DOCTOR OF PHILOSOPHY

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The Effects of M-learning within GCSE Geography:
Can Mobile Technology Enhance the Quality of Pupils' Learning?

by

Ryan Butler BA (Hons) PGCE MEd

A dissertation submitted as part of the requirements for the Degree of Doctorate in Education in the School of Education, Queen's University Belfast

November, 2011
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ABSTRACT

Over the last ten years the application of m-learning has increased within educational settings worldwide. Through everyday exposure to mobile technologies young people are rapidly becoming ‘digital natives’ (Prensky, 2001), making this technology something schools cannot afford to ignore (Sharples, 2007; Becta, 2009a). However, the current position within schools does not support the notion that teachers are keeping pace with technological advances (Bauer and Kenton, 2005; Ofsted, 2009) and most schools are not grounded in young peoples’ everyday technological experiences (Bauer and Kenton, 2005). The use of mobile technologies within schools, particularly secondary schools, is still in its infancy (Rogers, 2003; Beetham and Sharpe, 2007; Ofsted, 2009); it is not yet mainstream and as yet relatively few projects have been conducted considering the impact of mobile technology on learning (Keegan, 2005; Kukulska-Hulme and Traxler, 2005).

M-learning offers teachers the opportunity to work outside the constraints of the classroom environment providing pupils with personalised, up-to-date learning on demand; however vigilance is key as participation in m-learning does not automatically transform pupils into ‘learning natives’ (Passey, 2009). It is essential that the effects of m-learning are investigated further, which was the focus of this inquiry, to enable teachers to effectively integrate this new technology into existing pedagogy.

The goal of this small-scale action research inquiry was to expose GCSE Geography pupils to two location-aware (mediascape) mobile technology activities. The creation and delivery of each activity has been discussed, analysed and evaluated through the lens of Activity Theory. The effects of m-learning have been derived from qualitative data collection methods such as: interviews, observation journals from participants, key documentation, storyboards and pilot sessions. Quantitative data has also been used in the form of standardised assessments, predicted GCSE Yellis grades and quiz scores. The data obtained from these collection methods has been analysed and interpreted based on three key questions, which stem from the aim of the inquiry. These questions are:

- Does m-learning facilitate independent and/or collaborative learning?
- Does m-learning support problem-solving?
- Can mobile technology enhance performance in GCSE Geography?

The advantages and limitations associated with using mobile technology have been presented and discussed in terms of affective and cognitive findings. After weighing up the
advantages and limitations, this action research inquiry has discovered that sufficient evidence exists to assert that m-learning can enhance pupils’ learning experience. If embraced and embedded into the curriculum m-learning can become more than an idealistic dream moving beyond the ‘early adopters’ (Rogers, 2003) into mainstream education. This inquiry discovered that pupils were motivated and inspired by mobile technology, their self-confidence and self-esteem was inflated and learning was made more fun and enjoyable, interesting and exciting. Mobile technology helped to elevate pupils’ expectations and personalise their learning. In addition m-learning incorporated a range of multimedia ensuring it catered for a variety of learners. The inclusion of mobile technology made lessons active and participatory as opposed to teacher-led with pupils as merely recipients of information. M-learning also extended not only geographical knowledge but History and ICT knowledge and expertise. In support of Prensky’s (2001) notion of ‘digital natives’ m-learning tapped into the pupils’ technological culture and presented them with opportunities to lead, work independently or collaboratively and provide them with a mechanism to help solve problems. Performance was enhanced during the course of the m-learning tasks and reluctant learners were also included through the incorporation of mobile technology.

The inquiry also discovered that m-learning can have limitations. Teachers should be cautious when using mobile technology that the task(s) or the creation phase does not become too burdensome on the pupils. If this occurs or the primary focus is the technology and not the subject content then m-learning may potentially become boring or time-consuming, suffer from technological glitches or pose resource and creation concerns for pupils. Weather conditions, subject content and the format of any intended collaboration, when using mobile technology, were also seen as areas requiring careful consideration to minimise any negative impacts on learning.

In terms of the future, the inquiry found that whilst there may be occasional concerns about using mobile technology or how frequently to use it there was an acceptance that m-learning will have a future role to play, not just in GCSE Geography but other subjects too. To this end the inquiry concludes with recommendations for interested groups and individuals to help embedded m-learning into GCSE Geography.
I would like to thank my wife Aisling and my beautiful daughter Janey. Without their patience, tolerance and support this dissertation would not have been possible. To my parents I also owe a deep gratitude. Their support and encouragement has been unstinting throughout.

My sincerest thanks go to my principal dissertation supervisor, Dr Pamela Cowan, for all the help, advice and encouragement that she provided throughout this dissertation from its conception, mscape construction, dissertation write-up and completion. Her support and approachable manner made the dissertation enjoyable and allowed me to fully realise the importance of action research and mobile technology in education. I wish to also thank my second dissertation supervisor, Dr Colette Murphy and Kevin Coyle, from Ulster Mediascapes, who provided the mobile technology and training on the use of the Mscape Toolkit.

Thank you to my school who allowed me to carry out this inquiry. In particular I wish to express my thanks to the 16 pupils of Class 11M who participated willingly and provided a wealth of honest and valuable data.
ABBREVIATIONS

AQA  Assessment and Qualifications Alliance
AT   Activity Theory
Becta British Educational Communication and Technology Agency
BERA British Educational Research Association
BST  British Schools Technology
C2K  Classroom 2000
CCEA Council for the Curriculum Examinations and Assessment
CET  Council for Educational Technology
CCT  Cross Curricular Theme
CIC  Computers in the Curriculum
CPD  Continued Professional Development
DENI Department of Education for Northern Ireland
DfE  Department for Education (England)
EdD  Educational Doctorate
ET   Educational Technology
ETSMG Educational Technology Strategy Management Group
GCE  General Certificate of Education
GCSE General Certificate of Secondary Education
GIS  Geographical Information Systems
GPS  Global Positioning System
HCI  Human Computer Interaction
HoD  Head of Department
HP   Hewlett and Packard
ICT  Information and Communications Technology
IT   Information Technology
IWB  Interactive Whiteboard
Jpeg Joint Photographic Experts Group (method for compressing an image)
KLT  Kids' Life and Times
LETS GO Learning Ecology with Technologies from Science for Global Outcomes
KS3  Key Stage Three
LNI or Learning NI Learning Northern Ireland
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<td>MEP</td>
<td>Microelectronics Education Programme</td>
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<td>National Development Programme in Computer Assisted Learning</td>
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<td>QUB</td>
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<td>SCY</td>
<td>Science Created by You</td>
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CHAPTER 1 INTRODUCTION

1.1 Introduction

Whilst still not yet mainstream in secondary schools, there is a desire for greater integration of mobile technologies. Acceptance however is hampered by a current lack of published research into the impact of mobile technology on learning (McLean, 2003; Beetham and Sharpe, 2007). Therefore inquiries such as this one are a vital incentive for teachers contemplating the use of new technologies within their classrooms as a means of enhancing pupils' learning. Chapter 1 will demonstrate that a key underlying motivation of this research was to help inform and guide the future of mobile learning (or m-learning) within GCSE (General Certificate of Secondary Education) Geography.

Justification will be given to the decision to focus on m-learning within GCSE Geography, as a suitable pedagogy. The chapter will not only ground the inquiry within an organisation but the desire to engage with action research to evaluate the extent to which mobile technology could enhance performance in GCSE Geography will be discussed. A critical appraisal of information communication and technology (ICT) developments in Northern Ireland (NI) schools will precede an overview of how Geography has integrated ICT. The chapter concludes with a look at the key research questions, which centre on the ability of m-learning to support problem-solving whilst potentially facilitating independent and/or collaborative learning.

1.2 Rationale

1.2.1 Geography: An Ideal Subject for the Introduction of New Technologies

According to Ofsted,

\[
 Geology provides a rich and varied context for the use of new technologies to enhance both learning in the subject and to reinforce existing ICT skills (2004, p. 4). \]

In a similar vein to Ofsted, Becta (2004a) (British Education Communications Technology Agency) believes that ICT provides teachers with vital tools for teaching Geography in the
twenty-first century. According to Becta ICT has the ability to enhance geographical knowledge and understanding whilst helping pupils investigate, organise, edit and present geographical information in many different ways (2004a, p. 1). Technology and in particular mobile technology is unique because unlike textbooks, posters and photographs which are often static and outdated it is ‘dynamic’, portable and easily updated. Technologies such as interactive white boards (IWB) and mobile devices displaying video, animations and interactive activities can motivate pupils and bring the ‘real’ world into the classroom (Becta, 2004a).

