourage student engagement with feedback, and has been demonstrated to increase the perceived value of feedback by students (Hepplestone *et al.* 2010, Irwin *et al.* 2013, Jackson and Marks 2015).



### **Variety in Formats and Approaches**

The Y1 Feedback report *Feedback in First Year: A Landscape Snapshot* (Y1Feedback 2016) highlighted that across the four participating HEIs feedback is most commonly provided on paper, or orally. The use of technology can add greater variety to the provision of feedback, for example via the inclusion of audio and audio-visual feedback. Technology can also support provision of feedback from sources other than the teacher, for example via automated and peer feedback. In addition, technology can add “a dimension to the student experience [of assessment and feedback] that was not possible without technology” (Gilbert, Whitelock and Gale 2011: 23). For example, audio and audio-visual feedback may more accurately reflect the tutor's intended message than written feedback (Rotheram 2009, Hennessy and Forrester 2014) while screencasts can enrich feedback via the inclusion of visual elements (Haxton and McGarvey 2011, Marriott and Teoh 2012, Robinson, Loch and Croft 2015). In addition, technologies such as VLEs and e-portfolios can allow a longer term picture of learning to emerge and can generate opportunities for feedforward (Ferrell 2013).



### Opportunities for Dialogic Feedback

As discussed in *Section two* contemporary understanding sees dialogue as essential to effective and sustainable feedback practices. Technology can offer significant potential in this regard, for example via digital tools that support both formal and informal peer dialogue and review. Furthermore, as will be elaborated on later on, technology can be a useful mechanism for enabling both formal and informal peer dialogue and feedback, both within and outside the classroom setting (Gilbert, Whitelock and Gale 2011, Jones and Kelly 2014).

### Greater Flexibility and Accessibility of Feedback

Technologies such as VLES allow all of a students' feedback to be stored in one location, which may increase the likelihood of students revisiting it and applying it to future work (Hepplestone *et al.* 2011, Carless 2015, Jisc 2015). Such technologies also support students to access feedback at a time and location that is convenient to them (Jisc 2009, Parkin *et al.* 2012, Evans 2013, Ferrell 2014). Newer app-based tools such as myprogress (<http://www.myprogressapp.com>) can further enhance flexibility and accessibility by supporting provision of instantaneous feedback to students wherever they are, and thus may be particularly useful for students on placement.

The remainder of this section examines the particular affordances, benefits, and challenges associated with a number of technologies that may support feedback provision:

- Technology enabled written feedback
- Audio and audio-visual feedback
- Peer feedback technologies
- E-portfolios
- Automated feedback tools
- Classroom response systems
- Learning analytics

# Technology-enabled Written Feedback



Hand-written comments and annotations are perhaps the most familiar way of providing feedback on students' written work. In many cases, comments are written in the body of the work and in margins, with a more general commentary often provided at the end. One of the main impacts of the growing use of digital technologies in HE is a marked increase in the ways that teaching staff can provide written feedback to students (Jisc 2009, Ferrell 2013, Jisc 2015).

For example, word-processing software facilitates the typing of comments on a document and also includes review features such as track changes, comment bubbles, and notes (Crossouard and Pryor 2009). Similarly, tools such as the textbox, highlighter, comment box, and pen available in Portable Document Format (PDF) editors, can be used to provide feedback by annotating PDF files.

Hand-written comments may also be provided electronically via applications which allow one to add comments to a document on screen with a stylus (in the same way as might previously have been implemented on a paper-based document) (Plimmer and Mason 2006). Some applications can also convert such hand-written comments to digital text.

VLEs such as Moodle and Blackboard, as well as specialised systems such as Turnitin GradeMark, include the facility to create, reuse and adapt rubrics and marking guides.

## Focus on First Year: Technology-enabled Written Feedback on a Population Health Course



In a study involving students enrolled on a first-year Population Health course at the University of Auckland (n=335), Sopina and McNeill (2014) investigated the impact of paper-based versus electronic approaches to provision of written feedback on both student and teacher perceptions of the quality of feedback. Assignment one for the module was submitted on paper; feedback was then returned to the students by way of handwritten comments on their paper submission. Assignment two was submitted electronically via an e-submission drop box; in this case feedback comments were returned electronically, by way of typed annotations to the document.

Students indicated a significant preference for the electronic submission and return system: 91% of comments about the electronic submission of assignment two were positive compared to just 48% on the paper-based submission of assignment one. A recurring problem with assignment one was reading the markers' handwriting. Students appeared to be more satisfied with the annotated format of the feedback on assignment two, which "solved the issue of illegible handwriting" (p. 675).

Sopina, E. and McNeill, R. 2014. Investigating the Relationship between Quality, Format and Delivery of Feedback for Written Assignments in Higher Education. *Assessment & Evaluation in Higher Education*, 40(5), pp.666-680.

A further means of quickly providing written feedback at specific points in an assignment is to use frequently used comments from a comment bank. For example, Moodle marking guides, available through the Moodle Assignment activity, allow graders to create a bank of such comments. A similar facility is also available via the Blackboard VLE and in the QuickMark feature in Turnitin GradeMark. When providing feedback graders can either enter a new comment, choose a comment from standard comment banks, or create their own banks of comments. These comments can then be inserted at the appropriate position in the text of a piece of work. In addition, the Moodle assignment activity, Blackboard assessment, and Grademark all allow graders to provide a more general free text comment using a standard textbox.

## Potential Affordances and Benefits

Technology-enabled written feedback has potential to generate a number of practical and learning benefits for students and teaching staff, including: increasing the legibility, quality, and quantity of feedback; potential for time-saving; and improvements in relation to the accessibility and flexibility of feedback.

## Increased Legibility, Quality, and Quantity of Feedback

Provision of feedback via typed comments and comment banks address the issue of illegible handwriting, which is frequently mentioned in studies as a drawback (Carless 2006, Agius and Wilkinson 2014, Sopina and McNeill 2014). Agius and Wilkinson's (2014) literature review of students' and teachers' views of written feedback at undergraduate level highlights that students express a desire to receive feedback both via in-text annotations, and via general comment forms. They also value in-text comments which precisely identify aspects of their work that are in need of attention, while more general summary comments provide an overview of their performance and how it can be improved. The editing capabilities of software applications can facilitate teachers to develop their comments in greater detail and depth. In addition, students may perceive feedback in typed format to be more considered and thoughtful than handwritten feedback as tutors have the facility to edit and revise their feedback before dissemination (Parkin *et al.* 2012).





## Potential for Time-saving

Digital feedback approaches may save time for teachers once they are familiar with the requisite software. (Parkin *et al.* 2012). For example, in-text annotations and comments may allow for the provision of more feedback

in less time (Buckley and Cowap 2013, van der Hulst, van Boxel and Meeder 2014), while digital rubrics may also offer benefits in this regard (Anglin *et al.* 2008, Atkinson and Lim 2013).

### Focus on First Year: Turnitin Grademark with Psychology Students

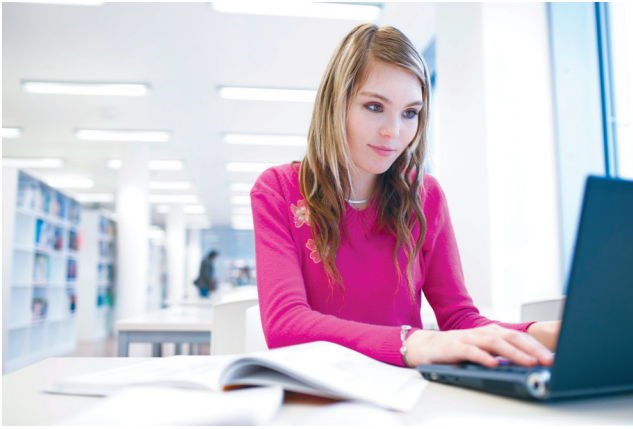


Buckley and Cowap (2013) evaluated the use of Turnitin Grademark with first year psychology students at Staffordshire University (n=160). Teachers indicated that the use of Grademark's QuickMark commenting feature made marking easier and quicker. Despite some initial technical issues with the software, they were generally positive about the benefits of using the tool.

