Use of Information Technology in Exam Revision

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Abstract

Using an IT based portable group support system such as Teamworker can transform a revision session from a place where a teacher delivers information to a place where students engage with one another to solve problems, discuss a topic and actively engage in the learning and revision process.

The Teamworker system consists of a set of individual wireless handsets: each with numeric keypad, 2 line LCD display and radio transmitter. The other part of the system comprises a radio receiver linked to a PC, connected to a video projector. The handsets enable students to respond to the questions displayed by the video projector. Individual responses can be recorded and the group responses displayed back to the class in the form of an anonymous bar or pie chart.

One study in the University of Portsmouth Business School used the system to help prepare students for an end of unit examination in Business Information Systems for a cohort of 300 students. The students, working in small groups answered a number of Multiple Choice Questions (MCQs). A question was displayed, the students discussed and agreed their answer, and then transmitted the numerical value representing the answer. The group responses were then displayed. Where the student groups returned a range of answers, or the majority returned a wrong answer, a group discussion followed as to what was the right answer. When the lecturer considered it appropriate the correct answer was displayed and the reason explained, generating further discussion. At each Teamworker session the performance of individual groups could be monitored and poorly performing groups could be identified for additional tutorial support.

Students reported, via a questionnaire, that they had enjoyed the revision session and found it useful. They particularly liked the instant feedback of answers and the chance to discuss straight away those things they did not understand. Other students identified that the session helped them recognise those areas that they needed to concentrate on in terms of their revision. As one student said ' It made learning and revision more fun – when people enjoy learning, they will learn more'

Keywords

Exam Revision, Multiple Choice Questions, Group Support Systems, Feedback.

Introduction

As a consequence of both increasing student numbers and a reducing unit of resource, many lecturers in the UK have had to revise their teaching and assessment strategies to accommodate larger class sizes. One way in which lecturers are evolving their curriculum delivery and assessment methods is through a greater use of Information Technology (IT) to support not only summative / formative assessment but to also enhance the learning experience within the classroom sessions. An innovative type of IT that is being increasingly used within an educational context is Group Support Systems (GSS). GSS are computer-based information systems designed to support and aid groups of people engaged on group based tasks. Traditionally, GSS have been used by decision making groups to enhance the quality of the decision making process, as they have been found to improve group communication, increase member participation, reduce dominance by powerful personalities and can help structure the group process (e.g. Nunnamaker et al, 1991; Gopal and Pollard, 1996).

More recently, academics have considered the potential of using GSS technology as a teaching tool. The use of GSS technology has resulted in greater student satisfaction and significantly higher exam scores when compared to more traditional methods (Walsh et al, 1996). Further research has found that using a GSS improves the learning experience for student pharmacists by encouraging discussion and debate (Hunt and Irving 1994; Hunt et al, 1999). Other research has examined the use of a GSS in an organisational training context, where the system has been found to improve training performance (Read et al, 1998).

Publicity has recently been given to a GSS type system used in classes of 150 students at the University of Strathclyde (Seenan, 2000). Where the GSS is used specifically for eliciting responses from large groups it is more commonly referred to as an Audience Response System e.g. the system used to 'ask the audience' in the popular TV programme 'who wants to be a millionaire?'

One specific way in which a GSS can be employed in an educational context is to support revision sessions aimed at preparing students for summative Multiple Choice Test (MCT) assessments. A number of options are available for lecturers wishing to use MCTs as part of their teaching and assessment strategy. Tools available range from the traditional 'paper and pen' through to the employment of sophisticated computer technology. Whatever technique is used, for a revision session to be beneficial and result in deep rather than surface learning, students should be actively engaged by both participating and receiving feedback (Anderson 1990; Post, 1992). Evidence suggests that the more immediate the feedback the more useful it is in terms of learning (Lewis and Anderson, 1985) and so ideally when an MCT is used in a revision session the students should receive feedback within the period of the session rather than having to wait for work to be marked and returned to them. Other research indicates that practising MCT might also help with student exam performance (Irving et al, 2000). When using a traditional 'paper and pen' MCT approach for revision sessions, providing immediate feedback can be problematic. Whilst answer sheets can be self or peer marked and answers discussed at the end of a session it is difficult for a lecturer to monitor individuals' performance, or find out easily what mistakes students are making.

