futurelab

# Mobile, collaborative and location-based learning:

## a case study of the MobiMissions prototype

**Call for Ideas**
MobiMissions was developed as part of Futurelab's regular Call for Ideas, open for anyone to submit an idea for innovative ways of teaching or learning with technology. Successful ideas receive funding and support in the form of creative input, learning research, user-centred design, and technological expertise to develop them into working prototypes, which can be trialled and evaluated with learners.

Development and research on the MobiMissions idea was carried out in partnership between Futurelab and Professor Steve Benford of the Mixed Reality Laboratory at Nottingham University and his team, who submitted the original idea.

**Authors**
Lyndsay Grant, Hans Daanen, Tim Rudd

**Project partners**
Steve Benford is Professor of Collaborative Computing at the University of Nottingham, where he co-founded the Mixed Reality Lab. He is a recipient of the 2003 Prix Ars Electronic Golden Nica for Interactive Art and has been BAFTA nominated in 2000, 2002 and 2005.

Adam Drozd, Alastair Hampshire **Mixed Reality Laboratory**
Nick Tandavanitj **Blast Theory**
Grace de la Flor (Information Architect)
Stuart Church **CX Partners**
Lyndsay Grant, Clara Lemon, Graham Hopkins,
Tim Rudd, Jo Morrison **Futurelab**

# Contents


NOKIA
MobiMissions
What's this?
Favourite projec
Whats for lunch
Options


# Introduction

MobiMissions is a new location-aware mobile phone game prototype created in partnership between Futurelab and the Mixed Reality Lab (MRL) at the University of Nottingham.

The MRL's initial concept used cellular phone networks as a locative device to provide the structure for a mobile phone game called 'Hitchers'[1]. As players move around, their phone connects to different cells, each of which has a unique ID. Some new types of phone can access the ID of the cell they are currently in, which can then act as a rough indication of the phone's location.

This initial concept was submitted to Futurelab's Call for Ideas[2], and developed to a prototype-stage game called 'MobiMissions'. The final game centred on the creation of 'Missions' consisting of photographs and text on a mobile phone, which were then released into the players' current cell, where they remained until discovered by another player. On finding a Mission, players were able to pick it up, respond to it and drop the Mission in their current location, where it would remain. As a player's phone moves from one network cell to another in the course of a normal day, different Missions become available to that player. Players were awarded points for creating and responding to Missions, as well as for the quality of their Missions and Responses. All Missions and their Responses were available to be viewed on a website.

1. Drozd et al (2006)
2. See www.futurelab.org.uk/get_involved/submit_an_idea

# 1. Executive summary

## Design and trials

Informant design workshops developed the initial game concept, creating a new experience called 'MobiMissions'. MobiMissions was trialled over a period of five weeks with 17 volunteers, aged between 16 and 18 years old.

## Key findings

**1. Local, social play**
Players preferred playing with others at the same time and in the same place to playing on their own. Through reciprocal play, groups co-created the meaning of their Missions and Responses, and reinforced social ties.

**2. Asynchronous, solitary play**
Social reciprocity did not extend to players playing asynchronously. This was partly because authors of Missions were anonymous, and partly because solitary play often occurred at home, where other players were less likely to be located in the same cell and therefore find Missions.

**3. Content of Missions**
The majority of players felt it was more important to create 'interesting' Missions than to maximise points by creating and responding to as many Missions as possible.

THE DEVELOPMENT OF THE GAME AND THE TRIALS INDICATED FUTURE DIRECTIONS AND LEARNING POSSIBILITIES FOR THESE TYPES OF TECHNOLOGIES AND EXPERIENCES

**4. Location of play**
The majority of play took place at home, late at night, when players felt free from other commitments. Play took place in short episodes in a limited number of locations, rather than throughout the day in many different locations. Location was not used strategically, only opportunistically.

**5. Conversational learning**
MobiMissions has the potential to support learning conversations through the exchange of photographs in specific located contexts. Support for greater immediacy, longer duration, and multiple participants to conversations could further promote learning conversations.

**6. Competition and motivation**
The emergent goal was to create 'interesting' Missions, rather than score maximum points. Points therefore did not provide sufficient feedback to assess progress against the goal of 'level of interest'. The game focused more on social feedback than competition.

## Future possibilities

The development of the game and the trials indicated future directions and learning possibilities for these types of technologies and experiences. These are described in the 'Future possibilities' section towards the end of this report.

# 2. Design process

**User group**
Young people aged 16-18 were identified as our target user group, as they are independent enough to be moving around the city on their own, and therefore able to take advantage of the mobile potential of this technology. We worked with a group of 15 young people from a Post-16 Centre in Bristol to design and trial the prototype created. They were all familiar with, and owned, mobile phones.

Using cell ID as a locative and communicative device is an innovative use of mobile technology that has not previously been investigated in an educational context, and many applications are possible. In order to explore the new and emerging possibilities of this type of technology, begin to frame questions about its potential to support learning, and discover the ways in which it might be adopted into learners' lives, we took an exploratory approach to design and development. This enabled us to begin exploring new ways in which location-aware, situated and collaborative technologies can be used to create innovative experiences that exploit the affordances of the technology and engage users, rather than simply reproducing existing pedagogies and delivering existing curriculum content through a new channel.

## Idea design and development

Informant design workshops were held with a group of 12 young people to explore ideas around mobile phones, location-based and collaborative games, and to generate possibilities and requirements for a new experience.

The informant design workshops generated several scenarios for possible games, and from these we identified key issues that had significant implications for the design and development of applications of this technology for this group of young people:

**1. Handsets and tariffs**
Students often owned relatively dated handsets and most used prepaid tariffs to manage spending. A wide scale of participation would depend on affordable connection costs and need to function on a wide range of handsets.

**2. Effort and movement**
Students would not spend significant time or travel to specific places to play a game. Any experience needs to take advantage of when and where young people want to play without requiring additional behaviour.

**3. Competition**
Competitive games with tactics, rules, points and winners were popular with some students but not others; they wanted to be able to choose whether to play competitively or not.

