Technology enhanced assessment and feedback: what counts as transformation of student learning?

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ABSTRACT: Calls for reform in assessment and feedback practice stress the need to keep pace with current pedagogical, cultural and technological developments affecting teaching and learning (JISC, 2010). As educators we are urged to shift our focus from assessment of learning to assessment for learning. A systematic review of peer-reviewed scholarly journals was carried out to investigate how current practitioners are using technology to change assessment and feedback practice. Drawing upon studies from JISC (2010) Effective Assessment in a Digital Age and using the SAMR (Substitution, Augmentation, Modification and Redefinition) Model of Puentedura (2010), insights were gained into how technology is being used to transform assessment and the way students learn.

The majority of articles investigated reported interventions where technology was used to replicate traditional assessment and feedback approaches. However, 46% of articles showed evidence of intentional task redesign and redefinition for transformation of learning. This paper aims to help both students and teachers to self-access their own practice by highlighting examples where a combination of good pedagogical practice and affordances of technology can lead to transformation in students learning. A key message from the study is that formative peer- and self-assessment for learning is becoming recognized and valued by teachers and students, aligning with good assessment practice outlined in JISC (2010).

1 INTRODUCTION

In higher education, there has been a shift in perception of what makes learning effective (JISC, 2010), highlighting a need to encourage assessment and feedback practices that engender learning rather than those that seek only to quantify it. Technology is now considered ubiquitous in higher education but there is little evidence that it has resulted in improvements in students learning (Price and Kirkwood, 2014). A study conducted by the authors set out to investigate whether, and how, technology-enhanced assessment can result in transformation of student learning (Sweeney et al, 2017). The study found evidence in a limited number of articles that technology can provide affordances for transforming learning in ways that were previously not thought possible.

In this paper we focus on examples of practice where transformation of learning has occurred based upon criteria outlined in Nicol's (2009) good practice in assessment and feedback and Puentedura's (2010) SAMR Model.

2 RESEARCH QUESTIONS, METHODOLOGY AND FRAMEWORKS

The research questions in the original study asked 'what technologies are being used?' and 'how are they enhancing or transforming assessment and feedback for student learning?'. A survey instrument was developed to interrogate peer-reviewed journals to discover how practitioners were using and reporting on technology-enhanced assessment (TEA) and feedback. A useful set of parameters to help analyse the articles were Puentedura's (2010) SAMR taxonomy to identify technology use and Nicol's (2009) criteria for good assessment and feedback.

The SAMR taxonomy classifies the use of technology according to level of sophistication of features. For example, levels 1 and 2 signify that technology mainly enhances existing practices, and levels 3 & 4 show a transformation in the use of technology.

1. Substitution: digital technologies replace other tools with no functional improvement;
2. Augmentation: digital technologies replace other tools but with functional improvement;
3. Modification: technology is used for significant task redesign; and
4. Redefinition: new tasks are created that were previously not possible.

Since the use of technology alone is not a guarantee of improved student learning, Nicol's (2009) criteria for good assessment and feedback practice (Table 1) are used in conjunction with the SAMR model in this study.

3 RESEARCH RESULTS

From 1713 articles in 19 journals (sample period Jan 2014-Jan 2016) 139 articles were identified as being focused on the use of technology for assessment (Sweeney et al, 2017). The study found that the majority of interventions (54%) used technology to substitute for traditional assessment approaches (Substitution and Augmentation, Figure 1). However 29% showed some task redesign (Modification), and 17% reported interventions where technology afforded redefinition of assessment and feedback for purposes of improved student learning (Redefinition).

Together SAMR and Nicol's frameworks provide parameters that assisted us to answer the question: *Where's the Transformation*? For this paper we further explore interventions in the Redefinition category of SAMR.

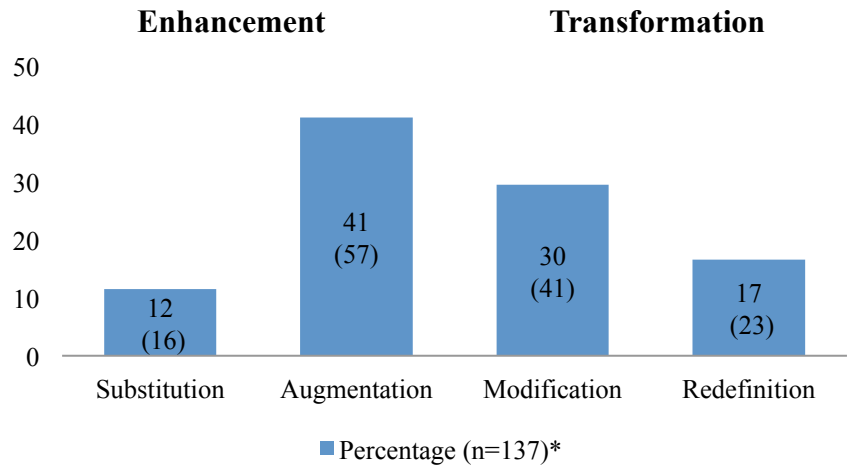

Figure 1. Journal articles mapped using the SAMR model (Sweeney et al, 2017)

4 EXAMPLES OF INTERVENTIONS IN THE REDEFINITION CATEGORY

4.1 Encouraging learning in large classes

The intervention reported by Drinkwater et al (2014) attempted to encourage active learning in large lecture theatres. Students completed online quizzes before each lecture and software was used to analyse the responses and identify misconceptions. This information fed-forward to inform subsequent interactive question-driven learning. This provided learners with opportunities to act on feedback as detailed in Table 1.

