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Smartphone feedback: using an iPhone to improve the distribution of audio feedback

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Abstract

The advent of accessible digital recording devices has made the production of audio feedback on students' work more viable, Ref. 1. Previous research into audio feedback has concentrated on using PC recording software such as Audacity and mobile MP3 recording devices. However, effective use of these methods can be undermined by unsuitable technical infrastructure and the demand for special ICT skills, especially when distributing the finished feedback to students. Smartphones, on the other hand, combine the flexibility of MP3 recorders and the connectivity of a PC in a discrete handheld device, thereby suggesting their application as a user friendly tool for giving recorded audio feedback efficiently. This paper describes a smartphone feedback methodology and presents findings from research on its use with 130 Level 5 Engineering and Computing students. The study found that the smartphone was more suitable than other technologies to the various demands of feedback production and distribution, and that this helped the tutor to manage the exceptionally stressful time associated with marking and giving feedback on top of an ongoing teaching load. Its pedagogic integration also resulted in a good dialogical experience as evidenced through student testimony.

Keywords: Audio feedback, mobile learning, smartphones, technology-enhanced learning

Introduction

Audio Feedback

Audio feedback has been shown to enhance student learning and engagement with feedback, Ref. 2. In contrast to written feedback, audio feedback can be more engaging due to its capacity to convey more meaning through the tone of the speaker's voice, Ref. 3, and other nuances, Ref. 4. Personal one-to-one audio feedback is an effective way of motivating students and highlighting areas for their attention, with students demonstrating how they value such feedback by sharing it with peers and reusing it to enhance their learning and performance, Ref. 5.

However, methods for distributing audio feedback need to be developed. In the days of analogue recording students were asked to submit clearly labelled blank cassette tapes with their assessment submission so that the tapes containing their feedback could be returned to them with their assessment submission (Ref. 3; Ref. 6). Today's equivalent to this would be to ask the students to either submit a USB pen drive in order receive feedback through the normal manual procedures or to bring their USB pen drive to the class so that they receive their feedback file from the tutor after class, Ref.7. Both of these methods would appear to be rather circuitous in the Digital Age. Distribution methods utilising the institutional Virtual Learning Environment (VLE), Contents Management System (CMS) or email system would seem more appropriate; however, such systems need to be capable of streamlining feedback distribution so that the management of the feedback is not arduous for the academic and to ensure the process is clear for the students (Ref. 5; Ref. 8). In the authors' experience of producing audio feedback and running workshops for UK universities on using media-enhanced feedback, institutional VLEs and CMSs currently not intuitive and

do not meet the specific workflow requirements for managing audio feedback. This is partly because the pedagogic approach is emergent. Feedback distribution, therefore, is often time consuming and there is a danger that despite its pedagogic benefits the use of inappropriate, albeit available, technology could deter both early adopters and the early majority adopters of audio feedback from using it at scale.

Distributing audio feedback as an email attachment provides another technical option; one that is attractive due to the familiarity of email for most academics and students. The method only requires that the producer knows the student's email address, which can be supplied by the student as a pre-requisite of the assessment submission. Ice, Curtis, Phillips and Wells (Ref. 4) reported that students were positive about receiving written and audio feedback by email. They also described how students had suggested dispensing with the written feedback altogether due to the preference of most students for audio feedback. In another study, by Merry and Orsmond (Ref. 9), students also indicated their preference for emailed audio feedback over written feedback.

However, they noted that email distribution has its limitations: they found that audio files greater than 11Mb could not be emailed and proposed that the VLE should be explored as a distribution tool. Furthermore, in each of these examples, production was limited by the need to use a PC for distributing the files; an approach that inevitably constrains the feedback production and adversely affects the benefits associated with taking a less formal, personal approach. In situations where a portable recorder has been used distribution adds an administrative layer to the process and this too can impact upon what can be achieved.

This paper describes how one member of a teaching team used a personal smartphone to produce and distribute audio feedback in a timely and manageable way to support

the tutor assessment of student submissions in Engineering and Computing. It also reports on the students' reactions to receiving feedback in this way.

Smartphones and their educational use

Smartphones incorporate wireless Personal Digital Assistant (PDA) technology and telephony, combining communication tools with a range of functionality including office software, Ref. 10. In addition to the connectivity required for mobile telephony, smartphones exploit technologies such as Wireless LAN, 3G and Bluetooth. They can be further customised and personalised with additional functionality through the user installation of small software applications, commonly known as 'apps', according to the owner's needs and interests. Apps are usually produced by third party developers and can be as diverse as free games, dictation tools and more expensive satellite navigation applications, for example.

