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Introducing Blended mLearning Solutions for Higher Education Students

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Abstract

Our ongoing work at London Metropolitan University investigates effective ways to design learning environments that add mobile learning into blended higher education modules. Our approach is one of evolutionary, iterative refinement of the learning environment based on student feedback. Blended learning effectiveness can be viewed as a function of effective pedagogical practices. Accordingly, a key question is: What combination of instructional strategies and delivery media will best produce the desired learning outcome for the intended audience? The paper will (i) outline the background issues that led to the development of the blended mLearning approach (ii) describe the initial survey that informed our design, (iii) outline the blended mLearning design, (iv) present our evaluation findings with students, and (v) conclude by commenting on the wider applicability of our approach.

Introducing Blended mLearning Solutions for Higher Education Students

Introduction

In his keynote at mLearn 2005, Stan Trollip (Trollip, 2005) exhorted the field of mobile learning to make a difference and not just to have fun. Our ongoing work at London Metropolitan University attempts to make a difference by investigating effective ways to design learning environments that add mobile learning into blended higher education modules. Our approach is one of evolutionary, iterative refinement of the learning environment based on student feedback.

Blended learning effectiveness can be viewed as a function of effective pedagogical practices. Accordingly, a key question is: What combination of instructional strategies and delivery media will best produce the desired learning outcome for the intended audience? Specifically, as the work got under way we took the provisional view that approaches to mobile learning have to take care not to 'invade' the personal mobile devices of learners, e.g. mobile phones, PDAs, iPods, etc. However, we also believed (we still do) that if we conduct, or listen to the research that is asking the right kind of questions, then we increase the chances of developing a blended model of learning that (i) puts pedagogy first, (ii) uses the different media effectively, and (iii) enables students to learn together effectively. Consequently, in our work we took some time to incorporate the student's view into the pedagogical design process.

We introduced mobile technologies, as a pilot project at the UK's Centre for Excellence in Teaching and Learning (CETL) for Reusable Learning Objects (RLOs), or RLO-CETL for short, to first year undergraduate students taking an introductory marketing module. The RLO-CETL (http://www.rlo-cetl.ac.uk/) is being funded by Higher Education Funding Council for England to develop a range of multimedia learning objects that can be stored in repositories, accessed over the Web, and integrated into course delivery. London Metropolitan University is the lead site, in partnership with the Universities of Cambridge and Nottingham.

An earlier project (Holley and Dobson, 2005) provided some tentative evidence which suggested that by assisting students to erode the time and space barriers between their multi-faceted lives, they will start to engage with the learning process. Consequently, the RLO-CETL team took the decision that the potential for 'any time, any places, at my own pace' flexibility that mobile learning is purported to offer would be of real benefit to our students. However, as stated above, we took the provisional view that approaches to mobile learning have to take care not to 'invade' the personal devices of learners and we were adamant that we wanted to put pedagogy first. Consequently, the next section describes an initial survey that intended to build up a profile of our learners so that we would, hopefully, be better able to incorporate the student's view in our learning environment design.

The students in the case study described in this paper visit the UK's Tate Modern art gallery as part of their 'Studying Marketing and Operations' module. This is a taught module that makes use of a blended learning approach. The module has lectures and seminars plus a series of assignments. In one assignment (the focus of this paper), small groups students visit the Tate

Modern art gallery, select a piece of artwork, and develop a product from this that is suitable for sale in the art gallery shop. Previous research on group work in higher education using Tablet PCs (e.g. Kiddie et al., 2004; Corlett & Sharples, 2004) has suggested that such an approach is a productive way forward. Corlett & Sharples (2004) investigated the use of Tablet PCs with 3rd year students from a Masters in Engineering course. They found that tablets afford anytime, anywhere access to productivity, communication and information tools, which meant that learning activities became more productive. Unlike these studies our work starts from gaining an understanding of the mobile devices that the students' own already in an attempt to design a blended learning environment that could potentially accommodate such a learner population profile.

The paper will (i) outline the background problems that led to the development of the blended mLearning approach (ii) describe the initial survey that informed our design, (iii) outline the blended mLearning design (plus preliminary evaluation of the design), (iv) our evaluation findings with students, and (v) conclude by commenting on the wider applicability of our approach.