Heaslip et al (2014) reported the collection of instantaneous anonymized formative feedback with the aid of electronic voting systems (clickers), and the consequent increase in formative self-, peer- and teacher-assessment in a large undergraduate class. They utilized a pre-test/mid-test/post-test to investigate the impact of the clickers on both individual and group participation. In both cases the results indicated that the use of the technology facilitated a more positive and engaged learning environment and provided a new way of encouraging peer-assessment and feedback within this large class. A key finding was that students highly valued the anonymity, previously not possible, that clickers provided for participation. The technology was used as an avenue for feedback that helped students learn and teachers shape their teaching (Table 1).

Kushel et al (2014) used student-produced video documentaries, developed over one semester, to replace traditional teaching of disciplinary and generic skills in large first year classes (>600 students). A key educational goal was to increase motivation by introducing peer-assessment and allowing choice of topic. Videos were uploaded to Youtube and the best were sent forward for external awards. This media was adaptable to the diverse range of backgrounds and scientific interests of the students.

Article in peer review journal	Drinkwater et al, 2014	Heaslip et al, 2015	Kushel et al, 2015	Sharpe and Blanchfield 2014	Chodos et al, 2014	Ng and Nicholas, 2015	Williams, 2014
Pedagogic intent	Improved learning in large lecture theatres	Improved learning in large lecture theatres	Increase motivation	Develop as self - assessors	Improve learning for large classes	Developing resilience building confidence	Assessment *for* Learning
Pedagogy	Interactive question-driven learning	Peer-assessment and feedback	Student-produced video documents	Student produced video news	Simulation	Digital story-telling	Building a reflective portfolio
Technology	Online quiz and quiz analysis	Student response systems	Video	Video	Virtual worlds	Video	eportfolio
Help to clarify what good performance is (goals, criteria, expected standards, etc.)							
	✓	✓	✓		✓		
Encourage 'time and effort' on challenging tasks							
			✓	✓		✓	
Deliver high quality feedback information that helps learners to self-correct							
	✓	✓	✓		✓		✓
Provide opportunities to act on feedback to close any gaps between current and desired performance							
	✓	✓	✓			✓	✓
Ensure that summative assessment has a positive impact on learning							
	✓		✓	✓	✓		✓
Encourage interaction and dialogue around learning (peer and teacher-student)							
	✓	✓	✓			✓	
Facilitate the development of self-assessment and reflection in learning							
	✓	✓	✓	✓		✓	✓
Give choice of topic, method, criteria, weighting or timing of assessments							
			✓	✓			
Involve students in decision-making about assessment policy and practice							
			✓	✓			
Support development of learning groups and communities							
	✓	✓	✓	✓		✓	
Encourage positive motivational beliefs and self esteem							
	✓		✓	✓		✓	
Provide information to teachers to help shape teaching and subsequent assessment tasks							
	✓	✓	✓		✓		✓

Table 1. Use of technology aligned with Nicol's (2009) criteria for good assessment and feedback practice

Students reported increased motivation and time on task due to freedom to choose a topic of personal relevance. The authors developed a detailed rubric, allowing higher-order competencies to be demonstrated and understanding of concepts to be assessed. This guided both students and teachers with summative assessment. In this intervention, the technology afforded the potential to align with all of Nicol's (2009) criteria (Table 1).

In a similar intervention Pegrum et al (2015) required students in large undergraduate science classes to create podcasts as team-based tasks to encourage collaboration and engagement with new media. Formative peer-assessment and peer-feedback were requirements of the task. Sharpe and Blanchfield (2014) had students take part in a unique assessment called 'Science for the Masses' where they were required to produce a video news item that explained a scientific journal article to lay people. Students were able to select their own scientific journal article and think about how they would connect this to a general audience thereby deepening their understanding of the content. A strong feature was the level of involvement that students had in decisions about assessment, making it more tailored and personalised. As a group exercise students decided the weighting for each of the assessment components as well as the criteria and standards that helped form the rubrics to assess the video news item. The technology was used to help students to develop as self-assessors of their learning (Table 1).

