Project Report:
To what extent do Personal Response Systems benefit learning and teaching within a Higher Education environment?

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Background

Personal Response systems (PRS) sometimes referred to as audience response systems (ARS) or Electronic Voting Systems (EVS) are being increasingly adopted by educational establishments. It is thought that the idea was first made into prototype units in the United States of America during the 1960s (Banks, 2006), but it has taken many years for the PRS to be manufactured and constructed into a more user friendly system. PRS allow students to interact and respond via handheld keypads that use either radio frequency or infa-red technology to communicate with a computer that can immediately analyse the data. Tutors can instantly collect responses to questions of varying levels of difficulty or complexity. The answers can then be immediately displayed on the computer projection screen at the front of the class for the benefit of both student and tutor in order to monitor and/or record progress. The university has recently purchased a small number of PRS kits and is looking to purchase more in the near future. Each kit (manufactured by Turning Point) is in the form of a mobile carry case, which consists of a number of remote handsets (often referred to as clickers), a USB receiver that attaches to the computer and the appropriate software, which effectively is a "plug in" to the standard Microsoft PowerPoint package (in most instances). These systems have been chosen as they are highly portable and advertised as being easy to use and maintain. The systems have the option of anonymous data collection or can be set up so that student handsets can be recorded against individual students for summative exams and assignments.

According to Draper & Brown (2004), there are a number of uses for PRS, which include assessment, beginning of lesson diagnostics, general evaluation, peer assessment and building mutual awareness within the student group. Some of the suggested benefits of using PRS (Bostock, 2007) are that instant feedback between the tutor and class can be obtained and that by mixing this with other modes of engagement, a variety of student learning activities can be provided. Bostock (2007) further suggests that more traditional modes of group learning can be enhanced by the use of response systems.

Extent of the project activities

This study considers the effectiveness of the PRS and it is anticipated that the study will provide several benefits to the University as a whole, not least that it will act as a source of reference for tutors who are considering implementing PRS into their teaching schedules in addition to helping to inform any decisions made regarding future institutional purchase of this form of technology.

The research focused on the following four sub questions:-

- To what extent does the PRS influence student-tutor and student-student interaction in the classroom?
- What is the overall effect on student attendance when adopting a PRS?
- How does the implementation of the PRS within learning and teaching affect student performance with regard to overall grades?
- In what way has the use of the PRS system influenced the way tutors engage with pedagogic processes?

Methods of data collection
The PRS technology was trialled by a small number of tutors who utilised the equipment throughout some of their classroom sessions. In order to satisfy the requirements of the research, data collection was in the form of questionnaires which were utilised with students, and semi-structured interviews which were undertaken with tutors. Students who have used PRS equipment within the classes were asked to undertake a short questionnaire, which included questions regarding their personal views on the PRS with regard to classroom interaction (see Appendix A for sample questionnaire). In addition, some students were able to voice their views through a short focus group.

Feedback
There were a total of 84 completed student questionnaires obtained and two semi-structured interviews were carried out with tutors. It was also possible to conduct an informal focus group with 12 students.

Research outcome 1: To what extent does the PRS influence student-tutor and student-student interaction in the classroom?

