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ABSTRACT

The aims of this paper are to examine and critically evaluate a selection of different technological methods that were specifically chosen for their alignment with, and potential to enhance, extant assessment for learning practice. The underpinning perspectives are that: (a) both formative and summative assessment are valuable opportunities for learning, and (b) using technology may enhance learning in assessment and feedback processes. Drawing on the literature and empirical evidence from a research study in a Scottish university, the advantages and drawbacks of using technology are examined. It is asserted that, by adopting a flexible approach and taking small incremental steps, the use of different types of technology can be beneficial in facilitating effective assessment for learning and feedback in higher education.

KEYWORDS

Assessment for learning; feedback; technology; higher education; alignment

Introduction

The basic premise of this paper is that *all* assessment can be used productively *for* learning. This includes summative assessment, although this is more commonly regarded as assessment *of* learning. As the development of skills, attributes and competencies are of value to students and their future employment, it is argued here that these aspects can also be included usefully and effectively in assessment for learning. However, the crux of the paper posits that assessment and feedback processes can be enhanced through creative uses of technology. It is important that the technological methods are constructively aligned with assessment and feedback (Biggs and Tang 2011).

This paper aims to offer an insight into how alignment and enhancement were achieved between technology and assessment and feedback processes in an undergraduate honours course in a Scottish university. Although this is a specific case study, it reveals innovative and creative use of technology that may inspire others to investigate technologies best suited to their own assessment and feedback processes. Informed by the literature on assessment and feedback for learning, and on the use of technology in assessment and feedback, this study presents advantages and drawbacks of this approach.

Assessment for learning

Assessment serves various functions. One of these is to measure or judge students' learning, which is necessary for the award of university degrees. This summative assessment is *of* learning, and is important in professional education and training, where standards of expertise are essential. Another function of assessment is *for* learning where the assessment process contributes to students' learning. Typically,

formative assessment does not in itself contribute to students' final grades, but is often regarded as assessment for learning. However, in well-aligned course design both formative and summative assessments can be valuable opportunities for learning and by using technology these opportunities can be enhanced further.

If assessment is indeed central to learning, as Taras and Davies (2012) assert, it would be most fruitful for summative assessment to be utilised *for* learning as well as *of* learning. In addition, it would also be beneficial if skills and attributes were also overtly embedded in assessment processes. An example of this is summative co-assessment of students' oral presentations, where each student self-assesses his/her own presentation and agrees a final grade with the teacher following critical discussion (Deeley 2014). Understanding all assessment in terms of *for* learning can alter our perception of, and approach to, assessment and feedback. A change to summative assessment being *for* learning may result in, or be indicative of, subtle changes in the relationship between staff and students, for example in co-assessment as noted above. Their relationship can become more of a partnership, challenging the traditional power structure within the classroom (Cook-Sather, Bovill, and Felten 2014; Higher Education Academy 2014; Deeley and Bovill 2017).

Using this pedagogical approach, it is vital for staff to nurture and maintain a supportive and caring environment, or 'ethos of care' (Sutton 2012: 39). It is claimed that the trust engendered by a staff-student partnership contributes to students' high levels of intrinsic motivation, resulting in students becoming more active and self-regulated learners (Deeley and Brown 2014). There is also evidence to suggest that this democratic approach can lead to students adopting deep approaches to learning (Higher Education Academy 2014). Furthermore, a staff-student partnership is a prime situation to facilitate students' grasp of academic literacy and the threshold concepts that are implicit in assessment and feedback literacies (Deeley and Bovill 2017).

