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eMapps.com

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MOTIVATING ACTIVE PARTICIPATION OF PRIMARY SCHOOLCHILDREN IN DIGITAL ONLINE TECHNOLOGIES FOR CREATIVE OPPORTUNITIES THROUGH MULTIMEDIA

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Professor Peter Brophy
March 2008

Executive summary

“During the few last lessons of this school year they have shown better knowledge ... and their analytic skills have improved”

This comment from one of the teachers involved in game playing within the eMapps.com project is testament to the project’s success in demonstrating that mixed reality, ‘anytime, anywhere’ educational games can be significant contributors to children’s learning.

The eMapps. com games were complex in terms of both of pedagogy and organisation. They took place in different countries with players using different languages; in different schools with very different curricula; with children of different ages and varying skills and abilities; and with teachers with different experience, training and skills. Despite this, it is clear that both teachers and children found them to be challenging and enjoyable experiences.

eMapps.com games used mobile technologies, including GPS (Global Positioning System), to enable mixed reality games to be played outside the school boundaries. The games required high levels of teamwork and collaboration, were challenging intellectually as well as technologically and broke new ground in mobile learning.

This report is principally concerned with the impact of the games on the children’s learning. It concludes that:

1. The children learned
 - new knowledge
 - new technology skills
 - improved generic skills
 - improved social skills.
2. Game playing stimulated other work such as artwork, acting, writing and video making.
3. Teachers believe that games do allow them to achieve their intended learning outcomes.
4. In half of the schools involved, teachers cite evidence that children remembered what they had learned through game playing, although other schools were not sure of this or didn’t know.
5. Children who do not respond well in the traditional classroom setting often emerged as positive and enthusiastic learners in the context of the games.
6. It is critical to manage the amount of time which teachers have to devote to the development, customisation and deployment of games if their potential for enhancing children’s learning experiences are to be realised. This issue of time also applies, but in a different way, to the deployment of this type of game. Time could not always be found during school hours to play the game. Embedding the game in the curriculum proved relatively easy for teachers, but embedding the game into the school timetable was not.

7. While there are great benefits to encouraging learning outside the walls of the school, we observed directly, and it was reported to us, that children's safety is a major issue.
8. One of the barriers to learning which we observed was poor design of mobile devices and of applications, and network/GPS failures. Many, many small complaints were made during the eMapps.com games about all these.
9. The evidence which we gathered suggests that, when the concept is carefully explained to them, parents are supportive of this kind of learning.
10. It was clear from our observations and from the responses of teachers that the children *enjoyed* playing the games and, as a result, were highly motivated both to participate and to complete their assignments.

All of this evidence suggests that mixed reality games of the type developed by eMapps.com have a significant part to play in encouraging and delivering children's learning throughout Europe and beyond.

1. Introduction

The eMapps.com project's objectives were:

- to build communities of creative, networking children in the NMS, generating their own cultural content and communicating with peer groups in other countries;
- to contribute to the growth of a community of teachers who are aware of the potential for change through 'schools without walls' and who exchange knowledge and experience through communication with counterparts in other NMS countries;
- to develop adaptable interactive tools (primarily games played on a mobile platform) with which to deliver learning objectives and which help to integrate the use of ICT in the delivery of the school curriculum;
- to establish processes and facilities for teachers and children to access relevant digital content available through a variety of sources while playing the eMapps.com games - and to make the multilingual and multicultural local content created during the games suitable for sharing and repurposing for use in the wider eLearning context of schools and children in NMS;
- to create a *child's living map of Europe*, based on geography, history and heritage, accessible through mobile devices, which can be continuously expanded as an important and rich content resource for schools in NMS and elsewhere;
- to design and implement effective training and multiplier mechanisms for future exploitation of the eMapps.com outcomes by schools and teachers;
- to influence education policymakers at national and regional levels in NMS.

The project has involved significant effort in terms both of technical development and experimentation in real-world school environments. One of the most critical questions posed by this activity, and shared with other use of games in educational settings, is whether learning is taking place as a direct result of the game-playing activity.

The evaluation of game playing activity in this pedagogical context is a complex issue, which demands consideration of a wide range of variables within the context of particular approaches to pedagogy and embraces temporal considerations of learning retention. The social context of game playing means that it is impossible, and indeed undesirable, to focus purely on individual learning. The use of advanced technologies makes the question of learning evaluation even more complex, since children are discovering and building upon both subject knowledge and technical skills.

The project's approach to assessing learning impact draws methodologically on grounded theory and makes use of a number of relevant evaluation frameworks, including SIPTEC, SIG-GLUE and logframes. Specific methods used focussed on observation of game-playing in practical contexts of school activity and detailed questionnaires completed by teachers who had led game sessions. The partner leading this work, MMU, has considerable experience in this field especially in relation to the evaluation of innovative ICT-based products and services.

2. Methodology

2.1. Theoretical basis

At the beginning of the project (and indeed during its gestation as a proposal) the partners engaged in considerable discussion of the pedagogical basis of the work. The main concern here was to reach a common understanding of the approach to eLearning which eMapps.com would support. As reported in D1: Requirements Study the partners were espousing an approach which relies on ‘the theory of a collaborative community of teachers and students, focused on a dialogue and co-construction of knowledge, viewing ICT as having a key role to play’. In early reports from the eMapps.com project (principally D1) a clear statement was made that the project saw itself as promoting a constructivist and collaborative pedagogy. Not all games are designed in this way – a recent report on m-learning suggested that at least five different pedagogical views can be detected in m-learning activities:

1. Behaviourist: activities that promote learning as a change in learners’ observable actions
2. Constructivist: activities in which learners actively construct new ideas or concepts based on both their previous and current knowledge
3. Situated Learning: activities that promote learning within an authentic context and culture
4. Collaborative: activities that promote learning through social interaction.
5. Informal and lifelong learning: activities that support learning outside a dedicated learning environment and formal curriculum.(Watson and White, 2006)

While acknowledging all these approaches, and espousing elements of each, eMapps.com remained committed to essentially constructivist understandings of learning, which focus on the need for each child to ‘construct’ their own understanding of the world through a process of continually comparing experience with prior understanding. Connectivism formalises this understanding by placing the focus on the way in which the development of new mental ‘connections’ underpin the dynamic of constructivism. This standpoint is further developed into the theory of social constructivism, which recognises that learning actually takes place in predominantly social settings through interactions between individuals and groups who share and compare their mental constructs, often in very practical ways, and that it is at these interstices that new understandings are generated.

It is also possible to relate the constructivist approach to pedagogy to the philosophical concepts of linguistic codes and language games. The concept of a *linguistic code* is widely used in human communication theory and elsewhere to express the idea that the language which any one group of people use demonstrates a different understanding of the world from that of other groups. It is simply not the case that each word in one language has an exact equivalent in another. Culler (1997), for example, points out that “speakers of English have ‘pets’ – a category to which nothing in French corresponds, although the French possess inordinate numbers of dogs and cats”. Furthermore, understanding of the linguistic code comes about through use just as much as by language learning. As von Glasersfeld has put it, “children are not given a linguistic code in order to speak and understand language - they have to discover it on their own. They have to construct for themselves the meanings of a good many words before words can be used to expand the range of their linguistic communications”.

Ludwig Wittgenstein, the eminent philosopher, pointed out that the process by which we operate within a social setting is one he characterised as a “language game” (Wittgenstein, 1953). Just as any game has to have rules – though not all of them may be written down – so any social context has its rules, both explicit and implicit. It is important to be clear that when Wittgenstein talks of ‘games’ he is referring, not to the kinds of activity to which the word is usually applied (and has been applied by eMapps.com), but to every kind of social interaction. In every social situation we learn the rules partly by being taught them formally (the objective element) and partly by observation and interpretation (the constructivist element). Continuing developing as human beings, we observe how other people act and we experiment with contributions of our own, noting how they are received and modifying our understanding and behaviours as a result. This understanding of human interaction and learning is essential as we approach the development of new tools for learning, such as ICT-enabled games. It provides a theoretical basis for encouraging the kinds of social interaction which takes place as children play games.

These theoretical considerations were important in defining both the design of the eMapps.com game platform and the evaluation strategy.

2.2. Evaluation strategy

The evaluation of eMapps.com’s impact on learning requires the use of methodological approaches which acknowledge that learning is a social activity where there is a high level of observable variability, while ensuring that value assumptions are not allowed to influence findings. These requirements suggested to us that phenomenological approaches were appropriate. More specifically, the systematic inductive approach of grounded theory was seen to offer the necessary structure.

Grounded theory is well-established in the social sciences and particularly suited to novel situations – as Stern (1995) says, “the strongest case for the use of grounded theory is in investigations of relatively uncharted water”. The central tenet of grounded theory is that the theory (or other conclusions) must emerge from the data which is collected, rather than the theory being presented first and the data used to test it. So the research question remains relatively open and the process is iterative, with different sources of data being examined and allowed to inform the emergent results. Data collection is quite deliberately fused with analysis, so that the questions being explored are influenced by early results. This is helpful in a project like eMapps.com where a series of temporally-separated events can be observed by a variety of participants and onlookers, so that understanding of if and how learning is taking place can emerge and then be used to guide later evaluation activity, analysis and theory-generation.

2.2.1. Evaluation frameworks

In the early part of the project discussions between MMU and EUN led to the adoption of a framework within eMapps.com which was designed to provide a common approach to assessment of the impact of interventions in school systems at all levels, from the individual learner and school to the wider national context. SIPTEC, originally designed by EUN in the context of the Calibrate project, provides a framework which was capable of being used across the eMapps.com learning evaluation workpackage, including those elements concerned with national policy. It structures the evaluation questions into six headings:

2.2.1.1. System

This dimension concerns aspects of the national schooling system that are largely outside the control of the individual school, but which affect what happens in schools, for example:

- National and regional education policy
- National and regional ICT initiatives
- The legal context
- The curriculum
- External examinations
- Teacher education, workforce supply and employment contracts and conditions
- Educational content supply and market
- Allocation of funding between schools, region and state.

2.2.1.2. Institutional

In this dimension we consider the impact of project outputs on the school as a whole, and vice versa: the effect of whole-school constraints on the project, for example:

- The timetable
- Buildings and physical spaces
- Deployment of computers, access/equity issues
- Leadership and school management
- Sharing, collaboration and communication within the school
- Roles and responsibilities of personnel
- The level of e-maturity of the school and the contribution of the project towards it
- The 'school ethos'
- Widening learning beyond the classroom, e.g. informal learning, involvement of home and local community and international collaboration

2.2.1.3. Pedagogical

This aspect covers the micro-level of teaching and learning, at the individual teacher, student, lesson and class level, for example:

- The impact on teaching and learning inside and outside the classroom
- Use of resources by teachers and learners
- Learners:
 - Whether the project changed the way in which students learn and if so, how and to what extent?
 - Whether new approaches emerged, e.g. student autonomy; collaboration/communication with peers and others, locally and globally; locations of use, school and home
- Teachers:
 - Short-term/long-term change in pedagogical approach, skills and attitudes of teachers
 - Transferability beyond the duration and boundaries of the project
 - Experiences in specific curriculum subjects

It is this pedagogical part of the framework that is the main focus in this Report.

2.2.1.4. Technical

This component is about the technology used in the school and the technical performance of project outputs in real situations, e.g.:

- Use in real settings
- The user interface
- Training and support requirements
- Installation
- Integration with legacy provision.

2.2.1.5. Economic

This component brings together financial issues for schools and government, e.g.:

- Purchase
- Set-up costs
- Usage costs
- Wider costs incurred, e.g. teacher time
- Scalability.

2.2.1.6. Cultural / linguistic

This is an important but often neglected aspect. It covers issues related to different political and educational cultures across European countries and specific linguistic concerns.

The scope of the area includes:

- Localisation: Is the project output easy to adapt for use in other countries, languages and cultures?
- Support for multiple languages and facilitating communication in a common language
- Intercultural
 - What aspects of national or local educational culture does the project support best?
 - What aspects of national or local educational culture does the project support badly or not at all?
 - What difficulties arose in implementing the project in different educational cultures (regional or national) and how were these overcome if at all?
- Trans-national collaboration
 - Does the project facilitate trans-national collaboration and if so what are its strengths
 - Could the project be adapted to facilitate trans-national collaboration. If so how and if not, why not?
- Cultures in education (e.g. attitudes to experimentation and innovation, the ethos of the profession, public service versus private sector and the market)
- Cultures in other stakeholders (including children, researchers, technical support staff, product developers)
- Other issues relating to cultural aspects in the implementation of this project

The current report is concerned principally with the pedagogical dimension of the SIPTEC framework, although other aspects are allowed to influence its conclusions. The

deliverable report D13: *Contextual Policy Analysis and Recommendations across Partner NMS* addresses other parts of the SIPTEC framework.

The project also took into consideration frameworks used by other research teams, particularly the EU-funded SIG-GLUE (Special Interest Group for Game-Based Learning in Universities and Lifelong Learning) project (although noting the different focus).

2.2.2. Exploring project learning objectives

At a number of relatively early points in the project exercises were undertaken to help project participants to clarify their understanding of the learning objectives of the project. In the main these exercises were based on the 'History of the Future' method. The first iteration of this exercise took place at the kick-off meeting in Prague involving partners and country coordinators, while the second was at the summer school in Nida, also involving teachers. A full report on these exercises is provided in Appendix 1.

3. Background

There has been considerable interest in the pedagogical potential of computer games for some years. A huge literature on the subject is readily available and there is no attempt at a comprehensive account of it here (though it is worth noting that the general literature on the subject and background issues were summarised in the eMapps.com report D1: Requirements Study). Kirriemuir and McFarlane (2004) have provided an excellent, if now slightly dated, overview and bibliography. It is still worth, however, quoting one of their conclusions:

“Use of mainstream games in schools remains rare, and is unlikely to be integrated into the curriculum. Reasons for this include:

- it is difficult for teachers to identify quickly how a particular game is relevant to some component of the statutory curriculum, as well as the accuracy and appropriateness of the content within the game
- the difficulty in persuading other school stakeholders as to the potential/actual educational benefits of computer games
- the lack of time available to teachers to familiarise themselves with the game, and methods of producing the best results from its use
- the amount of irrelevant content or functionality in a game which could not be removed or ignored, thus wasting valuable lesson time.

Nonetheless, teachers and parents recognised that games play can support valuable skill development, such as:

- strategic thinking
- planning
- communication
- application of numbers
- negotiating skills
- group decision-making
- data-handling.

Significantly the experience of game play seems to be affecting learners' expectations of learning activities. Preferred tasks are fast, active and exploratory, with information supplied in multiple forms in parallel. Traditional school-based learning may not meet these demands”.

Prensky (2001), in a major contribution to the literature, suggested that games engage learners in at least twelve different, though related, ways. They

1. are fun to play, giving enjoyment and pleasure
2. are a form of play, giving passionate involvement
3. have rules, and thus provide structure to activities
4. have goals, and thus motivate
5. are interactive, so that players are active, doing rather than just receiving
6. have outcomes and associated feedback, and thus provide learning
7. are adaptive, providing flow
8. have win states, providing gratification
9. have conflicts, competitions, challenges and opposition, thus raising levels of adrenaline (in the ‘fight or flee’ response)
10. require problem solving, thus promoting creativity
11. may be interactive, so requiring social skills

12. have a storyline and character representation, thus promoting emotional involvement.