Student – Tutor Interaction
Students were asked via the questionnaire if the use of PRS in their lectures enabled them to engage with their tutor more or less. The overall results for all student responses are shown in Figure 1.
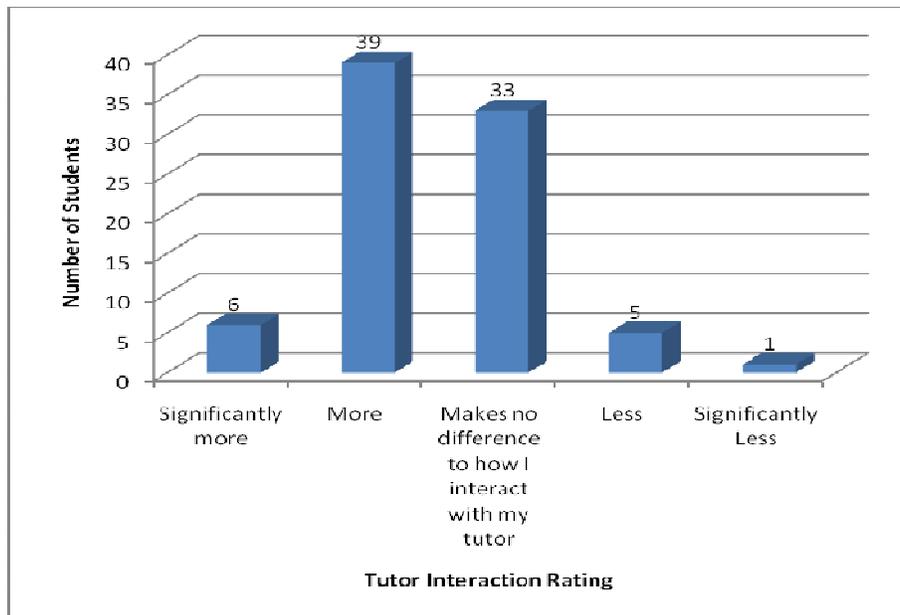

Figure 1 - Student perceptions of PRS with regard to Student – Tutor Interaction for all student groups

In percentage terms, a total of 39% of respondents indicated that the use of PRS made no difference to the way in which they interact with their tutor in the classroom. Of the students who indicated that the use of PRS did make a difference to student – tutor interaction, 88% indicated that their use in the classroom made for more or significantly more interaction with their tutor.

Student – Student Interaction

Students were asked if the use of response systems in the classroom enabled them to interact with other students more or less. The column chart showing all student responses is shown in Figure 2.
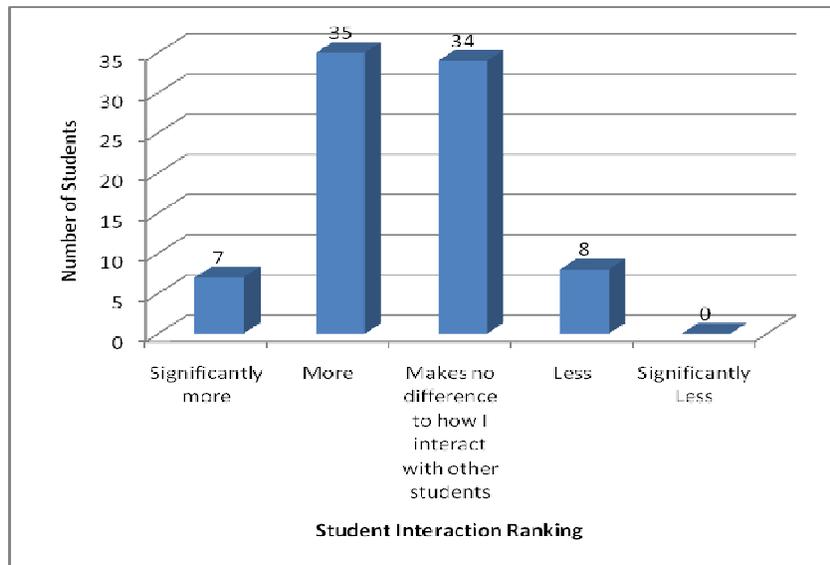

Figure 2 - Student perceptions of PRS with regard to Student – Student Interaction for all student groups

Half of the students indicated that interaction with other students increased, or significantly increased, while the other half thought that student – student interaction either stayed the same or even became less. Looking at the students who indicated that PRS made a difference to the level of interaction between students, 84% indicated that the use of PRS enabled them to make more or significantly more student to student interaction, while only 16% indicated less.