**4. Sharing content**
Sharing music, images, videos, and acquiring free media content was particularly attractive to the group.

SHARING MUSIC, IMAGES, VIDEOS, AND ACQUIRING FREE MEDIA CONTENT WAS PARTICULARLY ATTRACTIVE TO THE GROUP

**5. Digitally representing identity**
It was important for players to be able to display their status to one another, through, for example, the music tracks or images that a player chose to display, or their current score.

**6. Privacy and safety**
Students wanted to be sure that others would not be able to contact them directly, access their personal information, or find out their current location without their permission.

**7. Team play**
Students imagined they would be likely to play in groups with friends. Group play therefore needs to be supported.

## Idea refinement

The scenarios and resulting implications above informed a concept outline for a single experience. This was primarily based on the idea of players creating 'Missions' for one another, leaving them in locations for others to find and respond to.

This initial concept was further developed with students through low-tech prototyping sessions, in which small groups of young people created Missions with digital cameras and exchanged them with other groups, who then responded. Over three days, many different types of Missions and ideas for Missions were created and responded to. Two of these Missions are shown below.

## Mission: What film characters are we?

**Your challenge if you choose to accept it!!!**
You will have to try and guess what film characters we have thought of using pictures as clues. The clues get easier as you go along but you lose points for every clue you use. You have a maximum of four clues. You will then have to get a picture of the answer to show that you have got it right.

**Clues:**

1

2

3

4

**Response:**

## Mission: Success/Failure

- Take 3 pictures that represent success
- Take 3 pictures that represent failure

**NB:** These images were intended to represent both success and failure, depending on point of view.

**Examples:**

**Bristol town hall**

**Fruit machine**

**Responses:**


**Jobcentre (Success + Failure)**

**Public transport (Failure)**

**Modern medicine (Success)**

The informant design workshops and low-tech prototyping idea refinement sessions were used to inform the creation of the final software and game, which was named 'MobiMissions'.

MOBIMISSIONS IS BASED ON THE CONCEPT OF CREATING AND RESPONDING TO MISSIONS ON A MOBILE PHONE

# 3. The MobiMissions experience

## Creating and playing Missions

MobiMissions is based on the concept of creating and responding to Missions on a mobile phone. Missions can include up to five photographs and five sections of text. When a player creates a Mission, they 'drop' it from their phone, and it remains in their current cell location until found and picked up by another player. Players can search for Missions, again on their mobile phone, and the system returns all Missions available in their current cell. On finding a Mission, a player can upload it to their phone and it becomes unavailable to other players. Once a player has picked up a Mission, they can then respond to it, again using up to five photographs and five sections of text. On submitting their Response, the Mission is automatically dropped from their phone, and it remains in the cell where it has been dropped, ready for another player to find.


## Searching for Missions

When players search for available Missions, all Missions within their current cell are returned. If there are fewer than three Missions in their current cell, then the system searches adjacent cells until it finds at least three Missions. If fewer than three Missions are found, then up to ten 'floating' Missions, not attached to any particular cell location, will be returned.

## Website

A website allows players to view and search all Missions and Responses, allowing players to see whether and how anyone has responded to their Missions. The website supports personal profiles for each player, allowing them to leave comments for one another, or on specific Missions or Responses. When players create a new Mission or drop one from their phone, they are prompted to enter their current location, which is displayed on the website and gives other players a clue about where to find the Mission.

## Points

Players earn points by creating and responding to Missions, with more points given for creating Missions, a more time-consuming and difficult task. Each time a player's Mission is responded to, they earn another point. Respondents are prompted to rate each Mission they complete, from 0 to 2, and these points are also added to the Mission author's score. Players can also rate Responses on the website from 0 to 2, and these points are added to the respondents' score.

THE CELLULAR PHONE NETWORK DIVIDES THE COUNTRY INTO CELLS, EACH CONNECTED TO ITS OWN ANTENNA

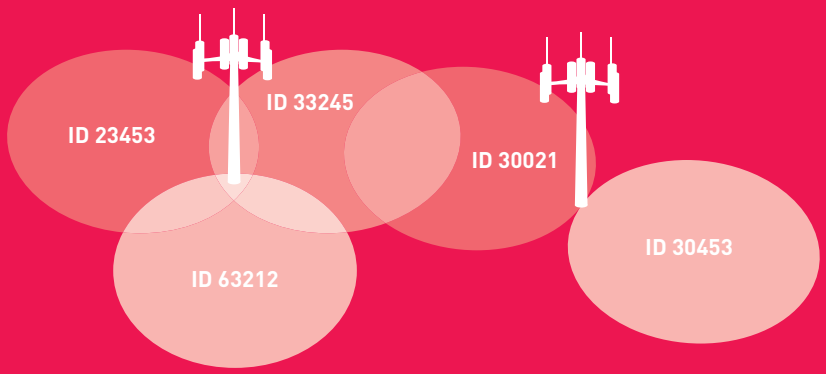
# 4. Using locative and mobile technologies

## Location system

The location system used in MobiMissions is based on the cellular phone network. The network divides the country into cells, each connected to its own antenna. Cells vary in size from a few hundred metres in cities, where antennas are more densely clustered, to several kilometres in rural areas.

Cells overlap one another, enabling users to move from one cell to the next without losing their connection. This means that in one location there may be several different cells each with different IDs (see Figure 1 overleaf). Each mobile phone operator controls its own antennas. As Missions are attached to unique cell IDs, users on different networks would never see each others' Missions. In this trial, we used only one operator which meant that all Missions were visible to all players.

**Figure 1** Overlapping cells in a GSM network




By keeping track of the phones' transitions from one cell to another, it is possible for the game server to build up a map of the game area. This is not a geographical map, but a logical map, showing which cells are near one another, but not representing direction or distance. This map was not presented to players during this trial, but may be a useful addition to future experiences using this technology.

## Developing software for mobile phones

Developing software for mobile phones is still a daunting task. The intricacy of many different brands, models and versions means that many versions of the same software have to be developed in order for it to operate on all types of phone.

