Learning Gains…"My (ARS)" The impact of student empowerment using Audience Response Systems Technology on Knowledge Construction, Student Engagement and Assessment

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CASE STUDY OVERVIEW:

This case evaluates the experience of a group of Vision Science students exposed to Audience Response System (ARS) technology. Uniquely students were given ownership of the (ARS) software. Students constructed knowledge on several pre-allocated themes with the aim of engaging peers in self-learning, peer-to-peer learning, discourse and assessment of peer responses using (ARS). Guidance was given on question design, engagement and formative assessment. Findings demonstrate both immediate informal and delayed formal feedback, is significant in assisting students deepen their learning, whilst improving motivation, enjoyment and engagement. Evaluations indicate that students using (ARS) to generate questions can be effective in developing higher order learning.

Keywords:
Student ownership of Audience Response Systems, Business Management, Peer Assessment, question posing, Higher-order learning

Focus	MGBT203 Business Management Level 3
Duration	15 Week Module (Including final Assessment)
Discipline	Management
Context	Caledonian Business School, GLASGOW, SCOTLAND
Learners	12 Ophthalmic Dispensing Level 3 Students for whom management is a non-core discipline.

CASE DESCRIPTION

The structure of the module has existed in its present format for around 12 years. It comprises two elements of assessment both worth 50%. The elements are one 2000 word report and a final exam where students choose to answer four questions from a possible ten question options.

Delivery of the module has been modified to simplify timetabling by concentrating delivery into a single weekly 3-hour session.

Key challenges faced were to improve levels of engagement and motivation. This was tackled by providing opportunities for active learning, formative and summative assessment

supported with effective feedback and relevant contextualised content, together with a pedagogical approach designed to develop student autonomy, independent learning and personal transferable skills.

The Key innovation used in this case was the introduction of ARS technology to allow for rapid feedback on formative questions embedded in lectures. In addition students were provided with the ARS software to enable them to poll their colleagues during formative assessments during weeks 9-11. Students were initially informed that by the end of the module they would be giving presentations using the technology and were invited to respond to ARS questions relating to their perceived confidence in being able to use the system. (An outline of the weekly activity schedule is shown in appendix 1).

Week 1 students were provided with PRS^{rf} handheld response devices. Students answered a brief set of questions on PowerPoint to generates some familiarity with the operation of the system. Data from the questions posed were used to ascertain basic details such as age, gender, and attitudes towards using the clicker system.

In week 2 students were issued with a structured group presentation topic to be delivered in week 3. To aid development of the presentations students were taken to the library and introduced to physical and electronic reference materials on which to draw upon for content.

In week 3 the various groups presented on their topics. After completion, each student was asked to verbally comment on each of the other groups' presentations. The emphasis was on what each group did well, and what would they like to see changed to improve the presentation. On completion of feedback to the other presenters, each student was invited to self-reflect on the group feedback. Students would then explain to the group what they personally drew from the peer feedback and what they could change in their approach to future presentations. Finally, the lecturer summarised their views of the presentation, reiterating their views on what went well and what could be done to improve future presentations.

The session in week 4 involved a referencing exercise and provided the opportunity for students to assess previous written coursework submissions. Students worked in pairs using marking grids to determine a grade together with verbal feedback on their justification for that grade. Students were invited to suggest additional criteria to be included in the final marking of their own reports due for submission in week 7.

In week 6 Students were given a booklet containing articles and a brief for the next series of presentations. This encompassed information on the benefits of asking questions and the importance of question design flow and sequence. Groups were created around presentation themes of; motivation, leadership and teams. The booklet contained a structured reflective logbook requiring individual students to provide details of group meetings, discussions, outcomes and actions. Students were shown copies of marking criteria used in presentations and invited to discuss the criteria and suggest additions/ modifications to the existing set of criterion.

A brief demonstration of the PRS was given showing students the process used to install the software and to create questions. Each group was provided with a USB pen-drive containing the PRS software thereby enabling them to work from any PC.

In weeks 9- 11 Students submitted PowerPoint presentations and PRS questions in advance of the class. The format of the sessions followed that of week 4 with group presentations followed by peer then tutor feedback. During the post presentation discussion emphasis was given to the processes that students underwent for arriving at their set of questions.