However beyond encouraging, supporting and reporting on the use of mobile technology both Ofsted and Becta have not yet succeeded in helping to promote m-learning into mainstream teaching and learning. For many teachers their fixation is still firmly associated with the device and not with the potential benefits m-learning offers to pedagogy and learning (Hartnell-Young and Heym, 2008). Therefore all too often mobile devices conjure up the fear of distraction in class, cheating and inappropriate use by pupils. This mindset needs to change before schools reach the ‘tipping point’ and the use of mobile technology becomes as natural as using any other technology (Rogers, 2003; Hartnell-Young and Heym, 2008).

With the implementation of the Key Stage 3 (KS3) Revised Curriculum (ENIO, 2006) and revised specifications at GCSE and GCE (General Certificate in Education) Advanced Levels Geography teachers are being compelled to review their pedagogical approaches to accommodate the changes that are taking place. A review of the AQA Geography GCSE Syllabus, which was the relevant specification for the inquiry’s participants, highlighted that technology should be used to give pupils,

...opportunities to apply and develop their ICT capacity through the use of ICT tools to support their learning (2008a, p. 7).

Although m-learning is not directly referred to within the syllabus the phrase ‘use of ICT tools’ provides an incentive to teachers to utilise new technologies, such as mobile technology, in an attempt to enhance pupils’ learning. In response to these recent changes in education, and the increasing use and availability of ICT outside of the school environment, school leaders now have a greater responsibility to ensure appropriate policies are created.

For those teachers who are currently contemplating using mobile technology a cautious and considered approach is vital (Weeden, 2000). Teachers need to realise that pedagogy involving
m-learning does not necessarily equate to an enhancement of learning (Passey, 2009, p. 3). Therefore,

*When planning for the use of ICT perhaps the most fundamental question is: How does the use of ICT enhance the quality of Geography.....? (Weeden, 2000, p. 203)*

Weeden’s (2000) question is one asked by many Geography teachers. However, answering this question can often be problematic because many teachers are too concerned with including ICT to meet whole school and departmental policy targets. Geography teachers need to define the role ICT plays in delivering topics, making geographical knowledge the end goal and technology the teaching tool enabling pupils to unlock the knowledge (Weeden, 2000). In response to Weeden’s (2000) advice the teacher-researcher (referred to in future as the researcher) realised that m-learning should not only be sensitively planned, to avoid the technology becoming the focus, but that the impact of m-learning upon pedagogy also required reflection.

It was at this stage that action research presented itself as a suitable framework (see Section 3.2 for a more detailed justification for the inclusion of action research). It offered a classroom-based researcher the opportunity to not only conduct a small-scale research inquiry, using accepted data collection and interpretation methods, but it also allowed for the reflection on active pedagogy designed to induce change. According to Elliot (1991) and McNiff (1995) the first stage of an action research inquiry is to identify an ‘issue’ or a ‘problem’. Following their recommendation and reflection on pedagogy it became clear that a gap currently exists within GCSE Geography regarding the potential of mobile technology to enhance pupils’ learning.

### 1.2.2 Importance of the Inquiry: Creating a Niche

*Mobile learning is a new way of learning. Mobile devices including handheld computers, mobile phones and smartphones make learning portable, spontaneous, personal and exciting* (Kukulska-Hulme and Traxler, 2005, p i).

The statement by Kukulska-Hulme and Traxler (2005) encapsulates the beneficial nature and relentless growth of m-learning over the last ten years. It has grown from a minor research interest to increasing widespread use in schools around the world (Sharples, 2007; Sharples and Roschelle, 2010). According to Sharples (2007) we have now entered the mobile age, where
handheld devices such as phones, smartphones, iPods, Personal Digital Assistants (PDAs) are
carried everywhere. From a teacher's perspective we now have the opportunity to design
learning differently. Teachers can begin to work outside the traditional constraints of the
classroom environment and link pupils to the real and virtual worlds as well as providing
personalised and up-to-date learning on demand. The use of m-learning tools however does not
guarantee their potential being realised (Duncan-Howell and Lee, 2007). The key to
successfully enhancing learning through the use of mobile technology centres on the teacher's
ability to design and develop pedagogically sound opportunities and environments (Duncan-
Howell and Lee, 2007).

A recent survey of more than 3650 young people in NI by Kids' Life and Times (KLT)
revealed that 93% of 11 year olds own a mobile phone (Lloyd and Devine, 2009), a figure that
rises to over 95% by age 13 (Mobile Life, 2006). These findings correspond with Prensky's
(2001) assertion that today's pupils have enormous access to digital technology and are
becoming increasingly familiar and fluent with new technologies, they are 'digital natives'.
However being a 'digital native' does not necessarily mean a pupil is also a 'learning native'
(Passey, 2009, p. 3). A distinction must be made by teachers between the potential functionality
of mobile devices and the intended learning outcomes.

Young people are exposed to mobile technology in all aspects of life, therefore it is not
something teachers can or should ignore (Sharple, 2007; Becta, 2009a; Sharple and Roschelle,
2010). According to Rollans (2007, p. 1) 'resistance is futile' when it comes to accepting the
fact that teachers must embrace new technologies; yet the current position within schools does
not support the notion that teachers are keeping pace with technological advances (Bauer and
Kenton, 2005; Ofsted, 2009). Despite huge sums of government money being spent on
upgrading and promoting new technologies within schools the reality is that schools are not
grounded in young people's everyday technological experiences (Bauer and Kenton, 2005).
Clearly, the use of mobile technologies within schools, particularly secondary schools, is still in
its infancy (Beetham and Sharpe, 2007; Ofsted, 2009); it is not yet mainstream and as yet
relatively few projects have been conducted considering the impact of mobile technology on
learning (Keegan, 2005; Kukulska-Hulme and Traxler, 2005). Recent research involving the
use of m-learning tends to favour informal learning and distance learning (Laouris and
Eteokleous, 2005; Attewell, 2005; Clough et al., 2008; Zawacki-Richter et al., 2009) or it takes
a thematic or cross-curricular approach (Davey, 2007; Burkett, 2008), blurring the dividing line
between subjects. On one hand this can be viewed positively as it helps integrate different
disciplines but from a pedagogical perspective it is unrealistic for a teacher who is attempting
to deliver a subject-specific scheme of work or syllabus. Studies into the impact of m-learning
within individual subjects tend to be sporadic and teacher-led, which often means the results
are not published nor the inquiries validated through accepted data collection and interpretation
methods (Traxler, 2009a). In addition the majority of the research tends to focus on the mobile
device and its functionality (Hartnell-Young and Heym, 2008). For teachers interested in
discovering how mobile technology enhances learning there needs to be shift away from the
device as the focal point and instead place the pupil at the heart of the learning activity
(Hartnell-Young and Heym, 2008).

A niche therefore exists within the secondary sector for more research to be published which
critically looks at the impact of mobile technologies on pupils’ learning. To encourage more
widespread use of mobile technology within schools, beyond the innovators and early adopters
(Rogers, 2003), there is not only a demand for research to be more pupil-centred but a necessity
to investigate how mobile technology enhances learning within discrete subject areas, and of
particular relevance to this inquiry within Geography. Research needs to create an acceptable
and worthwhile place for m-learning within the curriculum otherwise its uptake amongst
teachers will remain peripheral (Keegan, 2005). What the inquiry hoped to demonstrate was
that m-learning is not far away in the future, but a reality in daily life and teachers must
embrace it and utilise this medium to its full potential.

1.3 Contextualising the Inquiry within the School Setting

The inquiry was based in Belfast Grammar, which is the school where the researcher has
worked as a Geography teacher for the past 14 years. Based on ethical considerations, to
protect the anonymity of the organisation, pupils and employees (BERA, 2004; Cohen et al.,
2007), Belfast Grammar is a fictitious name – see Section 3.6 for more information. The
researcher, like many teachers at Belfast Grammar, has openly embraced ICT and believed it
can increase pupil autonomy as well as providing better opportunities for teachers and pupils
(Attewell, 2005; Mobilearn, 2005; Burkett, 2008). For teachers keen to use ICT there is often
the belief that technology can enable pupils to become more actively involved in the learning
process helping prevent teaching from being construed by teachers as a technical procedure of
transmitting knowledge to passive learners (Attewell, 2005; Burkett, 2008). Others however,
are apprehensive of technology. For them ICT may be increasing but many feel they neither have the time nor the expertise to design, resource and deliver quality lessons using technology (Becta, 2003; Robles, 2006).