Not all games will necessarily display all of these characteristics, of course, but to be successful it is likely that they will produce a majority of these effects. While Prensky was talking here primarily of software-based games, there is no reason to think that different characteristics apply to mixed-reality games of the kind eMapps.com has been developing.

Two major reports into the use of games in the classroom were published during 2006 (Entertainment and Leisure Software Publishers Association (2006), Futurelab (2006)). These detailed reports draw upon the real experiences of teachers in primary and secondary schools who have decided to use commercial games as teaching tools. They explore the work which needs to be done to adapt these games to the learning environment, and how feasible this is with the resources available to teachers. They report successes, but also highlight the problems which can arise when trying to 'fit' a commercial game product into the constraints of the curriculum.

The first report includes many real examples of how particular commercial games were used in the classroom, and the second discusses among other things the impact upon teachers' and classroom time, the importance of mapping games activities to the school curriculum, the importance of good technical support, and the impact upon the teacher's role in the classroom. The report ends with practical recommendations for policy makers, games developers, schools, and teachers.

Drawing on these and other reports in the literature the following are seen to be key issues in achieving real learning using mixed reality games:

3.1. Motivation

It has been noted that when children are supplied with mobile devices they are keen to take charge of their learning, and become independent learners. At the same time motivation to learn seems to increase, and they enjoy working collaboratively with other children; indeed one researcher noted that when teachers intervene, the children become much quieter and more passive.

Mobile devices enable children to learn wherever they are. If it is more appropriate for them to learn in the town library, or a shop, café or a bench beside the river, they can take their work with them. They can also communicate with teachers, learners and experts in other places in real time. Their learning is not limited to the resources of the classroom. If they feel like learning (even though they would almost certainly not express it in that way) they can do so wherever they are.

3.2. Skills development

Research suggests that children like the creative and artistic freedom offered to them by mobile devices. As well as their presentation skills improving, teachers report that they are using mobiles to create drawings, diagrams, and mind maps, and to annotate these with their own thoughts and ideas. They use publishing software, post their work on websites, use Wikis and write weblogs.

Formal government policies recognise the better development of skills as a key reason for promoting elearning, and are becoming enthusiastic about the use of games: “borrowing ideas from the world of interactive games, we can motivate even reluctant learners to practice complex skills and achieve much more than they would through traditional means” (Great Britain. Department of Education and Skills, 2005)

Researchers also report a number of areas where children’s social and life skills have been improved by exposure to educational games. Attewell and Savill-Smith (2004) refer to improved self esteem; JISC (2004) suggests that “developing learners’ confidence and pleasure in learning” is a key learning outcome; a UK government report stressed that “e-learning offers a wide range of online environments from school, college, home or work, to work with and learn from other individuals or groups of learners as well as tutors, and develop the cognitive and social skills of communicating and collaborating” (FERL, 2008).

All this suggests that it would be wrong to focus entirely on a narrow range of academic skills when evaluating mobile learning. The benefits, research suggests, are much wider and assessment needs to take this broad agenda into account.

3.3. Context

A critical characteristic of games is that they provide a broad *context* for learning. That is, they reflect the complexity of real situations and promote transferable skills by placing experiences in realistic environments where multiple influences are at play. As Oblinger (2003) put it, “context is important in games. learning what information or techniques to apply in which situations enables greater success”. Becta has observed, “games require transfer of learning from other venues: life, school and other games. Being able to see the connection and transfer existing learning to a unique situation is part of game play”.

3.4. Mobility

Most computer based games are static in the sense that the play does not move from the game-playing device, be it PC or game platform (though Wii is perhaps the exception!). The idea of mixed-reality games of the type developed by eMapps.com, however, is to take players out of the immediate IT environment and instead to use mobile devices to link into a virtual platform while on the move. Not only does this better reflect the reality of mobile games usage, but it mirrors the existent world where activities take place in real spaces.

Mixed reality games, in this sense, can be seen as a particular form of m-learning, defined by Quinn (2000) as “the intersection of mobile computing and e-learning: accessible resources wherever you are, strong search capabilities, rich interaction, powerful support for effective learning, and performance-based assessment”. The critical infrastructure for m-learning is both the mobile device itself (phone, PDA, handheld, etc.) and the communications infrastructure (wireless, whether GPRS, 3G, Wi-Fi or whatever). As network access becomes more pervasive, clearly the potential for m-learning increases.

3.5. Fun

It is claimed that using computer or video games in the school curriculum will make learning fun. There is no doubt that many children, especially boys, spend much of their

free time playing computer and video games simply for pleasure. The idea of combining 'educational' activities with 'entertainment' to produce 'edutainment', and that these educational games will create an ideal fun environment where children can engage with learning, has produced some controversy.

Supporters of 'edutainment' claim that although teachers design lessons with specific learning objectives in mind, the learner may simply not understand why these are important, and may not engage fully with the lesson. In 'edutainment', learning objectives can be hidden in an activity which appears to be driven by the same kind of interactive exploration, discovery and adventure which children experience in their leisure gaming. Children enjoy the fun activity, and may not be consciously aware that they are 'learning by stealth'.

Sceptics however claim that there is no proof that children do not already find classroom learning a 'fun' and pleasurable experience, and no proof that edutainment produces learning. They question the pedagogic soundness of 'edutainment' arguing that it does not allow for a critical part of the learning process, namely reflection and consolidation of what has been learned. For this reason, they say, game-type activities must be followed up in the classroom to ensure that the children have not just had fun, but have indeed achieved the intended learning objectives.

3.6. Flow

The 'understanding eMapps.com' book discusses the concept of 'flow', stating that the characteristics of flow are the basic components of a well-designed game. Flow is a state of mind in which one is fully immersed in what one is doing. In 1975, the psychologist Mihalyi Csikszentmihalyi, proposed certain characteristics of an activity which allow a true flow experience to happen. These are-

1. A clear set of expectations, goals and rules.
2. A high degree of concentration on a limited field of attention
3. A loss of self-consciousness while engaged in the activity, but an increased sense of self-esteem and achievement afterwards
4. A loss of sense of time
5. Availability of direct and immediate feedback, so that behaviour can be adjusted to overcome obstacles
6. A balance between ability level and challenge
7. A sense that one is in control of the situation or activity
8. A sense that the activity is intrinsically rewarding (Csikszentmihalyi, 1975, 1997).

The applicability of some of these characteristics to the concept of the eMapps.com games is immediately obvious; most games will have clear goals and rules, activities will be challenging but achievable, immediate feedback will be available through the 'chat' or 'help' facility, and the fun of playing should bring intrinsic reward. Other characteristics may be more problematic; concentration to the level of a loss of self-consciousness may be difficult in a team situation unless all players are engaged with the activity at all times, striking a balance between ability level and challenge when creating tasks could be a problem in a group of children of mixed ability, and a loss of sense of time may be simply undesirable.

Since Csikszentmihalyi first proposed the concept of flow, it has been studied in a number of contexts as diverse as sport, musical performance and spirituality, but is most often described as a profoundly individual rather than a team experience.

An interesting view of flow in games is provided by 'playologist' Bernie DeKover (nd).

3.7. Fragmentation

Fragmentation is an issue which has been highlighted in recent research into mobile learning. It is defined as 'when the learning experience does not form a meaningful continuum because the amount of incoming information and the multiplied communication sources make the learning situation more distracting' (Syvänen, Pehkonen and Turunen, 2004).

What this suggests is that when learning is designed to take place in a situation where disturbances and disruptions from the environment are likely to intrude, the ability to learn will be threatened, and learning will be 'fragmented'. Clearly this is particularly pertinent when children are out in a busy town where people, traffic and noise will inevitably distract their attention. In addition, the mobile devices themselves may be a source of distraction, especially to those children who are less used to coping with complex user interfaces and data transfer. Mobile learning may lack the luxury of time and space to think about and reflect upon learning content, which is integral to classroom learning.

However showing children that they CAN learn in places other than the classroom, and especially in those places where they live their home, social and cultural lives, may encourage them to become more rounded learners. They may more easily recognise links between the knowledge which they gain informally out of school to their formal education in the classroom.

3.8. Gender

Research shows that at the pre-school stage children of both sexes are interested in computer games. However as girls mature, they tend to lose interest in gaming, and other activities such as music, TV, and playing with friends become priorities (Agosto (2003), Banshee (2000), Inkpen (1994), Knox (2005), Thomas and Walkerdine (nd)). Boys, on the other hand, seem to like the competitive and control aspects of typical computer games. As one research team has commented, "Games have traditionally advantaged victory over justice; competition over collaboration; speed over flexibility; transcendence over empathy; control over communication; force over facilitation" (Heeter *et al.*, 2004).

Research into the design, content and popularity of computer games has shown that commercially designed games tend to cater for a male market, and that this has caused what some researchers call a 'gaming gender rift'. This means that children coming to educational software described as a 'game' may have certain expectations as to what they will find there, and how they should behave. However, one of the ways in which educational software should be different from commercial computer games, is that it should be designed from the outset to be gender inclusive.

Having said that, it has to be acknowledged that although much research has been carried out into gender differences and computer games, the messages are not always

clear cut. It is not uncommon for research findings to contradict each other, and what may be true for younger children is often different for older players. Nevertheless the challenge of ensuring gender neutrality is a real one for educational games designers and for teachers using those games.

3.9. Parental involvement and support

It is uncommon for children and parents to play computer games together in the home, though parents of younger children especially like to 'keep an eye' on which games their children are playing. Parents usually pay for games and may refuse to buy games which they think are too violent or otherwise unsuitable.

Some parents are concerned about the amount of time which boys especially spend gaming when they might be doing something more 'positive' such as playing outdoors, practising sport or music, or using the computer for something more 'serious' such as homework. They worry that too much gaming leads to social isolation, despite the fact that multi-player games are popular, that blogs and discussion groups provide a collaborative social outlet, and that children report that they enjoy gaming at home with their friends. There are children who are 'heavy users' of computer and video games for whom gaming can become a problem, but these are a minority.

On the positive side, parents have reported that their children were more enthusiastic about doing homework, and spent more time doing it when they could use a laptop or tablet. They also liked using the mobile devices as a three-way communication tool between teacher, child and parent.

Children say that they choose to play games at home when there is nothing else to do and they are bored, when the weather is bad, or when their friends are not around to play with them. Most prefer socialising, music, sport, reading and playing outdoors to gaming. It may be that for some gamers, gaming replaces 'doing nothing' rather than 'doing something active'.

3.10. Summary

The use of games for educational purposes is complex and some of the background research is contradictory or unclear. Different issues predominate in different settings, but there seems to be a consensus that games can stimulate children to learn in new ways. They have the potential to provide rich context and thus to help children cope with complex situations. They can be highly motivational, especially when they are fun to play and stimulate 'flow' – and where fragmentation is avoided. Gender issues are important to ensure inclusion. For schoolchildren, allaying the fears and gaining the support of parents may be crucial.

4. Data collection methods

4.1. History of the future

Experience of similar projects has demonstrated that there is great benefit in exploring expectations systematically with participants at the beginning of a project or project phase. Although there are always formal documents in place (such as the EC Project's Technical Annex) it is surprising how often participants bring different expectations to a project. For some it may be a technical development exercise, producing new software at the leading edge of current deployment. For others it may be a chance to test new approaches to learning. Yet others may be interested in new economic models opened up by Web 2.0. These views may be perfectly compatible, but unless there is clear recognition of them the progress of the project will undoubtedly be skewed.

In the case of eMapps.com it was imperative that each of the stakeholders views was heard early in the project and that due weight was given to the teachers' views – as key participants at the 'sharp end' – of desirable project and learning outcomes.

The History of the Future exercise is a helpful way to surface stakeholder views. It is described in Appendix 1 and in more detail in Markland, Butters and Brophy (2007).

4.2. Survey of teachers

The survey instruments were delivered to teachers online using the Zoomerang questionnaire tool, hosted on the EUN website. Not all teachers spoke fluent English, so a Microsoft Word version of the questions was provided so that Country Coordinators could translate and clarify what was being asked. In the event, some schools preferred to return a completed Word version of their answers and these were then transferred to the Zoomerang version manually, so that the data collected could be collated and presented automatically.

Two questionnaires were used. The first was timed to follow the first eMapps.com Summer School held in Nida, Lithuania in April 2006. At this time, teachers were learning how to use the new game platform, familiarising themselves with the handheld devices, and thinking about the form, content and administration of the games which they would produce. Once the questionnaire had been produced, the URL of the online Zoomerang version and the Microsoft Word versions were circulated to Country Coordinators and teachers with a request that they complete the questionnaire. No constraints were made as to who should respond, so that as many teachers as wished to could express their views.

The second questionnaire was timed to be completed immediately after children had played the final version of their developed game, and was administered in a different way. A Microsoft Word version and the URL of the online Zoomerang version were sent to Country Coordinators in January 2007, with an information sheet. This asked Coordinators to circulate the questions to teachers in good time for them to raise any questions for clarification before the children played the games. It also enabled teachers to watch out for issues of interest to the evaluators while game playing was underway. Once game playing had happened, Country Coordinators were asked to hold a focus group meeting with teachers to compile one set of answers for each school, and then submit this through the Zoomerang tool. There was sufficient flexibility within the questionnaire to enable multiple playing events to be recorded.

The decision to change the way in which the second questionnaire was administered was taken because it became clear that some teachers had found completing the first one to be quite an onerous task. The second questionnaire was considerably longer than the first, so by asking for one set of answers from each school to be delivered by the Country Coordinator, the burden upon teachers would be lighter.

4.3. Observation

While the assessment of learning outcomes had, rightly, to depend very greatly on the teachers who were involved, under the guidance of the project researchers, it was important from a methodological perspective to complement these findings by direct observation. A major commitment was made to this work, with careful design of the activity and roles taken, and it was conducted principally at the summer school held in Torun, Poland. Supplementary observation was undertaken at other events/locations but did not form a major input.

One of the problems with observation studies is that they can themselves influence the behaviour of the game players. Great care was taken to minimise this effect, not least by insisting that other members of the eMapps.com consortium, who were present in Torun, could not participate in any way – a crowd of European researchers would undoubtedly have influenced the children's behaviour!

Two researchers from MMU, Margaret Markland and Geoff Butters, undertook the observation. One accompanied the children into the 'territory', standing back but staying close enough to see and hear what was done and said. An accompanying teacher was needed to translate what was being said. Both teacher and researcher took care to stay as far as possible in the background. The second researcher stayed at the 'control base' room to observe the children there. Again, teachers provided translation where necessary but both researcher and teacher took care not to influence the actions of the children playing the game.

5. Results

In this chapter we report of our findings about learning which took place during the playing of the eMapps.com games. These findings, as reported earlier, derive from the two surveys of teachers in NMS partner schools and the observation by independent researchers of the games being played.. A full report on the findings is included as Appendix 2.

5.1. Motivation

We found clear evidence that the prospect of learning through game playing is highly motivational for children. Furthermore the experience of playing eMapps.com games was motivational for future game playing, even where there were problems. This is also evidenced by comments about what happened after the game playing in the classroom – one school, for example, reporting that “there was an informal discussion among the players and teachers (but the) initiative came from (the) children”. Another teacher reported that “children were more interested in (eMapps.com) lessons; it was attractive for them. I was more open to listen (to) their ideas and they appreciated it”.