Buckley, E. and Cowap, L. 2013. An Evaluation of the Use of Turnitin for Electronic Submission and Marking and as a Formative Feedback Tool from an Educator's Perspective. *British Journal of Educational Technology*, 44(4), pp.562-570.

van der Hulst *et al.* (2014) report on a study involving a team of twelve teachers who used GradeMark to provide online feedback to first-year psychology students at the VU University Amsterdam (n=500). Half of the teachers in the study found that use of the tool saved time, while both students and teachers perceived that the quality of the feedback was enhanced by the use of text annotations using QuickMark comments, combined with overall summary feedback.

van der Hulst, J., van Boxel, P. and Meeder, S. 2014. Digitalizing feedback: Reducing teachers' time investment while maintaining feedback quality. IN: Orngreen, R. and Tweddell Levinsen, K. (eds.) *Proceedings of the 13th European Conference on E-Learning, ECEL-2014*, Copenhagen, Denmark:pp.24 –250.



## Improved Feedback

### Accessibility and Flexibility

Digital feedback files can be made available to students via a VLE, meaning that the assignment and feedback are more easily accessed as they are in the same location. This can increase the timeliness of the feedback as students have immediate access and do not need to collect their feedback (Parkin *et al.* 2012, Carless 2015). Students appreciate the flexibility and convenience of having grades and feedback available online, and the facility to access them in private (Parkin *et al.* 2012, Sopina and McNeill 2014). Students also value the ongoing availability of online feedback, and report that this increases the likelihood of them revisiting it for future assignments (Parkin *et al.* 2012).

## Challenges

Notwithstanding the potential affordances and benefits of technology-enabled written feedback, there are some potential challenges that may need to be taken into account as part of an overall feedback strategy. For example, some students may not perceive digital feedback to be as personalised as handwritten feedback (Parkin *et al.* 2012, Tse, Christie and Rana 2014). Providing annotations and in-text comments may be more time-consuming initially (Buckley and Cowap 2013). In addition to making use of standard sets of frequently used comments, teachers may wish to create their own comment banks, which will involve an initial investment of time. However, although it will take time for teachers to become familiar with the software being used, it is possible that efficiencies may be gained over time with increased familiarity (Jones and Kelly 2014). In addition, extended periods of online marking can be tiring and can cause eye strain (Parkin *et al.* 2012).

# Audio and Audio-visual Feedback

Engaging the visual and auditory senses has been demonstrated to enhance student learning (Mayer and Moreno 2003). *Audio feedback* is a recording of aural feedback on student work, sometimes referred to as feedback podcasts. *Audio-visual feedback* incorporates both aural and visual elements, for example a video of a teacher communicating feedback to a student, or group of students, or a screencast that combines audio feedback with visual annotations to a student's work.

**A podcast is a digital media file that plays audio, is made available from a website and can be opened or downloaded from the website and played on a computer or another device.**

(Salmon 2008: 20)

**Screencasts typically include a video recording of the computer screen while the marker uses the cursor to point to examples, makes edits, highlights or annotates sections of the individual student's work while simultaneously audio recording the marker's voice as they talk about the student's work.**

(Henderson and Phillips 2014: 5)

## Potential Affordances and Benefits

Provision of feedback via audio, video, and screencasts has potential to generate a number of practical and pedagogical benefits for students and teaching staff. These include: supporting feedback comprehension and student engagement with feedback; provision of richer feedback; improvements in relation to access and flexibility; and potential for time saving.

## Focus on First Year: Audio Feedback on a Business Management and Information Course



Macgregor *et al.* (2011) used the Wimba Voice tool in conjunction with a VLE to deliver feedback ‘voicemails’ to students. To encourage dialogic feedback, students could record audio responses to their feedback via the system. The study participants (n=24) were drawn from a first-year cohort enrolled on a BA (Hons) Business Management and Information degree course at Liverpool John Moores University.

The authors report that audio feedback conforms to existing models of ‘quality’ formative feedback. They also found that it can be an efficient mechanism for provision of feedback.

Macgregor, G., Spiers, A. and Taylor, C. 2011. Exploratory evaluation of audio email technology in formative assessment feedback. *Research in Learning Technology*, 19(1).

### Improved Feedback Comprehension and Greater Student Engagement

Several studies have indicated that the personalised and conversational nature of audio and audio-visual feedback can support students’ comprehension of, and engagement with, feedback. Students are often frustrated or confused by cursory and oblique written feedback, or by unfamiliar academic terminology (Bailey and Garner 2010, Nicol 2010). The use of the tutor’s voice can help to convey meaning in a less formal, and more conversational way than written communication, and the use of tone, expression, and emphasis allows the nuance often lost in written feedback to be retained

and transmitted, thus supporting students to better understand, and engage with, feedback (Ice *et al.* 2007, Merry and Orsmond 2007, King, McGugan and Bunyan 2008, Middleton, Nortcliffe and Owens 2009, Rotheram 2009, Hennessy and Forrester 2014). Furthermore, a number of studies have shown that simply referring to students by name during feedback allows them to experience a greater personal connection to the tutor (Ice *et al.* 2007, Gould and Day 2013, Knauf 2015). Similar positive results have been reported in relation to the personalised and conversational nature of both video feedback (Parton, Crain-Dorough and Hancock 2010, Borup *et al.* 2014, Henderson and Phillips 2015), and

screencast feedback (Stannard 2008, Haxton and McGarvey 2011, Jones, Georghiades and Gunson 2012, Marriott and Teoh 2012, Ghosn-Chelala and Al-Chibani 2013, Robinson, Loch and Croft 2015). Feedback is often misunderstood by students in relation to the assessment criteria (Glover and Brown 2006). Screencast feedback in particular may enable this disconnect to be addressed (Stannard 2008, Haxton and McGarvey 2011, Marriott and Teoh 2012, Ghosn-Chelala and Al-Chibani 2013).

As was discussed in *Section one*, it is frequently reported that students do not collect traditional paper-based written feedback (Carless 2006, Lunt and Curran 2010, Y1Feedback 2016). Lunt and Curran (2010) utilised audio feedback with undergraduate students (n=60) and found that they were up to ten times more likely to download an audio file online than they were to collect written feedback in person. Similarly, a study by Harrison *et al.* (2015) reported that 95% (n=87) of students accessed their audio feedback following summative assessments, while 85% (n=112)

## Focus on First Year: Video Feedback on a Blended Distance Learning Course



Borup *et al.* (2014) investigated the use of video feedback in a blended distance learning course at Brigham Young University. Quantitative analysis for the study involved 190 first year students, while a qualitative analysis involved 22 students. Overall, the quantitative analysis found no significant difference between the perceptions of students who received video feedback and those who received written feedback, in terms of perceived teacher social presence. However qualitative analysis found that provision of video feedback enabled instructors to communicate emotions,

and to speak conversationally, which students felt created an increased sense of closeness to the instructor. It was hypothesised that the blended-learning nature of the distance course, where students could interact with instructors face-to-face, lessened the need to establish social presence.

Borup, J., West, R.E., Thomas, R. and Graham, C.R. 2014. Examining the impact of video feedback on instructor social presence in blended courses. *The International Review of Research in Open and Distributed Learning*, 15(3).

of the students involved in an evaluative study of audio feedback conducted by Carruthers *et al.* (2015) accessed their feedback. In Brearley and Cullen's (2012) study of third-year undergraduates students accessed their audio feedback on average three times.