At the end of the session in week 11 students were provided with copies of the feedback sheets relating to their written coursework. They were informed about whether their submission was satisfactory or not. They would not be given a final percentage until week 12.

The final session week 12, ARS questions were used in conjunction with a written questionnaire to evaluate the student experience of using the technology over 12 weeks. A formative multiple-choice assessment was administered using content or theory based questions. Next presentation feedback sheets (Appendix 2) based on the lecturers' perceptions of the group presentations were issued and an interactive discussion on the main learning points was initiated. The session finished with an interactive discussion around previous exam type questions.

RATIONALE IN TERMS OF EDUCATIONAL IDEAS

The module in this case adopts a student centred approach nested within a constructivist scheme of learning and assessment. Constructivist learning environments have been shown to outperform traditional modes in producing learning outcomes more consistent with the aims of higher education (Tynjälä 1998).

The pedagogy used in this module is derived from two connected experiences. Firstly in the early 1990's with the PEEP module detailed in (Donald, Hutton et al. 2000) who have argued that the value of university education has been not simply to equip the student with expert knowledge, but more importantly to teach the student to think for themselves, to work or their own and to contribute their work to the work of others, with an emphasis on what they describe as "an old Scottish primacy of the formative over the informative." Secondly from a presentation given by (Goldman 1991) where Goldman demonstrated using HyperCard, examples of Law student producing a tour of the American Justiciary on CD-ROM. The particular stimulus for the innovative use of ARS came in terms of the degree of student ownership over the learning process and technology. The unique manner in which the ARS technology has been applied in the Business Management pilot is simply an extension of the values and pedagogies outlined above.

Boud argues that renewed emphasis needs to be placed on formative assessment to focus learner attention on the processes and to encourage learners to take ownership of those processes (Boud 2000). Advocating that assessment needs to move from the exclusive domain of assessors into the hands of learners. This case highlights ways in which ARS become a scaffold for an enlarged student discourse around questions together with the capacity for testing the value of questions created, directly on their peers. Having access to the ARS software may facilitate a change in the nature of engagement by increasing both the number and quality of student interactions (Terwel 1999). (Honkimäki, Tynjälä et al. 2004) found that using an interactive pedagogy may decrease competitiveness between students and may benefit students with motivational problems. This theme is considered further by (Johnson and Johnson 1999); (Clements and Battista 1990) where students have been shown to regard peers as a source of knowledge and help. Shared values and social skills can be developed through team-work and peer encouragement, and thus self-esteem and critical thinking skills may be nurtured. (Boud 2000) stresses that assessment practices should contribute towards the building of students' confidence in their own ability to learn. Student engagement around questions and peer to peer assessment strengthens and constitutes deeper learning through active participation centred on understanding, rather than reliance on passive listening where learning is dependant on memorisation (Zurita and Nussbaum 2004). In gaining deeper understanding, students learn the process of *how* to solve problems rather than merely achieve performance goals (Boud 2000).

Studies have indicated benefits derived from inviting student to create questions using the Jeopardy game show format (Benek-Rivera and Mathews 2004). However, they report that in the main the questions tend to be instructor led. The rules of jeopardy force contestants to formulate a question in response to statements made on a theme. Similarly the Millionaire game show format (Cook and Hazelwood 2002) demonstrate high levels of student enjoyment, increased participation and pre-class preparation. (Beatty, Gerace et al. 2005) created the question driven instruction (QDI) cycle, making question posing, pondering, answering and discussing the key vehicle of learning. They argue that this cyclical process can be used to target development of cognitive skills, analysis and problem

solving ability, meta-cognition, learning and thinking and is capable of offering benefits beyond those of the peer instruction technique (Mazur 1997).

The approach adopted in this module, places students in a key role both in the preparation and delivery stages (developing, selecting and administering questions), and would suggest access to a set of potential learning gains of up to 150% (Thalheimer 2003). (Boud 2000) argues that good schemes of formative assessment must be accompanied by methods of enabling students to develop their own skills of putting together schemes of formative assessment.

EVALUATION

Data was gathered using ARS and survey questionnaire (11 respondents). A summary of data responses is shown in table 1.