Before embarking on the inquiry it was important for the researcher to gain an insight into the managerial structures of the organisation where the research was to be based (McNiff, 2000; Wong and Li, 2006). Although this inquiry focused on m-learning at the individual classroom level or micro-scale this did not mean that the activity occurred in isolation. Action research presented the researcher with the opportunity to step back from the routine of daily teaching and view the incorporation of m-learning in the context of departmental and whole school ICT policies. There can be no doubt that the management style within Belfast Grammar, which created the policies, did affect the design, implementation and in turn the mobile activities themselves along with their outcomes.

When reviewing the management structure within Belfast Grammar it became clear that it corresponded to Bush’s (1995) ‘Formal’ approach to educational management. In practical terms this means that the Senior Leadership Team (SLT) in Belfast Grammar tend to assume a ‘top-down’ leadership and management style. Within the school the SLT define the visions, the goals and develop the values, beliefs and policies and the Head of Department (HoD) is seen as an intermediary leader who aids in the dispersion of the goals and policies. Once these policies, and of particular relevance to this inquiry the ICT Policy, reaches departmental level it is left to individual teachers to look at their needs, the pupils’ needs, the available software and hardware, syllabus demands and combine these with the school and departmental ICT policies to enhance teaching and learning.

Like most schools Belfast Grammar has responded to all Government ICT initiatives and strategies (see Section 1.5 for more information). More significantly since the Educational Technology (ET) Strategy for NI was established in 1997 ICT has appeared on every annual ‘Strategic Development Plan’ signifying the high regard that the SLT place on the inclusion and development of ICT within the school. However, as the following information demonstrates, being held in high regard does not automatically mean that new technological advances flourish within the school or that ICT policies are relevant and continually updated.
According to Becta (2009b) ICT policies should be viewed in a positive light, they are not designed to cause additional bureaucracy for teachers but are designed to provide a safe and positive learning environment. However, when viewed in the contexts of Belfast Grammar it became clear that a layered approach was required to ensure the Geography Department and the three whole school ICT policies were adhered to. Initially these policies did cause concern as there tended to be overlaps and gaps which could have been overcome by one whole school policy. In addition two policies were created in 2000 and two in 2004; which in terms of ICT developments, particularly involving mobile technology, meant the policies urgently needed reviewed (Becta, 2009c). According to Becta (2009c) schools should be reviewing their ICT polices on an annual basis to keep up-to-date.

After examining the whole school ICT policy it became evident that,

"the acquisition of appropriate ICT skills is considered to be of vital importance to the personal development of both pupils and staff" (Belfast Grammar, 2000a, p. 1).

The whole school policy made it clear that teachers must attempt to equip all pupils with a 'high' level of personal and subject-specific competencies in ICT. Of particular relevance to this inquiry was the assertion that ICT should also be used as 'an effective tool' (Belfast Grammar, 2000a, p. 1) to enhance the quality of learning through worthwhile learning experiences. The policy also stipulated that pupils should have the opportunity to develop lifelong skills through ICT. From a critical perspective however the policy does require immediate attention to bring it into line with recent ICT developments and scope for future developments needs to be built into the policy which reflect the needs of all stakeholders, such as pupils, staff, SLT, parents and governors (Becta, 2009c). In support of the whole school policy two additional policies were created, in 2004, to cover use of ICT facilities and acceptable use of the internet.

The ICT facilities policy was essentially a code of conduct for the ICT classrooms and therefore had limited relevance to this inquiry, which was largely concerned with the use of mobile technology outside the traditional classroom setting. The fact that this policy did not directly reference m-learning indicates the frenetic pace of recent ICT developments within schools. Regardless of the need to update this policy there were sections such as, the use of the internet and behavioural issues surrounding the use of technology, that were relevant. There
was also a professional responsibility of the researcher to assume, even in its absence, that acceptable use of ICT facilities also applied to mobile activities as well.

In terms of the acceptable use of the internet policy some duplication existed with the latter policy. For teachers this can lead to unnecessary bureaucracy and result in misinterpretations. A review of the internet policy revealed however that it too had limited relevance, as it was only applicable to the creation phase of the second m-learning task. During this phase pupils were involved with researching and resourcing information, which at times meant they had to access the internet. In addition the second m-learning task also involved pupils participating in an online Learning Northern Ireland (LNI) course; therefore it was vital the research adhered to the acceptable use policy. Pupils were also constantly reminded of their responsibility not to misuse the internet and that they had previously signed a declaration accepting the school’s internet policy, which also applied to school work completed at home.

The Geography Department’s ICT policy mirrored the whole school policy, which meant it too was somewhat outdated and consequently requiring an urgent review. Nevertheless the current policy was still applicable and did stipulate that any use of technology had to ‘enhance quality learning’ (Belfast Grammar, 2000b, p. 1) and assist with the application of skills and motivation of pupils. The policy also encouraged teachers to use ICT to deliver a variety of information to pupils, whilst ‘reinforcing the understanding of the physical, human and environmental spatial process using simulations’ (Belfast Grammar, 2000b, p. 1). The latter statement about using simulations was particularly relevant to the inquiry as the mobile tasks intended to offer a location-aware simulation as a framework for practical and hands-on learning.

After looking at the four relevant policies it was clear that both the researcher and the pupils had responsibilities but ultimate responsibility lay with the researcher to ensure that:

- the policies were followed;
- pupil behaviour was managed appropriately, both inside and outside of the classroom;
- any rules and regulations were reiterated to the pupils before and during the m-learning activities;
- the internet and LNI course were used in an appropriate manner;
- pupils were guided through the m-learning experience and all learning outcomes were made clear;
accountability was stressed to the pupils;
- a suitable and secure mobile device was selected.

In terms of selecting an appropriate mobile device Section 2.3.2 will look more closely at the literature surrounding the selection process but suffice to state here that the iPAQ 214 from Hewlett and Packard (HP) was chosen. This device had all the functional requirements to run the m-learning tasks and it also was not a mobile phone, which ensured Belfast Grammar's code of conduct which prohibited the use of mobile phones during school hours was not breeched.

1.4 Why Use Action Research and What Form Will it Take?

A fundamental aim of action research, which complements this inquiry, is the need to engage with change to improve practice (Elliot, 1991) allowing teachers to become more aware of the options and possibilities for change (Johnson, 1993). Teachers who participate in action research become more critically reflective about their own practice (Oja and Pine, 1989) and according to Johnson (1993) teachers engaging in action research attend more carefully to their methods and perceptions when participating in the teaching process. Hollingsworth (1997) asserts that teachers are in an advantageous position to carry out action research and this combined with the recent rise in teacher-led action research will benefit the whole educational community. Action research inquiries, for example, such as Esposito and Evans-Winters (2007) into urban schools, Meyers and Rust (2003) into the voice of teachers in policy decisions and Crawford et al. (2003) into how teachers can improve practice through the use of technology have helped inspire others to become action researchers.

Lawrence Stenhouse once said,

_It is teachers who, in the end, will change the world of the school by understanding it_

(cited in Rudduck, 1995, p. 3).

The comment by Stenhouse (cited in Ruddock, 1995) illustrates that he had a clear insight into the ‘advantageous’ position of teachers. Stenhouse advocated the idea of ‘teacher as researcher’ and for him teachers who participate in action research are increasing their understanding of the
schooling process and what they learn will have a great impact on what happens in schools (Stenhouse, 1975). In essence action research enables teachers to not only engage with the change process but also to lead and affect change (Catelli, 2000; Neapolitan, 2000). Figure 1.1 summarises some of the main attributes that attracted the researcher to action research and Section 3.2.4 elaborates on the benefits of action research.