In this project Java was used to implement the software, which promises 'write once, run anywhere' development. On mobile phones a minimal implementation of Java (J2ME) is used but this doesn't fully live up to the 'write once' promise; different implementations and user interfaces mean at least a handful of different versions have to be created to cater for a range of handsets.

For these practical reasons, software was built for only one model of phone, the Nokia 6680. This phone is also one of the few types that allow user programs to access the cell ID of the cell the phone is currently using, which forms the basis of the location system.

Nokia 6680

# DEVELOPING SOFTWARE FOR MOBILE PHONES IS STILL A DAUNTING TASK

The phone connects to the server via a GPRS data connection and the internet. Using the Equip2[3] framework makes it easy to bundle updates to the server and limit the connection time to when players are actively searching for new Missions or submitting Responses. This limits costs and makes the charging much more transparent, as players only incur costs when they do something.

## System description

MobiMissions is a Java-based distributed system that runs on players' mobile phones and connects to a central server via an internet connection.

The server has three main interfaces:

1. It provides an interface for the phones so players can find Missions, respond to them and submit the results back to the server.
2. It gives a web browser view so players can view and search all Missions and Responses in the system.
3. It also has a web browser view for system administrators to manage and moderate the activities in the game.

3. www.mrl.nott.ac.uk/~cmg/EQUIP2

THE KEY AIM OF THE TRIALS WAS TO IDENTIFY AND EXPLORE SIGNIFICANT FACTORS AFFECTING YOUNG PEOPLE'S PARTICIPATION IN A LOCATIVE AND COMMUNICATIVE MOBILE PHONE EXPERIENCE

# 5. Trials

The key aim of the trials was to identify and explore significant factors affecting young people's participation in a locative and communicative mobile phone experience.

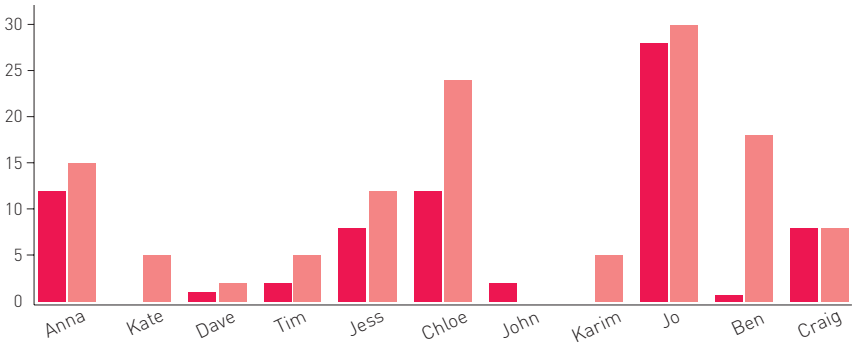
MobiMissions was trialled over five weeks in late 2006, with a group of 17 volunteers aged between 16 and 18, recruited from a single Post-16 Centre in Bristol.

A range of data was collected and analysed, including quantitative data from system logs displaying patterns of use, qualitative data from players' diaries of use, semi-structured interviews with players, and user-generated content created through the game.

**Future possibilities:**
Reaching critical mass

What if everyone in the city played MobiMissions, over a longer period, recruiting friends and creating new networks around locality and sociality? On reaching a critical mass, the game may reach new levels of sustainability, with enough players creating and responding to one another's content to create a viable long-term experience, with 'power users' leading new developments, and sub-groups of interest or friendship forming within the overall user group.

**Figure 2** Number of Missions and Responses created by each player




# 6. Findings and analysis

## Overview of game

Of the 17 volunteers, 11 played throughout the trial. Making Responses was more popular than creating new Missions, with players creating 123 Responses and only 73 Missions during the five weeks of play and nearly all players creating more Responses than Missions (Figure 2).

However, of the 73 Missions that players made, only 31 (42%) were responded to by anyone other than the author of the Mission. This means that a relatively few number of Missions attracted a great deal of the Responses. The Missions that had most Responses included those 'floating' Missions that had been used at the beginning of the trials to 'seed' the game, which were not fixed to location and therefore would have been found more frequently. It also included those dropped off in highly frequented locations such as the participants' college.

The relatively small scale of the trials is likely to have been a significant factor in these findings. Larger scales of play, involving hundreds of players across the country, would be likely to generate rather different results.

## Future possibilities: Supporting social play

The game could be developed to support social reciprocity more explicitly. Support could be provided by inscribing the social context more deeply into the content created, for example, by making the author(s) of content visible. Enabling search by author and other filters such as 'type' as well as location would also give players' Missions a greater chance of being found, even if they left them in relatively unfrequented locations such as their homes.

More explicit social network features could be provided, allowing users to display their interests and affiliations, share files, chat, and form groups, borrowing from web-based social network sites such as MySpace[4] and Bebo[5]. Such social networks may also depend on reaching a certain level of critical mass in order to allow discovery of new networks as well as interaction within existing local, social networks.

MySpace

Bebo

## Local, social play

Players preferred playing with others at the same time and in the same place to playing on their own. This co-located play involved players engaging with the game through one phone and one player's account, rather than each player simultaneously playing on their own phone. This finding reflects research observing teenagers sharing content on their phones, and physically sharing the phones themselves, with their immediate social group, even to the point that it was almost impossible to determine to whom the phone actually belonged[6]. In that study, sharing the phone and its content implied a level of trust and reciprocity, strengthening social ties between co-located friends.

Students found this co-located play more inspiring than playing alone, commenting: "You get better ideas". The group co-created meaning for their Missions and Responses, using each other as a source of inspiration. This reciprocity amongst established social groups can be seen as a way of reinforcing social ties. Taylor and Harper's research[7] showed how teenagers' exchange of text messages and voice calls can be seen as part of a ritualised system of reciprocal gift-giving, with exchange of 'gifts', or text messages, representing a tangible expression of friendship and reinforcing social ties.

4. www.myspace.com
5. www.bebo.com
6. Weilenmann and Larsson (2001)
7. Taylor and Harper (2002)

IN ASYNCHRONOUS PLAY THE VALUE OF THE MISSION DEPENDED ENTIRELY ON THE CONTENT OF THE MISSION ITSELF

This play took place in college common rooms and cafes – the times and places where these participants were already used to spending time with each other – and so can be seen as an example of how new technological practices are articulated and negotiated through existing local patterns of sociality[8].