Student mobile phone survey

The starting point for this work was to conduct a student survey. We assumed that the majority of students would have mobile phones, but we didn't really know this, and we certainly didn't know what phones they were likely to have and what they would be able to use them for. One of the lecturers working with the RLO-CETL suggested that we could give a questionnaire to her first-year students, taking a 'Marketing and Operations' module. The survey was conducted in October 2005. The questionnaire had 10 questions, designed to find out about their mobile phone ownership, and to identify their views on using their mobiles for teaching and learning.

69 students completed the questionnaire. The majority of the students were females (69%), and 60% were between 18 and 21, 25% 21-25, 10% 25-30, 3% 30-35, with 1 student over 35. Only 1 student didn't own a mobile phone (98.6% had mobiles). 73% of students had their own PC at home, and the remainder mainly used PCs at university (15%) or used an Internet café (3%) or a combination of PCs at university and in cafes (9%). From this we can deduce that the students should have relatively good IT skills.

The survey identified the type of mobile phones owned and showed that students possessed a range of different phones. Students owned 9 makes of phone between them (although some weren't sure what they had), with Nokia being the most common (44%). The range of models was also diverse. Most kept a phone for about 12 months (38%), with 36.5% changing them every 18 months, 9.5% every 6 months, and 16% keeping them for as long as possible. So the majority changed their phone quite frequently. To give an indication of how up-to-date their phones were, we asked what features they had (see Table 1). This was also important for us to know potentially what they could do with their phones e.g. take photographs, log onto the Internet. 68% had colour screens, 68% cameras, 56% Internet/WAP, 14% 3G and 41% Bluetooth. Only 1% had wireless (WIFI).

Insert Table 1: Mobile phone features

The survey also asked them if they had contracts with a mobile phone provider or were on ‘pay as you go’. We thought that those having to pay per item may be more reluctant to use their phones because of the costs they would incur. In reality the group was evenly split, with 46% having contracts, and 54% using ‘pay as you go’.

Three questions were asked about their views of using their mobiles for teaching and learning.

Question 1: Is the ability to learn at any time and in any place important to you? 62% of students viewed the ability to learn at any time and in any place as ‘extremely important’ (which is the combined scores for responses 1 and 2 in Table 2). Only 15% viewed this opportunity as ‘not at all important’ (which is the combined scores for responses 4 and 5 in Table 2).

Question 2: How useful would it be to access learning materials via your mobile? As Table 3 shows, 39% thought it would be ‘extremely useful’, whereas 41% said it was ‘not useful at all’.

Question 3: How would you view the university contacting you via your mobile for learning purposes? As Table 4 shows, 55% of the students answered that ‘it would be a positive aspect’. Only 23% thought ‘it would be a negative aspect’.

Insert Table 2: Is the ability to learn at any time and in any place important to you?

Insert Table 3: How useful would it be to access learning materials via your mobile?

Insert Table 4: How would you view the university contacting you via your mobile for learning purposes?

As we pointed out in the Introduction, the desire to learn at any time in any place (question 1) is a much touted positive of mLearning and our results seem to confirm this. Regarding access to learning materials via your phone (question 2) there appears to be some reticence at the moment towards this question with a slight majority in favour. However, this is really only feasible on phones with larger screens, and therefore it is possible that students with older models couldn’t visualise using learning materials on the particular phones they had (32% didn’t have colour screens for example). The result for question 3 came as something of a surprise to us. We had assumed that students would regard their phone as their personal property and would not wish to have their ‘personal space’ invaded by the University for learning purposes.

The results of the survey confirmed our assumptions that nearly all students (98.6%) owned a mobile phone, and therefore that it was feasible to embark on a pilot project which utilised their phones for teaching and learning.

Blended mLearning design

On the basis of the survey results we introduced mobile technologies as an RLO-CETL 'mini-project' into the module that had been used to gather the survey data, a first-year module on Studying Marketing and Operations. The lecturer we were working with was also developing learning objects on study skills with the RLO-CETL to incorporate within the module. This particular module is a core 1st year module taken by all new business and marketing students, and is in essence a 'study skills' module. It is a taught module that makes use of a blended learning approach. The module has lectures and seminars plus a series of assignments. It had recently been re-designed to include an initial assessed assignment that would encourage new students to settle in quickly and facilitate small friendship groups from their first week. It was supported by an online resource that would engage students from their first lecture/seminar and enable them to work independently on something interesting and directly related to their assessment. For this first assignment, in small groups students visit the Tate Modern art gallery, select a piece of artwork, and develop a product from this that is suitable for sale in the art gallery shop. They have to develop a marketing plan, and present this with their product idea as a presentation to the whole group.