### **Richer Feedback**

Various studies have reported that students perceive audio and audio-visual feedback to be of a better quality than written feedback. Merry and Orsmond (2008) for example, stated that students in their study perceived

audio feedback to be of higher quality because it helped them to better understand what tutors were trying to convey: "hearing [the tutors] speaking you could see where their thinking processes were, you could hear the thinking processes". Chalmers *et al.* (2014) conducted a comparative analysis between audio and written feedback with two groups of 30 first year science degree students. They concluded that the audio feedback was perceived by students to be much 'richer'. In Munro and Hollingworth's study (2014: 870) students involved in

## **Focus on First Year: Group Screencast Feedback with Chemistry Education Students**



Haxton and McGarvey (2011), in a study involving first year undergraduate Chemistry Education students at Keele University, created screencasts on model answers for a number of class tests. Students were also provided with written feedback on marked class test scripts, but the level of feedback offered on the marked scripts was limited to the key points and uncommon errors. Students were directed to the screencast model answer for further feedback. Students were asked to evaluate the screencast feedback in comparison with the written feedback provided.

Students indicated a preference for this mode compared to written feedback. The majority of the students reported that the screencast feedback was equal to or better than the written feedback in quality and quantity.

Haxton, K.J. and McGarvey, D.J. 2011. Screencasting as a means of providing timely, general feedback on assessment. *New Directions*, (7), pp.18-21.

practical examinations felt that audio feedback allowed them to be “verbally ‘walked through’ the assessment, and also reported that it facilitated a recall of the examination. Written feedback frequently focuses on mechanical aspects of the student’s work, such as spelling and grammar, and tends to place less emphasis on the quality of the work overall, or on feedback as feedforward (Duncan 2007). Audio and audio-visual feedback has potential to overcome these limitations. For example, Emery and Atkinson (2009) found that audio feedback was more likely to include suggestions as to how to improve student work, since such comments can be quicker and easier to narrate than to write down. The combination of both visual and auditory input may cater for a wider range of individual learning styles and preferences (Mayer and Moreno 2003) while screencasts may allow for the inclusion of demonstrations and resources that visually demonstrate how to improve future work (Jones, Georghiades and Gunson 2012).

### **Access and Flexibility**

The use of audio and audio-visual files can support students to access their feedback at a time and place of their choosing (Lunt and Curran 2010). Students can also pause and replay the feedback as necessary (Carr and Ly 2009, Haxton and McGarvey 2011, Jones, Georghiades and Gunson 2012). This ability to pause and repeat a podcast, video, or screencast may be particularly beneficial for students for whom English is a second language (Jones, Georghiades and Gunson

2012), or for students with a disability (Munro and McMullin 2009).

### **Potential for Time Saving**

It is generally agreed that giving feedback is time-consuming (Yang and Carless 2013). Audio and audio-visual feedback may offer potential for generating economies of scale in the context of provision of generic feedback to large groups (Cann 2007, Crook *et al.* 2012). In addition, studies have indicated that, in some cases, audio and audio-visual feedback may be an efficient way of providing individualised feedback. Voelkel and Mello (2014) compared audio and written feedback provided to undergraduate and postgraduate students in biological sciences. They noted that the average number of words in the audio feedback was 12 times greater than that which was included in the written feedback. Macgregor *et al.* (2011) in a study with a first-year cohort on an Business Management and Information degree course found that the production of audio feedback was twice as fast as for written feedback, while Ice *et al.* (2007) claimed that provision of audio feedback could save time by up to 75%. Not all of the studies reviewed report time-savings however. Knauf (2015: 6) reports a “moderate time saving for lecturers”, and points out that “the time spent may decrease as the procedure becomes more routine” and that “it may differ depending on the disciplinary culture (since dictation is more common in some disciplines than others)”. Rodway-Dyer *et al.* (2011: 229) reported that “From the tutor’s point of view [provision

of audio feedback] was certainly not time saving”. Reporting on the outcomes of the multi-institutional ‘Sounds Good Project’ Rotheram (2009: 2) provides a pragmatic viewpoint derived from experiences garnered from the use of audio feedback across four HEIs, and notes that audio feedback can save tutors time in the following circumstances: a) when “the assessor is comfortable with the technology”; b) if “the assessor writes or types slowly but records their speech quickly”; c) where “a substantial amount of feedback is given”; and d) if “a quick and easy method of delivering the audio file to the student is available”. Some studies have reported that production of screencast feedback takes a similar amount of time, and sometimes less time, than provision of written feedback (Stannard 2008, O’Malley 2011, Edwards, Dujardin and Williams 2012, Silva 2012). In relation to video feedback, Crook *et al.* (2012) reported that in general, preparation of a generic feedback video required a similar amount of time to other methods of generic feedback. McCarthy (2015) compared student and tutor experiences of perceptions of written, audio, and screencast feedback on summative assessment tasks. Audio feedback was found to be the least time-consuming to produce (15 minutes on average), followed by written feedback using rubrics (20 minutes). The most time-consuming was video feedback, taking on average 25 minutes to produce.

## Challenges

Notwithstanding the potential benefits of podcast, video, and screencast feedback, there are some practical and pedagogical challenges associated with these approaches that may need to be taken into account, including: students’ emotional responses to audio and audio-visual feedback; issues deriving from student difficulties in mapping audio-visual, and in particular audio, feedback to written work; differences in learning preferences and needs; and issues in relation to logistics and technology.

### Emotional Responses to Audio and Audio-visual Feedback

A number of studies have pointed to the need to consider the emotional impact of audio and audio-visual feedback. The students in Voelkel and Mello’s study (2014) reported that although it was not easy to read critical comments, this was considered less painful than having to listen to them. Frustration (at a poor attempt) or weariness (after correcting large numbers) may come across in a tutor’s tone of voice, and could be particularly demotivating (King, McGugan and Bunyan 2008). In their analysis of student perceptions of video feedback, Henderson and Phillips (2015) report that some students felt initial anxiety about seeing the assessor’s face while receiving feedback, particularly when they felt that they may be receiving negative feedback. Others described video-feedback



## Focus on First Year: Individual Screencast Feedback with Business and Event Management Students



Marriott and Teoh (2012) conducted a mixed method study with first year undergraduate Business and Event Management students at the University of Winchester. Screencast feedback was provided on the Business Profitability and Performance module where the students were assessed by means of a case study. Lecturers recorded their feedback annotations of the students' Word and Excel submissions via screencast software.

Students indicated a high preference for, and positive attitude towards, this mode of feedback. They also liked the clarity and instructional nature of the feedback.

Marriott, P. and Teoh, L.K. 2012. Using screencasts to enhance assessment feedback: Students' perceptions and preferences. *Accounting Education*, 21(6), pp.583-598.

as “confrontational” or “scary” in comparison with written feedback. Tutors should therefore be mindful of their tone of voice and facial expressions when providing feedback via audio or audio-visual means (King, McGugan and Bunyan 2008, Dixon 2015).

### Mapping Issues

A number of studies suggest that students can experience difficulties in relation to mapping an audio or video feedback commentary to the appropriate location in their written assignment (Ribchester, France and Wheeler 2007, Rodway-Dyer, Dunne and Newcombe 2009, Macgregor, Spiers and

Taylor 2011, Brearley and Cullen 2012). The fact that video cannot be “skimmed” in the same way that written feedback can was also cited as a limitation (Henderson and Phillips 2015: 57). Commenting on students' work in a linear fashion (Hennessy and Forrester 2014) may help students to relate feedback to their assessment. Instructing students to have their assessment in front of them while listening to the feedback may also be necessary. In addition, screencasting has significant potential to overcome these limitations, since students can see and hear exactly what is being commented on (Jones, Georghiades and Gunson 2012).