Feedback on assessment for learning

Assessment for learning necessitates effective feedback to help and guide students in improving their work. Despite the existence of guiding principles, effective feedback remains a multifaceted and complex issue (Nicol and Macfarlane-Dick 2006; Sadler 2010, 2013). It is essential for students to have opportunities to rectify their misunderstandings, improve their skills and adjust their approach to assessment. Effective feedback is based on assumptions that it is clear, meaningful and timely, and also that it is understood, engaged with and acted upon (Gibbs and Simpson 2004). However, feedback becomes redundant if it is returned too late for students to improve their performance in the next assessment (Jonsson 2012). To act on feedback requires guidance on how to improve future work, which is also referred to as feed-forward (Quinton and Smallbone 2010; Orsmond et al. 2013). For this to be effective and sustainable, mutual understanding of academic literacies is needed, which necessitates constructive dialogue between staff and students.

Staff may assume that students clearly understand their feedback; however, it is possible that students misinterpret or misunderstand the meaning of feedback (Sadler 2010; Adcroft 2011; Blair and McGinty 2013). This miscommunication can result in lost opportunities for learning as well as dissatisfaction. To address this problem, it is argued that academic literacies should be woven into classroom learning (Deeley and Bovill 2017). Academic literacies refer to knowledge and understanding of both subject-specific and assessment-feedback discourse (Lea and Street 1998; Stefani 1998; Sutton and Gill 2010; Higher Education Academy 2012; Price et al. 2012; Sutton 2012; Smith et al. 2013). Significantly, using technology to deliver feedback can speed up the feedback process, clarify feedback communication, and create a sense of an individualised and nurturing relationship between staff and students.

Using technology in assessment and feedback

With technology evolving at an increasingly rapid rate, aspects of it are likely to become outdated very quickly, so a flexible 'trial and error' approach to capturing its most suitable tools to enhance learning and teaching is advantageous. A useful principle is to adopt a 'multi-modal approach' (Crews and Wilkinson

2010: 411), using different technologies for diverse assessment and feedback methods. Although technology can be used for assessment, it is also useful for providing feedback. For example, audio-visual technology can enhance the quality of feedback information and be perceived by students as being more personal (Eckhouse and Carroll 2013; Carruthers et al. 2015). Consequently, this may facilitate greater student engagement in learning and encourage a dialogic approach to feedback (Nicol 2010; Parkin et al. 2012; Carless 2015; Murphy and Barry 2016). Crews and Wilkinson (2010: 410) shrewdly point out that 'students must be adept at interpreting... feedback however it may be provided'. Inevitably, problems can arise if there is incompatibility between electronic devices. Problems with audio-visual technology may also exist for staff and students who have disabilities, such as hearing or visual impairments (Lunt and Curran 2010). In addition, learning to use new methods of technology is invariably time consuming for staff in the initial stages, but paradoxically technology can ultimately save time in the long term (Cann 2014).

Until recently, there were relatively few empirical studies on using technology to enhance assessment and feedback (Lunt and Curran 2010), but interest in this area is growing rapidly (Hennessy and Forrester 2014; Henderson and Phillips 2015). Informed by and bringing together the various bodies of literature on assessment, feedback and technology, this small-scale study seeks to explore how innovative use of technology can be adopted and developed to address some of the issues concerning effective assessment and feedback.

A case study using technology in assessment and feedback

An internally funded research project involving a service-learning optional honours course in Social and Public Policy was undertaken at a Scottish university. Service-learning combines service to the community with an associated course of academic study, for which students gain credit from successfully demonstrating their knowledge and understanding gained by their experiential learning. The 20 students on the course were in their third and fourth years of undergraduate study for the degree of MA (Honours) Social Sciences and all agreed to participate in this study. Ethical approval for the research was given by the College of Social Sciences Ethics Committee.

One of the main aims of the project was to investigate ways in which assessment and feedback of students' skills and attributes might be further developed. The research methods consisted of three focus groups and five semi-structured individual in-depth interviews with students. This qualitative approach was used in the study in order to investigate students' perceptions of the technology enhanced assessment and feedback methods. Although the assessment methods had been used before with previous student cohorts, this was the first time that technology had been used in conjunction with the assessment and feedback. The service-learning course is a distinct offering at this university, and its assessment methods are innovative, including co-assessment between staff and students (Deeley 2014). Using technology to enhance the assessment and feedback methods was a further innovative step that the students had not encountered before.