Table 1 Student responses on the experience of using ARS (%)

Factor Description	SA %	A %	N %	D %	SD %
Deeper understanding of content	9.1	72.7	18.2	0	0
Improved presentation skills	50	50	0	0	0
Improved engagement/ participation	18.2	72.7	0	9.1	0
Increased attention span	18.2	63.6	18.2	0	0
Use ARS more widely in other modules	54.5	45.5	0	0	0
Enjoyed anonymity of responses	27.3	45.5	27.3	0	0
Enjoyed asking questions using ARS	54.5	27.3	18.2	0	0
Capability questions using ARS	18.2	17.2	9.1	0	0
Learned more effectively using ARS	36.4	45.5	18.2	0	0
Believed ARS was waste of time	0	0	9.1	18.2	72.7
Decreased interest in module compared with start	0	0	18.2	54.5	27.3
Key SA- strongly agree; A = agree; N = neutral; D= disagree; SD = strongly disagree					

In stressing that assessment practices should contribute towards students' confidence in their ability to learn (Boud, 2000), initial (week 1) appraisal of student responses revealed high levels of apprehension in relation to presenting using the technology. However, survey results undertaken in week 12 indicate a complete reversal in student responses, reporting high levels of ability and confidence in presenting when compared with week 1. This suggests that this pedagogy has been effective in improving learning capacity and sustainability. Students affirmed ARS as helping them learn 'more effectively'. Student responses validate responding anonymously using ARS as a key factor encouraging greater participation and discourse in class. An adjunct not immediately apparent was students' awareness that that under traditional settings, where there was limited understanding, students would not have responded due to fear of embarrassment. Respondents have acknowledged increased levels of engagement, enhanced motivation, morale and the capacity to work together.

During presentations students invited peers to try to predict the profile of the response charts after question polling, but prior to the bar-chart display, this appeared to stimulate knowledge construction and may indicate the development of higher order thinking in class.

Perhaps however, the most understated benefit of using ARS technology in this way has been to enable students, out-with the formal contact setting, to engage in an enlarged discourse based around higher-order thematic issues, thus nurturing students' ability to establish thoughtful questions they wished to poll their peers on. These discussions have the capacity to allow dialogue around student conceptions of knowledge and thus their perceptions of what would constitute good instruction. This would be consistent with the

view that pedagogical or instructional practices rather than technology provide the key to enhancing student comprehension (Judson and Sawada 2002). However in contrast to this students have indicated that had the ARS technology not been available to elicit anonymous responses from peers that they would not have asked any questions during the presentations. Another unanticipated benefit derived from these group dialogues has been the creation of new friendship groupings and a willingness to continue to maintain these working relationships across other modules. It would appear that student have begun to value peers as being useful sources of help and knowledge (Zurita and Nussbaum 2004). The group processes and dialogues undertaken within groups to create questions for use with the ARS technology would appear to warrant further investigation.

Considerations for effective use of this approach to using (ARS)

- Students need to be given sufficient time to familiarise themselves with ARS technology including software, to ensure learning is not centred around the mechanism itself but rather on seeking a deeper learning that can be gained through the process of using such a vehicle. In effect the ARS provides scaffolding for the social network. (Zurita and Nussbaum 2004)

- Development of retrieval practice skills intensifies the learning experience, as the process nurtures memory searching – a skill often underdeveloped in more traditional modes of learning (Thalheimer 2003).

- Giving of immediate informal feedback, followed by delayed formal feedback provides several benefits. Contextualisation of current issues and performance are more readily interpreted when discussed informally and fresh in students' minds. Moreover, immediate feedback on incorrect responses enables students to go back and redirect their own memory search to consider suitable alternative approaches, thus encouraging development of retrieval skills. However, delayed feedback revisits those themes and the overall student learning experience, and thus provides additional opportunity through repetition to reinforce learning on those areas. (Thalheimer 2003)

- Students should be provided with sufficient information to enable them to contextualise and make successful searches of memory in order to enjoy the learning experience. Therefore developing presentation topics within relevant educational or professional contexts is important. It is not always necessary for the context to be provided solely by the academic as in our case students borrowed heavily from their working life to provide examples and contextualisation. However it may be worthwhile encouraging students to examine their experiences as a valuable source of relevant context.