During the semi-structured interviews with tutors they were asked what their thoughts were about the statements of increased classroom interaction by manufacturers and other educational studies. Interestingly, both tutors stated that they felt that "*useful*" interaction was greater in seminars than when they had used the PRS with larger groups. Both tutors felt that it could be difficult to keep students in larger groups "*on track*" when using the PRS and that classroom management could become an issue due to large amounts of distraction and disruption. One tutor observed that the layout of the class and type of furniture made a difference to the level of productiveness of the class when using PRS. It was suggested that movable seating arranged in groups provided a less distracting environment than the fixed rows of seats in a lecture theatre when students were using the PRS. Both tutors stated that the PRS was a useful tool for the testing of concepts while one in particular was more positive about the affordances (Gaver, 1991) of the technology with the possibility of opening up further discussion(s).

Students in the focus group were generally positive about interaction with comments such as
> *"It (the PRS) gets you involved"*
> *"It allows shy people to speak out through the clickers"*
> *"Those who don't like to speak out can still take part"*

Research outcome 2: What is the overall effect on student attendance when adopting a PRS?

Students were asked within the questionnaire whether they would be more likely to attend classes if PRS were used frequently within their classroom sessions. The majority of

students (59%) stated that it would not affect their likelihood of attending class. Of the students who stated that the use of PRS would make a difference to the frequency in which they attend class, 91% indicated that they would attend more or significantly more, while only 9% indicated that they are likely to attend class less. The results are shown in Figure 3.
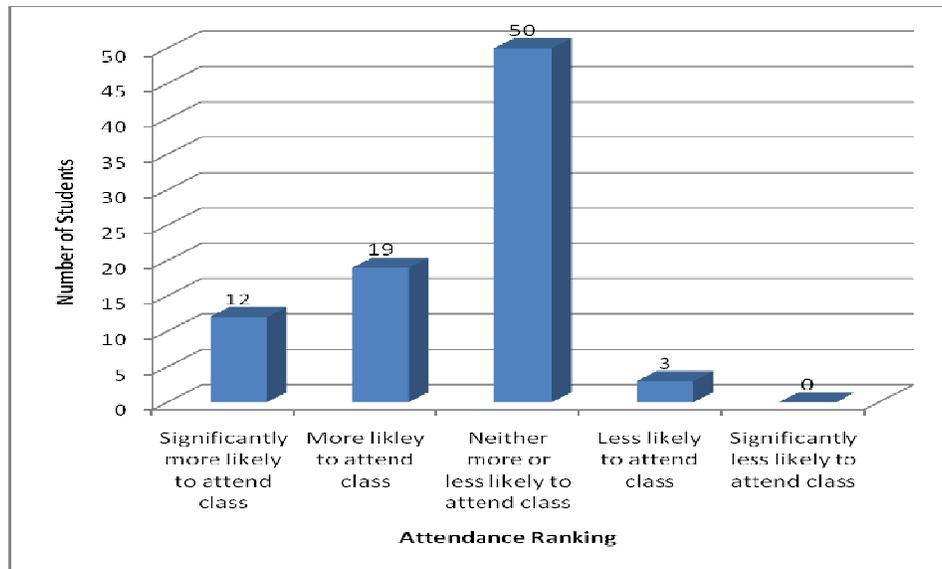