### Some Attributes of Action Research

- Promotes a collaborative and participatory approach to research
- Enables small-scale or classroom-based research
- Acknowledges bias role of researcher
- Encourages intervention and action
- Empowers participants
- Promotes reflection
- Focuses on improvement
- Real world setting and real situations
- Suggests a logical or procedural approach to research
- Caters for teachers not skilled in full time research

Section 3.2.4 also looks at some of the limitations associated with action research but it is appropriate at this stage to give a brief overview highlighting some of the concerns raised about this form of research. For some action research can be too small-scale with teachers often lacking the time, experience or funding to effect any real change or carry out credible research (Nolen and Putten, 2007). Acknowledgement must also be given to the fact that an expectation exists that action research brings about positive change but in reality there may no change or the research may have a negative impact (Van Manen, 1990). Critics of action research sometimes point to the excessive subjectivity displayed by the researcher and frowned on self-indulgent inquiries (Ladkin, 2005). In an effort to overcome these potential limitations the planning phase was used to ensure sufficient time was taken for the researcher to become familiar with action research and that the research reflected adequately the size and scope of the inquiry. In addition the researcher remained vigilant throughout for unwarranted subjectivity and employed rigour when following data collection methodology and the chosen action research model.
This inquiry used McNiff’s model for undertaking action research (see Figure 1.2). This is an open-ended model as it does not necessitate beginning an inquiry with a fixed hypothesis. Instead the model allowed the inquiry to begin with an idea which the researcher built upon (McNiff, 1995). There are a number of other open-ended traditional models available, such as Lewin (1946, cited in McNiff, 1991) Kemmis and McTaggart (1988) and Elliot (1991). McNiff’s (1995) model however was the most appropriate for this inquiry because she advocated proposing a solution after the identification of a problem/issue. The other models, whilst sharing similar characteristics such as cyclic, participative, qualitative and reflective, do not advocate putting forward a solution until much closer to the end of the action research process (Esposito and Evans-Winters, 2007). In the case of this action research m-learning was offered as the solution to the issue which is the continual need to strive for a better way to enhance pupils’ GCSE performance. Care however, needs to be taken, by teachers who use the more traditional approaches to action research, to ensure that in their efforts to examine their own classroom practices teachers do not place the burden of change onto their pupils (Esposito and Evans-Winters, 2007). This is exactly what this inquiry aimed to avoid.

McNiff’s Basic Model for Undertaking Action Research (McNiff, 1994, 1995)

1. Identify a problem/issue
5. Modify Practice
4. Evaluate the solution
3. Implement the solution
2. Imagine a solution
6. Identify a new problem

See Section 3.2.3 for a more detailed version of McNiff’s Model, which helps illustrates its flexibility as an appropriate framework for teachers engaging in Action Research.

1.5 ICT in Education

1.5.1 What has been achieved to date?

We wish to see digital, multimedia and communication technologies being used to enhance, improve and, ultimately transform, education (DENI, 2004a, p. 3).
The view expressed by DENI (2004a) emphasises the importance that the Government places on ICT within schools. DENI clearly places an onus of responsibility onto every teacher to make sure they incorporate some form of ICT into their teaching. For some teachers, particularly those lacking the confidence to fully engage with ICT, this responsibility can be a source of anxiety (Becta, 2004b). The traditional role for teachers has been as presenters of ready-made information and as organisers of learning experiences. There can be no doubt however that ICT has allowed this role to change, a process that has been on-going since technology first began being phased into education since the 1960s. As Davis et al. state,

One way in which information technology can be used in the classroom is to take over these presentation and organisation roles (1997, p. 15).

Figure 1.3 serves as a visual illustration of the frenetic pace which ICT developments within the educational arena have taken place. It highlights that the modern era of ICT in schools essentially began in 1989 with the introduction of a National Curriculum for NI. Since this time ICT use within schools has continued to grow at a phenomenal rate but unfortunately this has often been superficial, with focus directed more towards infrastructural changes. Despite the rapid growth, penetration of technological developments into the wider society have 'accelerated faster that any accompanying educational or pedagogical change' (Johnson et al., 2006, p. 137). According to Johnson et al. (2006) much of educational reform has centred around what should be taught and how it can be measured, largely ignoring the pedagogical processes and failing to examine the role of technology to assist pedagogy. Johnson et al. believe that,

Education has remained embedded in a system developed for the 20th century and does not comprehend how to educate the child of the digital age (2006, p. 136).

To break this trend it is clear that educators need to respond to the new generation of pupils who are used to and experienced with technology outside of school (Prensky, 2001, 2007; Rollans, 2005). The challenge is now to start afresh and without putting technology centre stage think of how it can assist the learning process (Buckingham, 2005). School leadership teams need to encourage and assist teachers interested in using technology and they can only do this by establishing a clear ICT vision, strategy and action plan aimed at ensuring,
An Historical Overview of the Introduction of ICT into Education: With Specific Reference to Northern Ireland

1. Council for educational technology (CET) formed.
2. 'Computers in Education' working paper produced by CET emphasised distinction between 'computing for education' and 'education about computing'.
3. Development Programme in Computer Assisted Learning (NDPCAL) launched.
4. 'Computers in the Curriculum' (CIC) project launched by Schools Council.
5. Microelectronics Education Programme (MEP) established for England, Wales and NI to help schools design and deliver teaching about microcomputers.
6. Department of Industry teamed with local education authorities to provide funds for at least one computer per school by 1982.
8. British Schools Technology (BST) - aimed at creating mobile computer laboratories and training teachers.
10. Micron in Education Support Unit (MESU) - set up to enhance teacher training.
11. National Curriculum (England and Wales) makes IT a required separate subject at all levels, as well as requiring use of IT to be incorporated across the curriculum.
12. National Council for Educ. Technology (NCET) set up and combined two earlier organisations, CET and MESU.
13. Classroom use of ICT became a statutory requirement in all subjects with the introduction of the NI National Curriculum.
15. Acorn launched Pocket Book - designed for use in schools.
16. CIC team published Impact Report which concluded that the contribution of IT to learning was significant only in Geography, Mathematics and primary English.
17. Revised National Curriculum (Eng. & Wales) makes IT a required separate subject at all levels, as well as requiring use of IT to be incorporated across the curriculum. In N. Ireland IT remained a cross-curricular theme (CCT).
18. Schools Online project launched to connect schools to the internet.
19. After Labour's election manifesto (1997 General Election) there was a pledge to increase access to IT in schools. After the Stevenson Report (1997) called for more ICT confidence and competence in schools the National Grid for Learning was launched and in NI NINE was the equivalent. (These aimed to deliver Labour's pledges.)
20. Educational Technology Strategy for Northern Ireland (ET) was established and it addresses the issues constraining the uptake of ICT in schools. Classroom 2000 (C2K) are also formed as part of the ET Strategy to help manage and deliver new technology to schools. The Education Technology Strategy Management Group (ETSMSG), working on behalf of the Department of Education, are charged with monitoring, managing and providing feedback on the progress of the ET strategy.
21. Laptops for schools initiative see schools, receiving state of art laptops to improve their technology.
22. New Opportunities Fund (NOF) established to promote ICT in schools and train teachers.
23. Classroom 2000 - established to equip all classrooms with up-to-date hardware and software. It also provided a managed service.
24. Review by CCEA of the statutory curriculum resulted in pupils being given the opportunity to improve their ICT competence.
25. A review of the ET is produced and it is revealed that 85% of the initial targets, set in 1998, are on schedule to be achieved. From this review stems the 'eMpowering Schools Strategy' and it aims to build on the foundations established by the ET to promote e-learning/online learning (DENI, 2006a).
26. 2002-4 saw an upsurge in m-learning within schools. Its use and integration has continued to grow.
27. C2Ks put the computer/pupil ratio at 1:5 and the computer/teacher ratio to 3:1. Secondary school connectivity is at least 2MB (DENI, 2004b).
28. Learning NI (LNI), a new online learning environment, was launched by C2K. It aimed to provide all teachers and pupils with a range of online educational tools, such as assessments, monitoring, tracking, submission and receipt of work.
29. LNI given revamped and updated. Renewed efforts to encourage wider use across schools.
30. New laptops for schools initiative. Schools provided with laptops for each teacher making the teacher/computer ratio 1:1 (C2K, 2008).
31. Foundation of Ulster Mediascapes, which helps a small number of teachers integrate 'escapes as a form of m-learning.
32. C2Ks contract was renewed for another two years. Moves are now underway to secure an update of all ICT equipment with schools.
33. More powerful smartphones (e.g. Android and iPhone) become available.
34. Learning NI (LNI), a new online learning environment, was launched by C2K. It aimed to provide all teachers and pupils with a range of online educational tools, such as assessments, monitoring, tracking, submission and receipt of work.
Closer examination of Figure 1.3 indicates that mobile technology was available for use within schools since the launch of the Psion Organiser in 1984 and subsequent developments such as the Acorn Pocket Book in 1992. However, it was not until 2002-2003 that mobile technology had advanced to such levels that schools were able to look to this form of technology as a viable alternative to personal computers (PCs) or laptops. According to Wierzbicki (2002) conditions prior to 2001-2002 were not conducive to m-learning due to technical difficulties with handheld technologies, unacceptable speeds and costs. Those who initially became involved tended to be primarily from research institutions or enthusiastic teachers with a keen interest in technology (Wierzbicki, 2002). The current situation in NI is that m-learning is still very much in its embryonic stage; although as Sharples et al. (2007) and Pachler et al. (2010) point out those utilizing m-learning tend to realise the focus is now on the learner and their mobility as opposed to initial m-learning ventures, which were often device centered. Neither DENI nor the AQA (2008a) GCSE Geography syllabus have any formal policies for m-learning inclusion. DENI only make fleeting reference to mobile technologies in relation to safety and the need for schools to develop ICT policies which include the use of all forms of technology (DENI, 2008b; 2008c). Where the support and guidance does exist however, is via small-scale initiatives such as Ulster Mediascapes. Established in 2007 Ulster Mediascapes' aim was to introduce location-aware mobile technologies (e.g. mscapes) to government departments, broadcasting and education (Ulster Mediascapes Team, 2007). Mscapes or Mediascapes are 'an experience....rich in interactivity' (HP, 2008). Section 2.3.1 elaborates further on what Mscapes are but suffice to state here that they allow for a physical location to be 'geo-tagged' with digital content. The Mscape Toolkit allows for images and text, sound and music along with videos and animation to be associated with the environment where we live and when the Mscape is experienced through the Mscape Player, on a mobile device, GPS triggers the 'geo-tagged' content (Loveless et al., 2008). Although small-scale and focused solely on mobile devices capable of supporting the Hewlett and Packard (HP) Mscape software Ulster Mediascapes is important because it acts as an mediator for those in education wishing to introduce m-learning. The provision of time, support and equipment from Ulster mediascapes is not to be underestimated, especially at a time when more teachers are embracing m-learning and
schools are being encouraged to embrace external agencies to support a wider variety of high level expert teaching support.