Smartphone ownership amongst students and staff is becoming common on campus suggesting that their educational potential needs to be considered, Ref. 11. However, Cochrane and Bateman believe a cultural shift is required amongst academics and students, together with further development of their IT skills, if the full educational potential of smartphone technology is to be realised (ibid). Research into the successful adoption of smartphone technology amongst Health professionals has shown how this is dependent upon the user's attitude and the device's perceived usefulness (Ref 10), factors believed to affect smartphone adoption in any professional field, Ref. 12. Another study indicates how the anticipated availability of further discipline related smartphone applications affects smartphone acceptance amongst Health professionals, Ref 13.

The authors have identified and evaluated many apps with audio recording functionality, Ref. 14. In most cases these apps were originally designed for business users. Nevertheless, several voice memo applications include functionality that allows audio recordings to be directly emailed as attachments using a small number of steps. Using a smartphone to record and email feedback can be much simpler and more accessible than using, for example, audio recording software on a PC and a separate email client. On a smartphone the recording application is able to distribute the automatically feedback file using email when the producer selects send at the end of the recording process. This assumes that editing of the audio file is not necessary, however most authorities agree that editing audio feedback is neither useful nor realistic, Ref 1. The only requirement for the smartphone feedback producer is to enter the recipient's email address from addresses previously stored on the phone, together with a note describing the attachment, its intended purpose, and perhaps recommendations for how it should be used.

Teaching context

At {xxxx} University, the curriculum for all Level 5 Engineering and Computing students includes assessment tasks and learning outcomes relating to graduate employability. The common task, which uses a mock application scenario, assesses the student's ability to apply for a placement position. Upon submission, the student applications are anonymously peer reviewed and both the submissions and peer feedback are then moderated by the tutor. In the case of the Engineers, the students are provided with job descriptions for placement positions at Tata Steel and are required to submit a completed application form with a covering letter. The Computing students are required to complete just the application form which is based

upon details provided for an IT Support position at A4 Employment. The Employability component is taught by a team of academics in each of the subject areas.

One member of the teaching team (author 1) provided audio feedback to support the tutor assessment of the student submission and peer feedback. The feedback was completed within 9 days following an anonymous peer assessment exercise of the mock application process, though some received it after only 5 days. The tutor in question was responsible for 58 students (30% of the Level 5 2010-2011 cohort) on BSc Computing related degrees and 72 students (30% of the level 5 2010-2011 cohort) on Engineering related degrees (BSc, BEng and MEng).

Pedagogic rationale

The graduate and placement job application process used by firms for the last 30 years is not dissimilar to an examination assessment: the student answers challenging questions, receiving little or no feedback other than a confirmation of whether they have passed or failed (Ref. 15, Fig. 1). Assessment of a mock application, therefore, provides students with an opportunity to receive feedback on their submission, in particular highlighting areas for improvement and maximising the student's potential in actual job applications (Ref. 15, Fig. 2). It was suggested earlier that students often engage more deeply with audio feedback because of the engaging nature of the voice than with some forms of written feedback, which in some cases results in scan reading, Ref. 14. Learning can also be deepened by the introduction of peer assessment which can encourage students to reassess their own submission in the light of the feedback they give their peers. This can be understood as a dialogic engagement with the feedback process, which has been identified as a principle of

effective feedback design, Ref. 16. A rich, multi-layered set of opportunities for learner engagement with their feedback is created by combining peer assessment with academic moderation, emailed audio feedback, student self-reflection and the prospect of student re-engagement with the audio feedback over time. This can be thought of as a ripple effect upon the student's learning with each iteration potentially adding to the meaning of the feedback over time, Fig. 3.

Figure 1: Student transmission, with limited feedback of pass or fail feedback

Figure 2: Dialogue feedback between assessor and student

Figure 3: Opportunities for multi-layers of learning through self-reflective feedback, peer feedback, tutor audio feedback, student re-listening to audio feedback

As Nicol and Macfarlane-Dick suggest (Ref. 17), good feedback practice should encourage academic and peer dialogue and facilitate self-reflection so that the student can measure their current performance and appreciate how to build upon it. If the feedback process is tailored to each student and each student assesses more than one fellow student, engagement with the feedback process can produce a rich dialogical experience, Ref. 18. The ripple effect of feedback on student learning can be enhanced further if students decide to share and listen to one another's feedback, Ref. 6, Fig 4.

Figure 4: The potential for learning through the re-listening and sharing of audio feedback.

Implementation

Audio feedback

The audio feedback files in this study were generated using the tutor's personal *iPhone* with the *Recorder Pro* app which she had already downloaded and installed.