Figure 3 - Student perceptions of PRS with regard to classroom attendance

Students were also asked on the questionnaire whether the use of PRS would make them enjoy their classes more. Results for this question were very encouraging with the vast majority (80%) indicating that they would enjoy their classes more or significantly more. Only 16% of students indicated that using PRS does not affect their enjoyment of lessons and only 4% of students indicated that they would enjoy classes less. This is shown in Figure 4.
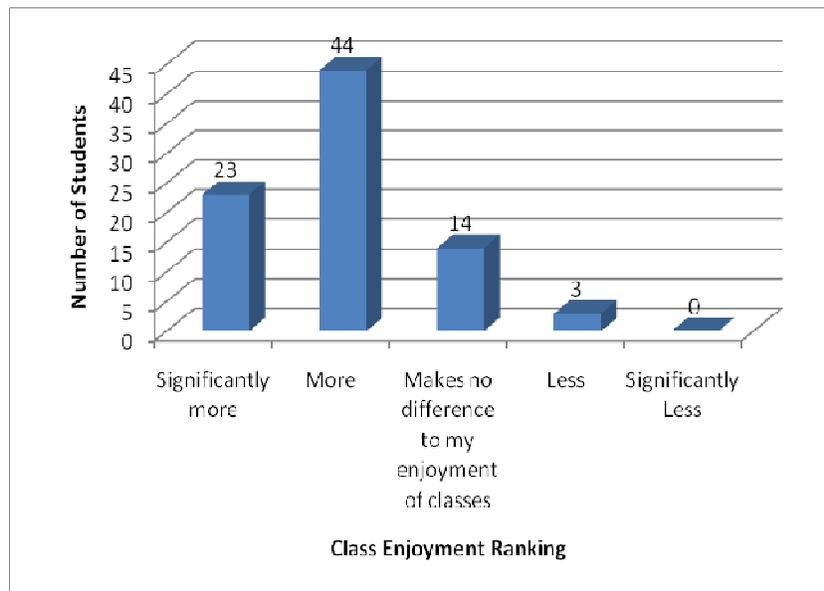

Figure 4 - Student perceptions of PRS with regard to class enjoyment for all student groups

Comments from student questionnaires regarding enjoyment of classes are given below.
*Fun! (*15)*
*Enjoy my lessons much more (*2)*
Cool!
Makes a change
Get some more

Less positive comments from students regarding their enjoyment of classes when using PRS were

Lack of content - too much time testing
*Could be used too often (*3)*
Needs to be used with more teaching

Tutors were asked during the semi-structured interviews what their perceptions were with regard to class attendance and how it would be affected by the regular use of PRS in lessons. Comments from both tutors were very different. Tutor 1 was less enthusiastic about PRS and its potential effects on attendance. This tutor was of the opinion that if used every week students could become bored and that attendance problems often related to other issues, such as personal or financial reasons/job commitments. Tutor 2 although agreeing that the PRS currently held a certain "*novelty factor*" stated that "*students want lectures to be more interactive – they feel that they are getting more out of them*" and it is therefore possible to see how students would be more likely to attend classes if PRS were used.

Results from the student focus group were encouraging as although students did not mention attendance directly, they did state that using the PRS was a fun way of learning and that the use of PRS made a welcome change to more traditional forms of teaching session

Research outcome 3: How does the implementation of the PRS within learning and teaching affect student performance with regard to overall grades?

Students were asked via the questionnaire if the use of response systems on a regular basis would aid their learning. Figure 5 shows the results for student perceptions of the PRS as an aid to learning.
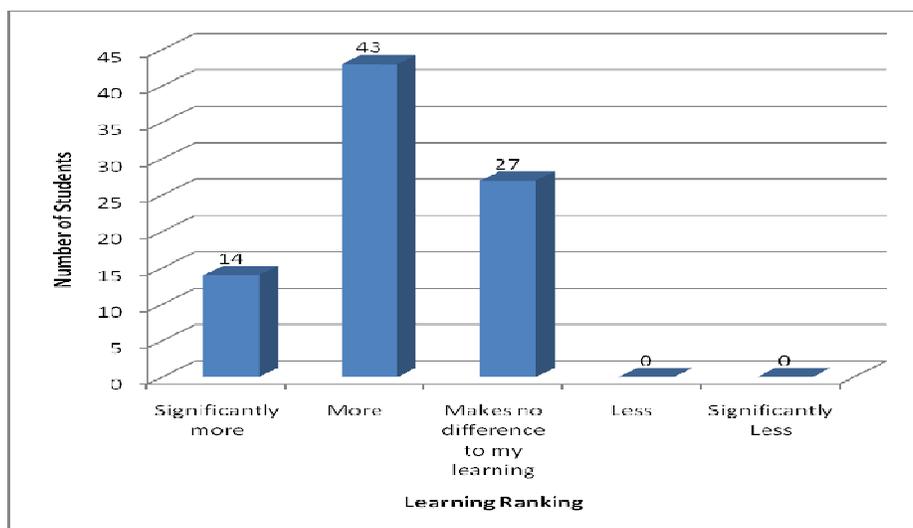