Although Computer Aided Learning (CAL) systems can provide immediate feedback to individuals, this traditional one to one computer/student approach is not suitable for all subjects, it is very resource heavy, it limits interaction and can prevent learning from the teacher and group as a whole. A variation on the traditional CAL theme is the employment of a GSS. A GSS provides a structured process, by which information/opinions are collected from the group, analysed and fed back for discussion. Such a system combines the advantages of CAL with the opportunity for group discussion

This paper examines the use of a GSS to help prepare a cohort of 300 first year students for an end of unit MCT assessment in the Business Information Systems unit at Portsmouth Business School. The paper describes the process used to support the classroom sessions with a GSS, and examines the results of a student questionnaire aimed at identifying the students' perceptions of the usefulness of the GSS to support these sessions.

The 'Teamworker' Group Support System

The GSS used for this study is known as Teamworker, a system that has also been used for organisational group decision making purposes (Gear and Read, 1993) as well as for supporting in class teaching activities (Hunt and Irving, 1994)

The Teamworker system comprises a set of individual handsets (each with a numeric keypad, a 2 line LCD display and radio transmitter) with which opinions and judgements can be sent in digital form to a radio receiver. The receiver is connected to a personal computer running suitable group support software. The personal computer is linked, via a video projector, to a large group screen that can be viewed by all members of the group. This large group screen is used to both display the Multiple Choice Questions (MCQs) to be answered and display back processed summaries of the group responses.

Handsets are given either to individual students or to small groups of students. The MCQs shown on the large group screen are written in the Teamworker software. These questions can incorporate text, pictures, video, and sound tracks and can be integrated into Microsoft PowerPoint presentations.

Group members select their answers from those presented on the large group screen and respond using the individual handsets. Once all responses have been received a bar chart or pie chart is shown on the group screen summarising the responses for the group as a whole. This information can then be used by the lecturer to identify whether or not there is a general problem in understanding the topic. It is particularly useful knowing the kind of mistakes students are making in answering the questions as this can support the lecturer in leading student discussions on each of the questions and help create greater understanding.

Multiple Choice Test Revision Using Teamworker

The Business Information Systems end of unit summative assessment includes a formal 'paper and pencil' Multiple Choice Test. The Teamworker GSS was used to support 300 first year students prepare for this test. The 300 students were split into three groups of 100 students, and each group attended three Teamworker sessions, evenly spaced throughout the teaching period.

Each Teamworker session typically consisted of 25 minutes of traditional lecture followed by 25 minutes of Teamworker supported work. There were 32 Teamworker handsets available for each session, therefore the students were split into smaller groups of around three students, and the handsets were distributed to each small group. The students were encouraged to take turns in using the handsets to respond to the various questions that were asked.

The students were asked to respond to ten multiple-choice questions, which were typical of the questions they would be asked in the formal test. Each question was entered into the Teamworker software and displayed to the group on the large group screen. Before responding to a question shown on the large group screen, the small groups would first discuss the question and possible answers. Once each small group had agreed on an answer, one member of the group used the Teamworker handset to send the small group response.

After all small groups had answered, a bar chart summarising all responses was shown on the large group screen. The bar chart showed the distribution of responses, and allowed each small group to see how many other groups had answered similarly to themselves. This gave the opportunity for an initial discussion between students on the variety of responses and also to immediately informed the lecturer whether there were particular problems of understanding and whether help was required.

Following the initial student discussions, the bar chart was enhanced with the correct answer. This gave immediate feedback to the students, allowing them to see if their answer was correct or incorrect. It also gave an opportunity for the lecturer to reinforce the rationale of the correct answer, and why the other answers were incorrect.