Co-located play tended to take place amongst groups of existing friends, and they also reported it as more fun, commenting: "You can have a laugh". Three of the most frequent players in the game were friends who often played together, supporting the suggestion that co-located play was more motivating than playing alone.

## Asynchronous, solitary play

However, this social reciprocity amongst co-located players did not extend to the asynchronous exchange of Missions and Responses between players across different times and locations. Only 31 Missions (out of 73 created) were responded to by anyone other than the author of the Mission, and one player described this lack of responses as "demoralising".

8. Yoon (2006)

One reason for this lack of reciprocity in asynchronous play was that it usually took place at home, and leaving Missions at home decreased the chances of other players finding and responding to them unless they were in the same location as the author's home.

A further reason is that when players found a Mission, they did not know who had made it, and there was therefore no social context or obligation to respond as there was in co-located play. This is illustrated by one occasion when a player picked up a Mission and, with pleasure, recognised her friend's 'style' of writing. While she did not choose to reply to it, it did later spark an offline conversation between them, acknowledging and reciprocating in a way that reaffirmed their knowledge of one another and reinforcing their social ties. However, because most players did not share this experience, they felt no social obligation to reciprocate to Missions.


## Future possibilities: Creating compelling content

Perhaps over a longer time or a larger scale, players may discover ways of creating engaging content appealing to particular audiences, in effect giving better 'gifts' in order to receive better returns. Support for the creation of interesting content could be introduced through the introduction of professionally-scripted examples and templates for players to appropriate, manipulate and adapt. Creating defined 'types' of Missions might enable players to find the type of content that interests them, and to find people with similar interests and tastes. Further emphasis on players' ability to reward 'quality' play may also encourage them to think a little more about the content of their creations.

### Content of Missions

In Taylor and Harper's[9] study of text message exchange as 'gift-giving', messages in which the personal, social context is essential to the meaning of the message were valued more highly than public messages sent to many recipients. In co-located play, the social and personal context similarly added meaning and value to Missions. However, the public nature of Missions and the lack of social context meant that in asynchronous play, the value of the Mission depended entirely on the content of the Mission itself.

A wide variety of Missions were created, from the relatively banal, to the more conceptual. One student, who played largely at home, alone, put a lot of effort into making Missions. She perceived her Missions as 'high value' because of their interesting content, reflecting the thought and time she had invested, for example Figure 3.

9. Taylor and Harper (2002)
10. Livingstone (2002)


**Figure 3**
More thoughtful Missions

Other players also commented on the value of this player's Missions: "She's been thinking". She was frustrated by the lack of reciprocation, as if her 'gifts' had not been appreciated, and stopped playing towards the end of the trial. When another player eventually found and responded to one of her Missions, she left a message on the website to comment on his Response, suggesting her strong desire for greater reciprocity in the game.

Players also commented on the 'low value' of some Missions that were seen as taking little time or effort to make and being 'boring', for example a Mission that showed a picture of a cigarette lighter with the question 'what is this?'.

The emerging etiquette of the game suggested that the majority of players felt it was more important to create 'interesting' Missions, rather than simply create as many Missions as possible in order to earn points. However, creating interesting Missions required significant time and effort, which players were not often prepared to spend, particularly when perceiving that their efforts were unappreciated.

PLAY WAS MORE 'EPISODIC' THAN 'FLUID', TAKING PLACE IN INTENSE BURSTS IN SPECIFIC LOCATIONS

**Future possibilities:**
Located interactions

Which groups would find location-based interactions more relevant? For example, people who are interested in exploring particular locations significant to location of wildlife, outdoor photography, oral history or tourism?

## Location of play

Most play took place at home, with 58% of all play described as taking place at 'Home' or 'Bed' (see Figure 4), often when players were alone and often late at night. Missions dropped off in players' homes were less likely to be picked up by other players, because they were unlikely to find themselves in that cell. Play at home was therefore solitary not only because players were playing alone, but also because the chances of social reciprocation were diminished. In contrast, as discussed above, co-located play tended to take place in locations where people gather socially, and where Missions therefore had a greater chance of being found by other players. The location of play therefore was a significant factor in communication and reciprocity, both in co-located and asynchronous play.

Players explained that they played late at night, at home, because that was when they felt they had spare time, free from homework, college, part-time jobs and other socialising activities. This relates to findings suggesting that much of young people's media use in the home is in response to boredom, engaging with media when other activities such as going outside with friends are not available[10].

Play was restricted to a relatively limited number of locations, with 86% of play taking place in just three types of location (Home/Bedroom, College and Pubs/Cafes), with one student reporting: "You're in the same environment every day [...] you don't go anywhere new". Young people this age are perhaps not the highly mobile people we might imagine them to be, at least not on a regular basis.