Although the use of mobile technologies is not widespread in schools across NI it is hoped that this action inquiry can contribute worthwhile information regarding m-learning in schools and act as an incentive for others. The following section takes a brief look at how Geography has responded to these recent developments in ICT.

1.5.2 How has Geography Responded to ICT Developments?

According to Geographers such as Harris (2005) and Jones (2005) the 1997 ET Strategy allowed for a ‘Global Geography Classroom’ and more recently a ‘Virtual Fieldtrip’ to become a reality. Pupils and teachers can now exchange information at the click of a button. GPS can be coupled to automatic data logging devices and linked directly to computers and/or handheld devices. Digital cameras feed images straight onto school websites and video conferencing allows pupils to exchange information and ideas, in real time, with other schools and organisations. News, images, sound and animations are instantly and constantly available on the web. Classroom activities such as electronic worksheets can direct pupils to a whole range of exciting online resources and Jones (2005) stresses that software packages, such as Microsoft Office and Microsoft Windows Mobile are powerful applications with major benefits for teachers and pupils.

Harris (2005) however, believes that although ICT can and has improved the teaching of Geography the uptake by teachers is still ‘patchy’. He feels that the ET and emPowering Schools Strategies have been necessary, worthwhile and certainly improved ICT use within Geography; but many teachers still lack the time, will, confidence and opportunity to utilise ICT within Geography fully. For those teachers who do embrace ICT Harris (2005), like Weeden (2000), stresses the need to focus on the geographical content. For Davey (2007) the views of Weeden (2000) and Harris (2005) are equally important and have helped prepare and equip Geography teachers for the era of m-learning. The emphasis is now on ICT competent teachers to take the next logical step and experiment with mobile technologies.
1.6 Research Questions

As Section 1.1 stated the aim of this inquiry was to research the use of mobile technology, to ascertain if pupils’ GCSE Geography learning experience could be enhanced. To achieve this aim it became clear that a number of discrete areas would have to be investigated. These areas included pupils’ attainment, ability to problem-solve using technology and opportunities for independent and/or collaborative learning.

In an attempt to investigate the aim of this inquiry it was decided to focus on the following key research questions:-

- Does m-learning facilitate independent and/or collaborative learning?
- Does m-learning support problem-solving?
- Can mobile technology enhance performance in GCSE Geography?

After initially reviewing literature surrounding m-learning it would have been possible to extend the questions listed above but the temptation to do this was resisted. In the spirit of McNiff’s (2005) action research model the purpose is not to begin an inquiry with all the questions and possible answers but to allow the research to develop. As the inquiry unfolds action research enables new discoveries and disclosures, which are relevant to the aim, to be discussed and their effects considered before modifying pedagogy.

The questions will be revisited when the results are presented, analysed and discussed. They will also help focus the inquiry’s conclusions and recommendations.
CHAPTER 2 LITERATURE REVIEW

2.1 Introduction

This chapter reviews the current position of m-learning in schools, with a particular focus on Geography. The benefits and limitations of using mobile technology are discussed, followed by a critical review of mscape and suitable mobile devices to assess their appropriateness to deliver quality m-learning. Section 2.4 asks the question, 'do theories of learning apply to m-learning?' Attention also turns to Activity Theory (AT) in an attempt to clarify a suitable definition and reinforce its relevance to this inquiry.

2.2 M-learning

2.2.1 Why Choose Mobile Technology to Assist Learning?

A review of the recent literature reveals that mobile technologies are increasingly seen as fertile ground for developing resources in support of learning (Kukulska-Hulme and Traxler, 2005; O'Malley et al., 2005; Metcalf, 2006; Traxler, 2009b). According to Facer et al. (2004) this interest is driven by a number of considerations. Firstly, there is an increasing awareness amongst teachers that young people, through interaction with mobile gaming devices (e.g. PSP and Nintendo DS Lite) and mobile phones, are developing a 'digital culture', an assertion reinforced by Sharples and Roschelle (2010), Sharples (2005), Rollans (2007) and Becta (2009a). Facer et al. (2004) believes this should be enough of an incentive for teachers to at least begin to engage with m-learning. A second consideration for Facer et al. (2004) is that some in the educational arena are themselves realising the potential offered by portable devices. For these 'early adopters' (Rogers, 2003) m-learning can enable pupils to interact simultaneously with both the physical and digital worlds. This shift offers new forms of learning experiences away from the classroom and promotes reflection for both the teacher and the pupils (Rochelle and Pea, 2002; Sharples et al., 2002).

Section 1.2.1 revealed the high regard that both Ofsted (2004) and Becta (2004a) hold Geography in when it comes to technology and learning. However a closer inspection of the literature revealed that the uptake of m-learning amongst Geography teachers is still in its embryonic stages which, as previously stated, helped ground this inquiry within a topical and cutting-edge field of research (Motiwalla, 2007). Researchers such as Wood et al.
(2004), Facer et al. (2004), Steward (2005) and Davey (2007) are just some educators who have researched the effects of m-learning within Geography. All the research projects found in favour of using mobile technology to enhance learning and recommended that teachers should engage more with this teaching and learning tool. According to Davey (2007) Geography pupils are extremely interested and engaged by m-learning and that the time is now ripe for teachers to assimilate this technology into lessons. Section 2.2.4 looks at the research of Davey and other Geography based m-learning projects in more detail.

2.2.2 M-Learning: Searching for a Definition

M-learning is a contested and multi-faceted term (Coyle et al., 2007). It means different things to different people. According to Kukulska-Hulme and Traxler (2005) m-learning is both a new reality and one that has some familiar connotations. European and Government agencies espouse its relationship to e-learning, technologists place an emphasis on novelty and device functionality, some researchers focus on the mobility of the learner, whilst others concentrate on learning in informal settings (Coyle et al., 2007). While this breadth of perspectives is welcomed by some (Coyle et al., 2007), because it leads to many possibilities for learners, it does create problems when attempting to define m-learning research.

M-learning is concerned with the learner being mobile, being able to move about freely without being confined by a delimited physical location while they learn (Kukulska-Hulme and Traxler, 2005; Sharples, et al., 2007; Sharples, et al., 2009). At its most basic level m-learning does not necessitate the use of technology. It can simply refer to a motivation enabling learners to learn from books, people, places or technology as they move about (Kukulska-Hulme and Traxler, 2005; O'Malley et al., 2005). However in today’s educational arena m-learning has a new associated meaning. Wood for example defines m-learning as,

....the use of mobile and handheld IT (Information Technology) devices, such as PDAs, mobile phones, laptops and tablet PCs, in teaching and learning (2003, p. 65).