5.2. Skills development

The evidence that learning did take place during the playing of eMapps.com games is very evident from the responses to the questionnaires. In the first questionnaire teachers were asked about their expectations. They replied that they expected that the games would promote:

- learning how to become skilled users of new technologies
- learning game creation
- teamwork
- communication skills
- generic skills such as thinking, problem solving, planning and organising
- information gathering and use
- presentation skills
- manual skills
- understanding links between curriculum subjects.

By the time the games had been played, and when we asked teachers to report to us on their more specific learning objectives, they identified the following skills

- mobile device use, including GPS use
- teamwork and cooperation
- information resource retrieval and use
- orientation / navigation and sense of direction
- problem solving
- behaviour in public places
- critical thinking
- leadership
- oral and written communication
- interviewing
- planning and organising
- presentation skills
- putting knowledge into practice.

It will be seen that although the skills which it was hoped would be developed were somewhat differently expressed, there had been few significant changes during the time

between the teachers learning about the games and developing their own specific instances. One difference was that most of the teachers were no longer suggesting that game creation would be a likely learning outcome. Despite this some schools had involved the children in setting up the games and found that these children were particularly enthusiastic, creative and hardworking when the games were subsequently played.

By this time teachers had also settled on the curriculum areas which were to be addressed. These were:

- History
- Geography
- Biology
- IT
- Physical Education
- Revision of curriculum subjects
- Architecture
- Art
- Language
- Cookery and nutrition
- Maths
- Music
- Multiple curriculum subjects.

In reporting back to us, teachers stated that children's skills had improved in the following areas:

- Use of mobile technologies
- ICT skills
- Oral skills
- Literacy skills
- Creative writing
- Reflective skills
- Analytical or appraisal skills
- Negotiating skills
- Leadership skills
- Teamworking and cooperative skills
- Planning
- Navigation and orientation.

The table below illustrates that skills had been learned in virtually all of the areas which had been identified in the learning objectives and games designs:

Initial Expectations	Learning Objectives	Learning Achievements
Use of new technologies	Mobile device use	Use of mobile technologies ICT skills
Game creation	-	-
Teamwork	Teamwork and cooperation	Teamworking and cooperative skills
Communication skills	Oral and written communication	Oral skills Literacy skills Creative writing

Generic skills: thinking, problem solving, planning and organising	Problem solving; planning and organising; leadership	Planning Negotiating skills Leadership skills
Information gathering and use	Information resource retrieval and use Interviewing skills	Analytical and appraisal skills
Presentation skills	Presentation skills	(Not specifically mentioned)
Manual skills	-	-
Understanding links between curriculum subjects	Putting knowledge into practice	(Reported, mainly positively, in relation to curriculum subjects)
-	Behaviour in public places; Orientation, navigation and sense of direction	Navigation and orientation
-	Critical thinking	Reflective skills

Individual comments supported the general conclusions:

“Some students who are usually more secluded were so proud of themselves after showing their skills with ICT”.

“They were more collaborative and ready to listen ideas of other team members”.

“Winning team members actually didn’t want to participate at the first place but finally were very successful”.

“We were afraid of arguments between them but as the helpers said they behaved well and negotiated more than we could ever expect”.

We also asked the question as to whether the teachers had evidence that this learning had been retained. Half of the schools asserted that this was the case; the other half felt that they did not at that stage have sufficient evidence to make a judgement. One commented on their retention of ICT skills, noting that after playing the game children “were looking for some of the features on their mobile devices; they are using more web browsing capabilities on mobile phones”. Another said: “during the few last lessons of this school year they have shown better knowledge ... and their analytic skills have improved”.

Not all teachers felt that game playing was the best way of developing children’s skills and knowledge, however. One commented, “I have no problem about this way of teaching, but I think that (the) traditional way is more effective and brings better results. Maybe it’s not so interesting for (the) children”. Since we were not able to carry out strict comparative exercises we have no way of verifying, or contesting, this claim. It does seem, however, that this teacher, and others, sees a role for game playing alongside more traditional methods.

5.3. Context

It was noticeable, particularly in the observation, that children were multitasking and problem solving in a way which mirrors real-life activity. As noted in Chapter 3, creating an environment in which multi-tasking is required helps to create learning situations

where the choice of tactics and methods forms part of the overall challenge. So, one teacher commented “during game play there was great cooperation between (the children)” as they discussed what to do. The same teacher noted that children took the responsibility on themselves – “children were negotiating by themselves – we didn’t enter into the game”.

The context was also influential in the way in which teachers and children related to one another. For example, one teacher commented: “it was more relaxed – they didn’t take us and we did not feel ourselves as teachers, rather advisers” while another said “we were on the first name terms”. This extended to refusal to help where the children needed to be encouraged to try for themselves: “if and when they got a wrong co-ordinate or did not get it at all we just said them to keep on trying”. Another comment was that the children “invented their own way out if instructions were complicated or they failed to get them”. This encouragement to develop resilience in tackling problems can be seen as of great benefit in preparing children for real-world situations.

5.4. Mobility

The experience of playing eMapps.com games demonstrated quite clearly that it is possible to design meaningful learning experiences which make full use of the benefits of mobility – in other words that ‘anytime, anywhere’ learning was a reality in the game-playing situations which were analysed and observed during the project. While there were problems – the most notable is probably the difficulty of using GPS in urban situations where there are tall buildings which block satellite signals – these did not militate against the games being played to a conclusion. Indeed we noted that mobile solutions have a distinct advantage in that alternate technologies can be brought into play – provided a network signal is available, chat, SMS etc. can be used to find alternative sources of the required information. This was also helpful in terms of learning with children being forced to show some ingenuity in overcoming unexpected problems.

The observation of the game playing was particularly helpful in demonstrating this flexibility. Although the children encountered many difficulties, they persisted in the tasks they had been set and showed determination to find solutions. Even when the technology proved less than robust – for example when laptop batteries failed or GPS satellites could not be found – they made serious efforts to pursue the activity in different ways, if necessary using alternative technologies. For example, children would use their own mobile phones to supplement the equipment they had been given when that equipment failed them.

However, a negative note must also be sounded. Many, many small complaints were voiced about the functionality and usability of mobile devices. Similar comments need to be made about accessibility, which must be improved if real social inclusion is to be achieved. Manufacturers need to pay much more attention to all these issues – although maybe the new iPhone will stimulate them to do so!

5.5. Fun

While only few teachers explicitly used the term ‘fun’ (though one did report, unprompted, that “students have lot of fun” and another said “they have discovered that learning can be fun”), it was apparent from most of their comments that one of the main reasons that the children remained engaged with the activity for long periods of

time was that they were enjoying themselves: “The game helped them to understand their roots in way they like and it’s attractive ... They appreciated the change of teaching in compare to traditional way – and changes helps them to pay attention for longer time periods”.

A good measure of whether an activity is enjoyable is whether the children would want to experience it again. Here there were very positive comments. For example, “they’d like to play it again and have more difficult tasks”.

5.6. Flow

Observation of the games showed that the eMapps.com game playing experience did produce ‘flow’. However, it seemed to the observers that this was both an individual and a team experience, and that individuals could drop out of the group flow and then come back into it. In other words, the flow observed in eMapps.com had both individual and corporate characteristics and, considered individually, was not infrequently interrupted. Teachers also observed that individuals sometimes lost the flow of the game. For example, “some problems with attention – not all students are able systematically check chat etc”.

5.7. Fragmentation

We observed evidence of fragmentation in the game playing where the course of the game was interrupted by, for example, failures of the technology/content or misunderstandings of the platform. This was a significant problem for a number of the games and led to the redesign of the platform late in the project. Where there was a hiatus children did become bored and were clearly not learning anything. Once the technology came back online they did, however, resume tasks and the learning recommenced. Thus while there was fragmentation it did not appear to adversely affect the overall learning experience (although of course it could be argued that more learning would have been possible without these interruptions – we have no way of making a judgement on this).

5.8. Gender

Differences in boys’ and girls’ approaches to game playing were highlighted in the last Chapter. The eMapps.com experience was mixed. In some ways gender stereotypes were confirmed: “(boys) were more device focused, girls were more focused on the game”. One teacher reported, of her after game-playing experience, “I asked (the children) to write down what they liked and what they didn’t like on this game. I saw they like this change to traditional way of teaching (but) didn’t like some levels – boys (didn’t like the) kitchen for example”.

But it was interesting and significant to note that the eMapps.com type of mixed reality game was an attractive environment to some of the girls. For example, a teacher reported that a “girl (who) is a little bit shy and is very quiet in class was very active and talkative during the game play.”

There was in fact some evidence that the mixed reality game may favour, or at least be more attractive to, female students especially in single gender teams. So one teacher commented, “Boys were more restless, girls thorough. The winner team was the team which consisted of girls only ... (The winning) girls were those who are actually very shy in the classroom situation”.

5.9. Parental involvement and support

Despite initial concerns that parents might regard game playing as a waste of valuable school time, the evidence was quite the contrary. One teacher commented, “I discussed the game with the parents of children involved in the eMapps group. Parents appreciated this project very much”. Another teacher reported that eight parents had been involved in helping with the game playing: “Parents were involved, they were interested, they were very positive and happy about they saw”.

In fact once the game had been designed and set up, little intervention was needed from teachers, parents or technical experts, but there were occasions when this was essential e.g. when the group set off in entirely the wrong direction. To some extent this may have been due to the experimental nature of the games being played, but it suggests that the presence of facilitators is essential during game play. Parents can make excellent facilitators.

5.10. Other issues

It seems that collaborative game playing, in the eMapps.com style of mixed reality environments, can help children who do not respond well in the classic classroom situation. One teacher commented: “Less able children make task which is consistent (with their) competence - work with GPS, collect information, to interview etc. They feel useful in the game ... more than (in the) classroom”. Another commented: “even the weaker ones can do something and experience success”. It was also apparent that the game playing was an opportunity for the teachers to get to know their pupils more closely. As one teacher put it: “we have learned a lot about the students”!

Finally, it is perhaps noting one unexpected comment, namely that learning by game playing outside the classroom was “good for health” – the children were out in the fresh air. Perhaps more could be made of this aspect of ‘anytime, anywhere’ learning!

6. Conclusions

The eMapps.com games were complex in terms of both of pedagogy and organisation. They took place in different countries with players using different languages; in different schools with very different curricula; with children of different ages and varying skills and abilities; and with teachers with different experience, training and skills. Despite this, it is clear that both teachers and children found them to be challenging and enjoyable experiences. Most important of all, there is clear evidence that significant learning took place and at least some of that learning was retained.

In sifting through the evidence we have gathered we have concluded that the following ten key findings are supported by that:

1. The children learned
 - new facts across a range of curriculum subjects; one of the strengths of the game is that it can be cross-curricular
 - new technology skills with handhelds, platform and ICT. Children are familiar with many of the technologies needed for this kind of exercise. They switched between chat, uploading and downloading images, watching videos, sending SMS etc. as they saw the need. Much of the technology was taken for granted – where they needed to learn about a new device or system they generally did so quickly.
 - improved generic skills, especially teamwork and cooperation, analytical appraisal, decision making, negotiating, independent decision-making, self-reliance, planning, navigating
 - improved social skills, including self confidence. Children seem naturally to work as a team. As with any other team there is sometimes friction and different roles are taken (and sometimes exchanged). Most of what was observed in this regard was positive. For example, where one player took it on herself to operate a laptop, others fell into supportive roles. This experience of finding the right dynamic to make the team work was an important part of the learning taking place.
2. Game playing stimulated other work such as artwork, acting, writing and video making, all of which are generic abilities of use across the curriculum.
3. Teachers believe that games do allow them to achieve their intended learning outcomes – all schools reported this.
4. In six schools children remembered what they had learned through game playing, although other schools were not sure of this or didn't know. This suggests that games can produce long-term learning effects, but do not always do so. Further investigation is needed of the criteria for successful learning + retention.
5. Children who do not respond well in the traditional classroom setting often emerged as positive and enthusiastic learners in the context of the games. Thus
 - passive children emerged as leaders in some games;
 - some children achieved more than teachers had expected them to.
 - shy children, especially girls, spoke up in the games. We believe that this gender-related finding could be especially significant for the design of educational games.

- teachers' predictions of which team would win were not always correct
 - the relationship between teacher and children was different from in the classroom, being notably more relaxed and less formal, thus encouraging different types of response and engagement
 - in schools where children were involved in developing the game, they were particularly enthusiastic, creative and hardworking. This suggests that learning is likely to be enhanced where the experience involves both design and game-playing elements.
6. It is critical to manage the amount of time which teachers have to devote to the development, customisation and deployment of games if their potential for enhancing children's learning experiences are to be realised. eMapps.com used game templates but we believe that there is considerable scope for further developing this concept, providing a rich set of template resources into which teachers can drop their materials, assessments etc. Further research is needed to identify pedagogically-sound ways of developing, sharing and exploiting structured templates, especially in the context of mobile devices.

This issue of time also applies, but in a different way, to the deployment of this type of game. Time could not always be found during school hours to play the game. Embedding the game in the curriculum proved relatively easy for teachers, but embedding the game into the school timetable was not. Most games were special events, some at weekends and after school. This is not necessarily a disadvantage, and indeed points to the need for schools to become more flexible in their timetabling, seeing learning as a 'whole life' activity and giving credit for learning wherever it takes place ('Anytime, anywhere' again). Our impression is that follow up work (reflection) was not always carried out when the game was played out of school hours. This could explain why some learning was not retained.

A further issue is that children easily become bored. This has the potential to disrupt the game (and thus the lesson and its learning). In the experimental situation the effects were not disastrous and those who became bored recovered and participated once the action restarted. However, this is clearly a danger and games need to be designed to ensure continuous stimulation.

7. While there are great benefits to encouraging learning outside the walls of the school, we observed directly, and it was reported to us, that safety is a major issue. This is particularly the case where children are using small, portable devices with considerable resale value. If it becomes possible to make widespread use of 'everyday' mobile devices (for example as the 'standard' mobile phone starts to offer GPS) then it will be much easier to encourage out of school use. Thus technological development is likely to lead to greater learning opportunities – provided schools grasp that their students already have mobile devices of considerable power.
8. One of the barriers to learning which we observed was poor design of mobile devices and of applications, and network/GPS failures. Many, many small complaints were made during the eMapps.com games about all these. In other words, learning was compromised because insufficient attention had been paid to usability by designers and because global systems are not as

reliable/available as network providers would have us believe. We would couple this comment with the remark that accessibility also seems to have been neglected – the accessible handheld device always seems to be a low priority. This needs to change if barriers to learning are to be overcome.

9. The evidence which we gathered suggests that, when the concept is carefully explained to them, parents are supportive of this kind of learning. When parents are involved in helping to run the games they can become enthusiasts for the approach. While we do not have evidence as to whether this in itself promotes learning, it would seem logical that parental support would be a positive factor.
10. It was clear from our observations and from the responses of teachers that the children *enjoyed* playing the games and, as a result, were highly motivated both to participate and to complete their assignments.

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8. Appendix 1: Report on the History of the Future exercise carried out with country co-ordinators and teachers

8.1. Introduction

The History of the Future exercise is a useful evaluation tool for the early stages of a multi-stakeholder project. It can be carried out in a short time at a meeting of stakeholders, focuses upon the individual, and provides a quiet and reflective activity which contrasts well with listening to presentations, or participating in group discussion. The purpose of the exercise is to surface or articulate the embedded assumptions of each individual as to how project activities will effect the changes necessary to achieve the goals of the project. These can then be compared, any misalignment between these assumptions can be aired and discussed, and consensus reached upon what the main outcomes of interest of the project should be.