Figure 5 - Student perceptions of PRS with regard to learning

68% of students perceived that the regular use of PRS would aid their learning more or significantly more while 32% of students were of the opinion that PRS make no difference to their learning. Clearly student perceptions on the whole are positive with regard to benefits to learning through the aid of response systems.

Students were also asked via the questionnaire how the use of PRS affected the way they engage with their learning. Students responded positively with regard to learner engagement, with 98% of students who said that PRS made a difference to learner engagement indicating that the use of response systems enabled them to engage with the learning process more or significantly more. 29% of students indicated that PRS make no difference to the way in which they engage with their learning. There were no negative responses from any students who completed the questionnaire. Figure 6 shows responses for all students below.
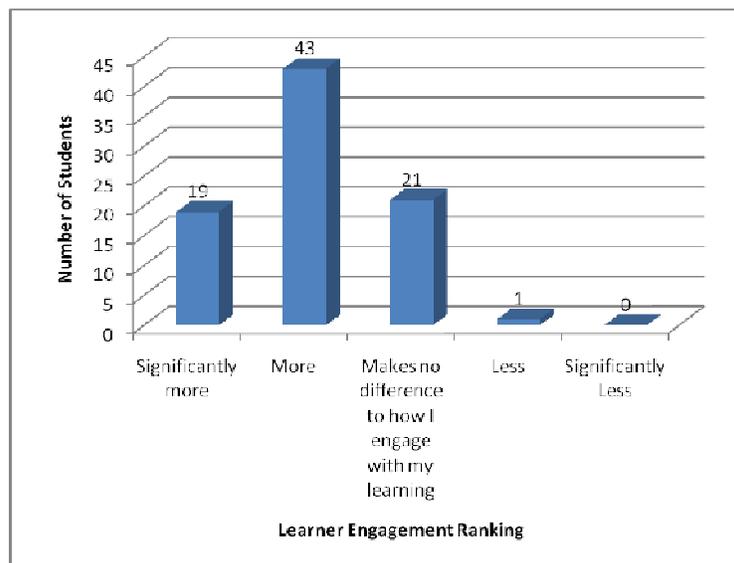

Figure 6 - Student perceptions of PRS with regard to learner engagement

There were further positive comments obtained from the students on the questionnaire with regard to learning listed overleaf.

> *Makes me learn more (*2)*
> *Plugs gaps in my knowledge*
> *This is active learning (*2)*

There were also some negative comments with regard to student learning obtained from the questionnaires. These are listed below.

> *Cause class disruption (*2)*
> *Distracting*
> *Lack of content – spend too much time testing*

Tutors were asked about their perceptions of how the use of PRS would affect student achievement during the semi-structured interviews. One tutor was of the opinion that it is easy to see that the PRS could potentially improve student grades as *"they* [PRS] *test concepts and encourage thinking at a deeper level"*. The other tutor was slightly less optimistic about their use to improve Grades. This tutor was of the opinion that although it allowed the tutor to check the students' level of understanding, it was difficult to tell if it

actually improved the students level of understanding of the topic. This tutor also mentioned the high cost in time with regard to designing effective questions.

Research outcome 4: In what way has the use of the PRS system influenced the way tutors engage with pedagogic processes?