10. Livingstone (2002)

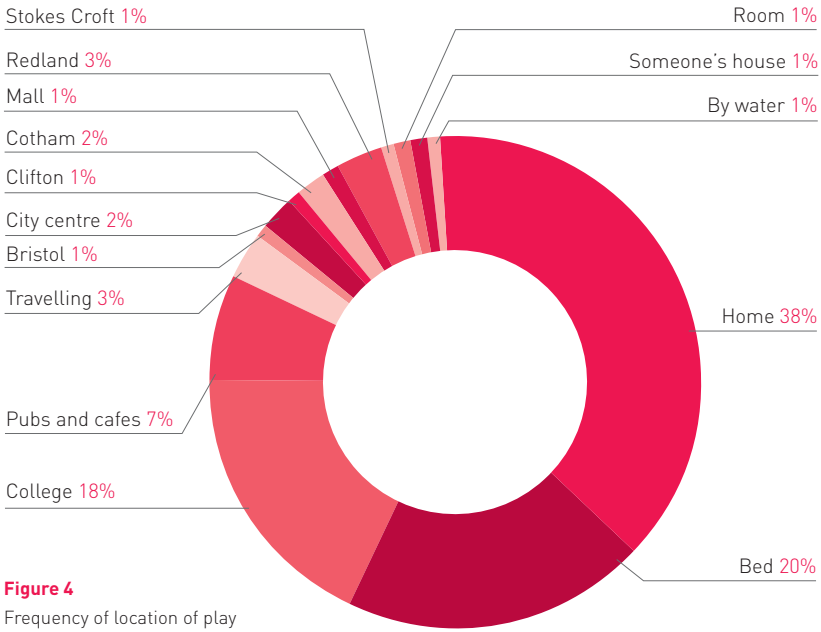



**Figure 4**
Frequency of location of play

Play was more 'episodic' than 'fluid', taking place in intense bursts in specific locations rather than dipping into and out of the game in different locations throughout the day. This meant that Missions did not travel a great deal, and therefore did not reach a very wide potential audience. Indeed, players complained that they saw the same Missions over and over again, as they often played repeatedly in the same location.

Location was used opportunistically, providing inspiration for the content of Missions, with players searching their environment for an image on which to base a Mission. This suggests that games like MobiMissions have potential to support players sharing their perspectives on a particular place, and utilising their environment as a learning resource. However, location was not used strategically; players did not consider dropping Missions in locations likely to maximise their chances of being picked up, or in places relevant to the content of the Mission. Interactions between players strategically sharing perspectives about specific locations were therefore limited.


## Future possibilities: Learning conversations

Creating progression between Missions, where players need to work together, reflect on what they've learnt in order to create and respond to further Missions, perhaps grouped around a particular topic, may encourage more reflective and extended conversation.

Over time, and with a greater scale of participation, reflective conversations may arise outside the game itself, as some groups form with shared interests that they wish to pursue further.

## Conversational learning

Conversation theory[11] sees learning as happening when two or more learners engage in conversation with one another, negotiating the differences between their understandings of a particular phenomenon, and attempting to come to a shared understanding. Rather than the transfer of knowledge from one mind to another, conversation theory sees each learner attempting to grasp how the other understands a particular phenomenon, with reference to a shared representation of the phenomenon under discussion. Learning, therefore, is "a continual conversation, with the external world and its artefacts, with oneself, and with other learners and teachers"[12].

MobiMissions has the potential to support learning conversations by enabling players to negotiate and interrogate each others' perspectives of the world through the exchange of photographs.

Situating the conversation in a relevant location has the potential to ground these exchanges within a meaningful context. The content of the Missions and Responses forms a shared representation of the subject under discussion.

11. Pask (1976), Laurillard (2002), Sharples (2000, 2003, 2005)
12. Sharples (2003: 5)

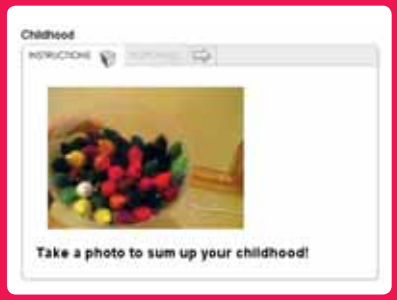



**Figure 5**
Mission

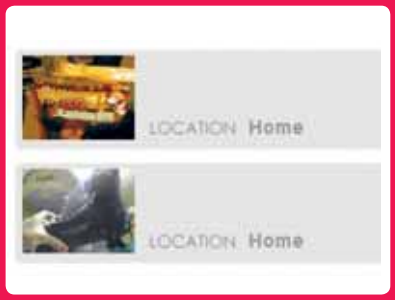



**Figure 6**
Responses

### Conversation at two levels

Conversation theory sees conversational learning happening at two levels: the level of actions, and the level of reflections. At the level of actions, learners are focusing on the specifics of the subject and the effect of their actions upon it. At the level of reflections, learners are making generalisations and reflecting on their actions. Conversation at both levels is essential if learners are to be able to abstract their learning and apply it in other contexts[13].

Players conversed at the level of actions as they shared ideas through the exchange of images referring to a common concept, for example a Mission focusing on memories of childhood (Figure 5) which attracted responses of chocolate bars and a roller skate (Figure 6).

While this exchange worked at the level of actions, it did not extend to the level of reflections and generalising about the concept of childhood at a more abstract level.

13. Laurillard (2002)


**Figure 7**
Mission requiring Response by the following day

There may have been more scope for reflective conversations outside the game, but for several reasons, conversation within the game was cut short, and did not develop into more extended, reflective conversations. Barriers to extended conversation within the game are addressed below.

### Immediacy of conversation

Players wanted a greater level of immediacy within the game. Some Missions implied a Response was required by a particular time, for example a Mission which required a Response by the following day (Figure 7).

To see if anyone had responded to their Missions, players had to check the website but would have preferred Responses to be sent directly to their phone. One player felt that after creating a Mission, "it goes into cyberspace", expressing the feeling that he had no continued connection with it after that point.

As players tended to check the website only once or twice per week, it could be a long time before they saw any Responses to their Missions. Also, as discussed above, many Missions were not responded to, meaning that the conversation in fact never got started.

The teenagers in our trials did not use other forms of asynchronous communication, such as e-mail, for social conversations, and so the delayed, asynchronous conversation with MobiMissions was unfamiliar and unwelcome. They saw e-mail as a formal channel, and social conversations were held through more immediate channels of voice calls, text messages, and Instant Messaging.

**Limited conversation**

Conversations did not extend beyond a Mission and a Response. Replying to a Response could only be achieved through leaving messages on the website, but players checked this far less frequently than their phones, and so most respondents never received feedback on their contribution, and the conversation was cut short at an early stage.

Conversation was also limited to the individual creating and the individual responding to a Mission, rather than supporting conversation with multiple participants. When responding to a Mission, a player would not know how others had also responded to that Mission, which made for a great deal of repetition. If players had been able to see previous Responses, it may have been possible to support a more extended and developed conversation, building on what others had said before.