O’ Malley et al. view m-learning as,

....taking place when the learner is not at a fixed, predetermined location, or when the learner takes advantage of the learning opportunities offered by mobile technologies (2005, p. 7).
Kukulska-Hulme and Traxler, like others (Sharples, et al., 2005; Sharples, et al., 2007; Sharples, et al., 2009), build on this definition and emphasise what makes m-learning unique as a modern concept is the employment of a portable device. They clarify that m-learning is now used to constitute,

...the possibilities opened up by portable, lightweight devices that are sometimes small enough to fit in a pocket or in the palm of one's hand (Kukulska-Hulme and Traxler, 2005, p. 1).

Examples of the devices (see Section 2.3.2 for more information) referred to by Kukulska-Hulme and Traxler (2005) include mobile phones, smartphones, palmtops and handheld computers (e.g. PDA), tablet PCs, laptop computers and personal media players (e.g. iPod). The common thread with all these devices are that they can be carried around with relative ease and when required utilised for communication, teaching and learning activities. Through the use of such devices learning can then,

...be spontaneous, personal, informal, contextual, portable, ubiquitous (available everywhere) and pervasive (so integrated with daily activities that it is hardly noticed) (Kukulska-Hulme and Traxler, 2005, p. 2).

Kukulska-Hulme and Traxler (2005) are eager to point out that with these attributes m-learning has much in common with other types of non-portable technology, such as the PCs. Therefore educators should not ignore this technology; instead they should be searching for ways to integrate it into their lessons to allow pupils to learn through and with mobile devices (O'Malley et al., 2005). With this recommendation in mind and the fact that m-learning is now moving beyond the short-term, small-scale pilot projects and becoming more accessible this inquiry sought to examine the extent to which m-learning enhanced pupils' learning. This decision places the inquiry into the same category as recent research carried out by Burkett (2008) and Davey (2007) for example. Burkett (2008) and Davey (2007) are both teachers who instigated action research, involving a small group of pupils, helping to add breadth and depth to a field of research investigating the impact of mobile technology on learning. Sections 2.2.3 and 2.2.4 look more closely at these research examples.

2.2.3 The Current Position of M-Learning in Education

As a result of the historical developments, outlined in Section 1.5, the ground work and ICT infrastructures were put in place to support the integration of m-learning. Stead states that,
In a short space of five years, mobile learning (m-learning) has moved from being a theory, explored by academic and technology enthusiasts, into a real and valuable contribution to learning (2005, p. 1).

Wagner (2005) like others (Kukulska-Hulme and Traxler, 2005; Faux et al., 2006) accepts Stead’s (2005) assertion that m-learning is a relatively new pedagogical option for teachers. Before 2005 there would have been no strong reason for looking beyond laptops (Wagner, 2005). However recent advances in handheld devices have now provided a real incentive for teachers to engage with m-learning and consider it as a viable tool for helping to enhance learning and pupil self-esteem (Attewell, 2005). For Wagner (2005) advances in mobile technologies have not just served to heighten the interest of teachers but have made handhelds part of our social fabric. An assertion supported by Prensky’s (2001) notion of pupils as digital natives. Most secondary school pupils now own a mobile device of some kind (Smithers, 2006, Mobile Life, 2006), which means the vast majority of pupils already have a high degree of competence in using such technology.

Despite the ownership of mobile devices having risen (Smithers, 2006; Tryhorn, 2009) there is still no statutory directive requiring teachers in NI or the rest of the United Kingdom (UK) to incorporate m-learning into their teaching. The current position in schools across the UK is that m-learning is still very much in its embryonic stage (Beetham and Sharpe, 2007). This means that leadership surrounding m-learning integration into the curriculum is largely dependent upon a bottom-up approach rather than top-down. Its use as a tool to enhance learning is very much determined by individual teacher initiatives, which in turn require support from SLTs to advance pedagogy involving mobile technology. Faux et al. (2006) notes a number of reasons why teachers have become interested in m-learning, such as personal conviction or individual teachers’ having the necessary ICT skills and competencies which drives them to engage with cutting-edge technology. Secondly, teachers also want to encourage personalisation of learning and enhance learner responsibility. Mobile technologies also overcome logistical issues surrounding booking the school’s computer room. Handheld devices facilitate learning anytime and anywhere. The fourth reason given by Faux et al. (2006) corroborates other research (Prensky, 2001, 2007; Sharples, 2007; Rollans, 2007; Becta, 2009a; Sharples and Roschelle, 2010), which asserts that teachers must take into account the digital world where pupils live outside of school.

A review of research literature provides many examples where groups or individuals have investigated the role and impact of m-learning on pupils. Frohberg et al. (2009) reviewed
102 m-learning projects published before the end of 2007 and asserts that since then the number of projects incorporating mobile technology has increased significantly. Science Created by You (SCY, 2011), LETS GO (Learning Ecology with Technologies from Science for Global Outcomes) (CeLeKT, 2011) and the Personal Inquiry (PI) projects co-led by the University of Nottingham and the Open University (Sharples et al., 2011) are all examples of more recent ventures centred on mobile technology within school-based Science lessons. Whilst all the findings have not yet been published, as first two projects are still ongoing, the signs are positive in terms of the potential benefits afforded by mobile technology. SCY and LETS GO have demonstrated the appeal and motivational attractions of using mobile technology and they have also demonstrated how m-learning can encourage collaboration and a constructivist approach to learning (de Jong et al., 2010) The results of one trial from the Personal Inquiry projects showed an increase in enjoyment and there was a positive effect on learning outcomes (Sharples et al., 2011).


\[ \ldots \textit{present an exciting opportunity for educational technology} \ldots \] (2003, p. 11).

For Roschelle (2003) m-learning is a pedagogical tool which enables teachers to create a more up-to-date and interactive learning environment, whilst offering pupils a more stimulating and memorable experience. However, Roschelle is conscious of the costs, both in terms of time and money, associated with the integration of mobile technology into school-based learning. Norris and Soloway (2008) are also very aware of the cost and technical implications associated with using mobile technology, but they highlight school-based m-learning in Alvin, Texas and Kailua Kona, Hawaii and state that if handheld technology is used appropriately then learning can be enhanced. For Norris and Soloway (2008) m-learning is a personal and portable way to provide pupils with a multimodal and constructive approach to learning. In other words the technology allows pupils to access an array of media, sound, video and communications at a pace which suits each individual, whilst still remaining compact and lightweight. The studies from Texas and Hawaii illustrate the motivational and enjoyment benefits of m-learning and they also help to highlight that pupils’ verbal and written communication improved and so too did their knowledge and appreciation of the topics under investigation.
The studies by Liu et al. (2003) and Chang et al. (2003) support the findings of Norris and Soloway (2008) but they also reveal the potential of m-learning to help pupils solve problems, become more interactive and collaborative and they demonstrate that mobile technology allows teachers greater opportunities, compared to traditional lessons, to monitor pupil performance. According to Liu et al. (2003) teachers are then better placed to provide more meaningful guidance to pupils. However Liu et al. (2003) and Chang et al. (2003), like Weeden (2000) and Roschelle (2003), take every opportunity to stress that not every teaching activity can or should include the use of mobile technology. The focus must remain on the subject content and teachers needs to decide on whether the same outcomes can be achieved through the use of other or similar interventions.

In Chile studies into the effects of m-learning in schools by Zurita and Nussbaum (2004) and Zurita et al. (2005) also provide evidence of the potential of mobile technology to enhance learning. Zurita and Nussbaum (2004) and Zurita et al. (2005) discovered that m-learning enhanced pupils’ co-ordination, communication, organisation, negotiation skills, synchronicity, interactivity and mobility compared to traditional classroom-based lessons. At a deeper level the findings by Zurita et al. (2005) also revealed that m-learning can help streamline collaborative work making group enterprises more productive. However, the finds were not designed to be generalisable so caution needs to be applied by anyone using mobile technology with groups.

Other examples of m-learning research projects, from a European perspective and therefore increasing their relevance in terms of this inquiry, include Ericsson (2002), LSDA (2003), Mobileam (2005), Attewell (2005) and Huizenga et al. (2009) and on a slightly smaller scale Burkett (2008) conducted action research into the benefits of using mobile devices to support pupils’ learning. Although not necessarily Geography-specific these inquiries, with the exception of Huizenga et al. (2009), were all conducted over a year or more and mark the transition from device-centred to learner-centred research. As mobile devices have become more functional, powerful and discrete some (Huizenga et al., 2009) integrated games-based technology in an attempt to investigate the development of strategic thinking whilst others (Burkett, 2008) focused more on notions of interactivity.