The exercise is introduced and explained. Participants are asked to imagine a time in the future when the project has ended, and to write a short press release for journalists explaining what they have achieved.

The report which follows results from two iterations of the exercise, the first carried out at a meeting of representatives of the EU New Member States (NMS), namely country co-ordinators, and project management partners. This meeting was held in Prague in February 2006. The second results from a Summer School for teachers, educational technologists, country co-ordinators and project management partners held in Nida, Lithuania in April 2006. The activity was facilitated on each occasion by staff from the Centre for Research in Library and Information Management (CERLIM), UK. The participants on each occasion included project partners from the UK, Belgium, Spain, the Czech Republic, Slovakia, Slovenia, Lithuania, Estonia, Hungary, Latvia and Poland.

8.2. Stage 1. The Prague meeting in February 2006.

Twenty five NMS representatives were present at the meeting, plus three other project management participants. Three CERLIM staff facilitated the exercise, but did not answer the questions. Twenty-one responses were collected.

The participants were given the difficult task of answering four questions as if they were teachers, thus being asked to think as they imagine teachers think. The purpose of this was to see whether they had considered the game as a tool for learning as well as a 'game'.

The participants were asked to spend no more than twenty minutes, without consulting others, to write a response to this scenario.

You are a teacher who has successfully used eMapps.com. Tomorrow at a press conference you will present its accomplishments to local journalists. Write a press release below for distribution at this meeting, explaining succinctly

- * What it is that you have accomplished, including what you set out to teach in this way
- * An example of what one child has done and what they have learned
- * Why it is important
- * What you did that as a teacher led to this success

Use your imagination to think of a scenario for this exercise!

The substance of the responses is given below, with particularly illuminating verbatim quotes included, though minor errors of English have been corrected.

8.2.1. What is it that you have accomplished, including what you set out to teach in this way?

Few respondents actually ‘talked with a teacher’s voice’, but they believe that what will be achieved are the following

- *the game will enhance the relationship between the teacher and the child.* They think that the children will see the teacher in a new light; as a ‘modern and mobile teacher’, a ‘respected person’. ‘The children think I am a more interesting person and a good teacher because of the way we worked in teams to play the eMapps game’. So they anticipate that playing the game will enhance the teacher / child relationship, will raise the esteem in which the children hold their teacher, and that this positive effect will last. One particularly interesting comment was ‘I have come three steps nearer to the generation which is born with info-technology and knows the logics of computers and mobile phones instinctively.’ Thus the teacher will be admitted to a world which children already know and understand well. The children will open up a new world to the teacher, and the teacher will learn from the child. The teacher / child dynamic which prevails in didactic teaching will be reversed.
- *The game will enable new kinds of communication and co-operation between children and teachers.* They express this as ‘found a common language with children to share knowledge!’ or the game ‘facilitated a real natural co-operation between teacher and children’. So they expect that the technology, as well as providing the game, will provide a new means of communication and co-operation which seems natural to both child and teacher. It will be interesting to see whether in the future children and their teachers continue to use the technology in this way, outside the context of the game. Will teachers and children communicate by mobile phone? In ten years time, will children text their teachers for homework advice? ‘During the learning process the child was motivated to be more familiar not only with new communication technology but at the same time to communicate more with me about the most suitable way to obtain more information about the study subject’.
- *The children will take to the game very easily and quickly.* The respondents do not anticipate that the children will have difficulty learning either how to play the game or how to use the technology. ‘We started work with students and they immediately took the idea of such kind of learning as something very usual.’
- *The children will learn through play.* The respondents expected the children to approach the learning process in the way that they approach play. Making learning a playful experience will ‘make learning more attractive for the children’. Bringing the elements of play which children enjoy and which motivate them to concentrate into a learning situation, they believe, will make it easier for the children to ‘understand a lot of concepts in a play based way’. The children will love the game, which the teacher will find a satisfying outcome in itself.
- *The children will understand more about the subject they are being taught, because they are shown how it is relevant to their familiar environment* One respondent believed this to be true, though it could be argued that this cause and effect would not be unique to teaching through gaming. He said ‘Through engaging children in ...

playing games in the environment they know, the knowledge and interest of children has increased significantly’.

- *The game lends itself to the teaching of the following subjects*
 - History, in particular local history – ‘the history of our town’ and of the famous people who have lived in their town; the ‘history of our local environment’, historical figures. History was the most frequently mentioned subject.
 - Geography
 - Physics
 - Natural sciences
 - Languages ‘the knowledge of English has improved very much as well as interest in studying foreign languages’.
- *The game lends itself to the acquiring of specific skills*
 - The use of new technologies
 - ICT skills
 - Computer design
 - Photography ‘the children were walking round the city, making photos’
 - Video making ‘about architectural objects’
- *The game lends itself to the teaching of generic skills*
 - Collaborative planning
 - Problem solving
 - Project management
 - Knowledge acquisition
 - Information management skills ‘ability to make a hierarchy of important information’
 - Team working skills
 - Decision making ‘they had to decide which place they wanted to visit’
 - Writing, and creative writing
- *The game will enhance the status of ICT in elementary schools* ‘not only as a tool, but as a means of providing pupils with combinations of skills that they will need in their daily lives’. There was a suggestion that the integration of ICT into schools had not been successful because the link between ICT and underpinning pedagogic use had not been made. ‘It is not very common to use technology for achieving better results in the educational process.’ However the game is ‘something different’ because ‘it was planned for real school work’
- *The game will be used in parallel with classroom work* ‘When we got back to the classroom I found out that the children had understood a lot of new things about their local history’

8.2.2. An example of what one child has done and what they have learned?

Most respondents in fact talked in general terms rather than give a specific example; however, they made the following points.

8.2.3. What children will do

- *The children will engage in practical activities.* ‘Children had opportunity to work with new technologies’ they were ‘walking around the city, were making photos and videos about architectural objects’
- *They will enjoy and take control of their learning* ‘no pupil is even thinking of getting bored’ ‘they enjoyed it extremely and to be honest they developed the game instead of me’
- *Children will be creative* ‘Used his/her imagination, became more creative.’ Perhaps the children will be tempted to do more than the task set because of the creative opportunities afforded to them by the technology. ‘They have started their own ‘blog’ with photos and some interviews’
- *Children will have few problems with the technology* ‘We learned that children are talented and can use technology without problems.’
- *They will have fun!* ‘Children have done a lot of fun and exciting activities,

8.2.4. What children will learn

- *They children will learn factual information* ‘much about the town and its history’, ‘people’s stories’. Their learning might cover several subjects in one single experience; ‘they learned multidisciplinary content ; history, geography, cultural heritage’. They will also learn how to use factual information.
- *The children will learn skills,* ‘to search information, select, organize’ and how to become competent users of new mobile technologies. ‘We went out into the city, took photos of our main cultural landmarks and it was all uploaded into the environment’
- *The children will learn how to share learning experiences with other children* ‘Every child worked as part of a team,’ ‘we were working with two schools in Poland and a group of children recruited from a number of schools’ ‘Made contacts with children from other countries’
- *Disadvantaged children (socially and educationally) will benefit from the game, and will be encouraged to demonstrate hitherto latent skills.* One respondent wrote ‘XY comes from a socially less favoured family. His studying results were lower than average and thanks to eMapps.com he got interested in geography as well as in foreign languages. We discovered his skills in narrative development as well as computer design. He got much better studying results and understood the importance of education and is now demonstrating project results to other schools in our region.’ Here there is the expectation that the technology might enable a child who hitherto had not engaged with learning to find a medium through which he can do so and can begin to flourish. This implies of course that this game and others like it will become embedded in the classroom situation; that gaming should become a mainstream teaching tool rather than an experimental approach.

Another respondent wrote ‘One of my students who was not very good in history has very nicely been able to integrate a (virtual) journey in our medieval city to different

historical events'. Here there is the idea that the technology will help a child to achieve beyond their previous ability.

- *Children will discover new things about their own families*, 'One child traced what her grandparents were doing 50 years ago, where they lived and understood some of the problems they had to deal with'. Helping children to 'understand' to create knowledge rather than simply to accumulate facts is a key learning process, which this respondent believes the game will facilitate.

8.2.5. Why it is important?

- *It motivates the learner* The expectation is that learning how to use the new technologies and to play the game, will impact upon the children's general motivation to learn. There will be a 'knock on effect' into other areas of their teaching and learning environments. 'It's the way to reach their minds.' It enhances their interest in studies in general' 'Even those boys who don't usually want to learn and co-operate were very enthusiastic'. 'The children said they enjoyed using the eMapps technology, phones, tablets etc. and wanted to do it again' 'According to the fact that children get lazy in learning, this way might be a good process how to re-start their interest in school subjects.'
- *It teaches skills and demonstrates that they are relevant and important to the modern world.* ' These skills are very important in our quickly moving times – to be mobile, to act quickly and to compare knowledge.' 'It makes them understand the importance of language learning'
- *It makes learning fun.* 'The children said this kind of activity is more interesting and more fun than ordinary lessons'
- *It takes learning outside of school and into new places and contexts.* 'Exciting historical games, quizzes have been worked out together about the local site related to 1956 television in homes, and they can be played at local history competitions.'
- *It encourages self-awareness;* of the child's place in the world and of others 'Children became more aware of the past and their cultural heritage and became ready for the challenges of the future'.
- *It improves the child's self esteem as they learn* 'Now, they can be 'those' who show off their history, heritage, geography and so on and at the same time, they themselves learn about it too.'
- *It improves the child's awareness of their own and other cultures* 'Generally children ask their teachers a simple question whether children in different countries learn about them. So, this project is a good answer for that question.'
- *The children learn through doing* 'They helped to change the style of teaching more learning than teaching through doing.'

8.2.6. What you did that as a teacher led to this success?

- *Worked beyond what was required because I thought the game worthwhile* 'I spent my free time in order to prepare all that was needed for the project – not only this; I gave my heart for the project'. 'The teacher could be proud about taking part in this kind of alternative reality game.'
- *Was a guide and facilitator rather than a 'director' of learning* 'I made the guidelines and merely acted as a moderator of the entire process' 'I did not have to be a teacher, but rather a mentor who showed the way and helped the student to discover things for himself.' 'I was a partner for the children.'
- *Made learning 'come alive'* 'I have made the history of the place where they live come alive for my students by using the emapps.com game platform as a way of discovering clues about the past'
- *Was also a learner!* 'I was ready to discuss things with children, became more flexible and learned new things' 'I was surprised how creative children are ...'

8.3. Stage 2. The Nida Summer School in April 2006

The activity took place on the third day of the Nida Summer School just after the teachers had presented the results of their experiences playing "The Amber Room" game. Everyone was in the room, including Cocos, technicians etc. as well as the teachers. The teachers did work at the exercise, but possibly in not quite such a relaxed environment as did the Cocos in Prague, as other activity was going on around them. Some had problems writing English. Their scenario was:-

You are a teacher who has successfully developed a game using the eMapps platform. Tomorrow at a press conference you will speak to local journalists about how you used the game in your school. Write a press release for distribution at this meeting, explaining briefly

- *what it is that you have achieved, including what subject you set out to teach in this way*
- *an example of what one child has done and what they have learned*
- *why it is important*
- *what you as a teacher did that led to this success*

18 responses were received from the teachers.

8.3.1. What is it that you have achieved, including what subject you set out to teach in this way.

Although based on a scenario in the future, the answers given by the teachers tended to be very practical rather than visionary. Possibly, of course, this is because they had just had three days of practical instruction and activity, and were focussing their thoughts upon how they could implement the game in a classroom situation. Rather than report upon 'what they had achieved', most spoke about how the game could be embedded into the life of their school, and the impact that it might have there. This is a summary of the comments made by the teachers

- *The children will understand more about the place in which they live, especially its history and culture.* It is evident that many of the teachers envisage basing their

game upon the area where the children live, especially those who are based in cities or large towns. They see the game as an exciting way of improving the children's knowledge of their local environment. They made comments such as 'The goal of this game was to get to know our city and the important places and people' or 'It was the basis to teach the children about the history of the place they live in (some unknown, rare, interesting or even mysterious pieces of information have been discovered and gathered) and about people who participated in that history.'

- *They expect the children to acquire specific skills using the mobile technologies* Learning how to make full use of mobile devices was seen as a key benefit of the eMapps game; 'the use of ICT and mobile devices such as GPS, 3G phones, digital cameras and so on'. One teacher described what one girl had learned thus, she 'understood that her mobile phone is for looking for information in digital form / from the internet / or is a device to document her work or journey to final goal. She learned the way to upload files on the computer and how to use it to explain how the task has been done. Also the language of that communication is important. English is IT language.' A whole range of skills and understanding had been learned by using all the facilities offered by the devices.
- *Winning the game is not an end in itself; it is important that the activity contributes to learning and fits into the school curriculum* As one teacher said 'The most important is that children combine game and learning and they achieve our curriculum plans'. Ultimately, the game may only become part of school activities if it fits into and enhances the school curriculum; it must support 'a part of the local history that belongs to the school curriculum', and moreover, part of the curriculum which is current at the time when the game is to be played. One teacher noted that although the game was very suitable for teaching local history, the way in which the history curriculum was organised in his school, meant that the children would not be learning about the most appropriate period for a 'local history game' until they were older than the target age for the eMapps game.

The curriculum is key to the thinking of most of the teachers. One said 'the game is important because the children learn the subjects that are in the curriculum in a playful way.' Another described his role as a teacher as 'to develop the narrative based on a curriculum subject'.

- *Using the technology will make learning more interesting.* The teachers clearly believe that using these new tools and mobile technologies will enhance what they can do with the children. There were comments such as 'To my surprise children are interested in the history of our region if there's some connection with high technologies. They've started to use PC more than ever, to learn to set up email box, to send emails and other steps. They had many ideas how to create a game using general information.' One teacher described how the mobile technologies had made local history come alive for the child. 'One child received co-ordinates of place of the old village and then he with other students make tasks - 'one day in old village life'. They learned to use GPS and other mobile devices; they get knowledge about ancient history and appreciate ancient people and society.' Thus they expect the game and the most modern tools used to play it to bring to life events and people long past.

- *Playing a game makes learning more interesting* Several teachers mentioned that turning learning into play made it more appealing to the children. They said 'Children don't usually like direct teaching, but if they can play a game, they can much better learn, and they can smile too'. The general consensus seemed to be that learning through playing would 'make learning more interesting for the pupil.'
- *The children will learn by doing* While playing, of course, the children are 'doing', and this element of learning by experiencing, or doing was seen as very important. 'They will learn a lot of things and knowledge by practice'. One teacher described a series of activities which a child might carry out. 'The child went out to the city where he / she walked around on the predefined path and solved the problems in his / her way with using hints (which he got before on the computer). To solve the level he had to take some pictures or just write about some signs on the building etc. Sometimes he just checked some information to see if it was true. When he / she came back, he used his 'results' from the terrain and put them into the computer. He could use GPS but at the same time he would have clear information to find the point without it.' Another suggested how a game might be used to teach a child who had recently come to live in the town something of the local history; 'One of the children moved to the town three months ago and she hadn't known anything about its history before. It was an excellent possibility for her to study the town. She needed all the information displayed on the desktop and then she went out to the scene and experienced it personally. She made photos, videos and got very excited about what she saw.' It is, as one teacher said 'a method of education by doing.' Another teacher noted the important point that the game was an opportunity to put into practice in a real situation, skills which were learned about theoretically in classroom lessons, 'they learned how to use devices that they heard about in IT lessons'. Practical activities, things to do, were obviously seen as highly important to the learning process, and the 'hands on' aspect of the eMapps game lends itself very well to this way of learning.
- *The children will learn valuable skills for their future lives* One teacher saw beyond the child and the school to the impact which games such as eMapps might have upon his country. He believed that this knowledge and these skills were valuable in the future development of his country in the modern world. He said 'I mean, if they can use these devices, they will reach benefit, and they can build a better country with this knowledge and ability.'
- *The game will involve other people from the children's community* The teachers had begun to think about how the game might reach out beyond the school community. One teacher thought of a scenario which involved the children in seeking help from other professional people in his town. 'One of the boys went to the museum and started a co-operation with the staff. While looking into some old documents and codes he found an unknown letter written by one of Town's authorities describing the local piece of history - unknown so far.' Another had imagined a scenario involving the local library and librarians. So the game might involve people outside of the schools community, and might ask them to share their skills with the children. Thus the children will be learning from others professionals besides their teachers.