## **Future possibilities:** Social exchange and motivation

Linking reward and feedback to the intrinsic, emerging goals of the game is important. Future developments of games like MobiMissions could address the changing nature of goals by utilising players' actions within the game as a form of social feedback. For example, making visible the number of times players' Missions have been viewed and played may provide information about the popularity of Missions and Responses. The game itself could incorporate an easy way of providing more in-depth qualitative feedback to players by embedding this within the Response, and allowing for viewing and replying to Responses via the phone rather than only the website.

Creating intrinsically motivating Missions requires a sophisticated judgement of the level of challenge needed to arouse motivational curiosity. Players may eventually achieve this for themselves but could also be supported with professionally produced content that could be manipulated, repurposed and redistributed by players within the game.


### Competitive game or social exchange?

In the initial informant design workshops, the idea of creating a competitive game appealed strongly to some participants, while others preferred the idea of a more casual and informal network of exchange. During the trials, these two approaches to MobiMissions emerged as a source of tension for how players chose to interact with the game and one another.

The points system had been intended to encourage play, and to enable players to visualise how well they were doing in the game. The system awarded points automatically for any play, regardless of quality, but players were also able to rate Missions and Responses, which would award points to the creator of that Mission or Response, in order to bring a qualitative element to the points. Players were required to rate Missions on the phone when they responded to them, but Responses could only be rated on the website, and no Responses were rated during the trials.

# CREATING 'INTERESTING' MISSIONS WAS MORE MOTIVATING AND VALUED MORE HIGHLY THAN SCORING POINTS

A minority of players were motivated by accumulating points and they created and responded to their own Missions, rating them highly, in order to maximise points. Because these Missions were never really intended for a wider audience, they were often rather banal, and were criticised by those players who focused on creating 'interesting' Missions to share.

The emerging consensus amongst the majority of players was that creating 'interesting' Missions was more motivating and valued more highly than scoring points by any means available. The points reward was therefore extrinsic to the goal of creating 'interesting' Missions. For most players, who did not care about points as a goal in themselves, points were not a motivating feature. Games that are intrinsically motivating, according to Malone[14], have challenging goals and provide sufficient feedback in order to judge progress against that goal. The feedback provided by the points system was not sufficient for players to judge themselves against the goal of 'interestingness' as it only provided an indication of quantity, rather than quality of play. This partly explains why most players did not see MobiMissions as a competitive experience. Players wanted greater social, qualitative feedback, rather than the quantitative feedback offered by the points system. For several reasons this was also lacking within the trial (see 'Local, social play' and 'Conversational learning' sections above).

14. Malone (1981)

WHAT IF MOBIMISSIONS WAS USED TO DEVELOP A WAY OF INTERACTING WITH LOCATION, CONTENT AND OTHER VISITORS IN MUSEUMS AND HISTORICAL SITES?

# 7. Future possibilities

Through trials with young people, one possible application of the MobiMissions idea was explored in depth. These findings have also been used to project forward to future possibilities for using such technologies and experiences to support learning.

In workshops with young people, teachers, technologists and researchers, and drawing on the broader theoretical and practical context, several avenues for future applications of the technology and for new research angles were generated, which are summarised below.

## Site-specific applications

What if MobiMissions was used to develop a way of interacting with location, content and other visitors in theme parks, museums and historical sites? Focusing the experience on a defined location, or set of linked locations, may concentrate the interactions between people, location and content in a more intense way in places such as historical battle sites, stately homes, theme parks, zoos, cities' cultural quarters and national parks. Opportunities also open up for exploring less formal spaces such as parks and open spaces, charting 'secret histories' of urban areas and locations for participating in outdoor activities such as skateboarding, football, surfing, etc.

Professionally-scripted Missions could support game-like activities, whilst visitors' creations and responses could build up over time to become an aggregated repository of reactions, responses and additions to information located in specific sites.

Creating and responding to Missions could be a way to get more out of return visits to the same site, making each visit unique depending on the activities of recent and simultaneous visitors. Consideration would need to be given to how people would access information about the location before and after their physical visits, and to the tensions between synchronous and asynchronous communication, providing immediacy to the experience yet also benefiting from the range of responses accumulated over time.

Taking advantage of mobility as much as location, MobiMissions could act as a kind of 'armchair traveller', with Missions collecting Responses about different locations from different travellers. Acting as a traveller's informal journey companion, Missions could provide up-to-date and 'from-the-field' information about things to do and see from people on similar routes.