The focus groups and interviews were all recorded and transcribed verbatim. Sequential data analysis was conducted throughout the study. This involved an initial line by line scrutiny of the transcripts and then further scrutiny of the transcripts while at the same time listening to the recordings. Themes emerging from the data were identified and subsequently analysed using concept mapping methods (Hay and Kinchin 2006).

There are limitations in using a small-scale case study because the findings emerging from it cannot be generalised. Nevertheless, drawing together the relevant threads from this case study does reveal that there can be potential benefits in experimenting with technology to enhance assessment and feedback processes.

Background to the study – service-learning and assessment

In this course, students were engaged in service-learning, which is underpinned by experiential learning theory. The course requirements involve students' active participation in their learning and in giving

service to the community. This pedagogical approach also provides opportunities for students to acquire or develop employability skills, competencies and attributes.

The main assessment for this course is a 5,000-word reflective journal, which is a metacognitive narrative of the students' learning. This assignment contributes 80% towards the overall credit for the course. Another assessment in the course is a critical incident report (Flanagan 1954; Deeley 2015), which consists of an exercise in structured critical reflection. This accounts for a further 10% of the overall course grade. A third summative assessment is a co-assessed oral presentation, which also contributes 10% to the course grade. In their presentations, students critically reflect on their skills and attributes developed through the service-learning course. Using specifically designed marking criteria, the students self-assess their own presentation, writing critical comments on and giving themselves a provisional mark for their presentation. As the teacher, I also assess each student's presentation and discuss it with each student in order to agree an appropriate mark. The agreed mark contributes to the student's overall final degree classification (Deeley 2014). Co-assessment is also a learning process and, in this specific case, blurs the definition of summative assessment, shifting its meaning to include assessment for learning. Although this innovative practice is successful, there are ways in which technology can improve it further.

Using technology in assessment and feedback

The technologies that were used in this case study had not been used before for assessment and feedback at the university. Camtasia was new to the university and was being piloted to give feedback on assessment in a few selected areas within the College of Social Sciences. Technology was used for each of the three methods of assessment referred to:

- Mahara – online personal webpage space within Moodle, a virtual learning environment. Used in the study to give feedback on students' reflective journals.
- Echo360 System and Google Glass – technologies for video recording. Used in the study to enhance co-assessment of students' oral presentations.
- Camtasia – software for audio-visual screen casting. Used in the study to give feedback on students' written critical incident reports.

Mahara – online personal webpage space within Moodle, a virtual learning environment

Mahara provides an online academic space where students have ownership and control of their personal pages. In the service-learning course, students were given the option of using Mahara to write weekly journal entries, which would be used formatively in preparation for their final assessed journal assignment. The entries consisted of students' critical reflections on their voluntary work experiences in connection with the academic coursework. Through Mahara, each student invited the teacher to read their entries online, in return for regular and individual feedback comments. Previously, formative feedback on the students' journal entries was only given verbally through class discussion in tutorials, however, giving additional individual written feedback was deemed to be beneficial to students' learning, and using Mahara enabled this.

Echo360 System and Google Glass – technologies for video recording

The Echo360 system is installed at the university to record lectures, and Google Glass is an electronic device with a voice-activated recording facility integrated into a pair of spectacle frames. To make self-assessment easier for the students and to enhance the co-assessment process, the university's Echo360 system was used to record the students' oral presentations. Unfortunately, inclement weather in the form of an unexpected very heavy snowfall on the day of the scheduled assessment prevented two students from travelling to the university. Being summative assessment, it was imperative that they were allowed another opportunity to give their oral presentations, but finding a suitable time slot

in a lecture theatre at short notice was very problematic and created somewhat of a dilemma given that this had not been predicted and was the first time that the presentations were being recorded. Fortunately, a solution was found as access to Google Glass was made available by a colleague to record the presentations in a scheduled tutorial class. All the recordings were subsequently accessed by students through Moodle, a virtual learning environment. As this was part of summative assessment, it was necessary for the external examiner to have access to the recordings and this was easily made possible.

