Extract: Chapters 4 & 5

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Assessment in a Digital Age:

A research review

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4. Using digital technologies for different types of assessment

Research has shown that formative assessment (or assessment for learning), as distinct from summative assessment (or assessment of learning), is a powerful tool that benefits learning and student achievement (Black and Wiliam, 1998; Nicol and Macfarlane-Dick, 2006; Sadler, 1989). Nicol and Macfarlane-Dick (2006) developed further ideas about the importance of 'self-regulated learning,' which identified an important role for students in their own assessment. However, even as evidence grows on the benefits of feedback through formative assessment and more teachers employ these methods, it still remains in the shadow of high-stakes summative assessment's level of influence and unshakeable prioritisation on national and international stages.

However, summative assessment has also weathered significant criticism, in that high-stakes assessment is seen as simply retrospective recall of knowledge previously learned that measures whether all students can attain the same level rather than individual development or growth. Additionally, it is seen to offer little in the way of evaluating the actual learning process or providing transferable skills to use in the world outside school (Gee and Shaffer, 2010). This may be partly explained by the development of assessment, which has been mainly driven by ways of measuring that are valid and reliable for large-scale tests, rather than by what would be the most useful reflection of learning for the student (Whitelock, 2010).

It is also important to note that while progress has been made in theoretical understanding of assessment and feedback, a concrete and reliable comprehension of what makes feedback effective for learners – in other words, what supports them to make beneficial changes – is still under debate. There appears to be a need for more research to understand what forms and processes of feedback help reach and move learners through their education process (Whitelock, 2010). Some researching in this area have utilised existing theories of learning and assessment to develop pedagogical models of assessment that focus on self-assessment, peer assessment and reflection tasks (Luca and Oliver, 2002 and Boud and Falchikov (2007), cited in Whitelock, 2010).

Both formative and summative assessment are deeply embedded within current educational systems. Recognising that both types serve distinct educational purposes, it is also important to note they are not necessarily exclusive processes and are often intertwined in teaching and learning activities. Technology enhanced assessment may offer some alternatives to suggestions that these types of assessment may be coordinated to provide more useful feedback (e.g., using summative assessment for formative purposes) (Black and Wiliam, 2009). Technology enhanced assessment has been used for both summative and formative assessment activities, though it is particularly suitable for formative assessment purposes, as it provides mechanisms for sharing immediate feedback, diagnosing and testing skills and knowledge, peer- and self-assessment, as well as offering private and non-judgmental feedback.

A closer look at the use of digital technology for summative assessment purposes can be found in section 7.2, but some examples where it has been used for formative assessment purposes are listed here:

- Virtual environment Quest Atlantis (www.atlantisremixed.org) uses a game-based curriculum that supports students to develop inquiry in ecological sciences. A study of two classes using Quest Atlantis found that the classes using QA had larger gains in

understanding and achievement than those that did not, and students that engaged more with the environment's formative feedback showed even greater gains (Hickey et al, 2009).

- The AsTTLE project in New Zealand (http://e-asttle.tki.org.nz/) is a software application that enables educators in schools across the country to create tests by selecting items from an online system. Teachers have access to large, calibrated banks of test items and can select those which reflect the test purpose and their own teaching. While AsTTle was developed in higher education, it is used by school teachers and administrators. Performance data is entered into the system, allowing teachers and administrators can access valid, reliable information of student performance, as well as relevant teaching resources. While meeting national standardised requirements, the system also provides feedback for teachers and ultimately supports assessment for learning, rather than just assessment of learning (Ripley et al, 2009; Hattie and Brown, 2007-2008).
- The REAP (Re-engineering Assessment Practices) project aimed to redesign feedback and assessment practices across HE institutions based on a conceptualisation of assessment via a self-regulation model, which asserts that learning is deeper and more meaningful when students actively share responsibility for their learning and assessment. The REAP project redesigned 19 classes at three Scottish institutions between 2005-2007. Each institution worked to a set of articulated principles that conceptualised their understanding of assessment and feedback, which were then transformed into new practices that involved regular opportunities for peer- and self-evaluation. Different technologies were involved in the redesign and new assessment practices, including podcasts, blogs, electronic voting systems, online tests, e-portfolios, discussion boards, simulations, intelligent homework systems and feedback software. The project demonstrated a number of successes identifying 'improved learning achievements, high levels of student satisfaction, (…) and, in some cases, reduced teacher workload' (Nicol and Draper, 2009: 194).