The tutor recorded the feedback whilst assessing and reflecting upon each assessment

submission. Each file was named “<student username>_peeu assessment b feedback”.

Once the assignments had been marked each audio file was emailed over the wireless network from the *iPhone* using the email functionality in the *Recorder Pro* app and the university’s standard student email address format: <student username>@my.{XXX}.ac.uk. The contents of the email advised each student that the email contained an attachment of an audio file providing feedback on their Employability Assessment B submission.

The audio feedback, in terms of content, was designed to highlight what each student had done well and areas in which they could improve; in this case whether the application would win them an interview or not, and if not, what the student could do about it. The audio feedback aimed to be succinct, clear and detailed enough to be useful.

Research Methodology

The paper reports on an aspect of a broader study into the use of audio feedback. This paper focuses on the evaluation of smartphones as an effective tool for giving individual audio feedback to students. The evaluation, therefore, requires that both the tutor's and the students' experience are considered.

First, the effect upon the tutor’s workload, the adequacy of the her skillset in giving feedback in a way that aligns with the pedagogic rationale, and the nature of the tutor’s subsequent engagement with her students is considered. Logs and diaries provide a useful tool for capturing diverse activity and reflection (Ref. 19) and so a record was made by the tutor to capture the details of, and reflections upon, her experience of the assessment feedback process. The log was analysed by the second author according to conditions he identified as affecting the marking and feedback

process, including: the amount of marking; the time available for marking as a whole and specifically for each piece of work, and how the time was used; the marker's general situation (spatial; temporal; both professional and external commitments); evidence of student learning from the feedback; and the adequacy of the tutor's technical skillset and tools. The smartphone method is also evaluated by comparing it to the tutor's previous experiences of giving audio feedback to earlier cohorts studying similar modules and then by comparing it to the written feedback provided as an alternative for a deaf student on one of the current modules and earlier iterations of the modules where written feedback was used. The comparisons draw upon timings made by the tutor during current and previous marking processes.

Secondly, the study considers the student's reaction to the smartphone feedback. The students were surveyed 5 to 6 days after they had received the feedback from the tutor. This took the following form,

- 4 Likert scale questions structured around Gibbs & Simpson's conditions for assessment designed to promote student learning (Ref. 20);
- 9 Likert scale questions structured around Nicol's design principles for assessment feedback (Ref. 21);

The survey included further open text questions designed to elicit the students' reaction to, and use of, the audio feedback. This aspect of the research is mostly beyond the scope of this paper.

14 students (half of one of the four tutorial groups) were later interviewed about the use of feedback and its impact on their learning. The interview took the form of semi-structured conversations, Ref. 22. Additionally, 11 students representing all tutorial groups were asked by email for their reflections on the pedagogic approach to

meeting the employability learning outcome. Mostly the findings from these methods are not directly relevant to this paper, though some comments are pertinent with regard to the technical quality of the audio, the style and approach used in giving feedback, and the usability of the medium.

Findings

The selected findings here relate to the effective use of smartphones for producing and distributing audio feedback that is formative for learners.

Tutor's experience

72 submissions (application forms and cover letters) from Engineering related degrees (BSc, BEng and MEng) and 58 submissions (application forms only) were marked for the BSc Computing students. Following the student peer assessment activity, a target of seven days (Saturday to Saturday) was set by the tutor to turn around the marking and feedback. Eight submissions went astray and were completed outside of this time frame. The marked submissions of the Computing students were returned within 5 and 6 days of the peer assessment (depending on their respective timetables). The audio feedback files for the Computing students and one engineering tutorial group were distributed after all of the marking for the group had been completed, taking one hour for each tutorial group. The feedback each student in the other Engineering tutorial group was sent as soon as it was ready.

10-20 assignments were marked each day with the marking of each assignment taking an average of 10 minutes. The average duration of the feedback given on the covering letter and application form (and therefore also its production time) for the Engineers was 4 minutes and 50 seconds. The average feedback for the Computing students was 4 minutes and 4 seconds. This discrepancy is due to feedback only being given on the

Computing student's application forms. This can be compared with the half hour it took to provide the same level of feedback in written form for a deaf student in this academic year and with written feedback given in previous academic years for a similar sized cohort taking three weeks. Marking and providing audio feedback on this assignment using the smartphone therefore took significantly less time than before.

The method involved selecting the *Recorder Pro* app on the smartphone as soon as the tutor began reading the work and commenting on it by using the app's auto pause feature. This prevented periods of silence from being recorded and made it feasible to take an unscripted approach guided by an assessment grid.