Camtasia – software for audio-visual screen casting

Camtasia allows mp4 files to be created, rather like a ‘mini-movie’ (Eckhouse and Carroll 2013: 464). Spoken feedback is recorded while a screencast of an individual student’s work is scrolled through and highlighted by the teacher where apposite. In the course, students were required to submit a Word file of their critical incident reports to Moodle. After downloading their Word files, audio-visual recorded feedback was made available to each student on individual mp4 files using Camtasia, which they then accessed through Moodle.

Findings

The aim was to explore various uses of technology to facilitate more effective assessment for learning and feedback in a service-learning course. Two main themes emerged that characterised students’ responses to their technology enhanced assessment and feedback. These themes were polarised as resistance and receptiveness, although there were also some nuanced responses from students.

Resistance

Students’ resistance to using technology was manifested at various levels between mild and severe. Mild resistance could be detected through students’ anxious questioning of the new methods that involved technology. This indicates the importance of explaining assessment and feedback methods and their rationale to students at the beginning of courses. It is vital that there is clarity and transparency of communication between staff and students. Resistance might be expected when technology fails to work efficiently, and indeed this was apparent in the study. However, there were differences between students’ immediate resistance and resistance that developed gradually as the technology was perceived to be unreliable or difficult to use, as with Mahara, or was incompatible with the students’ own electronic devices, as with Camtasia.

These technological problems were frustrating and, consequently, some students became disengaged. For example, a student felt very negatively about Mahara, explaining that ‘the level of stress to get that thing set up was unreal’. Another student added, ‘I typed out a whole lot of work and the page refreshed and I lost it all and had to start again’. Other students also ‘got frustrated with it’ because they could only access Mahara on campus. A different problem arose from the use of Mahara being optional, as a student explained, ‘it would be better if it had been mandatory, because then I would have done it more regularly’, whilst another student admitted that she ‘forgot about it sometimes’ because it was optional. Despite reassurances that students would receive regular feedback through Mahara, some students did not engage with it at all.

Further investigation into their disaffection revealed that a couple of students were hesitant in writing reflectively on their learning experiences because they lacked confidence. One student firmly resisted writing her personal reflections on Mahara because she felt it was ‘so invasive’. This is a paradox because she openly admitted to sharing her personal information on social media. This suggests that some students have different expectations about the role of technology, and that it is currently more easily accepted for using socially than perhaps it is for using with an educational purpose.

Resistance also occurred in some of the students’ self-assessment of the oral presentations. The video recordings made through the Echo360 system were intended to help students to reflect on their presentations. A few students claimed that they felt embarrassed at the prospect of watching their

recorded presentation and therefore did not view it. One of these students admitted that she 'hated it', and exclaimed that it filled her with 'absolute fear'. Resistance to this process meant that some students had to rely on memory for their critical reflections in the co-assessment process.

Receptiveness

Some students' initial dissatisfaction with Mahara eventually dissipated. As one student explained, Mahara 'lets you write down information and then you can go and make it into something sensible later'. Using the feedback comments she received, this student contributed weekly to her final journal, while editing it as she progressed through the course. Using Mahara provided an opportunity to self-review her work. Similarly, those who persevered with Mahara found it to be a rich source of learning because it enabled what one student described as, 'constructive, fast, positive feedback'. It was the use of this technology that enabled 'speedy feedback', which many students said was 'exceptionally helpful'. They said that 'it gives you the feeling that you're on the right track'.