Particularly important in the context of dialogic feedback, many of the students in Knauf's (2015) study indicated that they would have liked to respond to their tutors, indicating a need to include an invitation for a follow-on dialogue. Indeed, this was the approach taken by Macgregor *et al.* (2011) who used the WimbaVoice software to support students and staff to engage in a "voicemail" feedback dialogue.

### **Diversity in Students' Learning**

#### **Preferences and Needs**

The affordances of audio and audio-visual feedback may not be the same for all learners, particularly for those who have hearing

impairments or who are visually impaired (Lunt and Curran 2010, McCarthy 2015). A student's learning style or preference may also impact on their preference for audio, audio-visual, or written feedback (Gould and Day 2013, Chalmers *et al.* 2014, Johnson and Cooke 2015). Best practice guidelines thus tend to stress the importance of providing an alternative format by default, or at least of offering students a choice of how they would like to receive feedback (Munro and McMullin 2009, Gould and Day 2013).

#### **Logistics and Technology**

Finding a quiet location to record the feedback was reported as a difficulty for some tutors, thus provision of audio feedback may

necessitate out of hours work (Hennessy and Forrester 2014). Additionally, in one study tutors reported that the inability to edit the audio files was a drawback (Munro and Hollingworth 2014). Staff in some of the studies reviewed were also concerned that their audio feedback could end up in the public domain (for example on Facebook or YouTube) (King, McGugan and Bunyan 2008, Gould and Day 2013).

From the student perspective, difficulty in accessing multimedia files has been reported as a considerable challenge for some (Merry and Orsmond 2008, Lunt and Curran 2010, Hennessy and Forrester 2014), particularly where these were emailed to students and were substantial in size. However studies where audio and audio-visual files were uploaded to a VLE were less likely to encounter problems relating to file size or access (Macgregor, Spiers and Taylor 2011, Jones, Georghades and Gunson 2012, Rockinson-Szapkiw 2012, Munro and Hollingworth 2014, Knauf 2015), suggesting that, where possible, this should be the preferred method of delivery for such feedback. Further technical difficulties reported include students not having access to headphones to listen to the feedback, or encountering problems opening the audio or audio-visual file due to incompatible software. These problems were serious enough to “negatively influence” some students’ opinions of receiving audio feedback (Hennessy and Forrester 2014: 781).

# Peer Feedback Technologies

Opportunities for peer feedback have increased considerably with the growth of new technologies, and a number of digital tools can now be used to help students provide both formal and informal formative feedback on each other's work. Importantly, consistent with contemporary principles of feedback, an emphasis on peer-to-peer formative feedback should be underpinned by the conception of feedback as constructive dialogue (Nicol, Thomson and Breslin 2014, Ajjawi and Boud 2015). This understanding of feedback means that learners should play an active role in both giving and receiving constructive and reflective criticism throughout the learning process.

## Potential Affordances and Benefits

As previously observed, the literature on peer feedback tends to be dominated by a focus on formal or structured peer feedback related to assessment. The most common implementation of peer feedback involves

students, usually single peers, using pre-specified criteria to assess their peers and assign marks or grades, often providing additional written feedback to that given by the tutor (Ashenafi 2015). This type of peer feedback can now be facilitated through the standard features of most VLEs. In addition, specialist peer marking and feedback tools such as *WebPA* from University of Loughborough (<http://webpa.ac.uk/>) and *PeerMark* from Turnitin (<http://turnitin.com/>), have been developed, which help with online collection and collation of peer marks in a confidential, secure environment. An expanded conception of peer-to-peer feedback, nevertheless, recognizes the affordances that new technology solutions offer to engage students in constructive dialogue in-task rather than just at the end of a task. While the VLE can also support in-task peer feedback through asynchronous discussion fora (Gikandi and Morrow 2015), platforms such as *PeerWise* (<https://peerwise.cs.auckland.ac.nz/>) and *TEAMMATES* (<https://teammatesv4.appspot.com/>) have been specifically designed to support production of student-generated content where multiple

## Focus on First Year: Turnitin PeerMark with Engineering Design Students



Nicol *et al.* (2014) report on the use of peer feedback with a first-year engineering design class at the University of Strathclyde (n=82). The study is one of the few reported in the literature that does not involve students marking or rating other students' work; instead the approach employed specifically focuses on peer review and feedback.

The peer review process was managed via the Turnitin PeerMark software, which guided students through the review activities. Students were required to participate in two peer reviews, for which the review criteria comprised four questions formulated by the teacher. Students were also required to review their own work according to the same criteria.

The majority of students (86%) said that their peer review experience was positive, while 76% reported that they would definitely elect to participate in a future peer review exercise.

The authors note that the positive experiences of students participating in the study are in contrast with the difficulties and negative attitudes to peer assessment more often reported in the literature. They note that “what most notably distinguishes this study from many others is that students were not asked to mark the work of peers when providing feedback comments.” (p.109)

Nicol, D., Thomson, A. and Breslin, C. 2014. Rethinking feedback practices in Higher Education: A peer review perspective. *Assessment & Evaluation in Higher Education*, 39(1), pp.102-122.

peers can develop, review, and provide constructive feedback related to formal learning experiences. They can also scaffold multi-stage assessment and support a more student-led, participatory learning approach

(Bottomley and Denny 2011). However, the role of technology in supporting informal peer feedback should not be overlooked. For example, many of today's social networking tools provide a reflective space which

complement traditional face-to-face learning experiences. While technology can provide new spaces for informal feedback, the key point is that the conception of digitally enabled peer feedback should not be limited to single peers providing feedback on formal end of assessment tasks.

The main benefits of digitally enabled peer feedback build on those already described in *Section four*. Peer feedback is linked to the development of self-regulation, which can be enhanced through dialogue and active collaboration with other learners (Nicol, Thomson and Breslin 2014). In this

## Focus on First Year: PeerWise with Introductory Physics Students



Peerwise (<https://peerwise.cs.auckland.ac.nz/>) is an online tool that can be used to support students in the creation, sharing, evaluation, and discussion of multiple choice questions. Bates *et al.* (2011) introduced a PeerWise assessment activity instead of weekly homework with students at University of Edinburgh for two consecutive semesters of introductory Physics (n=200 - 300). The authors found that the first year students liked and engaged with PeerWise beyond the minimum requirement, and noted that a significant correlation existed between the use of PeerWise and improved student learning. Using the student cohort as its own control through pre-course test data, the authors divided the student cohort into quartiles, and found that the mean exam score of students with 'High PeerWise Activity' was modestly

higher than students with 'Low PeerWise Activity' in end of semester examinations. In an end-of-course evaluation, students generally agreed that they particularly learned from writing their own questions, though opinions were mixed about the benefits of answering others' questions.

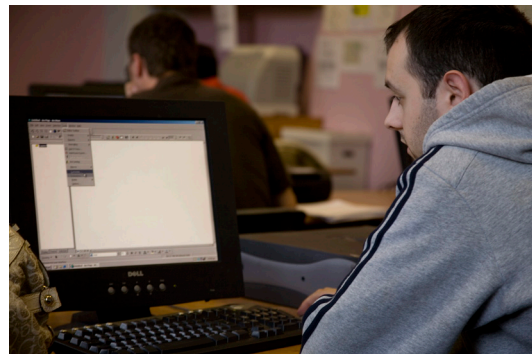
Bates, S.P., Galloway, R.K., McBride, K.L., Rebello, N.S., Engelhardt, P.V. and Singh, C. 2011. Student-generated content: Using PeerWise to enhance engagement and outcomes in introductory physics courses. IN: *American Institute of Physics (AIP) Conference Proceedings*, Vol. 1413, Issue 1. University of Edinburgh, pp.123-126.

respect, the abovementioned technology platforms, which have been specifically designed to facilitate multiple peer feedback, can help to shift formal feedback from the private individual domain to a more public collaborative space. An advantage of making peer feedback more public and accessible through web-based systems is that other students' responses and constructive criticisms may be more understandable to learners.