In response to the survey results (specifically question 2), we decided against using learning resources over mobile phones, but instead decided to opt for a resource that facilitates teamwork over multiple communication devices, and that could support the first assignment. In previous years, the lecturer had noted that the students had often not visited The Tate together, and that that this resource might help students to get their assignment underway. The Spring Semester intake of students was chosen for the pilot, as a much smaller group of 15-20 students were expected, and could more effectively be supported in using the new mLearning elements of the blend.

A multimedia message board 'mediaBoard' (http://www.mediaBoard.co.uk) was introduced to support communication, teamwork and the exchange of ideas for the students. Students can contribute by sending messages from their mobiles and PDAs or a PC, submitting text, images and audio files via SMS, MMS and emails. mediaBoard was an attractive solution because students could use their own mobiles to contribute to it, but could also use a PC if they didn't have a phone (accommodating the few percentage that don't) or didn't want to use their phone for the exercise.

The overall module blend included a weekly lecture and seminar, a multimedia message board (mediaBoard), supplemented with other web-based learning aids, which included an mLearning learning object on 'how to get going with mediaBoard' and learning objects (LOs) that gave assistance on reflective writing and how to cite and reference books, journals and web sites. We used a team-based, rapid prototyping technique (Cook et al., 2006) to develop our LOs; an example of a LO is shown in Figure 1. We also introduced timely text messages giving 'learning hints' (in response to question 3 of our survey), which included reminders for seminars, course-work deadlines and pointers to online learning resources that could help learners.

Our LOs have not yet been optimised for multimedia mobile learning; however, we intend to do this by drawing on the experience already built up in the team (Bradley and Haynes, 2005). The

brief for the design of the mLearning LO was to deconstruct the different methods of using the mediaBoard for students to communicate with their team and develop their product ideas to complete the assignment. Macromedia Captivate was used to capture the interaction of a user uploading material to the mediaBoard via the four distinct methods (SMS and MMS from mobile phones, email and directly in mediaBoard). The learning tool contained seven simple tutorials with the addition of audio commentary to explain in approximately twenty minutes how to take advantage of all the functionality of the mediaBoard.

Figure 1. Screen shot of learning object 'How to use mediaBoard'

Before mediaBoard was introduced to the students, we conducted the same mobile phone survey used before in February 2006, to ascertain that sufficient numbers of students had mobiles that would enable them to contribute to mediaBoard using their own phones. 48 students completed this second questionnaire. The student profile was slightly different to the initial questionnaire: there was a more balanced gender split (53% male and 47% female as opposed to 69% female in October), and the students were slightly older. However, the results on the whole were similar. 2 students didn't own a mobile, but we later found out that one of these students bought one after completing the survey. 50% had contracts with mobile phone providers. 45% of the students were positive about being contacted by the University on their mobile, 33% were not sure, and 22% were negative. On the basis of these results, we decided to go ahead with the pilot.

Three separate mediaBoards were created to adequately support the number of students (the intake for this module was larger than expected). The main interface for a mediaBoard is a graphical image. Zones are then created, in our case one for each team, represented by the red circles on the image in Figure 2. Each team member can click on their team zone and then add comments and resources via the several communication mediums that are possible (email, SMS, MMS, etc). We also created a 'Help' zone, where students could post messages if they were encountering problems, which we would reply to. Students were registered in the mediaBoard according to their respective team. Each board had its own password and is not visible to people not registered for it, but team zones were not protected, and therefore visible to all members of the board.

Figure 2: The mediaBoard for teams 1-10 in seminar group 2

mediaBoard was described to the students as a new internet technology which will enable them to create their own interactive message board in order to complete their assignment brief. It was also explained that it achieves this by providing a virtual space, which can be used in 'real-time' during the visit to the Tate Modern. It does this by acting as a virtual storehouse for ideas which can then be referred to at any point during the formulation of their final products. Students were given a handout with the details for accessing and sending messages to the mediaBoard, and they were encouraged to send test SMS messages to the board during the seminar to help them learn how to send them.

mediaBoard also has the facility to be able to send SMS text messages to members of a board. An SMS message was sent to all the students to encourage them to use the mLearning LO before the Tate Modern visit so that they were more fully informed about how to use the mediaBoard.