After the final Teamworker session and prior to the formal MCT, students were asked to complete a questionnaire on their perceptions of the usefulness of the Teamworker sessions. A total of 109 completed questionnaires were returned to be analysed.

Results and Discussion

The questionnaire contained a mixture of both closed and open questions.

Closed Questions

A total of ten closed questions, in the form of positive and negative statements to agree or disagree with, were asked. Each closed question used a five point Likert response scale where each scale point was defined as shown in Table 1. Table 2 shows the results for each of the ten closed questions.

Scale Point	Positive Statement	Negative Statement
1	Strongly Disagree	Strongly Disagree
2	Agree	Disagree
3	Neither Agree Nor Disagree	Neither Agree Nor Disagree
4	Disagree	Agree
5	Strongly Disagree	Strongly Disagree

Table 1 – Likert Scale Values

Statement	Average Response	Standard Deviation	Percentage Agreeing/Disagreeing with Statement
1. I like the way Teamworker tells me how the class as a whole have answered the question	4.128	0.829	84.4% agreement
2. Using Teamworker did not help me get more involved in small group activity	3.716	1.115	69.8% disagreement
3. I liked being able to discuss the question in my small group before having to agree on an answer	4.064	0.808	79.6% agreement
4. Using Teamworker was a waste of time	4.229	0.949	84.4% disagreement
5. I found Teamworker difficult to use	4.596	0.783	89% disagreement
 I would of liked to have used Teamworker more often in this unit 	3.89	0.896	68% agreement
7. Using Teamworker has helped me with my preparation for a multiple choice test	4.312	0.716	90.8% agreement
 I felt pressurised into giving and answer more quickly than I would of liked 	3.55	1.023	59.6% disagreement
9. Teamworker made the lecture session more enjoyable	4.431	0.629	92.7% agreement
10. I would of preferred to use Teamworker alone rather than as a member of a small group	3.394	1.163	55% disagreement

Table 2 – Questionnaire Results

Examination of this data is encouraging in terms of positive attitudes of students towards the Teamworker revision sessions. Students perceived the system to be easy to use (Question 5 - 89%), made the lecture more enjoyable (Question 9 - 92.7%), and was not perceived as a waste of time (Question 4 - 84.4%). 68% of students would have liked to use Teamworker more often during the unit (Question 6), whereas 24% nether agreed nor disagreed with this statement and only 8% wouldn't have liked to use Teamworker was favourably received by the students, and is in line with other studies (Hunt and Irving, 1994; Irving et al, 2000).

With regards to using the system for group work, 69.8% disagreed that using Teamworker did not help them to get more involved in small group activity (Question 2). 79.6% of students claimed they liked being able to discuss the question in a small group before having to agree on an answer (Question 3), whereas only 25.7% indicated a preference for using Teamworker alone rather than in groups. 60% disagreed that they felt pressurised into making a decision too quickly (Question 8), whereas 19.2% felt that they had been pressurised into making a decision too quickly. When analysing Question 10 'I would have preferred to use Teamworker alone rather than as a member of a small group', where there was 55% disagreement, student responses may reflect discomfort or dislike of working in groups in general rather than in this specific context.

In terms of student's perception of Teamworker as a helpful learning tool, 90.8% agreed that the Teamworker session helped them prepare for a multiple choice test (Question 7), with only 2.8% disagreeing somewhat and none disagreeing strongly. In response to 'I like the way Teamworker tells me how the class as a whole have answered the question' (Question 1), 84.4% of students agreed with this statement. This shows that students like the immediate feedback that the system can give, and are able to place their own performance against their peers.

Open Questions

Three open questions were also asked in the questionnaire:

- 1. What did you like about using Teamworker?
- 2. What did you dislike about using Teamworker?
- 3. How do you think Teamworker could be used in other situations?

The student responses were categorised according to the reasons they gave. A comparison of Questions 1 and 2 showed that where as 72 participants proposed 111 reasons why they liked using Teamworker, only 33 participants responded to why they did not like using Teamworker with 35 reasons being quoted. Reasons for liking the system have been categorised as shown in Table 3.