Notably, Cho and MacArthur (2010) found that students receiving feedback from multiple peers tend to perform complex revisions of their work and produce higher quality products. At the same time, the potential benefits extend to those producing feedback reviews for other students as the process can help to engage learners in reflections on their own work (Nicol, Thomson and Breslin 2014). Although there is limited evidence to support this claim in the specific context of technology, Hardy *et al.* (2014) report from a study of student-generated content in PeerWise a modest but statistically significant positive correlation between the level of students' activity and their examination performance. There is also evidence that active student involvement in peer-to-peer feedback using technology supports improved understanding of the feedback process as a whole (Ferrell 2013).

Other benefits include a reduction in teacher workload in providing assessment feedback (Jisc 2015), although this claim may reflect a more conventional transmission end of

task conception of peer feedback. Lastly, the administrative advantages of using technology to help manage multiple peer feedback should not be underestimated (Debus and Lawley). However, realizing these benefits depends to a large extent on how feedback is valued and embedded by teachers in the learning design as a space for dialogue.



## Challenges

The challenge of any digitally enabled peer feedback solution is to scale up beyond small pockets or islands of innovation to become fully implemented enterprise-wide systems. Many of the technology innovations for peer feedback reported in the literature have yet to achieve this status. Moreover, if students are to engage in peer feedback on a wider scale as a routine part of the learning process, then it must be both relevant and fit for purpose. This is where peer feedback on end of task formal assessment can suffer from a credibility challenge, as irrespective of technology, students' preconceptions of formal education involves learning from experts rather than peers (Jisc 2015).

## Focus on First Year: PeerWise with Chemistry Students



Galloway and Burns (2015) utilised PeerWise as a synoptic revision exercise with two consecutive first year chemistry student groups at the University of Nottingham (n=163, 182). Reviewing the student-generated questions using a revised Bloom's taxonomy demonstrated that, although circa 30% of the questions could be classified at the 'remembering' or 'understanding' levels of learning, approximately 40 - 45% could be classified as 'apply' or 'analyse', while the remaining 25 - 30% could be classified at the higher 'evaluate' and 'create' levels.

Making use of both student and expert reviews of question quality, it was found that 86% of the questions sampled over the two consecutive years were found to be 'high quality' in that they were "coherent, correct, require[d] more than a simple factual recall, and possess[ed] a valid solution along with reasonable distractors" (p.87).

Galloway, K.W. and Burns, S. 2015. Doing it for themselves: Students creating a high quality peer-learning environment. *Chemistry Education Research and Practice*, 16(1), pp.82-92.

A related problem is that students can be uncomfortable with both in-task and end of task peer feedback and do not always understand what is expected of them (Jisc 2015). The specificity of peer assessment criteria has been shown to affect the quality of peer feedback, with more specific criteria tending to provide more discriminative power to the assessment task but at the risk of diminishing the quality of peer feedback (Miller 2003, cited in O'Donovan, Rust and

Price 2015). This paradox raises arguably the greatest challenge facing the successful implementation of peer feedback, as despite the benefits claimed in the literature, many academic staff are unfamiliar with the conception of feedback as dialogue and more specifically "fear either student dissatisfaction, increased workload or both as a result of introducing peer review activities" (Jisc 2015: 44).

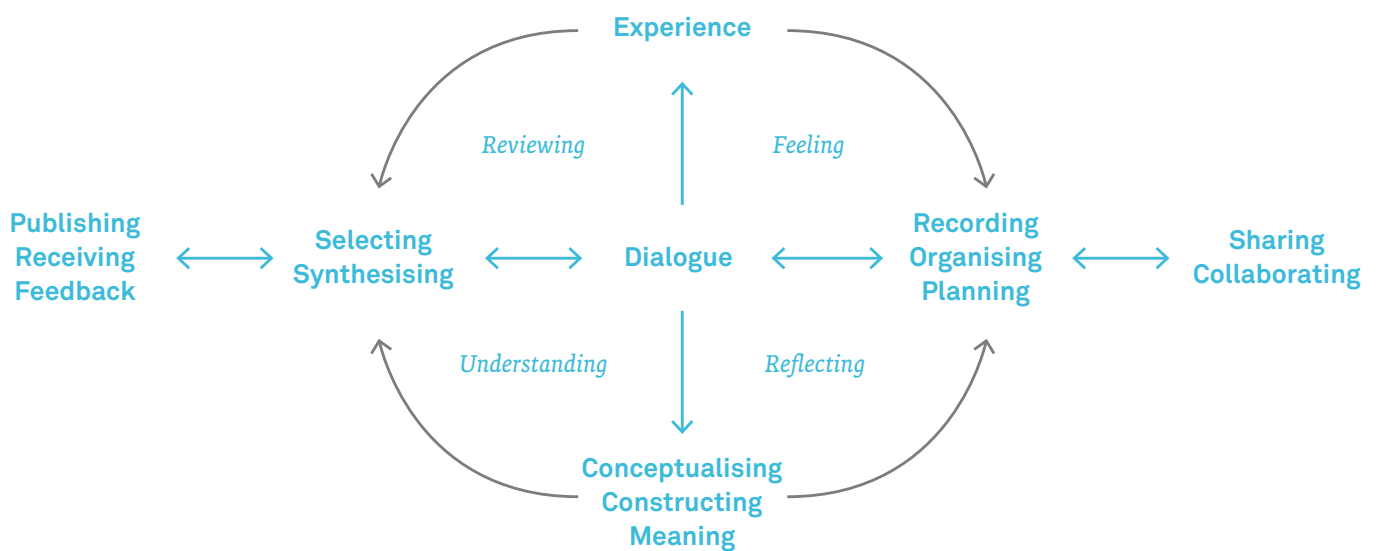


In many respects digitally enhanced peer feedback is still in its infancy. Although new technology opens up many new exciting possibilities for feedback as a form of dialogue, at this stage digitally enabled peer feedback tools are not widely used in practice and traditional conceptions of feedback appear to dominate thinking about the role of technology, with some notable exceptions mentioned on the previous pages. The ability to more widely implement specifically designed tools to enhance peer feedback, especially in-task multiple peer feedback from a dialogic perspective, requires further research on the affordances of specific technology solutions along with the ways that students' and teachers' beliefs mediate feedback practices within institutional cultures.

# E-portfolios

An e-portfolio is a student-created “collection of digital artefacts articulating experiences, achievements and learning” (Jisc 2008: 6). E-portfolios can be used in a variety of ways to document evidence of learning and to support student reflection and self-regulation. In its simplest form, an e-portfolio can provide students with a personal repository to store artefacts and reflections throughout their learning journey.

Additionally, it can be used to present evidence of learning to tutors or potential employers. Feedback is an essential element in the dialogic process of e-portfolio based learning, which encompasses continuous reflective learning, promoted and sustained by feedback (Jisc 2008) (See Figure 4).



**Figure 4:**  
**A Model of E-portfolio-based Learning, Based on Kolb's Experiential Learning Cycle (1984)**  
(Jisc 2008)

## Potential Affordances and Benefits

E-portfolios can offer a range of benefits in relation to feedback. These include their potentially dialogic function; their capacity to support student engagement with feedback; capabilities for mapping evidence of learning to graduate attributes; potential for supporting students to become reflective and self-regulating learners; and support for work-based learning.

## Dialogic Function

Creating an e-portfolio can be a collaborative process, with significant potential to support learner development through a dialogic approach, particularly where students receive feedback on a regular basis, either from their tutors, or from their peers. (Jisc 2008, Currant *et al.* 2010, Donnelly and O’Keeffe 2013).