The game lends itself to the teaching of the following subjects

- history, in particular local history both modern, recent and ancient

- geography
- languages (their own, plus English and German were mentioned)
- art
- ethnography, people and society
- civics and culture
- literature, especially the contribution of local writers
- the sciences, particularly biology
- ICT
- Computer science and informatics
- Website creation
- Physical education, though it must be said that this was probably coloured by the two days which the teachers themselves had just spent running around Nida in search of answers to clues. However, the physical exercise involved in playing the game is worthy of mention.
- One teacher made the point that the game was a way of combining subjects across the rigid framework imposed by the curriculum. He said 'The main advantage is that different subjects can be integrated into the one game'.
- *The game lends itself to the teaching and development of generic skills*
 - Visual interpretation skills
 - Speaking skills
 - Team-working skills, especially co-operation
 - Information seeking, organisation and management
 - Critical thinking
 - Thinking independently
 - Creativity
 - Observation skills
 - Presentation of their work

8.3.2. Why playing the game is important

A whole range of responses were given to this question

- *The game is important because of its practical nature.* One teacher emphasised that the child 'works - plays - learns in real time with real objects and he gets practical experience (this is also good for his memory)'.
- *The game enhances the relationship between the child and the teacher.* Only one teacher mentioned this as a possible positive outcome of playing the game, saying 'The importance of the game is that it could extend the learning environment, could change the teacher - student relationship'. This contrasts with the views of the participants at the Prague meeting, several of whom expected this to be a key outcome of playing the game in schools.
- *The game will teach the children new and valuable skills, especially technological skills which they will need in future* Many teachers could see the value of the game for a range of reasons. 'There's no question why it's important - cooperation, taking roles, critical thinking and using technologies - all of these our children will need in their lives.' Technology, they believe will play a major

part in the future. 'To be friendly with cyberspace is important in a cyberspace world' or 'Now, when technologies are very important in our own life, this game can help for all.' Or 'I think, in this world, - world of technology is very important and necessary to use and know, get more information about it.'

- The game will appeal to the way modern day children think and act. 'The new generation thanks to computer games learn another way than we did. Maybe their brains are partly different, and the game is their life and thanks to the game they are able to learn more and they are more interested in new things.'
- The children will learn while playing Playful activity will mean that the children learn easily. Because they like playing computer games, they will be interested in this game and will learn without realising that they are doing so. 'It's important because every time children spend time playing the game they enjoy being with each other and they are not aware of learning the same time.'
- This is better than a commercial computer game The teachers could see certain advantages of a game which they could control and monitor themselves over commercial games. One was that eMapps could be tailored to the child's level of knowledge, understanding and experience. 'Common computer games are unfortunately impersonal, but a group game like this with small secrets, are personal and very interesting things.' Another pointed out that the eMapps game was less aggressive than some other computer games, saying 'it's a nonviolent form of learning'
- *It enables the teacher to make a less interesting subject more appealing.* When I learn Slovak language, I think for children it is not very interesting, because they want some interesting methods and probably playing. And after that they could be masters in it.

8.3.3. What did you do as a teacher which led to this success?

The teachers' accounts of 'what they did' suggest how they expect to use the game in their school setting.

They expect to:-

- Acquire the devices needed to play the game (which they will be able to do thanks to their eMapps funding)
- Teach themselves and the children how to use them
- Select a suitable topic from the curriculum
- Develop the narrative
- Create and organise the game content
- Explain to the children what they will need to do
- Motivate the children to play the game
- Support and co-operate with the children as they play the game
- Evaluate what the children have done
- Publish the results.
- Archive the game

8.4. Conclusion

The two sets of responses showed a considerable amount of agreement between all stakeholders on what the eMapps.com project could achieve.

The Prague group particularly expected the game to be a success. Their messages were overwhelmingly positive. Very few reservations were expressed about the game as a teaching tool, and it was perceived as different from other ICT tools. There was a clear assumption that the game would enhance the learning of school curriculum subjects, would enable the development of new skills, would engage children who were not confident learners, and would have social, cultural and intra-cultural consequences such as changing the relationship between teacher and learner, or enabling communication between children in different countries.

The responses given by the teachers to the History of the Future questions were rather more similar than those gathered from the NMS representatives in Prague. All of the teachers were clearly focussed upon practical matters; upon what needed to be done then and there, upon what they would use the game for, what skills they would need, what they would have to teach the children beforehand, and how the game would fit into the school curriculum. They needed to resolve these issues before beginning to think about how it might be extended to include children in other countries and cultures, as envisaged by the Prague group. The responses were positive, but the teachers saw the curriculum in their institution as a possible constraint upon carrying out this activity.

It became clear from many conversations with them during the time in Nida that their other concern was time, that is the time which will be needed to play the game. Some simply could not see how they could play the game within the school day with its – typically forty minute – fixed lesson periods. The game would have to be played out of school hours or at the weekend, and for some this might prove problematic.

Both groups, however, could clearly see how a carefully constructed game would provide an appealing teaching tool. They know that many children are familiar with computer games, and expect them to be able to learn how to use a range of new tools and technologies with ease and speed. The teachers particularly see an opportunity to develop a game which is attractive to children, but which at the same time is non-violent and pedagogically sound. They expect the children to enjoy the learning experience, but to take it in their stride. They feel that they themselves will learn along with the children, but are confident of their ability to do so.

Both groups expected the game to be a positive elearning experience for the children, and are confident of success, though in the case of the teachers, perhaps within some constraints. This exercise, of course, was only the first stage in a lengthy process for them.

*** End of Appendix 1 ***

9. Appendix 2 Report on Surveys of Teachers' and Children's Experiences

9.1. QUESTIONNAIRE ONE

This questionnaire, being distributed **before** children played the games, examined teachers experience of developing games and their expectations of their pupils.

9.1.1.1. Design and structure

The questionnaire was split into nine sections.

- Brief demographics
- The Nida Summer School
- After the summer school: creating your game
- Pedagogical issues
- Issues for your school
- Economic issues
- Technical issues
- Cultural issues
- Final general question

Twenty three responses were received by the time the questionnaire closed at the end of September 2006. These are reported below. Apart from the question asking the respondent's country, none of the questions was compulsory. This explains why in some instances the number of respondents appears inconsistent.

1. Brief demographics

Two simple questions were asked: the country of the respondent, and the name of the teacher. The latter was an optional question in case the teacher did not feel comfortable with disclosing his or her identity, but most chose to do so.

Of the twenty three respondents, six were from Estonia, five from Poland, three from Hungary, two each from the Czech Republic, Lithuania, Slovenia and Slovakia, and one from Latvia.

2. The Nida Summer School

Q3. Thinking about the training sessions at the summer school, please tick all of the statements below which apply to you.

Statement	Number of respondents in agreement
I had sufficient training at the summer school	14
I needed more training	7
I feel confident that I can explain to the children how to use the mobile devices	16
I am not confident that I can explain to the children how to use the mobile devices	5
The children will teach themselves how to use the mobile devices	7

Q4. Please list any mobile devices which you have found difficult to use or are unsure how to use? - 15 responses

Few problems were listed. Six teachers had had problems with GPS, and five reported some difficulty with learning the functionality of mobile phones, PDAs and Pocket PC devices.

Q5 Thinking about the three worksheets which you were given to help you design your game, please tick all of the statements below which apply to you.

Statement	Number of respondents in agreement
The worksheets were very helpful	20
The worksheets were not very helpful	2
I understood all of the information on the worksheets	4
I understood most of the information on the worksheets	18
I understood some of the information on the worksheets	1
I did not understand most of the information on the worksheets	0

Q6. Please write here any suggestions you have for how the summer school programme could be improved, and any other comments you would like to make about this section – 11 responses

Three main suggestions were made for improving the programme

- a) More training generally was needed
- b) More detailed training was needed about some aspects of the game. One respondent suggested, for example, that introducing and explaining the techniques needed for one level in 'the smallest detail' would have led to better understanding. Another would have liked more work on dialogs and the use of other characters in the game, noting that the Amber Room game did not really have a plot. One commented that the platform 'was not very good' but did not elucidate this further.
- c) One respondent said that more 'question and answer' sessions would have been useful

3. After the Summer School, creating your game.

Q7 Thinking about your recent experience of designing and beginning to create your game, please tick the statements which apply to you.

Statement	Number of respondents in agreement
I am confident that I can design and create a game	8
I am quite confident that I can design and create a game	13
I am not very confident that I can design and create a game	0
Designing and creating a game has been easier than I expected	3
Designing and creating a game has been OK	17
Designing and creating a game has been more difficult than I expected	0

Q8 Please describe briefly what your game is about, and what school curriculum subjects it includes – 23 responses

The most striking thing about the responses regarding the school curriculum subjects is how many of the teachers are aiming to make this a cross-curricular activity. Most games will have an element of history or geography, as might be expected, but many combine these with other subjects. Such combining of subject areas may well be difficult within the constraints of the classroom setting. Examples are combinations of geography, history and literature, or maths, language and writing, or language, maths, nature, regional studies, music, arts and crafts, or arts, music, history, literature, biology, and folk customs.

At the time of the responses to the questionnaires, few teachers gave more than the briefest suggestion of their story or their plot, though three had clearly begun to think these through in some detail.

Q9. Where did you go to get help? Please tick all that apply to you.

Statement	Number of respondents in agreement
I didn't need to ask for help	2
I used the FAQ facility on the eMapps website	5
I discussed my problems with other team members from my school	20
I asked the project management team	10
I asked teachers from other schools who I met at Nida	12
I used the teachers' list set up by the project team	1
I used the nidagame@emapps.com email address	4
I went to other staff in my school	7
I went to other games designers not involved in the project	2

Q10 Please tell us about any problems you had for which you did not get the help you needed, and any other comments you would like to make about creating your game – 10 responses

Only four problems were reported

- How to record the points scored by individuals and by groups
- Confusing initial information from a country co-ordinator
- Difficulty connecting the background story to the real world
- A wish to choose the colour of the desktop in each level so as to create atmosphere relevant to the activity of the level

Q11. What do you expect the children to learn from playing the game? – 22 responses

Although teachers had identified curriculum subject areas which the games would cover, it is very evident from their replies that they are expecting learning to extend beyond content.

- Thirteen refer to learning how to become skilled users of new technologies
- Two to learning game creation
- Eight to teamwork, and two to communication skills
- Five to generic skills such as thinking, problem solving, planning and organising
- Three to information gathering and use
- One to presentation skills

- One to manual skills
- Two to understanding links between curriculum subjects

Q12 How will you select children to play the game? – 19 responses

It was hoped that this question would tease out whether teachers were expecting to form teams of children based upon their various technical and other skills. In fact only three mentioned this. The most usual way of selecting children appeared to be by age, by asking for volunteers or at random.

4. Pedagogical issues

Q13 Are there children in your class for whom the game is not appropriate? – 3 responses

Two teachers replied 'Yes' to this question, but unfortunately only one went on to elaborate upon the reason why. This was that their pupils do not have knowledge of modern technologies, which is of course part of the learning process envisaged for both teachers and children.

Q14. Will you have to personalise the game to meet the specific needs or learning styles of individual children? – 4 responses

Two teachers replied that their game would be a 'computer only' (or indoor) version for children in hospital. The lack of other response might suggest that teachers are not, as yet, considering their children's' different learning styles.

Q15 Any other comments you would like to make on pedagogical issues – 10 responses

Most of the responses to this question were to do with the safety of the children as they play the game, which is clearly of concern. This is taken up later in this report.

One teacher mentioned that 'learning by doing makes children happy and gives them a lot of fun'.

5. Issues for your school

Q16 Please tick all statements which apply to you. At my school ...

Statement	Number of respondents in agreement
Other teachers are interested in what I am doing on the project	21
Other teachers are not interested in what I am doing on the project	0
School managers are interested in what I am doing on the project	21
School managers are not interested in what I am doing on the project	0

Q17 have staff expressed any reservations about what you are doing? If so please tell us what these are – 13 responses

Nine teachers simply replied 'No' to this question, two stated that other teachers were actively helping with the game. One respondent expressed concern about 'destabilization of the timetable', but was confident that this could be overcome. The final comment was made at the very end of the survey period, and it is interesting that this is the least positive response. This teacher said that colleagues felt this was a project for teachers rather than children, and that the game design process had just been too difficult.

Q18 Please tick all statements which apply to you

Statement	Number of respondents in agreement
It will be easy to integrate the game into the school timetable	13
It will be difficult to integrate the game into the school timetable	8
It will be easy to integrate the game into the school curriculum	16
It will be difficult to integrate the game into the school curriculum	3

Q19 Please tell us about any problems you think there might be if the children have to go out of school to play the game – issues to do with school regulations, their safety, obtaining parental permission, for example. – 17 responses

Again, safety of the children is a major concern for teachers. Some are prevented by regulations from allowing the children to go out into their town alone, others perceive a heightened risk of robbery and mugging because of the desirability of the mobile devices. One stated and two inferred that the children would be supervised for safety reasons while outside, even if the supervisor did not intervene in the game activities. Safety in traffic was a concern, as was the cost of travel to the town centre to play the game, especially for children from very low income families.

Q20 If other teachers wanted to use your game for their teaching, how easy would it be for them to do this?

Statement	Number of respondents in agreement
Very easy	4
OK	12
Not very easy	6

Q21 Other comments on issues for your school – 3 responses

No other significant comments were made

6. Economic issues

Q22 Would your school be able to buy the equipment for this project from its normal ICT budget?

Statement	Number of respondents in agreement
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Yes	2
No	15
I am not sure	4

Q23 Has your school had to pay increased network charges in order for you to develop this game?

Statement	Number of respondents in agreement
Yes	4
No	14
I am not sure	3

Q24 Will the mobile equipment you have bought for the game be reusable for other school activities?

Statement	Number of respondents in agreement
Yes	20
No	1
I am not sure	1

Q25 Other comments on economic issues – 5 responses

Two teachers were unhappy with their personal financial reward for taking part in the project.

One teacher was unclear whether the e-equipment would remain in the school after the project

Two teachers expressed thanks for the technical equipment.

7. Technical Issues

Q26 Do you and your school have the equipment and connectivity needed for this phase of the project?