It is important to consider both types of assessment in the discussion on digital technology's potential to support changes in assessment innovation and reform, particularly in how the risks and complexities of change differ for each (Winkley, 2010). Digital technologies may appear to offer more potential to formative assessment because innovation within this purpose attracts less scrutiny and seems less risky. The use of digital technologies for summative assessment purposes is less straightforward, as changes to more standardised assessments face a number of constraints. However, recent projects and initiatives attempting to merge formative assessment within multi-level summative assessment processes are emerging (See section 7.2).

5. What do digital technologies offer assessment? The good and the bad

The possible benefits that digital technologies offer to learning and specifically to assessment are well documented. Becoming equally apparent are the challenges and threats that they may also bring. This is particularly the case with their use in assessment, which relies upon the collection and analysis of data, plays a critical role in determining learners' futures and raises a number of ethical issues. This section briefly outlines both the possible benefits and dangers associated with the use of digital technologies, though some of these areas will be investigated again in more detail in subsequent sections of the paper.

A list of possible affordances or benefits that technology may offer assessment is outlined below, as amalgamated from a number of sources (JISC, 2010; Pellegrino & Quellmalz, 2010; Winkley, 2010; Schwartz and Arena, 2009; Angus and Watson, 2009; Whitelock and Watt, 2008; Whitelock et al, 2006). Assessment with the use of digital technologies has been seen to:

- **Provide immediate feedback** – Can offer 'real-time', learner-led feedback that diagnoses and reduces misconceptions quickly (e.g., multiple choice questions in a lecture) and provides more opportunities to act on feedback from a range of audiences (teacher, peers, or large community via blog or web site). This can also lead to useful and new forms of teacher and learner dialogue, improvements of the assessment experience and increased student engagement.
- **Potentially increase learners' autonomy, agency and self regulation** – Could support more personalised responses to work and progress and can facilitate self-evaluative and self-regulated learning through diverse collections of evidence, immediate formative feedback, better tracking of progress to learning outcomes and reflection on achievements. The visualisation of data is particularly relevant here.
- **Support for collaborative learning** – Offers opportunities for peer assessment, undertaking and tracking knowledge building and sharing activities, co-evaluation and social interaction.
- **Provide authenticity** – Could present challenging problems and ways to assess complex skills like problem-solving, decision making, and testing hypotheses, which is argued to be more authentic to future work experiences and what skills and knowledge will be required after formal education.
- **Widen range of measurement** – Via the ability to create and visualise complex data sets and models that consider multiple factors, digital technologies can elicit and measure multi-faceted skills, sets of knowledge and cognitive processes that have previously been difficult to assess. For example, simulations can simultaneously measure technical computer skills, decision-making and strategy processes as well as subject specific skills like scientific enquiry. These also include tracking cognitive processes that can be developed into patterns showing levels of expertise.
- **Flexible and appropriate responses** – May offer choice in approach, format and timing of assessment for students, who can access assessment at a time and place of their own choosing, with no constraints due to time or location. Additionally, digital tools like simulations provide multiple modalities and could offer more accessible assessment than text-based tests for students with varied learning styles or language backgrounds.

Regular feedback can also make students feel less anonymous and more personally connected to their learning and courses, particularly in HE settings. These possibilities can also challenge traditional methods of assessment and require a rethink of old practices.