### Focus on First Year: E-portfolios for Dialogic Feedback with Psychology, Midwifery, and Combined Studies Students



Currant *et al.* (2010) report on the use of e-portfolios with first year students of Psychology, Midwifery, and Combined Studies at the University of Bradford, who were provided with an e-portfolio to support transition toward learner autonomy. Tutor feedback was given via a weekly blog for students of Combined Studies, while students of Midwifery were supported with formative feedback throughout the module.

Student interviews indicated that learners found the e-portfolios to be a useful mechanism to capture and improve their learning.

Currant, N., Haigh, J., Higgison, C., Hughes, P., Rodway, P. and Whitfield, R. 2010. Designing eportfolio based learning activities to promote learner autonomy. Final report to the fourth cohort of the inter/national coalition for research into electronic portfolios. University of Bradford.

## Encouraging Student Engagement with Feedback

E-portfolios may have potential to foster student engagement with feedback. Peacock *et al.* (2011), in a study with students of Nursing, Physiotherapy, and Radiography at Queen Margaret University, examined whether e-portfolios, with their dual emphasis on the product and process of learning, could encourage deeper learner engagement with feedback. They report that some of the students used feedback provided through the e-portfolio as a springboard for reflection, and for planning their future development.

However they also note that learners needed to become active agents in the feedback process in order to successfully engage with the feedback.

## Mapping Evidence of Learning to Graduate Attributes

A number of HEIs have rolled out e-portfolios on an institute-wide basis. A potential affordance of the e-portfolio in this context is the ability for students to map their activities and achievements to the institution's graduate attributes. This approach tends to be most successful when the e-portfolio (and accompanying graduate attributes) are embedded into the curriculum (Jisc 2016, Simatele 2014).

### Focus on first-year: Using E-portfolios to Map Student Learning to Graduate Attributes



Faulkner *et al.* (2013) described an action research study in which e-portfolios were used with first year (n=185) Engineering students at the University of South Australia. Students were required to collect evidence of their work, and to map it to competencies from the professional body of Engineers Australia. They were also required to reflect on their group projects and on their interactions with industry.

In turn, this collection of evidence was mapped to graduate attributes. Students responded positively to the use of the e-portfolio, recognising the value of documenting the learning.

Faulkner, M., Mahfuzul Aziz, S., Waye, V. and Smith, E. 2013. Exploring ways that ePortfolios can support the progressive development of graduate qualities and professional competencies. *Higher Education Research & Development*, 32(6), pp.871-887.



### **Support for Reflective and Self-regulated Learning**

E-portfolios may offer particular benefits in relation to self-reflection and self-regulation. In a study with postgraduate students specialising in finance at Dublin Institute of Technology (DIT), Morales *et al.* (2015) explored whether e-portfolios could support self-regulated learning. They found that e-portfolios provided students with a creative space to integrate their own ideas, while facilitating a feedback dialogue between student and instructor.

### **Support for Work-based Learning**

The use of an e-portfolio can offer a number of benefits for learners completing a practicum or placement. An initiative led by Wolverhampton University demonstrated how Nursing and Midwifery students used e-portfolios to map their learning to professional competences while on clinical practice placements. In this example, the e-portfolio provided a link between the tutor, student, and workplace mentor, and showed evidence of students being more reflective in their practice (Jisc 2008).

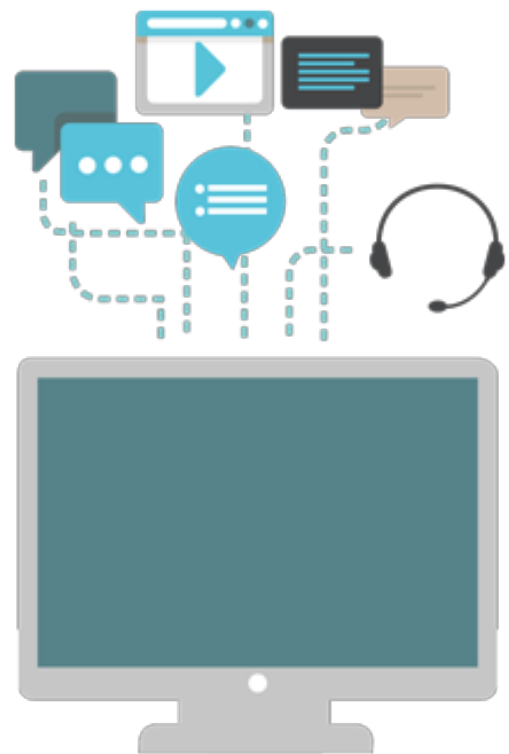
## **Challenges**

While they may offer many potential affordances and benefits, there are challenges associated with the use of e-portfolios. Several studies acknowledge the need to ensure that learners are clear about what is required of them in relation to the development of their e-portfolio (Currant *et al.* 2010, Jenson 2011, Welsh 2012, Faulkner *et al.* 2013). Additionally, the requisite ICT competence necessary to produce an e-portfolio cannot be assumed (Coffey and Ashford-Rowe 2014, Yastibas and Cepik 2015). Finally, if the e-portfolio is seen as “external to the core curriculum” (Simatele 2014: 873) then the uptake by students may not be as extensive compared to an embedded approach.

# Automated Feedback Tools

Online quizzes incorporating question formats such as multiple-choice, true/false, yes/no, matching, ranking, and fill-in-the blank are well established as a mechanism for both formative and summative assessment, as well as for the provision of automated feedback (Bull and Danson 2004, Gilbert, Whitelock and Gale 2011, Ferrell 2012). Until recently the feedback capabilities of such technologies was limited to the provision of feedback on predetermined responses, however applications have begun to emerge that can provide feedback on students' free text responses. For example Jordan and Mitchell (2009) have developed a natural language-based system that can provide tailored feedback on short-answer, free-text submissions. For longer pieces of work, tools such as OpenEssayist (<http://www.open.ac.uk/researchprojects/safesea>) and WriteLab (<https://www.writelab.com>) have recently been developed to provide students with automated feedback on longer pieces of text.

In a similar vein, tools such as Virtual Programming Lab (<http://vpl.dis.ulpgc.es>) and Web-CAT (<http://web-cat.org>) can be used to provide computing and engineering students with automated feedback on the quality of their programming code.



## Focus on First Year: Automated Quiz Feedback with a Large Class



As part of the REAP project (REAP 2007b), automated Multiple choice question (MCQ) online tests were introduced on a first year module, Principles of Marketing, delivered to students drawn from a variety of courses at the University of Strathclyde (n=520). During the module online MCQs were used for both formative feedback and summative testing.

Students were first offered the opportunity to take online MCQ tests generated via randomly-selected questions from a question bank. The tests could be taken on repeated occasions during a two week timeframe. Immediate feedback on performance was provided to students in order to allow them to pinpoint gaps in their knowledge and to take remedial action. Additional whole class feedback was subsequently provided during tutorials, where tutors and students discussed areas of weakness across the whole class based on the tutor's analysis of test scores.

Although only 55% of students availed of these formative feedback opportunities, 64.9% of participating students agreed that the tests helped them to understand class topics. Uptake of a mock MCQ test prior to the summative MCQ class test was much higher (90%) however, and this test was repeated more than three times by 44% of students. 97.7% of students agreed that the opportunity to repeat the mock test helped them to gain confidence in their knowledge, and 74.4% agreed that taking the mock test had improved their overall chances of success in the summative MCQ test.

REAP 2007b. University of Strathclyde principles of marketing case study report. Glasgow: Re-Engineering Assessment Practices (REAP) Evaluation Team.

## OpenEssayist: A Natural Language Analytics Feedback Tool

OpenEssayist is a natural language analytics tool developed by the Open University and the University of Oxford to provide students with automated feedback when drafting an essay. The system utilises a linguistic analysis engine to process the essay text, and a web application uses the output of this linguistic analysis to generate feedback.