Marker's situation

Even though the tutor's log notes that the marking week had 3 hours less teaching than usual, she describes the marking period as "a week from hell essentially" with marking at home on the Tuesday being interspersed with a 1 hour lecture and 2 hours of tutorials. On the same day she also met with her 5 project students, had a 1 hour placement administration meeting, and prepared a presentation for a staff development conference scheduled for the following day. On the Wednesday a 1 hour lecture was followed by an off campus conference presentation, which took the rest morning. Later this was followed by a 1 hour tutorial and two 1 hour lectures. On the Thursday she worked at home marking and collating grades before lecturing for an hour in the afternoon. This was followed by student project meetings for an hour and another 1 hour lecture at 4pm, which ran into project meetings and a lecture from 7 until 8pm. Sunday, Monday, Friday and Saturday were used for marking and feedback. She highlights the intensity of handling the marking and how she was "talking the feedback in my sleep!"

Some of the assessments were marked at her desk at work when the office space was quiet enough. The majority of the submissions, however, were marked at home on the sofa on non-teaching days and during evenings, through to beyond midnight on some occasions. The log describes how marking and feedback provision was fitted around family life that included providing a "taxi service" for two teenage children and the care of various pets, with some time set aside for herself.

Evidence of student learning from the feedback

The log concludes by noting how "students now do email, phone and stop [me] in the corridor asking for advice on their CV, letters, applications, though not that many."

She says she has the impression that she is more approachable to her students and how, in class, her students were able to reflect on what actions they can personally take to improve, with some students describing how the feedback had helped them to change their minds about the benefits of taking a placement.

The tutor found the *iPhone* approach to be more efficient than using an MP3 recorder, which requires the files to be transferred first to a PC and then either uploaded for distribution using the VLE or the email system. This is the method she had used in previous years for the Computing students when it had taken over 3 hours to complete, required an excellent working knowledge of the VLE, and good ICT skills, Ref. 23. In contrast, the tutor found using her *iPhone* to be intuitive, requiring fewer steps and technical skills, Ref. 24.

The Student Experience

Survey Results

56 students (43% of the cohort of 130 Engineering and Computing students) responded that they had listened to the audio feedback within six days of receiving it;

the point at which the survey was conducted. The results capture their views on receiving the feedback as an email attachment and the value of the feedback to them. Implicitly, this reflects on the smartphone method of giving audio feedback (see Table 1).

Students' responses to Gibbs & Simpson's assessment for learning feedback conditions

Table 1: 56 (43%) Student survey responses to listening to the audio feedback based upon using Gibbs & Simpson feedback conditions as measures

STATEMENT	STRONGLY AGREE	AGREE	DISAGREE	STRONGLY DISAGREE	DON'T KNOW/ MAYBE/ CAN BE/ NEUTRAL/NOT YET
The feedback was adequate in detail	20	33	1	1	1
The feedback was provided quickly enough to be useful	24	30			2
The feedback was understandable and meaningful	19	33			4
You have acted upon the feedback to improve your work	12	27	7		10

The findings indicate that nearly all students thought that the feedback was timely, meaningful, detailed, and useful for their personal development. Only one student expressed a preference for written feedback, which is consistent with previous research, Ref. 6. The speed of return, and the feedback's clarity and meaningfulness are particularly important here as they indicate a high level of satisfaction in the areas most related to the use of the smartphone as a production and delivery tool.

Students' responses to questions based upon Nicol's feedback design principles

Table 2: The tutorial groups' responses to eight of Nicol's principles for assessment design

STATEMENT	STRONGLY AGREE	AGREE	DISAGREE	STRONGLY DISAGREE	DON'T KNOW/MAYBE/ CAN BE/ NEUTRAL
The feedback helped to engage you more with the learning activities in this module	14	27	5		10
The feedback motivated you and developed your self-esteem	9	26	3	2	16
The feedback was of good quality	17	25	1		13
The feedback encouraged more peer and tutor dialogue	7	32	4	1	12
The feedback promoted personal connection with your peers and tutor	2	26	9	2	17
The feedback helped to engage you in module topics of placement preparation	5	33	5	2	11
The feedback adequately reflected the level of commitment you made to this module, in and outside the classroom	8	34	5		9
The feedback helped you to improve your performance	14	28	3		11

It is not possible to claim a direct correlation between the data in Table 2 and the use of the smartphone; however, the design qualities that underpin the statements are likely to have been affected by the circumstances in which the feedback was

produced. Of the students who had used the audio feedback at this point, the responses illustrate how the majority found the audio feedback method to be well designed, engaging them in the module and aiding their improvement.