Statement	Number of respondents in agreement
Yes	20
No	1
I am not sure	0

Q27 Did you have any technical problems getting the equipment to work? – 5 responses

Two teachers reported minor problems with GPS, and three (from the same country) noted that WLAN was not yet available in their town.

8. Cultural Issues

Q28 Do players need to be able to understand English?

Statement	Number of respondents in agreement
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Yes	7
No	16

9. Final Question – 10 responses

Q30 Please write here anything else you wish to tell us about your experience of the eMapps.com project so far

All of the respondents made positive comments about the project. Teachers talked about the fun which they had had developing their games so far, and about the fun they expected their pupils to have when they came to play. They see the games as something new and exciting which will provide a way for children to express their creativity and imagination as well as learning new information. Some have already involved children in the preparation of their game, and report that the children had found this exciting. One teacher had played a prototype game with her children, and had had very positive feedback.

9.2. QUESTIONNAIRE TWO

This questionnaire was distributed after pupils had played the games and so the focus was on the teachers' and the pupils' experiences.

Design and structure

The questionnaire was split into five main sections.

1. Brief demographics
2. Your reflections on your own experiences
 - Your intended learning outcomes
 - Using the game platform to create a lesson
 - Preparing the children to play the game
 - As the children played the game
 - After the children played the game
3. Your observations of the impact of the game on children's learning
 - Learning before they played the game
 - While playing the game; working as a team
 - While playing the game; the children's behaviour
 - After playing the game; evidence of enthusiasm for the game
 - After playing the game; evidence that learning took place
4. Your final reflections on the game
 - Thinking about your experience of designing and creating a game
 - Thinking about other teachers at your school
 - Thinking about your experience of working with other members of the eMapps.com project team
5. Your final thoughts

1. Brief demographics

Twelve responses were received by the time the questionnaire closed at the end of September 2007; two each from Estonia, Hungary, Czech Republic, Slovakia and Poland, one from Latvia, and one combined response from the two Lithuanian schools who worked together on the project. Additional results were later returned from the two Slovenian schools and from the remaining school in Latvia.

Q3 Ages of the children playing the game

The children's ages ranged from nine to fifteen years, with a weighting towards the older end of the scale. Four games involved younger children (9 – 11) and nine involved older children (age 11 and over). In two instances, the older children acted as chaperones or assistants to the younger ones.

Q4 How many children managed the game desktop

A total of 86 children was reported. On each occasion except one, two to four children managed the game desktop each time the game was played. The exception was the second Estonian Tallinn game when all children played in the territory, and teachers managed the desktop.

Q5 How many children played out in the game territory?

A total of 165 children was reported. The largest number was at the Tallinn school with 40 players, and the smallest was five players at Kosice, Slovakia, at Grebocin and ICIMSS, Poland.

These numbers may not reflect the actual number of players overall, as anecdotal evidence suggests that games were played on other occasions than those reported on for the purposes of evaluation feedback.

Q6 How were the children in the territory grouped in teams?

The children were organised into small groups of typically four to six children per team.

2. Your reflections on your own experiences

❖ Your intended learning outcomes

Q7. Please describe briefly what skills and knowledge you intended the children to learn from playing your game.

Skills	Number of instances
Mobile phone use	7
GPS use	6
Teamwork and cooperation	6
Information resource retrieval and use	2
Orientation / navigation and sense of direction	2
Problem solving	2
Behaviour in public places	1
Critical thinking	1
Leadership	1
Oral and written communication	1
Planning and organising	1
Presentation skills	1
Putting knowledge into practice	1
Knowledge	
History	7
Geography	4

Biology	3
IT	2
Physical Education	2
Revision of curriculum subjects	2
Architecture	1
Art	1
Cookery and nutrition	1
Maths	1
Music	1
Multiple curriculum subjects	1

Q8. Were you able to include content relevant to your school curriculum for children of this age?

Statement	Responses
Yes	11
No	1

Q9. Do you have any lesson plans or teaching plans for the game which we could see?

None were received.

❖ **Using the game platform to create a lesson**

Q10. Approximately how many hours were spent learning how to use the game platform?

Number of hours	Number of respondents
40	1
24	1
20	1
10	2
5	4
3	2
1	1
Unable to say	1

Q11. Approximately how many hours were spent creating your game

Number of hours	Number of respondents
300	2
200	1
150	1
100	1
80	2
50 – 70	1
30 - 50	2
Unable to say, but many	2

Q12. Approximately how many hours were spent doing administrative or organising activities before the children could play the game?

Number of hours	Number of respondents
300	1
100	1
40	1
20	3
10	3
4-5	2
1	1

Q13. What new skills did you have to learn in order to design and create your game?

Skills	Number of respondents
GPS use	7
How to use unfamiliar mobile phone functions	7
New generic software packages	6
How to create animations, audio and visual materials	4
Video and camcorder use	1

Q14. Were there things you wanted to do with the eMapps.com games platform but could not?

Most respondents replied 'no' to this question, but a small number of minor technical problems were identified here. One respondent would have liked a facility for more 'pure computer game play' so that children could play the game in the safety of an indoor environment, rather than in among heavy town traffic, or at a distant location.

Q15 Please describe any problems you had when using the game platform, and who helped you to solve these problems.

A number of problems were reported, some of which were not specific to the platform. Several complaints were repeated in meetings and other conversations

Complaints about the platform included;

- It is not designed for teachers; too much technical knowledge is needed to use it successfully
- The interface design and performance is poor
- The interface is confusing and difficult to use
- The platform lacks the logic of familiar educational software packages
- The platform lacks good editing facilities once materials are uploaded. Content has to be removed, reworked elsewhere and then uploaded again
- Editing videos is difficult
- Video clips longer than one minute cannot be uploaded
- Uploading and downloading pictures to and from the platform is time-consuming
- It is difficult to upload music clips
- It is difficult to move between game levels
- The maps cannot be scaled accurately, and placing pins on them is difficult
- Manipulation of the maps, especially zooming and scrolling is difficult
- Using some ASCII characters causes the platform to hang

- Internet Explorer and Firefox browsers are unreliable when used on the handhelds
- GPS devices fail to work in bad weather and close to high buildings
- Buttons on mobile devices are too small

One school responded that they 'managed to survive not solving the problems, but avoiding them'!

Q16. Please list up to three attractive things about the eMapps.com platform which makes it a special teaching tool.

Responses can be summarised as:-

- Children find it an innovative and attractive tool, different from their usual school curriculum activities
- It is good to use modern mobile technologies in teaching
- Children like to use chat
- A wide variety of file formats can be used
- Using the map, and inserting pins and information on it is interesting
- Applicability to many subject areas

❖ **Preparing the children to play the game**

Q17 Please describe what you had to teach the children before they could play the game, including how many hours you spent teaching them to use the game platform and the mobile devices, and how easy it was for you to fit this preparatory activity into the school timetable.

Teaching the children to use the mobile phones, including uploading and downloading to and from the platform does not seem to have been problematic, and took between two and eight hours. Using the GPS device took around 1 – 2 hours of teaching time, and around 3 hours was spent teaching the children how to play the game.

Instruction was given in scheduled class sessions or as an after school activity. Several respondents commented on the children's eagerness to learn, and to give up their free time to be involved in the project.

Q18 Please describe how you involved the children in designing and preparing the game.

Five schools had not involved children in preparation at all, one keeping the game a secret until the children came to play it.

Six schools did involve children in various activities.

- An after school 'hobby group' looked for information on their town's history and took pictures of historical locations which were used in their game
- Special two hour sessions were held after school, during which children helped to create and test the game levels
- A 'special eMapps group' was asked to prepare ideas and scenarios for their game as part of their homework, which was later presented at the school
- Children searched archives for materials, made up the story and tasks, visited museums and acted parts in the game
- Children found materials for the game desktop, invented the main character and the story line, they tested the game and suggested improvements, and they acted parts in video clips

- A history lesson was used to explain the game story, and children drew the game heroes, and made up the game title

One school involved older children in ensuring the safety of the younger players out in the game territory.

❖ **As the children played the game**

Q19. Thinking about your role as the children were playing the game, can you define ways in which your relationship with the children was different from your usual classroom relationship?

Many responses identified such differences. Some teachers had maintained a distance from the children while the game was played, in order to ensure that they did not influence the game playing process. One commented that the teacher's role was 'much less active than in lessons' whereas the children were challenged to 'action, decision making and cooperation' unusual in their classroom context.

Several commented that their relationship with the children was 'more relaxed' and 'less formal' than usual. They had clearly enjoyed this new way of interacting with the children as helper, friend, advisor and collaborator, and they had enjoyed being away from the constrictions of the classroom with its culture of 'teaching in the traditional way'. This had led to 'more openness' between teacher and child and the child appreciating the teacher's willingness to listen. Teachers had benefited personally too 'We have learned a lot about the students' said one.

Q20 If possible, please give an example of when you intervened with what the children were doing.

Prior to game play, teachers were asked to intervene as little as possible, though of course it was acknowledged that they or older children had to be in the game territory to ensure the safety and security of the children.

Mostly intervention was limited to troubleshooting a small number of technical problems which arose with the mobile devices, intervening when incorrect information was sent from the game desktop, and when children began to follow the wrong route around the territory and risked putting themselves in danger.

At times a few teachers intervened when children began to behave badly, lost motivation, became bored or were unsure if they were allowed to enter particular public buildings.

Q21 If possible please give an example of when you stood back and let the children work out problems for themselves.

Teachers appear to have been very successful at doing this. Several said that they could clearly see that children were confused or making mistakes during game play, but that they did not intervene to help them make decisions or solve problems, only to ensure their safety.

Q22 As the children played the game, did you notice any of them struggling to use the games desktop or the mobile devices?

Eight teachers answered 'yes' and four 'no'.

What is notable in the responses to this question is that when problems were encountered, the children cooperated well to solve them among themselves. They relied on each other for help, and few asked for support from a teacher.

❖ **After the children played the game**

Q23 Please indicate your agreement or disagreement with the statements below.

Statement	Yes	No	Not sure
My ICT skills have improved since I worked on this project	11	0	1
My teaching skills have improved since I worked on this project	6	4	2
I am more keen to use ICT in my teaching as a result of working on this project	11	1	0

Q24. Do you have any concerns or anxieties about teaching in this way?

Three major concerns arose repeatedly. These were –

- **Time** – seven schools said that game preparation was very time-consuming. It could not be fitted into ‘normal school hours and the teachers’ daily routine’ and therefore impacted upon their already heavy workload during school hours, or upon their free time after school. Time is needed for teachers to learn how to use new technologies, new software and the game platform, to write the story, devise the activities and challenges, prepare materials, liaise with parents and community organisations, organise and supervise the game playing event.
- **Expense** – three schools mentioned the cost associated with teachers’ time. Preparing a game is an expensive activity which they would not be able to afford without the support of funding. Physical resources such as the mobile devices need to be bought, and class substitution hours to replace teachers taken away from their timetabled classes to do project work has to be paid for.
- **Safety** – although only three schools mentioned here their concern for the safety of children while playing the game, and the associated cost of arranging their supervision, this has been regularly reported as being an issue for all schools throughout the project.

Teachers also mentioned

- problems with the battery life of the mobile devices, and difficulties connecting to the Internet
- a preference for traditional teaching methods which are ‘more effective and bring better results’

Q25 The game is aimed at children aged 9 -12. Do you think this type of game is suitable for all children within this age range?

Nine schools responded to this question. Opinion was divided, but it should be noted that only three schools answered with an unqualified ‘Yes’. Of these, one school said that the game provided ‘a perfect opportunity to give everybody the chance – even the weaker ones can do something and experience success’. One school said yes, but added that ‘the game is suitable for ages 13 – 15 also’, whereas another said the opposite, that the game was ‘extremely suitable for children in this age category – they are keen to explore new

technology’ but that ‘frankly speaking I’m not sure if the game is interesting for older age groups’. This of course, might depend upon the content provided.

The other six schools had reservations about the suitability of the eMapps.com game for their younger children. They commented that:-

- the game is suitable for students age 11 – 12. At a younger age the usage of these special devices are not taught and could cause problems
- Basic knowledge can be different, and students with different abilities cannot work together effectively.
- I think it suits more for children in the age 12 – 15
- The age is too young; safety, independence, ability to make decisions etc.
- Our game could be too difficult for some of the children, especially the younger ones
- In our opinion that type of game is suitable for older children (12 – 15). The younger ones can have problems with focus on the game tasks, and tend to lose interest.

3. Your observations of the impact of the game on children’s learning

❖ Learning before they played the game

Q26 Please indicate whether or not you agree with the statements below

Statement	Agree	Neutral	Disagree
The children understood the idea of the game quickly	11	0	1
The children understood the idea of the game easily	10	1	1
The children learned how to control the game platform quickly	7	3	2
The children learned how to control the game platform easily	8	2	2
The children learned how to use the mobile devices quickly	9	1	2
The children learned how to use the mobile devices easily	10	0	2

Clearly, having spent sometimes many hours learning how to use the game platform and mobile devices themselves, teachers seem to have been very successful at teaching the children how to use them.

❖ While playing the game – working as a team

Q27 Did you see children behaving more co-operatively or talking to each other more than they do in the classroom? If so, can you give an example of what happened?

It was expected that as teachers or other supervisors were accompanying the children in the territory for safety reasons, and also observing those controlling the game desktop, they would be able to comment on how the children behaved. Eleven schools answered this question. Three reported no particular change in the behaviour of the children. Those who usually behaved cooperatively in school also did so outside during game play. ‘There is no big difference. Children having good cooperation skills had these also during the game, and opposite.’

Eight schools report observing very cooperative behaviour, some teams exceeding their teachers' expectations of how they would behave. Their comments included:-

- 'We were afraid of arguments between them but as the helpers said they behaved well and negotiated more than we could ever expect'.
- 'they were very cooperative, and were talking and thinking together about the forthcoming tasks'
- 'They were solving together some unclear situations'
- 'Children behaved more cooperatively in the game time because they wanted to make tasks in time, and they were in the small team'. This school goes on to comment that '...but in the classroom they are much more', which it was later clarified meant that when in the classroom situation, the large number of children in a lesson tends to inhibit the individual child from speaking out. The children found discussion easier in the small game playing teams.
- 'All of them were interested in their team's success, so they were tactful, cooperative and worked in a team'.
- 'Yes, the children were distributing tasks among themselves easily to save the time of playing'.
- 'The game was prepared and played in a friendly way – they were discussing all the aspects of the game. Also during game play there was great cooperation between them. Unfortunately, sometimes they were discussing the game level goals with emotional expressions. For example, there were hard talks where the statue is located in the village.'... so we take it that there were a few arguments along the way!
- 'We were afraid of arguments between them but as the helpers said they behaved well and negotiated more than we could ever expect.'

Q28 Did the children negotiate between themselves how tasks would be carried out, or did you instruct them?

Apart from initial instruction provided by the teacher, and one particular mention of children requesting assistance, all schools report that the children decided among themselves how tasks should be carried out. They were all able to divide up tasks and roles during game play.

Q29 Did you see children talking to children who they do not normally speak to in class or helping children less able than themselves? If so, can you give an example of what happened?

Only three of the twelve schools commented on this question.

- One school said that the groups were made up of children from different classes, and that therefore they had to work with new people
- One mentioned that the children helped each other to use the unfamiliar handheld devices
- Only one school observed that children who are less able in the classroom seemed to shine at the game activity. They commented that 'They (the children) feel useful in the game time more than in the classroom'.