Whitelock *et al.* (2015) outline the findings of an evaluation of the system with students enrolled on 'Openness and innovation in elearning', a module contributing to three postgraduate programs at the Open University (n=41).

The authors report a significant positive correlation between the number of essay drafts submitted to OpenEssayist and the grades awarded for the first essay. Students using the system also gained significantly higher overall grades than the those in the previous cohort, who did not have access to OpenEssayist.

Whitelock, D., Twiner, A., Richardson, J.T., Field, D. and Pulman, S. 2015. OpenEssayist: A supply and demand learning analytics tool for drafting academic essays. IN: *Proceedings of the Fifth International Conference on Learning Analytics and Knowledge.*, ACM, pp.208-212-212.

## Potential Affordances and Benefits

Well-constructed online quizzes and tests potentially offer a number of pedagogical and administrative benefits in relation to feedback provision. Once up and running, they can be an effective way to provide frequent, immediate, and tailored feedback to large

cohorts (Bull and Danson 2004, Jisc 2009). Online tests can afford greater flexibility to learners, since they can be accessed at a time and location of the student's choosing (Nicol 2007, Jisc 2009). They can also provide opportunities for self-regulation: since feedback is immediate learners can rapidly identify, and seek to correct, misconceptions (Jisc 2009, Jisc 2015). In addition, adaptive



approaches, whereby questions posed are tailored to a student's current level of ability, can be useful in increasing student motivation and in setting benchmarks to be attained (Čisar *et al.* 2010, Roels, Van Roosmalen and Van Soom 2010, Hepplestone *et al.* 2011).

## Challenges

Automated testing systems do have some practical and pedagogical limitations. The development of a large number of test questions, along with accompanying feedback, can be time consuming (Conole and Warburton 2005, Farrell and Rushby 2016). Question formats such as multiple choice and true/false have been criticised for tending towards the testing of simple recall of facts, and for promoting shallow, as opposed to deep learning approaches (Draper 2009, Nicol 2007, Gilbert, Whitelock and Gale 2011). In addition, although the use of adaptive feedback can personalise feedback to a degree, in general, the feedback provided is limited to that predetermined by the teacher during test construction (Nicol 2007). As was discussed earlier in the section on *Peer Feedback Technologies*, one way to address this is to involve students in question construction and peer critique of the same (Nicol 2007, Denny, Luxton-Reilly and Hamer 2008, Bates *et al.* 2011, Galloway and Burns 2015).

In light of the contemporary understanding of feedback as dialogue discussed in *Section two*, the most significant challenge to be addressed derives from the fact that automated testing is not in itself a dialogic approach. As Nicol (2007) points out however, by paying attention to the context in which they are used, online quizzes can be used to foster dialogue. For example, after the responses to a test have been collated the teacher might use them to identify areas of weakness or misconceptions. During class time students can then work in groups to justify the reasoning behind their answers, followed by a teacher-facilitated whole-class discussion whereby students reappraise their reasoning when the correct solution has been revealed. In a similar vein, students might be asked to work in pairs to convince their partner that they have the correct solution before being retested on the same questions. Used in this way an online quiz potentially facilitates three levels of feedback: the computer-generated feedback; dialogic peer feedback; and whole-class teacher-facilitated dialogic feedback.

# Classroom Response Systems

One of the key digital technologies to emerge over the last decade in relation to enhancing interaction and feedback in large lecture-based classes are classroom response systems (CRS). These are also variously referred to as ‘audience response systems’, ‘student response systems’, ‘personal response systems’, ‘learner response systems’, and ‘polling technologies’, but are perhaps most often colloquially referred to as ‘Clickers’. Clickers are individual handheld devices that allow students to answer questions electronically and get immediate feedback on their own, as well their peers’ responses while in the classroom. Initially developed in hard wired form in the 1960s, wireless handheld versions became available in the 1990s. In recent years, growth in the use of smartphones and Wi-Fi enabled tablets and laptops has resulted in the development of a multiplicity of app based and hybrid systems normally involving the student providing the device. Where the student device is a smartphone, tablet, or laptop, a broader range of responses may be possible. For example McCloone *et al.* (2015) describe a CRS which allows students to respond to questions posed via freeform sketches.

**Classroom response systems (CRS), often referred to as ‘Clickers’ are individual handheld devices that allow students to answer questions electronically and get immediate feedback on their own, as well their peers’ responses while in the classroom.**

## How does it work?

The following are the steps in a typical implementation of CRS:

1. During class, the lecturer poses a multiple-choice or numerical question either verbally or via the computer projector.
2. Each student submits a response using a handheld transmitter which may be a proprietary device, or a student-owned smartphone, tablet, or laptop. The response time limit may allow for peer dialogue.
3. Student responses accumulate on the lecturer's computer and are projected in aggregate form, typically as a bar graph. Individual student responses can be stored for summative assessment purposes or to identify 'at risk' students.
4. The lecturer makes 'on the fly' instructional choices in response to students' responses by, for example, leading students in a discussion of the merits of each answer choice, or allowing students to discuss the question in small groups (Bruff 2009).

## Focus on First Year: A Visual Response CRS System with Electronic Engineering Students



McLoone *et al.* (2015) at Maynooth University have developed a unique CRS system which allows students to respond to questions posed in class via freeform sketches. As such, the system allows student responses to include “higher quality and more relevant information and thus, improves their active learning” (p. 2071). The CRS consists of three elements: a student sketch application; a lecturer ‘view-and-edit’ application; and a cloud-based service for co-ordinating information between these applications.

The system received positive feedback from both lecturers and students in two different engineering classes, one of which was a first year group.

McLoone, S., Villing, R. and O’Keeffe, S. 2015. A novel smart device student response system for supporting high quality active learning in the engineering and science disciplines. *AISHE-J: The all Ireland Journal of Teaching and Learning in Higher Education*, 7(2), pp.2071-2078.

## Focus on First Year: CRS Implementations with Psychology, Biology, and Chemistry Students



In a study involving first-year Psychology students in large lectures (n=149) at the University of Bergen, Ludvigsen *et al.* (2015) reported that the use of a CRS allowed them to monitor their own learning. Students also valued the ‘reflective space’ provided by the question-response cycle.

Ludvigsen, K., Krumsvik, R. and Furnes, B. 2015. Creating formative feedback spaces in large lectures. *Computers & Education*, 88, pp.48-63.

Fredericksen and Ames (2009) questioned 700 first year students at Cornell University on their experience of a CRS in a Biology module. They found that students valued the prompt response from the system. They also valued knowing how their classmates voted and found the opportunity to discuss their responses with their adjacent classmates useful.

Fredericksen, E.E. and Ames, M. 2009. Can a \$30 piece of plastic improve learning? An evaluation of personal responses systems in large classroom settings. EDUCAUSE.

King (2011) describes the use of clickers in a large group chemistry class at Drexel University, to facilitate the identification of points of student confusion (the ‘muddiest point’ principle) which would otherwise have been “logistically difficult using traditional implementation” (p. 1488). He observes that clickers allow students the same anonymity of a paper-and-pen approach, while making the process of gathering ‘muddiest point’ information significantly faster for lecturers.

King, D.B. 2011. Using clickers to identify the muddiest points in large chemistry classes. *Journal of Chemical Education*, 88(11), pp.1485-1488.

## Focus on First Year: A Mobile Technology CRS with Chemistry Students



Lee *et al.* (2013) describe the use of mobile phones in conjunction with an 'iClickers' server, which was used to aggregate SMS responses from a first year chemistry class at Hong Kong Baptist University. Responses were then displayed to the class and used to prompt a discussion among peers, which was followed by a second round of responses.

The authors noted that using mobile phone technology, which students typically already possessed, reduced the cost of CRS polling, and saved time in relation to distributing and collecting clickers.