# WHAT IF MOBILE, LOCATIVE AND COMMUNICATIVE EXPERIENCES WERE AN INTEGRAL PART OF SCHOOL?

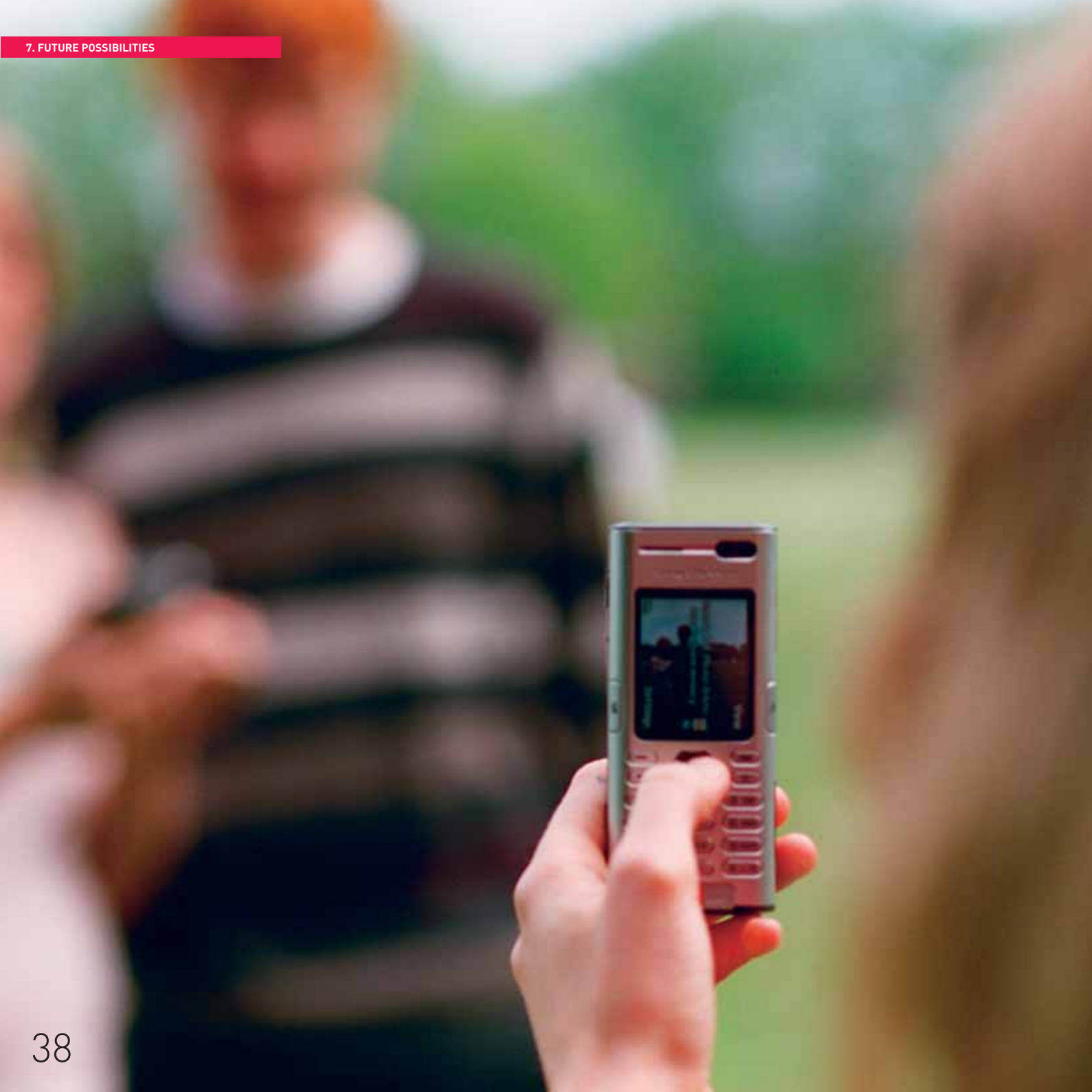
## School

What if mobile, locative and communicative experiences such as MobiMissions were an integral part of school experiences?

On field trips, activities could meaningfully link the location where data is gathered with later analysis. Over time, a school knowledge base could be compiled, tracking changes over time. The exchange of Missions about specific locations could link activities between those participating in a field trip and other learners participating in complementary activities back in the classroom.

The discovery and exchange of located content in particular areas could be developed into ways of linking a school more closely to its local community, through the sharing of ideas and images. Discovering and mapping the learning and knowledge resources already present in local communities could be approached through the located exchange of images and information.

If content could be 'sent' as well as 'found' then exchanging information and perspectives between different countries could be a way of building partnerships between different schools, as learners developed ways of representing themselves and their ideas to other young people with very different ideas and perspectives.



THE INTERSECTIONS BETWEEN GEOGRAPHICAL AND SOCIAL MAPS COULD PROVIDE USEFUL FORUMS FOR DEVELOPING GREATER COMMUNICATION WITHIN COMMUNITIES

## Located social networks

Supporting greater social communication may enable an experience similar to MobiMissions to develop into a located social network site similar to web versions such as MySpace or mobile, located versions such as Socialight[15]. Interactions could be aggregated to build up a social map, displaying individuals' movements and favourite locations, and showing how individuals' maps might intersect with friends' maps, and the maps of the wider community. The intersections between geographical and social maps could perhaps even help to provide useful forums for developing greater communication within communities.

## Shared interest groups

Setting up an experience based on MobiMissions with defined interest groups may provide a focus for and purpose to the content of exchanges. For example, naturalists could share information about the location of wildlife, local historians could build up an interconnected network of information and memories of an area rich in history, or environmentalists could mobilise community resources and debate what action to take to fight pollution and neglect in particular locations.

15. socialight.com

STRATEGIC AND TERRITORIAL GAMES COULD BE PLAYED OUT AS PLAYERS LAY CLAIM TO PARTICULAR CELLS BY CREATING CONTENT, OR APPROPRIATING CONTENT CREATED BY OTHER PLAYERS

## Games

Gaming applications could be developed further with similar technology and experiences. Exploiting the located and mobile affordances of the technology, the cityscape can be transformed into a giant gameboard.

Strategic and territorial games could be played out as players lay claim to particular cells by creating content, or appropriating content created by other players. Interactions such as these, linking real and virtual locations, could lead players to new explorations and understandings of their surrounding areas.

Viral games could also be distributed through the use of MobiMissions technology. For example, players could create Missions or other content that could reproduce and spread throughout the player population, perhaps communicating marketing information or other networking information. Conversely, viral distribution may also be a way of collecting information, for example the 'mood' of players, which could be displayed and communicated to the group as a whole.

## Exchange across networks

In future developments, users may be able to exchange Missions via Bluetooth™ as well as through the central server. This could make it possible to link cell IDs of different operators, as users are exchanging information directly with each others' handsets, not via their network. The system could make inferences about which cells overlap each other, as when two phones in different cells, whether on the same or different networks, exchange data via Bluetooth, they must be in the same location and hence the cells must overlap.

## Scalability

If an application such as MobiMissions was generally available on everyone's mobile phone, then the experience might change significantly as it reaches critical mass. Over time, 'power users' might emerge who gained reputation amongst the community, creating quality Missions that were in demand from other players. A larger group would include a greater diversity of players, increasing the opportunities for heterogeneous content, and the emergence of distinct and divergent interest groups.

# 8. Conclusion

Through the MobiMissions prototype project we were able to explore some of the significant factors affecting young people's interactions with locative, mobile, social games, and to identify possibilities for future development and research.

These were relatively small-scale trials, designed to identify further questions and possibilities for these types of experiences and technologies to support learning. It is likely that very large-scale trials, reaching a critical mass of participation, would have produced different patterns of interaction, and further iterations and developments of this idea would benefit from larger-scale trials.