- Lecturers should facilitate the process by guiding students on focussing on higher order information and important themes rather than generic issues which could weaken the learning experience by provoking limited or one-dimensional thinking.

- Students should be encouraged to develop meaningful, interesting and challenging questions aimed at supporting and enhancing the overall learning experience, rather than questions which intimidate, catch out or undermine others involved in the learning experience.

- Lecturers are required to develop an environment of trust, promoting students' confidence in their ability. Such factors remain key in delivery of sustainable formative assessment practices. In addition the need for students to maintain anonymity when responding appears fundamental in building and maintaining such a climate of trust.

References

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Appendices

APPENDIX 1

Business Management Programme (Sem A 2006)

Week	Lecture Programme (2 Hours per week)	Seminar Work (1 hour per week)	Reading Chapt Daft & Marcic
1 25 Sept	Ground Rules Introduction To Management & Organisations Missions Stakeholders	No Seminar Week 1	 1 5 & 4
2 2 Oct	The Organisation Environment Macro Factors Political & Economic	Personal Accounting Grid Download from Blackboard Study Guide P11 MAQ Choose Organisation for CW	2 5
3 9 Oct	The Organisation Environment Macro Factors Social & Technological	Week 3 Economics Group Presentations to Class	2
4 16 Oct	Industry Analysis Porters 5 Forces Model	Referencing Exercise download from Blackboard Study Guide P88 Goal Setting Exercise Group Presentation Identify CW Marking Criteria	5
5 23 Oct	Internal Analysis Resource Audit & Core Competencies SWOT Analysis	Study Guide P90 Personal Strategy Using template Submit CW plan and references	5
6 30 Oct	Organisation Structure Classical Approach Organisation Structure Contingency Approach	Study Guide p 92/93 Developing Strategy for your CW organisation Collect Journal Articles for group presentation. Discussion of Presentation assessment Criteria and question creation	1 7
7 6 Nov	**No Input Coursework Submission**	**COURSEWORK DEADLINE 3PM 9 NOVEMBER HAND IN TO JACKIE BRYDEN W116**	
8 13 Nov	Organisational Control	P570 Discussion questions 1,4,8 Is your budget in control?	16
9 20 Nov	Leadership & Power	Group Presentation on Leadership Class Feedback	12
10 27 Nov	Employee Behaviour & Motivation	Group Presentation on Motivation	13
11 4 Dec	Groups & Teams	Group Presentation on Teams	15
12 11 Dec	Module Review Exam Revision		

APPENDIX 2

Business Management Oral Presentation

Please note the numbers associated with headings used below do not relate directly to a mark for each section.

Students			
Names			
Topic	Leadership		
Date			
Mark %	%		

STRUCTURE & CONTENT

VISUAL AIDS	Unsatisfactory **1 2 3 4 5** Highly Satisfactory
Eye Contact	Unsatisfactory **1 2 3 4 5** Highly Satisfactory
Clarity of Presentation	Unsatisfactory **1 2 3 4 5** Highly Satisfactory
DELIVERY (Includes voice & Body Language)	Unsatisfactory **1 2 3 4 5** Highly Satisfactory
Organisation & Structure Introduction, Summarising, Logical Progression	Unsatisfactory **1 2 3 4 5** Highly Satisfactory
Team working	Unsatisfactory **1 2 3 4 5** Highly Satisfactory
Originality of Content	Unsatisfactory **1 2 3 4 5** Highly Satisfactory
Leadership/Performance Link	Unsatisfactory **1 2 3 4 5** Highly Satisfactory
EI/Performance link	Unsatisfactory **1 2 3 4 5** Highly Satisfactory
Use of PRS questions	Unsatisfactory **1 2 3 4 5** Highly Satisfactory
Degree of Interactivity	Unsatisfactory **1 2 3 4 5** Highly Satisfactory
Hand Outs	Unsatisfactory **1 2 3 4 5** Highly Satisfactory
Entertainment	Unsatisfactory **1 2 3 4 5** Highly Satisfactory
Handling Questions	Unsatisfactory **1 2 3 4 5** Highly Satisfactory
Overall Rating	Unsatisfactory **1 2 3 4 5** Highly Satisfactory

Additional Marker Comment

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-