Reflections on the Use of a Personal Response System (PRS) for Summative Assessment in an Undergraduate Taught Module

Alan Hilliard

School of Health and Social Work, University of Hertfordshire, College Lane, Hatfield, U.K.

Abstract: This paper outlines the author's experience of using a Personal Response System (PRS) for summative assessment in a 3rd year undergraduate taught module, over a 2 year period. The rationale for implementation of this method of assessment was a relatively high failure rate in the previous written examination (37%), and to reduce the marking burden for the teaching team. Key challenges identified with the implementation of the assessment process were reliability of the hardware/software, and student and staff confidence with the PRS and assessment process. Following the introduction of the new assessment method, the assessment failure rate was reduced to 9%. The PRS was seen as a good tool for summative assessment and received very positive student feedback comments. The PRS proved to be reliable, and with support and guidance, both students and staff felt confident with the process.

1 INTRODUCTION

Comparative Imaging is a 3rd year undergraduate taught module (30 credits at level 6), which explores the applications of different imaging modalities for three anatomical areas: head and neck, thorax and heart, and abdomen and pelvis. Previously the assessment of the module was by an individual written assignment, and a two hour unseen examination at the end of the module. In 2011, the examination was replaced by three, one hour long, summative multiple choice question (MCQ) tests, which were undertaken using the TurningPoint™ personal response system (PRS). The tests were staged throughout the module, each of the anatomical regions being assessed individually on completion of the taught content. Part of the rationale for the change, particularly with respect to staging of the assessment, was as a result of previous student feedback which highlighted that students felt overwhelmed with the volume of information learned, and a relatively high failure rate (37%) in the previous year's examination. The change in assessment method was also introduced to reduce the marking burden for the teaching team. This was significant, as there is a relatively large student cohort (125 students were registered on the module). The student cohort was also diverse with respect to age, with approximately 50% of the cohort being mature entry students, and also diverse with regard

to ethnic and cultural backgrounds.

Previous research by the author investigating the use of the PRS for formative feedback with students had been very positive. 98.5% of students reported that the system was easy to use and 92.5% perceived that the use of the system helped their learning (Lorimer and Hilliard, 2007). Other studies have reported similar findings (Jefferson and Spiegel, 2009; Chen and Lan, 2013). Despite many studies exploring the use of PRS for formative feedback, there is little information on the use on the use of PRS for summative assessment.

2 USING THE PRS FOR SUMMATIVE ASSESSMENT

PRS typically comprise four elements: a tool for presenting lecture content and questions (e.g. a computer, PowerPoint™, and a digital projector), electronic handsets that enable students to respond to questions, a receiver that captures students' responses and PRS software collates and presents students' responses (Kennedy and Cutts, 2005).

In order to use the PRS for summative assessment, a number of steps needed to be undertaken: Firstly, a "participant" list needs to be created which includes the students' individual identification numbers along with a designated keypad number for each student. The student cohort

undertaking the assessment did not have possession of their own individual handsets, so an assessment signing in sheet was created. When students signed in at the assessment room, they showed their student identification to the invigilator who could then locate and give them their individual handsets. At the end of the assessment, the handsets were collected from the students prior to them leaving the assessment room.

Each test consisted of 20 MCQs, and each question was allocated a time limit of 2 minutes. Traditionally, when used for instant formative feedback, it is common to display a graph showing the percentage responses for each option answer, and to display the correct answer for each question. As the system was going to be used for summative assessment, the author felt that displaying this data would be a distraction for the students, and could impact negatively on their confidence if they saw that they were getting a number of questions wrong. Therefore, after each question was polled for 2 minutes, signalled by a countdown indicator, no data was displayed in the assessment room and the lecturer would move on to the next question.

Following the completion of each MCQ test, The PRS software was used to generate reports of individual student marks, and also generic feedback for each question with pie charts showing the spread of responses and identifying the correct answers. For each of the tests, the students' individual marks and generic feedback was made available through the module website on the University's managed learning environment (MLE) within a 24 hour period.

3 CHALLENGES

One if the primary considerations in considering adopting the PRS as an assessment method in the module, was the overall contribution of the assessment towards the students final module mark. The three PRS assessments were equally weighted at at 20% so, collectively, The PRS assessments contributed 60% towards the students' final module mark. The other 40% contribution towards the students' final module mark was by submission of an individually written assignment. As the PRS assessments contributed the greater portion of the Students final module mark, it was important to ensure that the assessment method and process were robust and reliable. Prior to the implementation of the PRS for summative assessment, a number of key challenges were identified:

   i. Reliability of hardware/software.
  ii. Student trust in the PRS and assessment process.
 iii. Lecturer confidence in the PRS and the assessment process.