Students also used Mahara in different ways. For example, one student confided, 'I didn't use it regularly, but when I did use it I found it quite cathartic – because if it had been a hard day at the placement, I got to type it and take my frustration out on the keys almost'. She then added, 'type it away, send it away, almost like I was passing on my worry to someone else'. Indeed, using Mahara as a therapeutic outlet became an important source of help for another student who went through a particularly challenging incident within her placement. Through Mahara, a helpful and supportive response could be offered to her very quickly and her tricky situation was resolved rapidly. This student said 'I really liked (using Mahara and) felt it really helped me to look back at what I was doing'. She found this technology to be 'a useful tool' that helped her to develop her critical reflection.

Most of the students found the recording of their oral presentations to be helpful in their self-assessment (Murphy and Barry 2016), and conducive to a fruitful discussion in the co-assessment process. One student laughed, recalling, 'I was moving my hands all over the place like I was directing a 747 (jumbo jet) into the lecture theatre!' Similarly, another student after watching her recorded presentation chuckled after realising that she had done 'a wee curtsy to everyone'. Another student admitted, 'I thought maybe with the video I'd be like freaking out, but actually no – I definitely found it useful'. Another student said that 'I thought the video was really good. It gives you the chance to switch roles and sit and criticise yourself and also compliment yourself... it gives you the chance to see it from a different perspective, which is good'. The Echo360 recording technology allowed students to be more objective in their self-assessment of their oral presentations, which is important for learning (Boud and Falchikov 2006). This led them to being more actively and authentically engaged with the co-assessment and, as one student confirmed, 'being able to watch (our oral presentations) back made grading easier'. Another student commented that 'you're actually criticising your own work'.

The method of feedback provided on the critical incidents using Camtasia proved to be very popular with students. One student in this study said, 'it was like the marker was in the room talking through the good and bad parts'. Another student said that was 'more personal' and led to a deeper 'level of understanding' for her as more feedback was given 'indicating areas that could be improved'. The advantages found with personal feedback resonate with other studies in the literature (Sutton 2012; Eckhouse and Carroll 2013; Carruthers et al. 2015).

Discussion

This paper demonstrates a case study of using different types of technologies within one course that were used for self-assessment, co-assessment and feedback. It reveals how using various technologies may facilitate and enhance assessment for learning and feedback. It was predicated on a pedagogical approach evolving from a staff–student partnership and an interest in improving students' assessment and feedback literacies (Deeley and Bovill 2017). Importantly, the rationale underpinning the use of aligned technology was reinforced by the view that all assessment can be used for learning.

Using Mahara regularly facilitated a deeper level of trust and understanding between the students and staff. This proved beneficial as it led to spontaneous dialogue between them that continued beyond, but remained connected to, the technology (Parkin et al. 2012). Interestingly, and perhaps coincidentally, the students who did not participate in using Mahara did not perform as well in their final journals, and thus received lower grades than the other students. However, as the study was limited in size, this finding cannot be generalised. Despite the level of success, Mahara was also the most problematic of the technologies that were used and was disappointing from my perspective as the teacher. Solutions to some of the problems encountered with Mahara would be to offer more student support in terms of its initial use, or indeed to use an alternative software that offers a similar function.

Using technology in recording the oral presentations was overall very helpful to students because it allowed them to be more objective, and gave them more time to reflect carefully in their self-assessment. Students could view the recordings as many times as they wished before the co-assessment meeting. Poignantly, they could also choose *not* to view the recordings, as some students admitted to feeling discomfort at the prospect of seeing themselves on video. Unfortunately, some students encountered difficulties in accessing the recordings, but this was due to the incompatibility of their electronic devices. One of the limitations in using the Echo360 system was its inflexibility. The system is designed primarily for lecture recording, so the time and place for the presentations had to be pre-booked in advance and according to the availability of lecture theatre space. Google Glass offered more flexibility, although there are other drawbacks in its use, such as limiting head movements when recording.