Q30 Thinking about the children managing the game desktop, and the children out in the territory, did you see 'group leaders' emerge? If so, were they children who usually assume the role of 'leader' or not?

Two schools did not comment.

Six schools reported that those children who assume leadership roles in the classroom did so during game play also.

One school commented that children undertook tasks appropriate to their skills, and assumed the role of leader at times when these skills were particularly needed.

Three schools had observed new leaders emerging, that is children who did not normally assume this role in the classroom. They said:-

- 'One boy who is a leader in his class did not take the leading role, but another boy did, who has better technical skills'.
- 'Usually the role of leader take children what is leader in the school time, but sometimes there are children what doesn't lead in school time, and it is a big pedagogical accession'.
- 'Yes, usually they were the same children who always take this role, but it happened that two children (one in the territory and one at the desktop) became leaders probably for the first time and it was because their skills were discovered by other children and they had enough self-confidence thanks to that to lead the whole group'.

❖ **While playing the game – the children's behaviour**

Q31 Please answer the statements below

Statement	Agree	Neutral	Disagree
<p>I observed children thinking and reflecting upon what they were doing</p> <p>Additional comments on this statement were - Yes from the second day, because on the first day they were awaiting teachers instructions</p> <p>-Yes if they were actively fulfilling the task; if they had a technical device in their hand, they did</p>	12	0	0
<p>Some children were motivated to do more than I had asked them to</p> <p>Additional comments on this statement were - Yes they'd like to have even more tasks and more difficult</p> <p>- No matter the instructions via mobile and GPS they asked for help from the citizens; invented their own way out if instructions were complicated or they failed to get them</p> <p>- Some of them were motivated, some did not care</p> <p>- They often took pictures themselves</p> <p>- No they have not time to do more, but in the presentation at the finish of the game, they did more than I asked</p>	10	1	1

<ul style="list-style-type: none"> - Especially students who are bored in traditional way of teaching showed their motivation and loved the game during game play - Yes, but it depends on the tasks 			
<p>Some children behaved more aggressively than they do in the classroom</p> <p>Additional comments on this statement were</p> <ul style="list-style-type: none"> - Vice versa! - I think no - No they like the game and they have not time for other activities and they wanted to realize all level of game 100% - Especially towards the other group (territory had some quarrels with the base, by chat of course). 	1	2	8
<p>Some children did not join in with the game activity at all</p> <p>Additional comments on this statement were</p> <ul style="list-style-type: none"> - Sometimes yes, but it was because they were tired - Occasionally, but passively passed the game 'dragged' by the rest of the group - No, but some had problems with motivation 	3	1	8
<p>The children were able to make decisions without the support of the teacher</p> <p>Additional comments on this statement were</p> <ul style="list-style-type: none"> - The greatest part of them, but not all - Usually, yes 	9	1	1
<p>The children used the chat facility to gain immediate help and feedback</p> <p>Additional comments on this statement were</p> <ul style="list-style-type: none"> - In general, yes - Yes, from the second day - Chat was used a lot 	10	1	1
<p>The children were able to upload files to the desktop easily</p>	6	3	3

<p>Additional comments on this statement were</p> <ul style="list-style-type: none"> - In general yes, but there were some problems in first checkpoints - Yes but sometimes there were small technical problems - The greatest part of them but not all - Yes, but first game play was supported by our technician, who showed children how to upload pictures to the platform - Only some problems with uploading pictures in one group but we managed to eliminate the reason for the problem 			
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Q32 Can you give an example of how an individual child achieved more than you expected when you played the game?

Ten examples were given

- Teachers didn't expect that this team will win – four boys who are not the best in everyday learning but were very successful as a team
- The quiet ones seemed to be more active while attending the game
- One student who was known as just a 'technical expert' turned out to be a many sided personality
- Children with average abilities had good comments when ones with better abilities did not know what to do. During the game the children were more relaxed, and that's why more active and talkative.
- When he or she found solutions individually
- Our team went to the Gatehouse which was closed. They phoned the gatehouse manager (telephone number was on the door) to ask where he was. They had no idea he would be late. They thought it was part of the game.
- They collect more information about objects than is necessary and acquaint with some objects, developments, persons, who doesn't contain with game tasks.
- One of the tasks was to act out a scene. We did not expect the children to be so good actors!
- Girl who is a little bit shy and very quiet in class, was very active and talkative during the game play.
- We were pretty amazed by one girl who learnt really quickly how to use GPS and was in charge of it all the time feeling very responsible for her role. The girl is not a 'techie' type.

Q33 Can you give any examples of how boys and girls reacted to the game in different ways?

Seven schools could not identify any particular gender differences.

Two schools claimed that boys were more 'device focussed' while girls were more 'game focussed'. The girls preferred to 'go outside, collect information, and make presentation....' while the boys 'work with desktop, GPS, mobile, camera'.

One school thought that the boys were more restless, and girls more thorough. Their winning team consisted of girls only.

One school said that boys had liked the 'handicraft activities' better than the girls.

One school, whose game was based on the wartime experiences of local people, noted that boys seemed to imagine themselves in the position of the hero of the story, whereas girls reacted more fearfully and with sympathy for the victims.

Q34 Were the children worried about working without a teacher guiding them closely through the learning experience?

Once the initial learning phase was over, no schools reported that their children had problems working independently of the teacher. In fact three said that the children positively enjoyed doing so.

Q35 Can you think of an example of how the game improved a child's self-esteem or confidence?

Eight schools provided examples. Several of these commented on how involvement in the game had improved the confidence of normally shy children, girls in particular. It had also allowed unexpected individuals to emerge as leaders, had enabled children to show off their skills, and had given them confidence in their ability to make decisions. Two schools noted that children involved in the games had gained prestige in the sight of their peers.

Q36 Can you give an example of how the children's attitudes towards each other have changed since they played the game.

Six schools commented briefly and in similar vein, that children behaved more cooperatively, that they found new respect for each other, and that they had become better listeners.

❖ **After playing the game – evidence of enthusiasm for the game**

Q37 Please indicate whether you agree or disagree with the statements below

Statement	Agree	Neutral	Disagree
<p>The children told me that they enjoyed playing the game</p> <p>Additional comments on this statement were - Yes, they were all happy at the end; even the ones who were a bit behind at the very beginning - They did not want to finish the game - A lot!</p>	11	0	1
<p>The children wanted to play the game again</p> <p>Additional comments on this statement were - Yes, they'd like to play it again and have more difficult tasks</p>	11	1	0

- But somewhere else			
<p>The children were keen to play the game outside of scheduled class lessons</p> <p>Additional comments on this statement were</p> <ul style="list-style-type: none"> - Absolutely. Dreaming is not prohibited! - The game was played in a school holiday - Yes but in the afternoon, when they usually have special lessons or sport activities, they were not as keen as in the morning - Some of them yes, and some no. 	10	2	0

Q38 Please tell us about any ways in which the children's families were involved in the game. We are particularly interested to know whether families were positive about the game, and whether their family members could tell the difference between this game and other computer games which their children play.

Seven schools reported no or minimal involvement of parents, particularly no participation beyond providing consent for the children to play out in the game territory, or attending a school meeting during which the game activity was explained to parents.

One school had taken a group of eight parents out to the game territory to help supervise the children as they played, and reported that they had found it a positive, interesting and happy event.

Another school had had a parents meeting before game playing took place, and had encouraged children to talk about the game at home. Families had taken part in a presentation after the end of the game. The school reports that families were positive about the game because their children enjoyed it, they learned about local history, acquired 'modern skills with ICT', and because the game was non-violent.

One group of parents was keen to help with the game, and took the children to the Zoo after school hours. They expressed appreciation of the project.

One school reported that families were very supportive of the game, and particularly liked the fact that children could take part in creating 'something which can be used by others'.

One school had involved parents in gathering content for the game. Although they had had limited feedback from the families, two had told them that they had spoken to their children about their life during the Solidarity period, and that the children were much more interested in what their parents had to say than they had been previously.

❖ **After the game - evidence that learning took place**

Q39 Please tell us what kind of follow-up work you did with the children in the classroom after they had played the game.

Four schools do not appear to have done any kind of follow-up work; in at least one instance this is because the game was played just prior to breaking up for the summer vacation.

However eight schools report:-

- **Feedback sessions** with the children where they talked about their experience of their game, expressed their likes and dislikes, and made suggestions for improvements
- **Artwork**, including making dolls, creating displays with photographs and pictures
- **Formal presentations** by the children
- **Formal assessment** by the teachers of their acquired knowledge
- **Announcement of results** and awards for winning teams

Q40 Did you see any evidence that the children learned relevant new facts about the subject matter of the game (historical, scientific facts, for example)?

Two schools have not yet evaluated this, but all of the others report knowing that the children absorbed new facts while playing the game.

Q41 Did playing the game stimulate other work, such as creative writing, artwork, scientific investigations etc.?

Only four schools had clear evidence of this, reporting good artwork, acting, writing and video making.

Q42 Have you noticed the children using their new skills afterwards in the classroom?

Two schools report that their children are more confident users of mobile technologies, and one that they are more confident when expressing their opinions. One school specifically said that they had seen evidence of these skills being used in other school subjects. Otherwise schools replied 'no' to this question.

Q43 Do you think the children have remembered what they learned?

Half of the schools believed this to be so, the other six were unsure, or said 'no'.

Q44 Did the children achieve your intended outcomes.

Despite the lack of certainty that children had learned and had retained this learning, all schools believed that they had achieved their learning outcomes.

Q45 Which of the children's skills listed below do you think have improved as a result of playing the eMapps.com game.

Type of skill	Number of teachers reporting improvement
Use of mobile technologies	8
ICT skills	9
Oral skills	4
Literacy skills	3
Creative writing	3
Reflective skills	5
Analytical or appraisal skills	8

Negotiating skills	6
Leadership skills	5
Teamworking and cooperative skills	9
Other, please specify	Planning Navigation and orientation

4. Your final reflections on the game

❖ Thinking about your experience of designing, creating and playing the game

Q46 Has using the eMapps.com games platform changed your opinion of the value of ICT as a teaching and learning tool, and if so, in what way?

Nine schools replied that their opinion had not changed. Several of these made the point that they already had a 'positive attitude towards ICT'. One school though, noted that this was the first time they had used ICT outside of the classroom.

Two schools responded that their opinion of the value of ICT as a teaching tool had improved as a result of the project. They now realised that it could 'make the lessons and study process more variable and effective', and that the teacher can 'unite conservative teaching methods with using ICT' for a more interesting experience for both child and teacher, and, most importantly that using ICT 'is necessary for our modern society'. Another teacher now plans 'to use more ICT in my future classes'.

Q47 Can you sum up in a short paragraph the main benefits you think the children you teach have gained from playing this game?

Four main areas of benefit were identified

- Improved knowledge of modern technologies, such as the mobile devices
- Improved ICT skills
- Improved generic skills, such as information seeking techniques, team work, task sharing, leadership, planning, organisation
- Enhanced appreciation of subject matter, particularly local history

And of course, they had fun too!

Q48 If you use the eMapps.com game platform again, what will you do differently?

The answers suggest that no schools have given much thought to reusing the game platform in the future. A few suggested minor amendments to the game platform, or that they would choose a different topic for the game, but most had no ideas to offer nor said that they were planning another game in the future. One school stated that they would not be using the game again, as the platform is 'far away from the tool they really need for such kind of learning. It should be much more comfortable and user friendly. Teachers are not ICT experts and such kind of environments should be easy to use without hard learning.'

Q49 What changes would you recommend should be made to the eMapps.com game platform?

Several minor technical changes were suggested, but most of the comments suggest that the teachers would like a platform which they can learn to use more quickly, which is 'bug free', has a simpler interface for content uploading, is more customisable and generally easier and quicker to use.

❖ Thinking about other teachers at your school

Q50 Will you encourage other teachers in your school to use the eMapps.com game in the future?

Eight schools replied 'yes', three 'no', and one 'will try'. One school added the caveat that 'they should be warned that it needs a lot of extra energy and work'.

Q51 Please list three recommendations which you would give to these teachers before they started to use the eMapps.com game platform.

These were

- To be prepared to spend considerable time and effort learning how to use the platform
- To spend time and effort learning how to use the mobile devices
- To acquire good ICT skills
- To involve other teachers, children and parents from the early stages
- To be creative and full of ideas, constructing interesting tasks
- To be ready to troubleshoot at short notice
- To expect this learning experience to be different from classroom learning

❖ Thinking about your experience of working with other members of the eMapps.com project team

Q52 Was there any time when you did not get the help and support you needed? If so please tell us what happened.

Most schools were satisfied that they had had the help they needed. However there were complaints about the manual provided with the game platform, the lack of response to technical questions, and the lack of a budget for playing the game itself. It is clear that teachers depended heavily upon their technicians for help.

❖ Your final thoughts

Q53 Please note here any comments you would like to make about what happened when you played the game on other occasions

Few real differences were noted, in fact it was unclear how many times in total the games had been played up to this point. However one school noted that the children 'were more self-confident' the second time 'since they knew what they are supposed to play'.

One surprising result reported was that in one school the 8th grade children were less successful than the 3rd grade children. The respondent wondered if this was because the older children were more set in their academic way of working than the younger ones.

Q54 And finally, what unexpected things happened, both positive and negative.

Negatives often included problems which had already been reported

- Problems with using the mobile technologies, which took some time to resolve
- Short battery life of mobile devices
- Poor internet connectivity

- Browser problems
- Safety – one player was attacked
- Time taken to prepare a game and the extensive learning needed on the part of teachers
- Children losing expensive devices
- Children did not like being observed
- The knowledge the players acquire is only incidental to their learning
- Teachers cheating by whispering answers to children in the game territory!

Positives included

- The game had much media attention from state television, the media, radio, the press, and the First Lady
- The children behaved well – no fights or disagreements
- Children in the territory were helped by members of the public
- Cooperation between children
- Fun and enjoyment for the children playing the game

*** End of Appendix 2 ***

10. Appendix 3 Report on Observation Studies

10.1. Introduction

Two simultaneous observations were carried out by CERLIM staff. Children playing in Torun city centre, the 'game territory' were observed by Margaret Markland and children managing the game desktop / platform in the 'control base' room at the Hotel Gotyk, Torun were observed by Geoff Butters.

10.2. General remarks

Torun is a busy tourist city with many visitors. On the day of the game, the city centre was full of tourists of many nationalities, and also many parties of young school children with their teachers.

5 June was a very sunny and warm day, so the working conditions were bright, but also rather hot and tiring.

The game selected is one of three strands of the Polish game, and is based on actual historical events which took place in Torun during the years of the second world war. The version played on 5 June took the children to the town jail, a church, a historical building and a former city library.

The equipment used in the territory was a Nokia N70 mobile smartphone with 3G data transfer capability, a GPS device and a laptop computer. At control base the team was managed by members of the team (children) using a networked laptop with internet access from where they accessed the game desktop and other internet sites as required to help solve clues. Also at control base was the person known as the 'puppet master', who, from a control view of the desktop on a separate computer, passed clues and tasks to the game desktop, checked solutions of those tasks from the players, and allowed progression to the next level as the tasks on one level were completed. A technical assistant was also present in case of problems.

The game took around three hours to play.

10.3. The morning game.

A Polish teacher of English accompanied the observer in the game territory, and was most helpful in explaining what was going on. She did not intervene with the children as they played. At control base the observer obtained information occasionally from the teacher supervising the children.