Similar challenges have been identified by other researchers (Roe and Robinson, 2010).

The PRS has been used extensively since 2005 for formative feedback, and during that time, had shown itself to be reliable. In order to be assured of reliability of its use for summative assessment a number of checks were put in place. Once the MCQ test had been created, it was given a trial run using a small number of handsets (approximately 6). This allowed a visual check of the questions for visibility and clarity of format. It also allowed for visibility and consistency of the countdown indicator on each question slide to be checked as a means of showing the open polling window and automatically closing the question poll after the allotted timeframe had elapsed. Finally, a report was generated to demonstrate that the question data had been captured and could be displayed as both individual marks and generic feedback.

A key challenge to the assessment method would be the need to gain the students trust and confidence in the process, particularly as this would be the first time that they had encountered this method of summative assessment. This was approached in a number of ways. Firstly, the assessment process was described in detail during the module induction session, which helped to demonstrate to the students that the structure and process of the assessment had been fully considered prior to its introduction. Secondly, early in the module following the first topic, there was a formative session arranged with a "mock" of an actual summative assessment. At this point handsets had been assigned to individual names, and were distributed to the students. The first slide asked students to "press button 1" to check that the handsets were working. During the polling timeframe, the "show response grid" button was selected on the TurningPoint™ toolbar. This projected a grid of all the handsets, and students could see their name change colour as they pressed their handset buttons (see figure 1 below – the student names have been removed to ensure confidentiality). This helped to increase the students' confidence and trust in the reliability of the technology.

Following the "mock" PRS assessment, the process was discussed and any questions or concerns were addressed. One issue that the students raised was concerns that their handset wouldn't work on

the day. It was agreed that a paper "receipt slip" would be used during the assessment and handed in with the handsets at the end of the assessments. The paper "receipt slip" listed the question numbers and students could write their answers in the boxes provided.
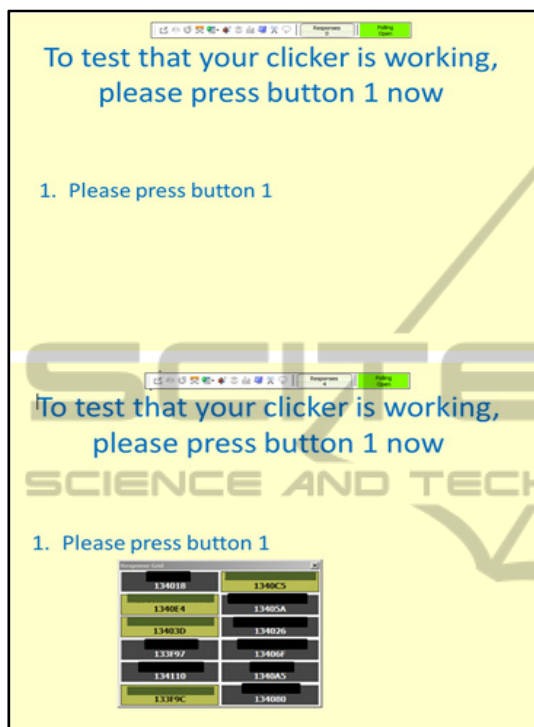

Figure 1: Showing the student participant response grid.

In adopting this system, three points were made clear. Firstly, the paper "receipt slips" would not be marked. Secondly, the paper "receipt slips" would only be considered where there was clear evidence of a non-functioning handset, and thirdly, because students could change their answers to questions within the polling window timeframe, there would be no discussion where students selected one answer using their PRS handset and wrote a different answer on their "receipt slip". The electronic response would be taken as the official answer.

Finally, the issue of lecturer confidence in the PRS and assessment process was not without its challenges. I had a number of years of experience of using the PRS for formative assessment, but had not previously used it for summative assessment. I was very conscious of the need for the process to work without problems to establish the students' trust from the outset. I would be the main administrator for the assessment, and a colleague would simultaneously undertake the assessment in a separate room with students who had specific study

needs agreements. An experienced teaching team member was selected, and a step-by-step guide for the assessment process was produced and it was discussed prior to each assessment. Also before each assessment, every handset was checked that it was working and was set to the correct radiofrequency (RF) channel for the RF receiver so that data responses would be received. This was checked by again using the "show response grid". Next the assessment question slides were run using a small number of PRS handsets, and a report was generated to ensure that the software was working correctly.

4 STUDENT RESULTS AND FEEDBACK

Combining the marks for the individual PRS assessments resulted in an overall fail rate of 9%, as compared with the previous failure rate of 37%. Student feedback on the module was very positive:

"This was a very well organised module, and the modular assessment was helpful. This has been an enjoyable module to study".

