Postgraduate Certificate in Higher Education
Nottingham Trent University

# Module 2 – Assessment and Programme Design and Development in the University

## Assignment 2 – Design and evaluate an ‘e-learning tool’

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# Attempting to encourage student engagement and active learning through use of a response system

## Background

### *Value of technology in teaching and learning*

Use of technology usually requires additional time for training and development and this must be weighed against the benefits such use brings. Draper (2009) writes that the use of technology does not produce direct educational benefit but rather that it is the change of pedagogic practice brought about or facilitated through the use of technology that produces any benefit. There are clear benefits to the use of technology when either a change of practice that is beneficial is produced, or current practice is replicated more efficiently. So when using technology it is important to ask what pedagogic need the technology addresses and how this need could be otherwise addressed.

### *The problem: Engagement in lectures; and solution: response systems*

Lectures are an effective method of one individual communicating with an audience but this one-way content transmission encourages passivity and disengagement from members of the audience (Rosenthal, 1995; p. 223; Wit, 2003; p. 16). One method to increase engagement is to ask questions but in reality this only engages students who 'volunteer' an answer (d'Inverno, 2003; p. 19).

Lammers and Murphy (2002) report on the effectiveness of teaching activities based around active learning techniques which "focus on the direct involvement of the student with the learning material" (p. 62). The e-learning technology under investigation here is TurningPoint, a *response system*[1] through which individual responses to a query are collected and collated, providing an active engagement opportunity to every member of the audience. Simpson & Oliver (2007) say that effective use of response systems "requires an understanding and belief in active learning".

A further advantage of individual responses is that each student is able to feel a personal connection with the lecturer's feedback on the possible answers. Wit (2003) says that, having chosen some answer, "the psychological investment in that answer turns the student from a passive attendee into an active participant for whom the outcome has some emotional value" (p. 16). This is a form of engagement and personal interaction even in an audience of many which can be missing from more automated assessment/feedback systems. A response system also allows the lecturer to receive feedback from the students, a feedback direction traditional lectures do not facilitate, and this can highlight conceptual differences between understanding of the lecture content by the lecturer and students, of which the lecturer may be otherwise unaware (Boyle and Nicol, 2003; pp. 54-5).

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[1] **Note on terminology:** The use of terminology in the literature is not very co-ordinated. Simpson & Oliver (2007) report use of: "Electronic Voting Systems", "Audience Response Systems", "Personal Response Systems", "Group Response Systems" and "Classroom Communication Systems". In personal conversation I have also heard "Student Response Systems". "Electronic voting" is a term also used in technology-enabled electoral polling and perhaps suggests the system is used only for 'opinion' questions when it certainly has no such limitation. "Classroom Communication System" is evocative of a desirable scenario but suggests more of the technology that the simple operation it performs. It is a system for collecting responses from individuals in a group; whether this develops "classroom communication" is dependent on the particular use. Here "response system" will be used as this describes well what the system does: it collects and collates responses.

## *How could this problem be solved without this technology?*

This effect could be attempted without use of technology. A 'show of hands' would offer each student the chance to participate and provide feedback from and to the lecturer. However, the practical difficulties of counting hands mean this approach does not scale very efficiently. Also, Wit (2003) reports students experiencing inhibitors such as "fear of ridicule by the lecturer or their peers" (p. 16) so the lack of anonymity in a show of hands may preclude a comprehensive and honest response. Anonymity can be addressed somewhat through holding up more discreet coloured cards matching different responses but not completely and the problem of counting remains. The response system technology can be seen to address this pedagogic need in a way which is an improvement over non-technological methods.

## *Does an educational benefit emerge?*

Many published studies of response system use report on student and teacher perceptions of the benefits of systems on learning (see, for example, Draper and Brown, 2004; Wit, 2003), which are generally positive. King and Robinson (2009a) note this as a weakness of the published research and attempt to determine whether there has been "any significant change in the academic performance" of students taught using a response system (p. 197). Also noticing this trend, Kennedy and Cutts (2005) aim to assess the association between individual student response system use and learning outcomes (p. 263). The results of these two investigations are not so positive.

King and Robinson evaluated the differences between cohorts of students taught with and without response systems. They found "no significant difference in the overall grades," no difference in attendance patterns and "negligible" impact on student retention (p. 197). Kennedy and Cutts found that while students who were "frequent users" of a response system and were "relatively successful" in answering questions performed "significantly better" in formal assessments and "low responders" did not, they also found that students who were "relatively less correct" in their responses over the course of the semester tended to perform "more poorly" in formal assessments, "regardless of whether they were high or low responders" (p. 266). This undermines the constructivist principles of this approach, which would predict that students who were "relatively less correct" but "high responders" would still nevertheless benefit from the experience of responding. Kennedy and Cutts suggest students who attend and answer correctly are those predisposed to improved performance regardless of the technology use (p. 267). These results suggest the benefits of response systems are extremely limited.

Looking to some of the pioneers of response system use in the USA tells a different story. Dufresne, et al (1996) report that their use of a response system to provide active learning opportunities through small group and class-wide discussions had a positive effect on students' attitudes and motivation and consequently on retention of students. Crouch and Mazur (2001) report on the use of peer assessment over an extended period of time by several instructors with differing styles and find clear evidence that students' "grasp of the course material" and performance in formative and summative assessments improves above that of "courses taught with traditional instruction" (p. 971).