> "Could those of you going to the Tate Modern please go to http://www.rlo-cetl.ac.uk:8080/rlos/mboard/index2.html. The tutorial will only take about 10 minutes and it will give you an opportunity to learn about using mobile technologies while fulfilling your assessment brief. Please answer the short questions after use. Many thanks ..."

We also started using the mediaBoard SMS facility to send regular messages to students, giving them weekly learning hints. These learning hints included reminders about deadlines and learning resources that became available that could help them complete their assignments. These were sent to students over a 7 week period, usually each Wednesday, before teaching took place on the following Friday. Examples of some of the text messages sent can be seen in Table 5.

Table 5: Examples of SMS messages sent to students

Use of the mediaBoard

We monitored the use of each of the team's boards for the duration of the assignment, but there was not much activity after the initial test messages were sent. 3 students contributed messages. One student in Team 4 posted 5 messages and images over a 14-day period from a mobile phone and from a PC. Beginning with a social message saying that it was nice to meet her team mates and that she looked forward to working with them, she then posted another 4 messages after the Tate visit, with images and suggestions for products they could take forward. Some of these messages are shown in Figure 3.

One student posted a message to arrange with his team how to get to The Tate, and another sent a message whilst at The Tate, saying they couldn't find where to go.

Overall, we were disappointed with the level of use of the mediaBoards, and investigated the reasons why in the student evaluation that was planned to take place later in the module.

Figure 3: mediaBoard in use by Team 4

Evaluation of the mLearning elements

Evaluation of the mLearning intervention had been planned from the outset of the project introduction, to find out the students' views about it, and to determine the level of success. We monitored the use of mediaBoard, and gave students a questionnaire to complete after the assignment was finished. We also asked the students for feedback on the SMS messages sent and the lecturer provided some reflective feedback.

40 students completed the evaluation questionnaire, about a 57% completion rate. Only 2 of these students said that they used mediaBoard to communicate with their team. The main reasons given for not using it were that they didn't really need it, because they either went to the Tate together, or they communicated by other means (several said they used their mobiles to send messages or call their team mates). Some simply said they didn't use it, without giving any reasons why. Only 37% said they enjoyed using the mediaBoard. 43% were concerned that other teams could see their discussions/ideas. Two students actually made comments in the questionnaire about not wanting other teams to see their ideas, whereas conversely another student liked this aspect and thought that this gave inspiration. In terms of usability, only 39% found it easy to send messages to the mediaBoard. 2 students made comments about it being 'a bit confusing', 2 said they didn't understand it, one said it was 'tedious' and another 'inconvenient'. However, 79% said that they were happy to use their mobiles for this exercise, with 50% being concerned about the cost of sending messages to mediaBoard (the other 50% were not concerned about the costs involved).

Here are some of the qualitative comments that students made about mediaBoard.

If you used mediaBoard, what did you like about it?

> "It acted as a central unit where info gathered could be stored, accessible by other team members. It was good to see other team's responses on the board - inspiration."

If you didn't use mediaBoard, what were the reasons?

> "We went together to the Tate and we go to all our lectures and seminars together so we had no need for it in terms of communication."
>
> "Contacted via other communication. Didn't need to. Other people could see your ideas."

Other comments

> "I would use media board as an alternative if I can't meet with my group."
>
> "Would be good if we could upload documents i.e. Word."

Surprisingly, given the levels of usage, enjoyment and engagement of mediaBoard, 56% said they would like to use mediaBoard again for another module or project.

We also asked the students for feedback on the SMS learning hints that we had sent them. In the mobile phone survey completed by the students at the beginning of the module, the majority had positive views towards the university contacting them via their mobile for learning purposes (45% were positive, 33% were neutral and 22% had negative views). However, we wanted to get direct feedback on the messages sent, to see if the students thought that they were helpful, and not an irritation or an invasion of their personal space. Feedback was gathered via a post-it note exercise in the last 2 seminars (a technique used successfully before by the lecturer to get instant reactions from students on something). The lecturer asked the students "What did you think about receiving text messages to your phone?" The question was written up on the whiteboard, and the students were asked to write their response to it on a post-it note that they were each given, which were collected at the end. 17 students wrote responses, and they all made some positive comments, even if there were some criticisms as well. A sample of the responses is

shown in Table 6. Two students said they hadn't received the messages (having either started late or having changed their mobile number), but both said they felt messages would be useful reminders for students. 6 students said the messages were 'useful', 5 said they were 'helpful', with 1 saying they were both 'useful' and 'helpful'. Other adjectives used to describe them were 'excellent', 'great' and 'really nice'. 3 of the students actually thanked us for sending them the messages.