- **Increase efficiency and reduce teachers' workloads** – Potentially improves efficiency of data management such as marking, moderating and storing information by helping teachers use their time and resources better; offers more environmentally friendly administration of assessment.
- **Improve student performance** - Evaluations show that e-feedback can improve student performance and demonstrates other benefits, such as better student engagement (see Whitelock and Watt, 2008; Angus and Watson, 2009).
- **Integrate formative and summative assessments** – Summative assessments tend to be retrospective, in that they test knowledge previously acquired without leaving an opportunity for ongoing learning. Digital technologies can integrate assessment and instruction, as in immersive learning environments or programmes that monitor how students solve problems on the computer and provide immediate feedback.
- **Improve assessment validity and reliability** – Can help track assessment validity (if the activity is a fair measure of skill and understanding) through use of rich media rather than just text. Also provides improvements in reliability of scoring and robust data sets for deeper analysis.

Of course these affordances do not guarantee benefits, and a look at the possibilities technologies offer to assessment must also consider some of the more concerning issues and outcomes. Many of the possibilities offered by technology are tempered by the practical or educational difficulties of implementing them to a high level of effectiveness. For example, successful use of computer-assisted assessment for multiple choice testing involves significant institutional commitment, technical infrastructure, and high levels of quality assurance practices (JISC, 2010).

Likewise, taking a set of tools and affordances at face value can be deceiving. Many in the field have argued for a more ecological approach to examining the potential of digital technologies as innovations in education. Rather than taking a technologically determined perspective that views a tool as a 'black box' with a set input and output, educational innovations using technologies should acknowledge how the unique cultural, social and institutional context helps determines its use and outcomes. (Jenkins et al, 2006; Zhao and Frank, 2003). As Jenkins et al (2006: 10) point out: 'It matters what tools are available to a culture, but it matters more what that culture chooses to do with those tools'. However, as Whitelock et al (2006) points out, early development of ideas and tools based on pedagogical issues can also soon be overshadowed by tool development.

Draper (2009b:309, 307) discusses the still-developing understanding of what makes effective feedback and investigates what constitutes working feedback loops – that is, feedback that causes learners to 'do something differently'. He demonstrates the likelihood of differences in motivations and understanding of feedback between teachers and students and warns that e-assessment 'is even more vulnerable to such questionable assumptions' as it automates what can be a highly emotive, nuanced and sensitive dialogue. With a better grasp of how feedback can match learners' motivations and expectations, assessment practices could open new dialogues and truly support learners to do things differently.

There has also been an increasing awareness of challenges and threats presented by the growing use of digitised information and data for education and assessment, despite common assumptions that collecting and measuring data is a good thing and automatically leads to objectively determined and deeper understandings. However, Goldstein (2012) questions whether this 'data deluge' is necessarily a wholly positive development and demonstrates how educational data analysis (such as that related to league tables and exam results) can be questionable and misleading.

Additionally, the growing prevalence and sheer volume of the digitalisation of data raises ethical concerns around how the data is collected, used and stored. (While this area is discussed in greater detail in section 7.5, it is briefly addressed here.) Data management, ownership and sharing will only grow in prevalence for both individuals and the organisations and networks they belong to (Facer, 2012). Indeed, data flow within the education sector, at classroom, institution and national levels is prolific, which raises ethical issues about how and if learners consent to, can access, own or control their own personal data. Facer (2011) describes how this proliferation of data, significant increase in use of surveillance technology and constantly expanding 'digital footprints' for auditing and management of educational performance, as well as the slow integration of technology that shares control with students (e.g., portfolios, social software), reflects how schools' responses to current socio-technical changes have the potential to create school atmospheres based on control rather than democracy and young people's agency.

This discussion should also consider the types of data that are collected and deemed relevant and useful to support learning and educational decision making. As discussed in section 7.3, there is an increasing call to include more affective skills, attributes, and dispositions within education, which raises questions not only of how to assess these but if such personal characteristics should be evaluated at all and, if so, how that information is protected.