Reasons	Number
Different, more interesting	26
Fun, light-hearted, enjoyable	19
Encourages group/teamwork	12
Helps identify strengths and weaknesses	12
Helps revision/preparation for exams	8
Good practice of multiple choice questions	8
Feedback provided	7
Aids understanding	6
Easy to use	5
Requires active participation	5
Anonymity	2
Other ('all of it')	1
TOTAL	111

Table 3 - Responses to Question 'What did you like about using Teamworker?'

From a teaching and learning perspective, Teamworker was perceived to aid understanding of a subject, help with revision purposes/preparation for exams, help students to identify their strengths and weaknesses, and provide experience of answering multiple choice questions. Teamworker was also perceived to encourage and support group work. Other positive aspects of using Teamworker included receiving feedback and being encouraged to actively participate.

However, most prevalent in reasons why Teamworker was liked related to the student's subjective experience of the session, that is how and why they enjoyed the experience of using Teamworker. Many of the participants in this study reported that they liked Teamworker simply because they found the experience enjoyable and fun, and that it was interesting and different from normal lectures. Some responses directly quoted include:

'A light-hearted form of learning and a break from normal lectures', 'Fun learning- light-hearted yet educational', 'It made learning and revision more 'fun'- when people enjoy learning, they will learn more'.

Reasons presented for not liking Teamworker have been categorised as shown in Table 4.

Reasons	Number
Poor screen quality/visibility	15
Not used often/long enough	4
Had to answer too quickly	2
Too basic/ simple	3
No final scores	2
Waste of time	2
Reaching a consensus	2
System too slow	1
Didn't like waiting for other groups to	1
answer	
Other (no feedback, doesn't test reaction	4
time, too many people sharing, questions	
too hard)	
TOTAL	35

Table 4 - Responses to question 'What did you not like about using Teamworker?'

Whilst a variety of reasons emerged as to why students did not like using Teamworker, they were less in number and weaker in comparison to responses as to why students did like using the system. The most common criticism of using Teamworker is that low screen quality resulted in poor visibility. 15 students mentioned this as a reason for not liking the session, yet this is a technical problem that can be overcome without too much difficulty. The other most commonly cited reason Teamworker was not liked was that it was not being used often enough. This is not a criticism of the system but an indication of students expressing a preference to use the technology more often!

The final closed question asked students how they thought Teamworker could be used in other situations. In-class tests and exams were proposed, as were elections, surveys and questionnaires such the one used to collect this data and those examining student feedback for lectures/courses as a means to saving paper. However, most suggestions referred to similar uses for other subjects, especially for courses where multiple choice questions may be part of the assessment method used.

Conclusions

The results of this study are encouraging in terms of students reactions to using technology such as Teamworker for exam revision. The system was perceived as a fun experience and an enjoyable change from standard lectures. Teamworker was also reported to be easy and enjoyable to use, and said to encourage and support group/team work. The session helped students identify 'what I already know (or don't as the case may be)' and 'which areas I need to concentrate on when revising'. Overall students were very positive about the experience, enjoying it as a novel way to learn yet educational in terms of preparation for exams, practising multiple choice questions, and enhancing understanding.

From a lecturer's perspective, the results of the study are also extremely positive. The system allowed the lecturer to identify quickly and easily areas of weakness where remedial action was required. The normal student feedback received at the end of the unit suggested that students had enjoyed the Teamworker sessions, and had felt that the sessions had supported preparation for the end of unit MCT. Technically, the system was also very easy to set up and use, and proved very reliable with no system problems.

The results of this study reinforces the findings of other research in the use of GSS in an educational context. GSS technology engages the student in the learning experience, allows students to access and utilise the knowledge of others, and gives instant feedback to the inputs of participants. As active participation and feedback has been found to increase retention levels and lead to a deeper level of learning it is also likely that using GSS technology may lead to benefits for students which are not always measurable.

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