During the semi structured interviews, tutors were asked if they had been required to change their pedagogy when incorporating the PRS into their lessons. The first tutor stated that there were significant differences to pedagogic approaches with regard to seminars and large lectures and PRS implementation. It was suggested that during seminars, there was little or no change required to the pedagogic process. This tutor was encouraged by the way the PRS helped to facilitate what he/she was already doing in the classroom environment. The PRS offered added advantages such as student anonymity allowing the less confident students to take a fuller part in the lesson, while also allowing the tutor to have a better understanding of whether students were still on track.

Unfortunately this was not the case with large lecture groups. This tutor stated that the use of PRS caused too much distraction in lecture theatres and he/she did not consider it suitable in these circumstances. This is unfortunate as the PRS is often advertised by manufacturers as being suitable for all class sizes. The second tutor also agreed stating that it was very difficult to keep students focused in large group lectures, but that it was a useful tool in seminars to aid discussion and involvement. One of the differences stated by this tutor with regard to pedagogic approaches was that because PRS systems made it easier to question students, more time was being spent designing effective questions in order to use with the PRS in the sessions. He/she felt that this wasn't necessarily a bad thing and that it may mean less time has to be spent designing other student activities, or carrying out more didactic forms of teaching.

By looking at students comments from the questionnaires, it was possible to see that they had perceived that adjustments had been made to the design of their lessons as some commented that more time was now being spent testing and less time being allowed for lecturing although it is difficult to gauge what precisely is meant by the term "*lecturing*" in student responses i.e. whether this is presenting at the lectern or more informal open discussion and learning activities.

Summary
In general, the PRS technology used throughout this study has been received very well by both staff and students who have taken part in this research. Comments have broadly been positive for all of the four research questions and in general the technology has proved easy to use, particularly from a student perspective. Staff found the PRS reasonably straight forward to use but as is usual with all forms of technology there is a learning curve during the initial stages of use. Orders have now been placed to increase the number of PRS kits available at the University

Recommendations for the future of the PRS at the University of Worcester
1. The use of PRS to be extended to all tutors within the organisation beyond this Pilot Project.
2. The software (Turning Point) to be installed on all lecterns at UW in order for the equipment to be used in any teaching room.
3. The software (Turning Point) to be installed on all new staff PCs in order for staff to familiarise themselves with its operation.
4. The PRS equipment to be more widely publicised at the University together with details of how staff may borrow the equipment for lectures and receive training in the software.

5. Consideration to be given to the possibilities of how loss of handsets will be funded and by which department (i.e. ILS or the borrowing department?)
6. Consideration to be given to installing permanent PRS handsets into the seating in some teaching rooms.

References

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Appendix A – sample questionnaire

Thank you for completing this questionnaire. You views will help to inform the results of a study considering the effectiveness of Personal Response Systems (PRS). **Please circle the appropriate response.**

A) If Response systems were used in my lectures regularly, I would be:
1. Significantly more likely to attend classes
2. More likely to attend classes
3. Neither more or less likely to attend class
4. Less likely to attend classes
5. Significantly less likely to attend classes

B) The use of response systems on a regular basis would aid my learning:
1. Significantly More
2. More
3. Makes no difference to my learning
4. Less
5. Significantly less

C) The use of response systems enable me to engage with my learning:
1. Significantly More
2. More
3. Makes no difference to how I engage with my learning
4. Less
5. Significantly less

D) The use of response systems enable me to interact with my tutor:
1. Significantly More
2. More
3. Makes no difference to how I interact with my tutor
4. Less
5. Significantly less

E) The use of response systems enable me to interact with other students:
1. Significantly More
2. More
3. Makes no difference to how I interact with other students
4. Less
5. Significantly Less

F) The use of response systems make me enjoy my classes:
1. Significantly More
2. More
3. Makes no difference to my enjoyment in classes
4. Less
5. Significantly Less

Please state what advantages (if any) that the use of the Response system affords.

Please state if you think that there are any disadvantages to using the response systems.

Do you have any other comments to make about the use of response systems in your classes?