The most popular technology used in the study was Camtasia, because it offered students direct, individual and personal feedback. It also allowed more feedback to be given than had it been written (Cann 2014). Many of the students believed that feedback was of better quality, easier to understand and more personal (Bourgault, Mundy, and Joshua 2013; Eckhouse and Carroll 2013; Gould and Day 2013; Hyde 2013). They claimed that it was more interesting than reading written comments, and indeed some of them commented that they paid more heed to the feedback. As Carruthers et al. (2015, 354) affirm, 'expression, nuance, tone and personal input add layers of meaning for the listener'. There is an inference here that students respond positively to personal attention, which in turn can create a sense of trust and care (Sutton 2012).

This technology can also enable speedy feedback so that students can use it effectively to improve their work (Jonsson 2012). As with other technologies, there are both advantages and drawbacks in its use. In this case, one of its advantages is that audio-visual feedback delivered by an mp4 file can be accessed off campus and at any time if students' devices are compatible. However, a drawback might be that students with hearing or other difficulties may find audio-visual feedback less useful, so written feedback could be offered as an alternative. This could be achieved through using additional technology, for example, voice recognition software such as Dragon would produce a transcript of the recorded audio feedback comments that could be returned to students as a Word file in addition to the mp4 file.

Unfortunately, there were barriers to using technology effectively at all times. For example, on occasions the technological method failed completely or was counterintuitive and difficult to use. Using technology within the context of assessment was also a barrier because of student resistance. Perhaps, this was due to the conservative nature of traditional practices in higher education where innovative assessment and feedback methods can sometimes be viewed with discomfort and cynicism (Deeley and Bovill 2017). Typically, resistance was evident when assessment methods were foreign to the students' experiences. Other pertinent factors to fuel students' resistance may have been their modesty and self-effacement, which echoes findings from previous research (Deeley 2014). Students' resistance may also have been due to the idea of change itself, as sometimes this can bring discomfort. Moreover, a few students were concerned that using a different method of assessment might negatively affect their achievement as one student affirmed, 'I am used to the traditional setting'.

As referred to earlier, the extra time needed to learn new technological methods in assessment and feedback may be an initial hindrance for staff, but ultimately it may save time (Cann 2014). Moreover, the use of Camtasia can also be extended, for example, in making podcasts for student learning, recording over lecture slides, and for delivering overall feedback to large classes. Technology is constantly and

rapidly improving, which poses exciting opportunities and challenges in developing assessment and feedback methods. In this respect, being open to new ways of working with technology is vital. Taking small and incremental steps in experimenting with different technologies aligned with assessment and feedback can revitalise assessment for learning and feedback to make it more effective.

Conclusion

This paper has shown that summative assessment can be utilised *for* learning and that it can be enhanced by technology. Similarly, the study has demonstrated that feedback can also be improved by using technology. However, technology is a useful tool only if it is fit for purpose and aligns with the aims of the assessment and feedback. It is also imperative that the communication between staff and students is characterised by openness and clarity. For example, explaining to students how and why specific technology is being used can encourage their more willing engagement and stem or alleviate any feelings of discomfort they may have. An aid to success in using innovative methods is trust between students and staff within a supportive learning environment, which is where a staff–student approach can be most helpful. Using technology may also facilitate a dialogic approach to assessment and feedback. Such dialogue reinforces the notion of assessment for learning and is conducive to sustainable and deep learning (Nicol and Milligan 2006; Nicol 2010; Carless et al. 2011). Technology can also be used to deliver feedback speedily as well as creating a sense of an individualised and nurturing relationship between staff and students, as with the use of personalised feedback through Camtasia and Mahara.

This case study demonstrates that more effective assessment for learning and feedback using technology can be achieved. It also shows how assessment *of* learning can be transmuted into assessment *for* learning. These aspects are rewarding for students and staff. However, experimenting with the use of technology in assessment can be challenging and risky. In these respects, it is prudent to remain flexible and to take small and incremental steps.

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