Insert Table 6: Some responses from students about the 'learning hint' text messages sent them

This feedback is extremely encouraging, and indicates that if timely and useful messages are sent to students that help them in some way, they are pleased to get them.

The lecturer also provided some reflective feedback on the incorporation of mediaBoard into the module. She felt that it was a really good idea, and that it can assist students to bridge some of the 'time and space' barriers needed to be overcome for group work to be successful. However, the workload for the team was quite overwhelming, mainly due to the unexpected student numbers (requiring 2 seminar groups), and the amount of time required to set up the mediaBoards, producing explanatory handouts and the learning object, getting student details and registering them for the boards. More thorough preparation in terms of preparing resources in advance could have alleviated some of this pressure. Team roles blurred as everyone 'mucked in' to provide support and make it work. Some technical hitches also hindered students' understanding, for example in one of the seminar groups we could not get an Internet connection to demonstrate the mediaBoard online. The tutor also felt that she could have been more confident with the technologies being introduced. She also felt that it would work much better with being integrated more fully with the whole module pedagogic context, with the pilot being a bolt-on to an already crowded curriculum.

Whilst the level of use of mediaBoard was disappointing, the students do show a positive attitude towards it. We considered that its incorporation into the module would facilitate the communication and teamwork amongst the student groups, but this did not happen in reality. We didn't follow-up the student questionnaire with interviews, as we considered the level of use too minimal to pursue, and didn't want to over-burden the students with even more evaluation feedback. In addition to the comments made by the lecturer, the team proposed a number of reasons. Several students in the questionnaire mentioned that they used their mobiles to communicate with their team by SMS or voice calls, and one theory proposed by the team was that the high percentage of ownership of mobile phones changed the way that the students communicated from previous years. The usability issues mentioned also probably contributed to lack of use. Each type of message (SMS, MMS, email) has to be sent using a different convention, which is difficult to remember without having access to the handout or the learning object every time a message is sent to mediaBoard. In addition, because of the large numbers of students that eventually signed up to the module (80 as opposed to the envisaged 20), it was difficult to support and help them.

Conclusion

The introduction of mediaBoard into the module as a means of facilitating student group communication and completion of their assignment was well founded. Whilst most groups did not make use of their mediaBoard, the one that did showed that it could be helpful. Student feedback confirmed that they didn't feel the need to use it, but 56% said that they would like to use mediaBoard gain for another module/project, so they must be able to see the value of it. We can claim therefore that our blended m-learning design has the potential to support teamwork and social discourse for our students.

Our findings also indicate that if handled with sensitivity, students welcome SMS 'learning tips'. Obtaining learning hints in the convenient medium of their own mobile phone fits into the students' overall university life balance and time management requirements and is therefore seen in a positive light.

The key question posed in the introduction was: What combination of instructional strategies and delivery media will best produce the desired learning outcome for the intended audience? As a consequence of the work described in this paper, we feel that the effectiveness of our design revolves around three key aspects: (i) hooking into learner-owned mobile technologies, (ii) providing SMS learning hints in a timely manner, and (iii) providing links through to more substantial e-learning resources that are appropriate to the task in hand (mediaBoard and learning objects). Future work is currently extending the use of this blended mLearning model to other modules and subject areas.

Acknowledgements

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Table 1

Mobile phone features

Phone features	Colour screen	Camera	Internet/WAP	3G	Bluetooth	WIFI
% of ownership	68%	68%	56%	14%	41%	1%

Table 2

Is the ability to learn at any time and in any place important to you?

	Extremely important	1	2	3	4	5	Not at all important
Q1 Is the ability to learn at any time and in any place important to you?		38%	24%	23%	6%	9%	

Table 3

How useful would it be to access learning materials via your mobile?

	Extremely useful	1	2	3	4	5	Not at all useful
Q2 How useful would it be to access learning materials via your mobile?		26%	13%	20%	22%	19%	

Table 4

How would you view the university contacting you via your mobile for learning purposes?