An in-depth review of the aforementioned studies reveals that initial research by the ‘innovators’ (Rogers, 2003) into m-learning tended to be relatively large-scale involving many partners (Mobileam, 2005), to provide support, and often survey-based (Ericsson, 2002; LSDA, 2003; Attewell, 2005). Only recently, as technological advances and cost effectiveness have combined with greater teacher ICT expertise is there an increase in
small-scale initiatives (Burkett, 2008) by the ‘early adopters’ (Rogers, 2003). Although this is not to suggest that the larger scale initiatives (Huizenga et al., 2009) have ceased or diminished. The small-scale inquiries however, are heavily reliant on individual teacher initiative. In terms of generalisability the larger studies are certainly welcomed, as the validity and reliability of their conclusions are enhanced not only by large numbers (Huizenga et al., 2009) of participants but also by an international perspective (Mobilearn, 2005; Attewell, 2005). Huizenga et al. (2009), for example, carried out research far beyond the scope of this inquiry involving 458 pupils (20 classes) aged between 12-16 years. The focus of the inquiry was to determine the extent to which pupils’ engagement, motivation and learning increased as a direct result of an active game-based m-learning activity, centred on Amsterdam city. In their evaluation of mobile game-based learning Huizenga et al. (2009) did conclude that m-learning increased pupils’ level of engagement, motivation and knowledge, although their research could not determine the extent to which mobile technology was responsible. There were discrepancies over the role that technology played and the extent of learning which occurred because the pupils worked actively within the context of medieval Amsterdam. Another criticism of the research undertaken by Huizenga et al. (2009) was that the pupils only got to experience the m-learning activity for one day. Therefore the validity of the conclusions must be questioned as the time span might not have been sufficient for pupils to become familiar with the task or the technology. A lack of familiarity would certainly have prejudiced the views of the pupils, their responses and in turn the data collected. On a positive note the research did highlight the fact that technical glitches, such as loss of GPS and time spent loading data, were to be expected.

For those inquiries involving a small number of participants (Ericsson, 2002; Burkett, 2008) they often have to contend with accusations regarding possible limitations to the reliability and validity of their findings (Lincoln and Guba, 1985; Schofield, 1990). Schofield (1990) argues however that when inquiries depend on a small number of participants they can in fact benefit from rich qualitative data that serves as a point of reference for others conducting similar research. Therefore the fact that Ericsson (2002) and Burkett (2008) discovered that the majority of participants had fun using mobile technology and that most would recommend it as a method of study to others gains real merit within qualitative research. Ericsson (2002) and Burkett (2008) also discovered that the majority of participants witnessed enhanced communication when using mobile technology yet occasionally technical problems, such as downloading and resolution issues, did arise. The crucial point about these small-scale inquiries however, is that they act as an important incentive for other researchers and provide creditable data to allow comparisons and similarities to be drawn.
On a critical note, out of the all the inquiries referenced within this section, only two (Burkett, 2008; Huizenga et al., 2009) stem from the formal educational setting and only one (Burkett, 2008) focuses on GCSE level. All the other research relates more to ‘young adults’ (LSDA, 2003; Attewell, 2005) or informal education (Ericsson, 2002; Mobilearn, 2005). The conclusion from this observation is that there is a need for more research into the effects of m-learning within the formal educational arena. Another criticism relating to the inquiries is that they placed the mobile device centre stage. LSDA (2003) and Attewell (2005) for example were very keen to discover the main reasons why young adults used their mobile device, such as for phone calls, text, email, music, photographs. Burkett’s (2008) inquiry did however take the use of the device to a more interactive level, but it still required the 50 participants to trigger the events ensuring the activity was presented in a linear fashion as pupils experienced artwork during a gallery tour. There were also logistical and safety concerns involved with getting pupils to and from the gallery. From a beneficial perspective however, pupils were less reliant on the teacher or gallery staff for information, rather they were able to ‘interact’ with the art work and learn more about previous unseen pieces of art. For Burkett (2008), and other researchers carrying out similar school-based m-learning tasks, her small-scale inquiry held two important outcomes; educators need to focus more on ‘how’ pupils learn rather than on ‘what’ they learn and secondly, increased teacher reflection on practice when using m-learning is critical to future success.

On a positive note all of the research projects found that m-learning provided pupils with unique opportunities to enhance learning (Attewell, 2005). Burkett in particular discovered that because pupils were at ease with the technology, as it was part of their everyday normal life, this encouraged a high level of engagement and promoted an enjoyable and positive experience. For most pupils however the design and subject-specific content of the m-learning activities were crucial in making learning fun and sustaining enjoyment (LSDA, 2003). The portability of the devices also served as an encouraging aspect of m-learning, with most participants of the research projects stating that this helped to make learning more personal. This personalisation helped to change perceptions on learning. Learning was no longer seen just as classroom-based activity but as an experience that could be conducted anytime and anywhere with the learner having complete control on the pace of delivery and content could be easily revisited (LSDA, 2003; Attewell, 2005; Mobilearn, 2005; Burkett, 2008). Research into m-learning has also discovered that the technology often presents pupils with a choice to work autonomously, collaboratively or a combination of both, unless directed otherwise by the task or teacher (Attewell, 2005; Mobilearn, 2005; Burkett, 2008). The privacy that using a handheld device affords appeared liberating to participants and
helped instil a sense of responsibility and self-empowerment. With an increased sense of responsibility pupils were able to become more autonomous and communicate more confidently using subject-specific terminology (Attewell, 2005; Burkett, 2008). Burkett was fascinated to discover that the development of personal confidence that came from working independently appeared as a pre-condition for the pupils’ subsequent constructive collaboration. For Burkett collaboration was the consolidation stage of learning where pupils through social interaction with their peers needed to embed and verify the knowledge they received through the m-learning activity. Burkett’s research saw pupils as recipients of the m-learning activity, they were not involved with the design and construction stages, but research from Mobilearn (2005) and Wood et al. (2004) has demonstrated that collaborative learning experiences were valuable at these earlier stages as well as at the consolidation phase.

The notion of collaboration relates closely to constructivist learning theories and according to Naismith et al. (2004) mobile devices can support constructivist learning activities (see Section 2.4). They suggest m-learning can help create a constructivist learning framework which encourages pupils to discover principles for themselves. Burkett (2008) also observed pupils constructing knowledge for themselves as they interacted with the mobile device and began to analyse features they might otherwise have overlooked. This interaction also made learning active and motivational for some participants helping to enhance the learning process and improve performance (Attewell, 2005; Burkett, 2008). It also helped inspire reluctant learners and retained pupil focus longer than in normal classroom conditions (LSDA, 2003).

The multifaceted nature of m-learning, which delivered high quality and colourful audio-visual stimuli, was also found to be an attraction of m-learning (Ericsson, 2002; Burkett, 2008). So too the fact that content tended to be interactive and dynamic which for some enhanced the ‘novelty’ factor of m-learning (Mobilearn, 2005; Burkett, 2008). Research by LSDA (2003), Attewell (2005) and Burkett (2008) also revealed that m-learning helped foster greater participant self-esteem whilst improving literacy and ICT skills. This enabled pupils to communicate more confidently with each other using more subject-specific terminology. A final key finding of the research projects listed in this section was the fact that m-learning allowed pupils to problem-solve with greater clarity and identify areas where they needed support.
2.2.4 M-Learning within Geography: What are the Benefits and Limitations?

As Section 1.2.1 revealed m-learning within Geography, particularly at secondary level, is still in an exploratory phase. The literary examples that are available are often small-scale case studies, involving one or two classes, which supports the view that m-learning is still sporadic and limited to individual teacher initiative (Steward, 2005; Davey, 2007). On a positive note these ‘early adopters’ (Rogers, 2003) act as an incentive for other teachers, interested in using mobile technology, but worried about the manageability to become involved (Wishart, 2009). The scale of these activities makes the m-learning venture more controllable for teachers, and helps to place this small-scale inquiry within an accepted practice and a field of interest.

To date there have been a number of key research inquiries carried out into the impact of mobile technology within the subject of Geography. Simply put we can classify these into those that used mscapes (Facer et al., 2004; Wood et al., 2004; Battista, 2008) and those that did not (PEP, 2002; Steward, 2005; Davey, 2007). While this inquiry has more in common with the former a review of the latter research studies is also necessary as they help highlight the impact mobile technology has upon learning. With the exceptions of the tertiary level research, into the potential benefits for fieldwork (Steward, 2005), Davey (2007) and PEP (2002) grounded their research within the primary and secondary sector respectively. Davey (2007) was interested in exposing the effects of m-learning on pupil motivation, engagement and attainment through an urban study incorporating Geography and Maths. The research undertaken by PEP (2002) was also a fieldwork enterprise and centred on an investigation into a river’s water quality.