4.2 Encouraging learning using virtual worlds

The use of virtual worlds (VWs) in very large classes is reported by Chodos et al (2014). The pilot study engaged first year emergency medical technician students in a virtual rescue and handover. The authors categorised actions in the VWs by aligning with real world activities. They developed a framework to enable teachers to monitor and assess student learning in the VWs, and to provide feedback (Table 1).

Cela-Ranilla et al (2014) described the development of the transferable skills of self-management and teamwork using digital games within a 3D simulation environment using OpenSim. The premise was that the technological features of 'serious games' using simulations can provide affordances for putting learners in situations where they can acquire transferable competencies. Students completed a group project by creating their own space with activities related to the transferrable competencies that would later be evaluated. The researchers note that the virtual environment presents exciting opportunities for designing assessment processes that are active and situated and measure complex student knowledge.

4.3 Encouraging learning using a Learning management system (LMS*)*

A trial of a LMS to transform practice in assessment and feedback is reported by Glover et al (2015). The researchers considered the full assessment cycle including task design, submission, marking, issuing feedback and using feedback. They gathered evidence to investigate student's perceptions and critique of the affordances or limitations of the institution's LMS. As a result of this holistic approach, and a clear educational goal to change the assessment culture, the beliefs of students who had previously considered feedback from modular and terminal assessment of little value to their future work were transformed as they began to value feedback and engage in productive online student-tutor dialogue.

4.4 Digital storytelling developing resilience

Ng and Nicholas (2015) used digital storytelling as a reflective tool for pre-service teachers to assist with their confidence, self-efficacy and digital literacy skills. Students were asked to reflect on their teaching practice using the multimedia software tool, *VoiceThread*. Students posted video and audio artefacts to *VoiceThread* allowing peers to review and comment on their work. The features of this technology are quite nuanced and suit the SAMR redefinition category in that a student is able to provide feedback as voice, video or text annotations around a specific aspect of the digital artefact, for example a specific point in a video recording. The authors assert that using the technology enabled students to demonstrate their ability to identify adverse situations, and find means to overcome them, raising self-awareness of the challenges that confront them in teaching (Table 1).

Thompson and Hall (2015) detailed a study of pre-service teachers using a digital storytelling format (instead of a traditional essay format) to encourage students to reflect more deeply on critical incidents in their teaching. Students were encouraged to engage in structured 'story circles' where peers helped to draw out teaching stories and add further perspective. Student feedback suggests an

overwhelmingly positive experience in deepening their reflective insights into professional practice by exploring their teaching journey, re-evaluating learning goals, tracing transformations in learning, and highlighting significant landmarks or achievements. The use of video enabled students to narrate their teaching in a way not possible with an essay format alone.

4.5 Assessment for learning with eportfolios

Williams (2014) presented a conceptual framework to harness the power of learning technologies to move toward assessment *for* learning. He outlines the need to reduce reliance on high stakes summative assessment where the learning outcomes are not effectively assessed using traditional methods and useful feedback is limited. Williams argues that eportfolios, and effective use of the LMS learning analytics capabilities, allows assessment to be re-conceptualised to be more appropriate, effective and personalised. Transformation in this case relates to two key elements. At the broader level eportfolios can provide evidence related to the learning journey which was previously not visible to enable more effective assessment and feedback. At the individual level, eportfolios and learning analytics can support students to personalise assessment and provide evidence in ways not previously available.

4.6 Using Social media for student interactions

An example of the use of social media to transform assessment and feedback practice is reported in the article by Demirbilek (2015). In this intervention, wiki and Facebook tools were used to clarify what good performance is through the provision of peer feedback on students' instructional material projects. The data indicated that the use of these social media tools to reflect and provide feedback on other students' projects, improved students' critical thinking skills and the quality of the material they produced.

4.7 Use of highly specialised software for learning

A unique example in terms of redefinition involved students learning the highly nuanced technique of violin vibrato (Ho et al, 2015). An integrated team developed digital visualisations of sounds that could not be conveyed accurately by expert violinists using sound or movement alone. Students were able to analyse their vibrato skills visually and rapidly hone their technique through self-assessment and self-regulation. They made remarkable improvements within one week.

5 DISCUSSION AND CONCLUSIONS

The results from this study suggest that formative assessment (peer- and student-tutor) and feedback is valued, and that technologies are realising their potential to build community, support student participation in discussions, critique, collaborate and co-construct knowledge. This is changing relationships and reworking hierarchies in a subset (17%) of the examples studied.

The reported interventions share a common characteristic – the educational goals were intentional for improved student learning. Teachers had a clear pedagogical intent and interventions were evaluated against their goals. Therefore, this study can demonstrate a transformation and redefinition of student learning through the synthesis of strong pedagogy and the affordance of technology. Unless we explicitly name our goals, and underpin our use of technology with principles of good assessment and feedback, the potential that technology offers for improved student learning may not be realised. The examples briefly presented here can serve as models to assist educational practitioners recognise and unlock the potential of technology to help redesign and redefine assessment.

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