Social reciprocity emerged as a key feature of this experience, motivating and inspiring co-located play, and perceived as lacking in asynchronous and solitary play. The social, qualitative feedback received during reciprocal interactions was more useful in providing feedback on the emerging game goals of creating 'interesting' Missions, than the quantitative feedback provided by the scoring system. Building in further opportunities for reciprocity is likely to be essential in developing the emergent learning conversations observed in the game into more extended, reflective, learning conversations.

# THESE WERE SMALL-SCALE TRIALS, DESIGNED TO IDENTIFY FURTHER QUESTIONS AND POSSIBILITIES FOR THESE TYPES OF EXPERIENCES AND TECHNOLOGIES TO SUPPORT LEARNING

Learning conversations could become more meaningful, purposeful and reflective by focusing on networks created at the intersections of content (including curriculum content), social groups and locations.

Locative, mobile and social experiences such as MobiMissions offer many opportunities for learning, not least in their potential as tools to support a personalised and active approach to learning situated in our immediate environment, as participants are able to share ideas and build networks as a precursor to taking action on issues of local importance.

This prototype project has begun to identify some of the questions and significant issues around the potential for locative, mobile, social games in learning, and it is hoped that future research and development will be able to take these beginnings further.

## References

Drozd, A, Benford, S, Tandavanitj, N, Wright, M and Chamberlain, A (2006). Hitchers: designing for cellular positioning. Proceedings of 8th International Conference, UbiComp 2006, 17-21 September 2006, Orange County, USA (eds P Dourish and A Friday). Berlin and Heidelberg: Springer, 279-296

Laurillard, D (2002). Rethinking University Teaching: A Framework for the Effective Use of Learning Technology (second edition). London: RoutledgeFalmer

Livingstone, S (2002). Young People and New Media: Childhood and the Changing Media Environment. London: Sage Publications

Malone, T (1981). Toward a Theory of Intrinsically Motivating Instruction. Cognitive Science 4, 333-369

Pask, G (1976). Conversation Theory: Application in Education and Epistemology. Amsterdam and New York: Elsevier

Sharples, M (2000). The design of mobile technologies for lifelong learning. Computers and Education 34, 177-193

Sharples, M (2003). Disruptive devices: mobile technology for conversational learning. International Journal of Continuing Engineering Education and Lifelong Learning 12 (5/6) 504-520

Sharples, M (2005). Learning as conversation: transforming education in the mobile age. In Proceedings of Conference on Seeing, Understanding, Learning in the Mobile Age, 28-30 April 2005, Budapest, Hungary (ed K Nyiri) 147-52. Available at: **www.fil.hu/mobil/2005/Sharples_final.pdf** (viewed 28/11/06)

Taylor, A and Harper, R (2002). Age-old practices in the 'New World': a study of gift-giving between teenage mobile phone users. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems 20-25 April 2002, Minneapolis, USA (eds L Terveen and D Wixon). New York: ACM Press, 439-446

Weilenmann, A and Larsson, C (2001). Local use and sharing of mobile phones. In B Brown, N Green and R Harper (eds) Wireless World: Social and Interactional Aspects of the Mobile Age. Godalming and Heidelburg: SpringerVerlag

Yoon, K (2006). Local sociality in young people's mobile communications: a Korean case study. Childhood 13 (2) 155-174

## Acknowledgements

We gratefully acknowledge the support of the young people involved in informing the development of the design and participating in trials, and the support of their teachers. The project described in this paper is the result of collaboration between Futurelab and the Mixed Reality Lab at Nottingham University. We also acknowledge the support of the DCSF in funding Futurelab's Call for Ideas programme, which made this project possible, and the EPSRC through the EQUATOR IRC (grant GR/N15986/01). Our thanks also to teachers who gave their time and energy to participate in a workshop contributing to the development of ideas for future scenarios: Linda Beskeen, Duncan McCalmont, Sarah Ashworth, Ian Rodgers, Justin Slowey. Though parts of this report draw on this workshop, it should not be taken to represent the views of the participants, and any errors and omissions remain our own.

## Credits

**Page 10** Images of Wallace & Gromit and their associated characters are reproduced courtesy of Aardman/Wallace & Gromit Limited

**Page 26** Map copyright Bristol Legible City Initiative, Bristol City Council

**Page 21** MySpace.com, Inc

**Page 21** Bebo, Inc

## Also from Futurelab:

**Literature Reviews and Research Reports**
Written by leading academics, these publications provide comprehensive surveys of research and practice in a range of different fields.

**Handbooks**
Drawing on Futurelab's in-house R&D programme as well as projects from around the world, these handbooks offer practical advice and guidance to support the design and development of new approaches to education.

**Opening Education Series**
Focusing on emergent ideas in education and technology, this series of publications opens up new areas for debate and discussion.



## Get involved

Has this report been useful to you? We would like to hear your comments and suggestions at **research@futurelab.org.uk** or leave a comment at **www.futurelab.org.uk/projects/mobimissions/leave_a_comment**. More information about MobiMissions, including a short video, is available at **www.futurelab.org.uk/projects/mobimissions**, where this publication can also be downloaded.

**About Futurelab**
Futurelab is passionate about transforming the way people learn. Tapping into the huge potential offered by digital and other technologies, we are developing innovative learning resources and practices that support new approaches to education for the 21st century.

Working in partnership with industry, policy and practice, Futurelab:

- incubates new ideas, taking them from the lab to the classroom
- offers hard evidence and practical advice to support the design and use of innovative learning tools
- communicates the latest thinking and practice in educational ICT
- provides the space for experimentation and the exchange of ideas between the creative, technology and education sectors.

A not-for-profit organisation, Futurelab is committed to sharing the lessons learnt from our research and development in order to inform positive change to educational policy and practice.

**Futurelab**
1 Canons Road
Harbourside
Bristol BS1 5UH
United Kingdom

tel: +44 (0)117 915 8200
fax: +44 (0)117 915 8201
e-mail: info@futurelab.org.uk
blog: flux.futurelab.org.uk
**www.futurelab.org.uk**

Registered charity 1113051