Students' Free Text Question Responses

55% (31) of the students who had listened to the audio feedback indicated that they had listened to the audio feedback more than once, whilst 7 indicated that they had listened just once but intended to listen to it again. When asked what action they had taken as a result of the audio feedback, 57% (32) of the students indicated they made notes. For example, this student "Amended my work while been spoken through it" While another was more interested in making brief notes "for future reference." Others amended their CV, covering letter or application form in response to the feedback. Eight students reported how they had listened to the audio feedback with others or had shared it. Additional comments show the students to be generally enthusiastic about the approach,

"An interesting format to provide feedback"

"Wicked, because we can listen to it as many times as we need"

"A lot of benefits... Greater understanding of what I am doing wrong"

However, one student, whilst enthusiastic, identified a difficulty in playing the file,

"Quick feedback to student. However, maybe save the audio file in universal format, e.g. mp3, as I had to download QuickTime to play .aiff."

Qualitative results from the group interview and solicited email

Overall, the interview group indicated their preference for the audio feedback over written feedback, citing a variety of reasons including its more descriptive nature, the pleasure of listening to a voice rather than reading text and, as has been noted by other commentators on audio feedback, not having to deal with illegible tutor hand writing. The portability of the feedback and its access through a mobile device was also highlighted. One student in particular described how audio feedback is, "*an interactive way of getting feedback. Nice and quick. You can play it again and again...*", suggesting an appreciation of its dialogic nature.

An email respondent appreciated the asynchronous nature of the spoken feedback, explaining how he could, "listen to your feedback at a time that suited me, even if it was 4 in the morning."

Discussion

The study demonstrates how the use of the familiar personal smartphone device simplified the tutor production and distribution of audio feedback on individual student assignments in a number of ways and for several reasons.

The smartphone is a familiar and personal device. It is a casual technology: one that can be picked up and put down without inducing a techno-anxiety. It is a portable device that travels with the tutor across formal, professional environments and situations and on into less formal situations. In this respect it pervasive and ubiquitous and technologically less dominant and determining. In this study the portability of the device, psychologically, appears to be liberating for the academic, even when the academic is under pressure responding to the exceptional demands of the marking week.

The tutor in this case is a confident and relatively highly skilled user of learning technology. However, the appropriate focus of the smartphone recording app dispenses with overly complex user interfaces and multiple systems. This means that though specific apps have new functionality, learning how to evaluate and operate them is bound to be simpler and less intimidating for most people. It is suggested, therefore, that most academic users should be able to distribute audio files more easily using a personal smartphone with a suitable app than they can with either PC or an MP3 recorder.

Neither the tutor nor the students reported any difficulty to do with the technical quality of the audio recordings. Instead, the evidence suggested that the quality of the feedback and how it was used suited the way they wanted to work with it. It should not, therefore, be seen as inferior in anyway to either the PC or the MP3 recorder.

The student surveys and interviews indicated a high usage level amongst those students who had used the feedback. This level of engagement with the feedback, despite it only having been available for six days, at this late stage in the assignment indicates how a dialogic approach, in this case using audio feedback, extends the life of the activity and the learning around it well beyond the submission and marking of the assignment. In other situations this might be expected to be the point at which students disengage with learning from an assignment.

However, not all of the students accessed the feedback. It is unlikely that this is due to the form of the feedback, but reflects a general lack of interest in using feedback amongst some students. In these modules it can also be explained by some students questioning its relevance because not all of them intended to proceed to a placement.

An important part of this study has been to consider the smartphone's impact on managing the distribution of audio feedback. At this point in time and at the scale of this study the smartphone appears to have simplified the tutor's workflow significantly. The device used in the study was owned by the tutor and incurred no additional cost due to her particular data plan for the device. This may not be the same for all academic users. A further implication of this study is that institutional services such as VLEs should be updated to simplify the production and distribution of audio feedback and, where this happens, some academics may continue to find other approaches more suited to them.

The study has suggested further areas of work that need to be explored from the existing data as well as a need to conduct more research. Eight of the students here reported how they had listened to the audio feedback with others or had shared the recordings they had received with others, including family members. How common is this and is it a phenomenon associated with audio feedback in particular? More work is also needed to investigate how well the smartphone is suited to other feedback situations. What happens, for example, when the student uses *their* own smartphone to gather and manage their feedback? The casual approach to producing feedback also needs to be explored further: how does this affect the authority and formality of dialogue and the relationship between the tutor and the students, for example?

Conclusion

This initial study into the use of personal smartphones for giving feedback to students has been encouraging. In this case, the quality of the feedback has been enhanced due to the quick turnaround of the feedback, which to some extent has been facilitated by the use of the smartphone. Though more research is now needed, the methods used in

this study have improved efficiency in the production of feedback and this in turn indicates an enhancement in the quality and affect of the feedback.

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