Participants: One History teacher in the territory and one teacher at base. It was noted that the outside teacher interacted closely with the children throughout the game. The 'puppet master' role was undertaken by two teachers from the other school.

Sixteen children: 4 boys at base, 8 girls and 4 boys in territory, all aged 13 – 15.

These were children from a Torun school for gifted young people. Some came from Torun and others were boarders, so they all knew the city well. They were very confident and very talkative, constantly discussing and arguing with each other and with the

teacher. They had already played 'their own game' twice, so they knew a little of what to expect, but this game was new to them.

General observations of playing game 1 in the territory

The children watched a short introductory film at base and then went out into territory, walking to a starting point which they had been given. A further film was shown on the laptop by the teacher. The laptop battery was low, which immediately caused problems. The teacher also realised that there was no software on this particular laptop suitable for viewing the film. One child offered software from his pen drive but this was not successful. The teacher rang the base on his mobile phone to ask for information on how to download the software, but eventually two children returned to base to get a new laptop. In the meantime the others went off to McDonalds.

On their return the game resumed. They were told (via the chat facility from the desktop to the N70) to go to the prison. One girl held and used the Nokia throughout, and another girl held and used a GPS device throughout. They had been warned that information given to them might be unreliable, so there was a lot of chat to clarify and verify this. It was a very sunny day, and the children were unable to see the laptop screen, so they went into a small shop to watch the film again, much to the annoyance of the shopkeeper, whose customers could not get into the shop. A girl was now working the laptop and continued to do so throughout. She listened to a message on the film through a set of headphones and then told rest of group what was being said. There was a long discussion of what to do.

The Prison – The first game level took place at the city prison which is still used as a prison today. The children were very interested in the prison and what it had been used for during the second world war period. They asked lots of questions of the teacher who responded to them all. They took a photograph and uploaded it to the game desktop, followed by a message asking if they had completed the task. There was a long wait for a response and they got very bored. I understood that the reason for the delay was that the control base players could not decide what was in the next task. Eventually the children were told to move on to the next venue, which was the church. They watched another film on the laptop which gave clues as to their task: to find a plaque on the wall inside the church building commemorating the death of a priest during the war.

The Church – The children went into church and the teacher took them straight to the plaque on the wall and began speaking to them about it. They did not find it for themselves. The children took a photograph, which they sent to the base, then they sat and watched a film involving a priest telling a story of his martyrdom. The same girl as before took control of the laptop and headphones, and retold the story to the other children. They seemed very attentive and appeared to be engaged with the activity and interested in it. They were told that they had completed this level, and were given their next clue. There was much discussion among the children, and between the children and base via chat, though by now one or two appeared bored and restless. It became clear that the children were having difficulties using GPS as it was inefficient in the city centre because of the narrow streets and tall buildings. Instead they were intending to rely on their local knowledge of streets, buildings and places to solve the clues.

After waiting around for some time for communication, they were told to watch a film with a certain name. A girl found a film but it was the wrong one. The teacher intervened to try to help them find the correct film but was not successful. The children

got help from the desktop and identified the correct film. The battery on this second laptop began to run down, so the children left the church and went into the Tourist Information Office to recharge it. They did not appear to explain who they were or what they were doing. There was no internet connection in the tourist information office, so they were unable to get information from the base, and hence there was a considerable delay, during which some of the children became quite bored and restless.

Eventually they were given one GPS coordinate and waited for a second which they needed in order to find the next venue. They were puzzled, but decided to ask for extra clues. Eventually they were given a second coordinate. There seemed to be some general confusion so the base sent the children an SMS message instead, telling them to find some streets nearby. They took a photograph of a statue on a science building, but seemed unsure that this was the correct building. They were having constant problems with coordinates and GPS, checking all the time to see if they had got this correct. Only one or two children were involved with the game at this point and the others were clearly bored. They eventually realised they needed to go to a former library building for the next level.

The former library building – Inside the library building, the children were crowded together on a small dark staircase landing. The teacher began to tell the children the history of the library building. Then they again watched a film of the boy in the dark room with the girl with headphones relating to the others what was said. The children said they thought the film was boring, and that they were bored by waiting to get the task. They were having problems with the laptop, the phones and the lack of things to do. There was lots of loud discussion / arguing.

Eventually they worked out that the next object they had to find was 200m due south, and they were able from the clues to work out where to go because of their local knowledge. They did not need to use coordinates or direction finding. Two girls went off to take pictures of street names and the others remained behind. They again changed the laptop so that they could all hear, not just the girl with the headphones. The task was solved very quickly, and they were told that this was their final task and that they had completed the game.

Observations of playing game 1 on the game platform at control base

The control base players watched the introductory film with the rest of the players. The four boys then arranged themselves around the laptop so that one could handle the keyboard and mouse with input from the others. They accessed the game desktop which contained a street map of Torun (the territory), objects related to tasks for the first level, and the window for live chat to the outside team and to the puppet master. The puppet master(s) had a view of the desktop, a repository of objects to load onto the desktop as required, and a text script of the game. (The boys believed that the techie was puppet master and did not know that the two teachers from another school were undertaking that role).

The initial objects were three texts and one video, some of which the boys used to find GPS co-ordinates to allow them to locate a place on the map. They added a photograph from their laptop to that location on the map. They then tried to locate another set of coordinates on the map but they weren't able to do so, and the technician had to help: parts of the map were incorrectly geo-referenced and eventually it was substituted (by the techie) with a new version. Completion of these tasks provided the boys with

information to pass to the outside team. (In fact one of these tasks was given to the boys to keep them occupied when there was a delay in the outside team getting started.) The video object seemed to be puzzling the boys and they returned to it several times.

I noted here that the four boys were behaving very well and cooperating on the tasks, showing great interest and enthusiasm. They were competent and comfortable in using the platform, which the teacher told me was due to having used it on three previous occasions playing a different game.

In the next task they acquired coordinates for a place and sent them via chat to the team, so that they could use them to go to a location. They attempted to upload more items to the map but it failed several times before succeeding. I don't know whether that was their fault or a fault with the platform.

More text objects were put on to the desktop by the puppet master. One contained the clue (in symbols) π -r-squared to indicate 'round'. The boys laughed sometimes and retained their enthusiasm. They were busy all the time and received encouragement and advice (but not direct help) from the teacher – e.g. she advised them not to rely on guessing, but to concentrate on the clue.

After about 45 minutes, believing that they had completed Level 1, the boys used chat to ask the puppet master to move them on to the next level, which she did. There was an incoming phone call to one boy's personal phone from a member of the outside team, which the teacher did not allow to take place.

One boy was in charge of the computer, and he seemed to me to be very much the leader anyway, although all four contributed a lot. The teacher told me that in fact an element of competition was developing between them. The leader read the texts out loud sometimes. One boy was less involved than the others.

A photo of the round building (the prison) was uploaded onto the map by the outside team using the N70, receipt being confirmed to them by chat. A video containing further clues was given to the team by the puppet master (using a memory stick because upload was too slow - I did not understand why). At this point teacher asked the boys to change leader and swap places. The new leader was not as competent with the system and not as confident at reading out loud to the other boys. The teacher told me that reading aloud was a deliberate exercise in developing their skill and confidence in that.

They were kept very busy with tasks from the puppet master. (Again, tasks were given to the boys by the puppet master to keep them occupied when there was a lull in response from the outside team). A considerable number of objects were 'pinned' to the map by now. The teacher advised them to concentrate on the clues and not get too carried away with just using the technology.

Nearly two hours had passed and the boys still seemed to be enjoying themselves, discussing things excitedly. One boy was a bit quieter than the others: the teacher told me he was not quite as bright (remember this a school for specially gifted children), had not used the platform as much as the others, but was particularly good at spelling, and was helping the others often with that. Another is better at maths than the others.

The game continued. There appeared to be few if any difficulties now with the platform, and there is no doubt that the techie has put considerable effort into mastering its capabilities and idiosyncrasies. The teachers acting as puppet masters are very comfortable with using the platform and there is no doubt that they too have put a lot of effort into learning it. Similarly there had obviously been a lot of effort put into creating the game. Overall everything seemed to be working well.

Two-and-a-half hours into the game the boys are still concentrating enthusiastically on solving clues. They have not had a break, although they have had biscuits to eat and water to drink at their desk, something not normally allowed in school. Teacher encouraged them to take a comfort break at this stage, but only one did.

The outside team reported that coordinates recently given to them were wrong and they were waiting impatiently for the correct ones: this took some time to resolve and no doubt the outside team had little to do but wait.

The first signs of tiring were now beginning to show - fidgeting, rubbing eyes, stretching - but they kept going. However, whilst waiting for a solution from the outside the boys began to look bored, despite the puppet master sending them additional tasks to occupy them. Another boy went for a break.

After nearly 3 hours even the teachers were starting to become fidgety. I was beginning to feel weary, too - and I was only watching! Tasks were still going on though, with lots of chat (a bell rings on the platform each time new message is delivered). The outside team were uploading photos of street names to the desktop, and the boys were plotting their route by placing them on the map: one street wasn't on the map so they used a map website to find it and thus locate it on their map. They wanted to put a line on the map indicating the route but that does not seem to be possible.

At three hours and fifteen minutes the boys were really getting tired. Fortunately, the game was completed, all tasks on three levels having been accomplished. The boys were very surprised when told who in fact had been their puppet master.

Post game feedback from the game 1 children

Negative - The children in the territory did not like the films. They were too long and drawn out. The film of the boy in the dark room was dull. They didn't like it at all. They would prefer using GPS and mobiles to using laptops.

Positive - they said they had learned some new local history, even though they live there in Torun and thought they knew a lot about it. They thought the game would be good for children living outside of Torun.

10.4. The afternoon game

The game was observed out in the territory by a group of teachers from other schools and the MMU observer, and at control base by the MMU observer and sometimes by teachers from other schools (mostly the Slovenian team, who moved between watching the Polish game and doing something on their platform).

Participants – One teacher in the territory and one at base. The puppet master role at base was undertaken by one of the teachers who had done so in the morning - i.e. from the school now playing.

Nine children: 5 boys and 2 girls in territory, 1 boy and 1 girl at base, all aged 13 – 15.

General observations of playing game 2 in the territory

Throughout the game, two children (boys) used the phone and GPS device, and the rest shared the laptop.

The children were not from Torun and did not know the city well at all. They were much quieter, and appeared quite nervous because of the (initially) large group of adults watching them. It was extremely hot, and the group of observers dwindled quite rapidly. It was notable that teacher stood aside and let the children get on with the game, which is what was expected.

These children had not played a game before.

Having watched the film at the base, the children went out to the starting point in the territory. They watched the first clue film on the laptop with some difficulty because of the strong sunlight, and then set off in entirely the wrong direction. After a while the observer suggested that the teacher intervene as they were completely lost and had no idea what they were doing. She did so and hauled them back; this was the only time she intervened.

The prison – the children spent a long while looking for the first location (over an hour) and then a long time outside the prison wall, much to the interest of the prison guard (complete with rifle) sitting in his observation tower. Eventually they took a photo and sent it back. They seemed to be waiting for information from the base for some considerable time, and were using chat. They thought they had done everything but were told they hadn't, and were having problems working out what to do. It turned out that they had chosen a picture from the wrong folder on the mobile phone. This was because they couldn't see the picture, just a list of filename numbers including ones from previous games which had been left on the phone.

Once the photograph had been uploaded, they were sent the next clue, the film connected with directions to the church. They did not appear to be talking to and helping each other much, didn't pick up clues from the film and had to watch it again. It was evident that these children were being required to concentrate way beyond their capacity, and they said it would have helped them to have pens and paper with them to make notes on the film.

The boy using the mobile phone was a poor typist and worried about his spelling and grammar. This caused delay because he was not confident and was working very slowly. He would not let another child help him.

The church – the children eventually arrived at the church, and solved the clue reasonably quickly. They left the church and sat in the road in the hot sunshine trying to work out what to do next, but complained that the people at base did not have information ready for them. Unfortunately they ran out of time and had to return to base for a feedback session.

Observations of playing game 2 on the game platform at control base

Having watched the introductory film, the boy and girl took their places at the laptop, the girl seemingly taking charge. They were passed clues and tasks onto the desktop by the puppet master, and soon also began using chat. They set about doing the tasks more slowly than the morning team, speaking to each other gently and quietly. The map wasn't displayed and the techie was asked to help. Apparently they did not know how to display the map. In fact they do not seem to be very familiar with the platform at all, and did not know how to put pins on the map until shown by the techie. Nevertheless they seemed to cope reasonably well with a little help.

The two progressed quite slowly, taking coordinates from chat and writing them down rather than using them directly from the chat window. After one hour they swapped places, the boy now being in charge of the computer. They were still on task 1 and progressing very slowly.

Level 1 tasks were completed after nearly one-and-a-half-hours and they moved to Level 2. The two seemed to be working well together and enjoying it. The teacher explained to me that this school's platform had not been available in proper working order until two weeks before so the team had had limited opportunity for training and practice, and had not played a game before (unlike the morning team who had played and practiced quite a lot).

After two hours the two were still working well together, getting on with the tasks, albeit still quite slowly. The puppet master was looking a bit bored though!

At just before two-and-a-half hours they finished Level 2 and stopped.

[Interesting that although this team worked much more slowly, they completed two levels in two-and-a-half hours which seems to compare quite well to the morning team having completed three levels in three-and-a-quarter hours.]

Post game feedback from the game 2 children

Positive – they said the game was interesting, and a 'nice way to spend time with friends'. They agreed that they had learned something new about the history of Torun, and would like a game in Grebocin, their home town.

Negative – nothing

Post game plenary feedback session

This session was conducted in English and Polish

Points made by the children included that:-

- Using laptops is uncomfortable (but was what teachers could afford.)
- It was hard for children in the territory to understand some of the information which was sent to them
- GPS was useless in the city centre, as few satellites could be located, sometimes only one, and sometimes none at all. Even when it worked was not very precise (i.e. only to within 100 metres)

- Clues need to be simpler, particularly for first time players. This was particularly important for the children who were on unfamiliar territory.
- There were some problems with slow connections which the children found irritating.
- Some children suggested that the game should be a competition with a prize. They said this would make them work faster and be more motivated.
- The children would like a true virtual reality game. They want something that looks like a commercial computer game. This wasn't really a computer game to them. They want professional films, not films made by their teachers.
- The children did not like using the laptops which were heavy and did not work well enough. They want palmtops instead of laptops.

Recommendations made by teachers and observers included that:

- Each game needs attached to it a checklist of exactly what hardware and software is needed for successful game playing
- The teachers must check and recheck the battery strength of devices before leaving. They should give the children spares to carry with them if possible.
- The teams should not be too big. In the morning game, there was simply nothing for several of the children to do and they became clearly bored and restless. This problem was made more acute because they could not hear the sound track of the films. This was confirmed by the control base teacher: teams should be about six.
- There should be competition between teams playing at the same time.
- Old folders of pictures from previous games should be removed from mobile phones before the game is played. The filenames are not sufficiently distinctive to allow the children to know for certain which file they are uploading. In the second game they uploaded 'the most recent' but from the wrong list.
- Teachers were very concerned about the security of the children in city centre. Laptops are very conspicuous, they said, and they were afraid that the children might be mugged. None of the Polish teachers would consider allowing the children to go into the city centre unaccompanied..

*** End of Appendix 3 ***