"I really liked the structure of the in class tests... Got feedback of exam results the next day! All the teachers are really good and helpful".

"The current set-up of the module is great. I wouldn't change anything".

"This has been an excellent module…I like the way the module has been split into 3 sections which are tested throughout the semester. The PRS system of testing appears to work well and gives the student prompt feedback".

One feedback point that was mentioned by a number of students was about the linearity of the assessment, i.e. each question slide was answered in turn, without the opportunity for students to go back and review their answers to previous questions, which they would have liked. This point was taken on board for the second year that the assessment method was used. In order to enable this, students had a conventional paper-based MCQ. At the end of the allotted time, the PRS was used to collect the data. The answers to each of the questions were collected in turn, with students entering the answer they had previously written down. At the end of the assessment, the students handsets were collected in along with their paper-based MCQs. Here the students MCQ papers replaced the previous idea of the "receipt slip", and it was again made clear that the students' electronic responses would be taken as

their official answers.

5 PERSONAL REFLECTION ON THE ASSESSMENT PROCESS

Following undertaking this method of assessment over a 2 year period, and reflecting on the process, a number of advantages and challenges have been identified.

Some of the clear advantages of this method are the reduction in staff marking time, along with the ability to provide rapid student feedback and rapid release of marks. In each of the student assessments, individual marks and general feedback was provided within a 24 hour timeframe. An unexpected finding was that the assessment method and process appeared to be very suited to the ethnically, and culturally, diverse student cohort. Some students who had not performed well with traditional written examinations appeared to perform better with the PRS assessments. This finding is not specifically supported within current literature.

The process was not without its challenges, however. There was a considerable time input required to construct MCQs at the appropriate level, and which would challenge the students to demonstrate their level of knowledge and understanding. Additionally, time was required to create participant lists, check handsets and TurningPoint™ question slides prior to each assessment.

Due to the cohort size and the centralised timetable booking system at my institution, it became necessary to run the summative assessment in more than one room at the same time. This led to the need to train other teaching team members in the use of the PRS and how to conduct the summative assessment process. There was also a greater staff input required to invigilate the assessment in multiple rooms.

Any concerns regarding the reliability of the hardware and software, proved to be unfounded. Each of the assessment sessions ran smoothly and without technical error.

Student trust in the system and assessment process was established early in the module, through careful explanation, dialogue and discussion. It was supported by running a formative "mock" assessment, which enabled students to experience the process and become familiar with using the PRS handsets. Student feedback on the module provided further evidence regarding the success of this method of assessment.

Lecturer confidence in the system and process could be a challenge if staff felt inexperienced in the use of the PRS or lacked understanding of the structure and process of the assessment. Myself, as lead lecturer, had considerable experience in the use of the PRS and took responsibility for the design and structure of the assessment. Where other teaching team members were required to administer the assessment, support, training and guidance were given. The teaching team managed to successfully run the assessments, and reported high levels of confidence as a result.

6 CONCLUSIONS

The PRS has shown itself to be a successful tool for summative assessment, which can save on staff marking time, although there is a need to be mindful of the time requirement to set up and check the PRS and handsets prior to use. The assessment method may be well suited for ethnically and culturally diverse suited cohorts, although this has not been established. It is important to support students, so that they have trust and confidence in the assessment process and the use of the PRS. Similarly, it is important to recognise the needs of the staff teaching team, and to provide training, support and guidance as required.

REFERENCES

Chen, T., Lan, Y. 2013. Using a personal response system as an in-class assessment tool in the teaching of basic college chemistry. *Australasian Journal of Educational Technology*, 29(1), 32-40.

Jefferson, W., Spiegel, D. 2009. Implementation of a university standard for personal response systems. *Association for the Advancement of Computing in Education Journal*, 17(1), 1-9.

Kennedy, G. E., Cutts, Q. I. 2005. The association between students' use of an electronic voting system and their learning outcomes. *Journal of Computer Assisted Learning*, Vol. 21, 260-268.

Lorimer, J., Hilliard, A., 2007. Net gen or not gen? Student and Staff Evaluations of the use of Podcasts/Audio Files and an Electronic Voting System (EVS) in a Blended Learning Module. Conference Proceedings: *6th European Conference on e-Learning*, 407-414.

Roe, H. M., Robinson, D. P., 2010. The use of Personal Response Systems (PRS) in multiple-choice assessment: benefits and pitfalls over traditional, paper-based approaches. *Planet*, Issue 23, 54-62.