	It would be a positive aspect	1	2	3	4	5	It would be a negative aspect
Q3 How would you view the university contacting you via your mobile for learning purposes?		32%	23%	22%	10%	13%	

Table 5

Examples of SMS messages sent to students

"bssmstudy e-learning - check referencing tools + get your report right"
"Reflective writing due Friday. See reflective writing tool online"

Table 6

Some responses from students about the 'learning hint' text messages sent them

"It started to bug me but was useful."
"I got them and I liked the ones during the Easter break, which were giving suggestions about the report."
"I thought the text messages were great because every time I forgot about it I had someone pushing me to get on with it.
I really like to receive the text messages. I do think it is very useful. Thank you so much to send them to us."

Figure 1. Screen shot of learning object 'How to use mediaBoard'

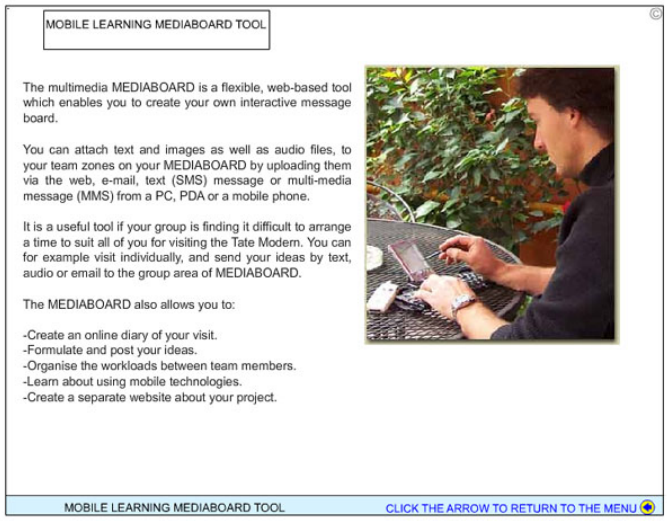

Figure 2: The mediaBoard for teams 1-10 in seminar group 2

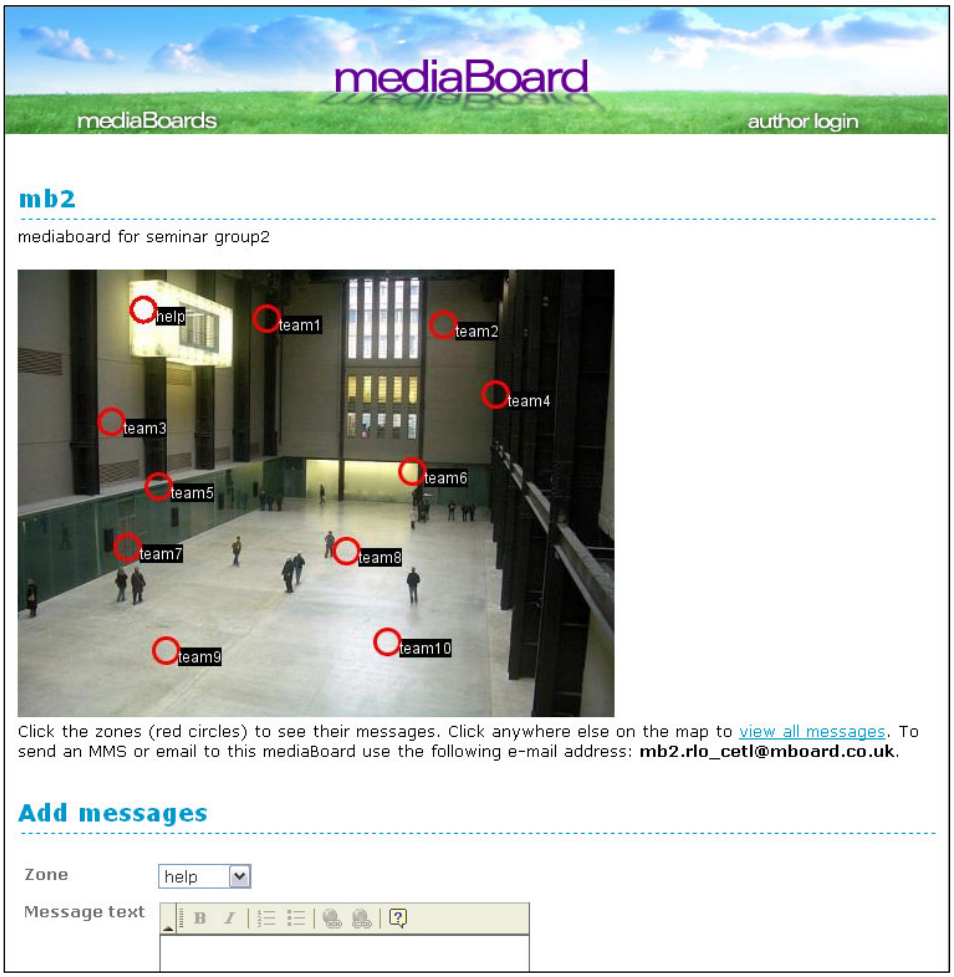
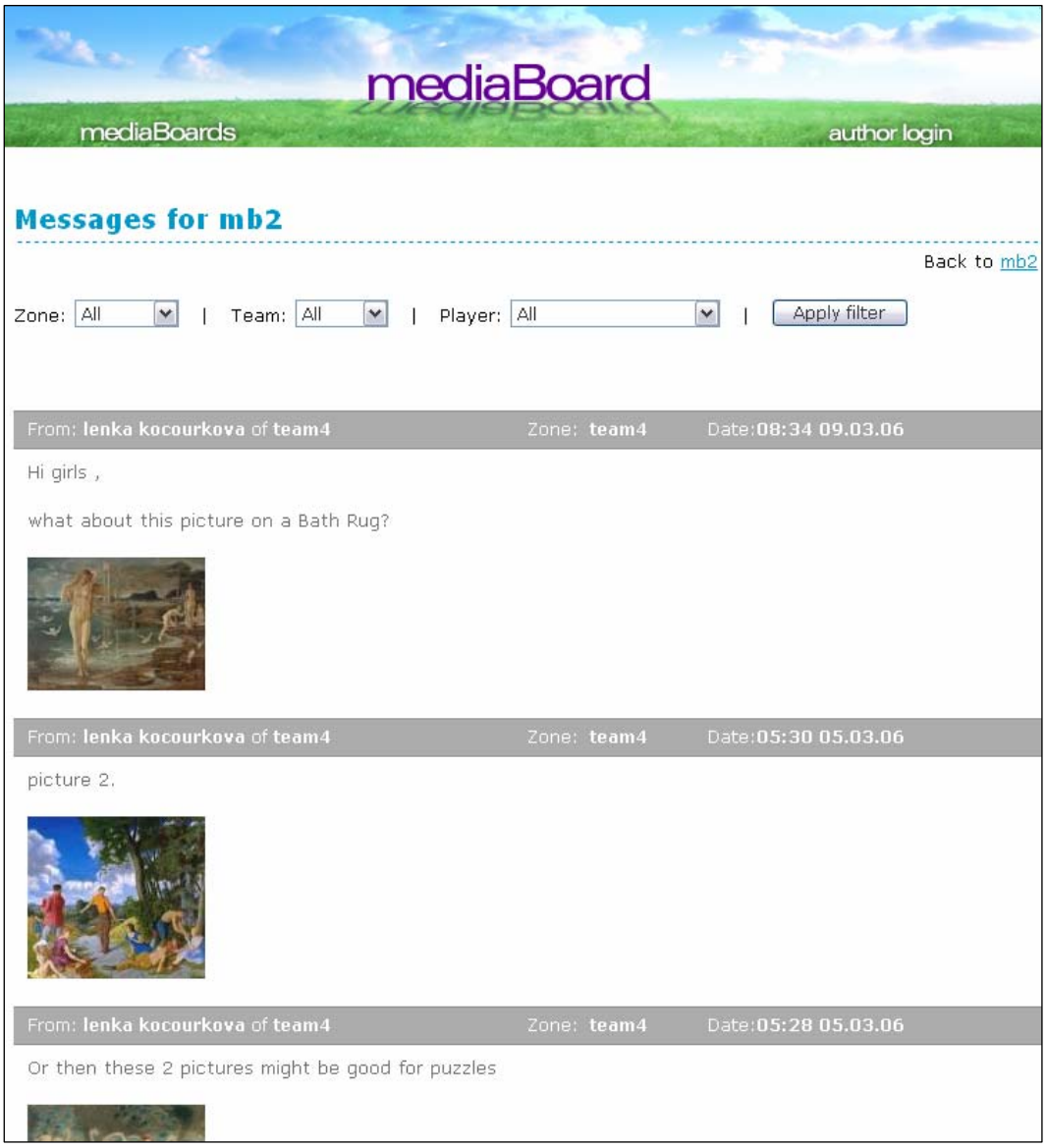
Figure 3: mediaBoard in use by Team 4