Lee, A.W., Ng, J.K., Wong, E.Y., Tan, A., Lau, A.K. and Lai, S.F. 2013. Lecture rule no. 1: Cell phones on, please! A low-cost personal response system for learning and teaching. *Journal of Chemical Education*, 90(3), pp.388-389.

## Potential Affordances and Benefits

The literature on CRS attributes a range of positive pedagogical and practical benefits to their use. For example, they can support increased student engagement, particularly in a large group setting (Beatty 2004). Students can anonymously test their knowledge and receive feedback, not just on their own knowledge, but also on their performance relative to their peers (Beatty 2004).

Clickers can also make it easier and faster to collect real-time student responses, and in doing so, the lecturer is able to offer immediate feedback regarding obvious errors and incorrect responses, and can take "just-in-time corrective action" (McLoone, Villing and O'Keeffe 2015: 2072). CRS systems can also allow tutors to identify 'at risk' students (Beatty 2004).

## Challenges

Reported difficulties with CRS include the cost of the proprietary devices, and the bureaucracy associated with managing them.

Where a student-owned device is intended to be used, it cannot be expected that all students will own an appropriate device.

Notwithstanding newer technologies such as that described by McLoone *et al.* (2015), a key limitation of many CRS is that there is no capacity for text-based input, thus students are limited to instructor-identified points of confusion (King 2011).

# Learning Analytics

Learning analytics is widely recognised as one of the fastest growing areas of development in HE. For example, the 2015 international edition of the New Media Consortium (NMC) *Horizon Report for Higher Education* (NMC 2015a) places learning analytics on a one-year or less time-to-adoption horizon. Similarly, the Irish edition of the 2015 Horizon Report identifies learning analytics as a key trend in Irish HE, placing it on a two to three year horizon (NMC 2015b). Despite the growing interest in learning analytics there is no single accepted definition or common language to describe the field, since both conceptual (what it is) and functional (what it does) definitions co-exist in the literature (van Barneveld, Arnold and Campbell 2012). According to Gašević, Dawson and Siemens (2015: 65) learning analytics is “a bricolage field drawing on research, methods, and techniques from numerous disciplines such as learning sciences, data mining, information visualization, and psychology”. While a precise definition is problematic, there is general consensus that the term operates on a number of levels: the institution; the faculty or department; the programme leader or individual lecturer; or the learner, depending on particular goals and objectives.

**Learning analytics and educational data mining refers to data emanating and collected from student interactions with major IT systems that help to identify patterns, better understand problems, inform student support interventions and aid decisions on resource allocation.**

(Gašević *et al.* 2016)

In brief, the field of analytics can be described as data-driven decision-making, used to inform decisions at all levels of an enterprise (van Barneveld, Arnold and Campbell 2012). In general terms, the sub-set of learning analytics and educational data mining refers to data emanating and collected from student interactions with major IT systems that help to identify patterns, better understand problems, inform student support interventions, and aid decisions on resource allocation (Gašević *et al.* 2016). Within this general description of the field a useful distinction can be made between *Academic*

*Analytics and Learning Analytics.* The former refers to data collected through a variety of IT systems at an institutional level for business intelligence, external reporting, and quality assurance purposes. In contrast, Learning Analytics should be seen as ‘about learning’ (Gašević, Dawson and Siemens 2015) where the focus is on the role of the lecturer in the early detection of students at risk of attrition or failure and the importance of personalised feedback and related interventions. In this regard, learning analytics involves collecting, interpreting, and acting on trace data from relevant IT systems, particularly the VLE and Library, in order to respond to the needs of specific students to enhance their success.

An important side branch of this line of thinking about learning analytics involves *Predictive Analytics*, a pro-active approach to predicting behaviour and implementing appropriate learning interventions that target specific groups of students (van Barneveld, Arnold and Campbell 2012). More recently the field of Learning Analytics has evolved to recognise the potential value of sharing IT data back with students in order to promote self-regulation. Both learner and lecture-focused initiatives usually involve the integrated presentation of data in the form of a relatively simple dashboard, which helps users to respond appropriately.

## Focus on First Year: A Predictive Analytics System

Y1

Corrigan *et al.* (2015) at Dublin City University (DCU) have developed a predictive analytics system (PredictED), which uses student behaviour to predict their likely performance in end of semester final grades. The system has been piloted across 10 first-year modules. Of the 1558 students enrolled on these modules 1181 (75%) opted in to the service. PredictED automatically emailed participating students on a regular basis with a prediction for the outcome of their exam performance, based on the student’s levels and types of engagement with the institutional VLE. Pre-intervention there were no differences between participants and non-participants on a number of

measures related to previous academic record. However, post intervention the first-attempt final grade performance yielded an almost 3% improvement on average (58.4% to 61.2%) for those who opted in.

Corrigan, O., Smeaton, A.F., Glynn, M. and Smyth, S. 2015. Using educational analytics to improve test performance. IN: Conole, G., Klobučar, T., Rensing, C., Konert, J. and Lavoué, É (eds.) *Proceedings of Design for Teaching and Learning in a Networked World, 10th European Conference on Technology Enhanced Learning, EC-TEL 2015*. Toledo, Spain: Springer, pp.55.



## Potential Affordances and Benefits

The field of learning analytics offers considerable promise in helping to develop more adaptive, personalised, and self-regulatory approaches to teaching, learning, and assessment. More specifically, in the context of feedback, in the future learning analytics may help us to understand how particular types of learners respond to different types of interventions. This line of research may even lead to technology solutions that trigger personalised feedback at key stages or milestones within a course.

The adaptive, personalised, and self-regulatory focus of learning analytics intersects with a more contemporary understanding of the role that feedback and feedforward plays in teaching, learning, and assessment. For instructors, the basic premise is that data from major teaching and learning IT systems can be used to identify patterns in learner engagement, which in turn can lead to actions that help better personalise instruction and provide more targeted feedback and interventions to meet the needs of specific students. The aforementioned NMC Horizon Reports contain a number of examples of institutions that are using learning analytics in this way to help address the problem of student retention and success. Moreover, in Europe, the Learning Analytics Community Exchange (LACE) (<http://www.laceproject.eu>) provides an active professional forum for sharing examples of practice.

In the case of students, the assumption is that by giving learners an indication of their progress relative to other students at particular stages of the course, they may act on this information to either change their level of engagement or if deemed necessary seek additional support from the lecturer and/or relevant learning and development services. An interesting Irish pilot of this self-regulatory approach to learning analytics is currently underway at Dublin City University (DCU), where first-year students receive a weekly email with a prediction for the outcome of their exam performance (Corrigan *et al.* 2015). The UK Open University is leading a much larger project where distance students receive a regular dashboard of their progress, which also indicates how they might act to address any concerns (Rienties *et al.* 2016). Notably, this project also involves a finer grain of data analysis of student interactions based on four pre-defined pedagogical designs for course offerings.

## Challenges

The field of learning analytics has fuelled ethical and privacy debates about the collection and use of student data. In response to these concerns, in 2015 a Code of Practice for Learning Analytics was published by Jisc in the UK (Sclater and Bailey 2015). For students, the question still largely remains whether the intervention of sharing data back with learners will have a longer-term impact on their behaviour and ultimate success.

Other challenges include deeper institutional barriers in adopting a data driven approach to teaching, due to added workload on lecturers to monitor student progress and the time required to provide targeted and personalised feedback outside of normal course assessment. On a technical level there is also the challenge of how to most appropriately collect data and share this with staff and students in a format that is both valid and useful. Gašević *et al.* (2016) warn that learning analytics should not promote a one-size fits all approach as institutional conditions and individual course variations are crucial in efforts to predict and promote student success.



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# Supporting Transition: Enhancing Feedback in First Year Using Digital Technologies

Further information  
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