Kennedy and Cutts address these results directly, saying: "it is not clear whether this change was predominantly a result of the altered teaching and learning method - both implementations involved a radical shift in this regard - or the introduction of the... technology" (p. 263). King and Robinson note that in their evaluation of two cohorts, the "only major difference" was one cohort was taught using a response system, while other factors, including "instructor pedagogical practices," "largely remained the same" (p. 197). This points to a difference in approach between the usage of Dufresne, et al and Crouch and Mazur to that studied by Kennedy and Cutts and King and Robinson. The findings of the latter authors that response systems are of little benefit are based on their use without any pedagogic change, which backs up the suggestion of Draper (2009) that benefits from use of technology are linked to changes in pedagogic practice that occur as a consequence and not intrinsic to

the technology.

An additional consideration in use of this technology to encourage constructive development or motivational improvements is the appropriateness of the questions. Kennedy and Cutts note "it was not uncommon for students to correctly answer the lecturer's questions only 20-25% of the time" (p. 267) and this seems to indicate the questions may not have been pitched appropriately to the audience to allow the students to incrementally construct knowledge.

These results indicate that using response systems to simply replace occasional questioning in lectures has little benefit. However, if response systems are used to facilitate a pedagogic change towards more active learning the indication is this can be quite effective.

## Motivations for use of tool

Use of the response system followed a session given by the university careers advisory service on career development skills to my cohort of second year BSc (Hons) Mathematics students before the assessed task began. My use of the response system was motivated by a desire to evaluate whether the students' understanding of the topic matched my expectations and to reveal any misconceptions over the advice given. I was also interested in providing an active learning opportunity by encouraging class discussion following earlier unsuccessful attempts. Further, I am interested in the potential application of this technology to larger-scale mathematics teaching and this small-scale use was an opportunity to familiarise myself with the technology.

## Evaluation method

Since my use of the tool was motivated by lecturer-centred questions ("does the students understanding match my own?", "does discussion take place?"), following the suggestion of King and Robinson (2009b), the evaluation would be by the lecturer; in this case through personal reflection. I planned to keep a video diary[2] through the process of discovering how to use the technology, when producing the questions and during the day the sessions with students were held, to be reviewed during the evaluation of this tool. There is a clear consensus that students respond positively to use of response systems (Simpson & Oliver, 2007). There is some suggestion that simply asking whether the students feel systems are useful carries little benefit (King and Robinson, 2009a; Kennedy and Cutts, 2005). Following this and reflecting on the relatively small use of the system (seven questions) a formal student evaluation was not carried out.

## In practice

The e-learning task ran in class one week after the career development skills session. Seven questions[3] were written and these were to be presented sequentially following the procedure: question presented; students vote; answers revealed; teacher-led whole group discussion.

The system was straightforward to use and develop questions for. Unfortunately, on the day technical problems meant that only five handsets worked. The students were arranged into five groups with one handset per group.

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[2] Available in portfolio.

[3] The question slides are included in the appendix. Since this task requires specialist hardware, it is not available to the examiner to 'try' in the same way an online assessment would be. The responses given by the students are included in the slides in the appendix.

For the first session the groups were of three students. For the second, smaller session the students worked mostly in pairs. In the first session the use of the handsets caused a noticeable level of peer discussion in consideration of the answers which has been mostly absent from previous lecture-based sessions. This was encouraging but as anonymity was lost anyway, the response system could have been replaced by simply asking each group what they concluded. The second session was much quieter.

Whole-group discussion of the answers did take place and I was able to identify and address some misconceptions that were at odds with the good practice advice given in the careers skills session, mostly by students who had not attended the previous week. I noticed further misconceptions were corrected by peer discussion in session 1, having overheard this on several of the questions.

## Discussion

This exercise largely met its aims, in that use of the system identified and corrected some miscomprehensions both through peer discussion and responses given. No large-scale differences between student comprehension and my expectations were exposed and ultimately this was validated by the quality (in this regard) of coursework submissions. The system encouraged peer discussion in the first session but not the second. I would hypothesise that in pairs the students could indicate non-verbally which button they preferred whereas in groups of three this was less practical without open discussion.

However the way in which the system was used was not as planned and in fact the use conducted could more easily have been achieved using non-technological methods. Beyond the discussion of the literature above it is difficult to speculate whether use of the system as planned would have been as or more effective than this. Since an effective method has been used that could more easily be replicated offline it is difficult to imagine that the investment of time in setting up an electronic task and dealing with technological barriers would be worth doing. I suspect that if the material involved more private cognitive activity that simple memory recall such as applying some mathematics method to answering a question then the use of the tool may be worth investigating.

Peer discussion played a larger part in the process than I had thought it would and this is worth noting. Boyle and Nicol (2003) prefer peer to whole class discussion in encouraging engagement as it is more likely all students will be able to participate; however they prefer whole class discussion when the aim is to expose to the teacher the reasons misunderstandings have arisen (p. 55). Wit (2003) points out "re-describing the acquired information in one's own terms is an activity that powerfully promotes learning" (p. 16). So it seems peer discussion would be more appropriate for allowing students construction of their own knowledge on a topic while whole class discussion would be useful in improving delivery of material to reduce the number of misunderstandings that occur. To involve peer discussion, adapting my procedure to follow that proposed by Crouch and Mazur (2001) might be an improvement: question presented; students vote; discuss in small groups; vote again; answers revealed; teacher-led whole group discussion (if needed). This way the peer discussion ought to cause the second vote to converge on the correct answer. Finding the answers through peer-discussion rather than in a lecturer-led session, the students ought to be encouraged into more active and deep learning.

## References

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# Appendix

To include the slides and student responses.