All the inquiries lasted several weeks and incorporated two or three classes into the study; which meant around 25-35 participants. With regards to support all three studies were largely left to their own devices in terms of acquiring the essential equipment and supplying the necessary training and skills. Therefore, it is clear that those leading the research had a positive vision of the usefulness of technology as a teaching tool. The reliance on individuals, rather than schools, organisations or educational authorities, to resource and deliver the m-learning tasks also helps explain why mobile technology has yet to penetrate into mainstream education. With regards the validity and reliability of these case studies they derive their merit through the following of accepted data collection and analysis methods. None of the studies however claim that their research findings are generalisable for others. Instead they conducted their inquiry and published the results providing a benchmark for others to compare their findings to. This is a critical point; the small-scale
inquiries do not make radical nor unsupported claims regarding their findings, it is left to others to draw conclusions and make comparisons (Schofield, 1990; PEP, 2002). On a critical note however, all three inquiries were too device-centred requiring the pupils to direct the activity by triggering relevant information as and when required. This leads to a linear activity, with limited interaction, which could have been conducted via other technology, such as a notebook or laptop.

In terms of the research involving mscapes there appears to be greater interactivity between the participants and the device (Facer et al., 2004). The activities are no longer dominated by pupils having to trigger events; instead GPS sensors now add an extra dimension helping to drive the activities, making them almost game-like (Facer et al., 2004). Early research into mscape application was undertaken by Facer et al. (2004) and they explored if the use of mobile technology could enable a rich, interactive and collaborative learning experience for ten secondary pupils aged 11-12. The pupils took part in a two day teacher-led game or simulation, which was driven by the GPS enabled Mscape Player and saw them assuming the role of a lion roaming the African Savannah. The intention was for pupils to learn about lion behaviour and by facing some of the challenges the animals would face in surviving the wild.

On a positive note Facer et al. (2004) conducted school-based research, involving a small sample population which was in keeping with the intentions of this inquiry. In terms of equipment the PDA was presented as the more suitable device, having the potential to host windows mobile as an operating system, which was a necessary prerequisite for Mscape Player. Another positive aspect of the inquiry was that participants periodically got the opportunity to review their progress on an IWB, which tracked their movement. This allowed for reflection and engaged pupils in the decision-making process as they contemplated their next move. Facer et al. (2004) discovered that when this reflection was led by the children the pupils became highly engaged and motivated yet when the teacher took control the pupils became more passive and resistant to engagement.

From a critical perspective however a number of concerns surfaced when reviewing the Savannah Mscape. The timeframe of the activity was not sufficient for the children to become familiar with the equipment or the rules governing the game (Facer et al., 2004). The activity also required the participating teachers to have a high competency in ICT and be open to the use of new technology. It also became clear that,
the use of games formats are unlikely to sit easily alongside traditional classroom power relations (Facer et al., 2004, p. 407).

Facer et al. (2004) discovered that teachers tended to direct pupils more when they were reflecting on their performance using the IWB. This phase of the activity tended to not inspire pupils and caused them to lose interest. By contrast when simulating the role of the lion pupils enjoyed the experience and viewed it as a fun activity.

Following Facer et al. (2004) geographical-based research involving mscapes was also conducted by Wood et al. (2004) and Battista (2008). The former, focusing on a sense of place and space, investigated how a class of 36 nine and ten year olds perceived or mapped their environments dependent on sound. In a similar vein to the study conducted by Wood et al. (2004), Battista (2008) carried out a project to enable a class of primary seven pupils and a class of Year 8 pupils to design and create a personalised interactive piece of fieldwork. Unlike Facer et al. (2004) the pupils of both these studies were involved with the creation phase of the activity, although Battista (2008) did acknowledge that pupils were slightly disadvantaged by not experiencing a prepared mscape as a starting point. This meant that pupils were not totally clear on what to expect or what the proposed learning intentions were. Jarvis et al. (2009) also highlights that when participants are involved with the creation of an mscape those leading the activity need to tread carefully. An expertise gap often exists between the using of the Mscape Player and the Mscape Toolkit. The latter involves design issues and this can be quite complex for both pupils and teachers as map importation and scripting can pose challenges.

It is also important to note that none of the studies mentioned so far take into consideration GCSE Geography, which helps to justify the need for more research inquiries similar to this one. Furthermore, it was discovered that none of the m-learning inquiries overplayed the generalisability of their research findings. Each one is viewed by the authors as a separate case study offering exemplars for teachers interested in pursuing m-learning within Geography. It is then up to interested parties to conduct their own research and draw parallels or differences where appropriate.

Taking a positive overview of all the aforementioned Geography related research projects it became evident that they reached similar conclusions as the research inquiries mentioned in Section 2.2.3. They acknowledged that the researchers were building on the reality that most participants already had some knowledge of mobile devices. They discovered that the portability of the technology was a massive appeal and that pupils found learning to be fun, enjoyable and motivational (Facer et al., 2004; Wood et al., 2004; Davey, 2007).
variety of stimulus offered by the devices ensured most pupils' learning needs were catered for (Davey, 2007). Davey also discovered the personalisation afforded by technology helped to empower pupils and sustain interest levels. In turn this increased self-confidence whilst improving more subject aware and appropriate language. Facer et al. (2004) and Wood et al. (2004) focused on the fact that m-learning provided unique opportunities for collaboration. This collaboration was proven to operate throughout the activity from conception and design (Wood et al., 2004) through to participation and post inquiry (Facer et al., 2004) as pupils constructed information from their social setting. Self-esteem, problem-solving and improved performance were also shown to be key outcomes of the inquiries.

While many of the outcomes mentioned above are applicable to most subjects the inquiries also made some important findings specific to Geography. Facer et al. (2004) and Davey (2007) discovered that during and after the m-learning activity pupils had acquired the knowledge and skills to communicate better using subject-specific terminology. The activity appeared to instil a sense of confidence and responsibility amongst the participants, which in turn empowered the pupils and helped them formulate coherent arguments and questions. The research also demonstrated that attainment and understanding of geographical topics had improved (Steward, 2002; PEP, 2002; Wood, et al., 2004; Davey, 2007; Battista, 2008). Davey (2007) in particular discovered that m-learning motivated learning beyond normal parameters and did raise achievement. There was a 48% increase in pupils' understanding of the geographical themes studied and pre- and post-test results demonstrated that pupils had increased geographical and ICT learning by accomplishing all the goals of the inquiry.

The research by Wood et al. (2004) was able to prove through involvement within the design phase that pupils achieved a greater sense of 'place', a central geographical theme. Another outcome was the discovery that using handhelds in Geography helped pupils interpret and make meaning out of the world (Wood et al., 2004). However, all the research projects emphasised the need to weigh up the benefits and limitations associated with m-learning before committing to the use of mobile technology. Figure 2.1 reviews the benefits and limitations that the researcher discovered as part of the literature review.
<table>
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<tr>
<th>CLASSIFICATION</th>
<th>BENEFITS</th>
<th>LIMITATIONS</th>
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<tr>
<td><strong>Affective Factors</strong> (i.e. emotive)</td>
<td>Helps engage and motivate pupils (Facer et al., 2004; Attewell, 2005; Huizenga et al., 2009)</td>
<td>Mobile technology is not for everyone (Sharples, 2007)</td>
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<td></td>
<td>Stimulates learning – makes it interesting, fun and enjoyable (LSDA, 2003; Davey, 2007; Attewell et al., 2010)</td>
<td>Initial learner motivation is required (Stead, 2005)</td>
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<td></td>
<td>Exciting and interesting (Sharples, 2007)</td>
<td>Can be time-consuming developing resources and becoming familiar with new technology (Bate, 2008)</td>
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<td>Can increase pupil autonomy, responsibility and self-esteem (Mobile, 2005; Burket, 2008; Attewell et al., 2010)</td>
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<td></td>
<td>Raises pupil and teacher expectations (Attewell et al., 2010).</td>
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<td><strong>Cognitive Factors</strong> (i.e. learning through reasoning and logic)</td>
<td>Improves communication and promotes the use of subject-specific terminology (Davey, 2007; Burket, 2008)</td>
<td>Teachers need to be wary for content overload (Futurelab, 2006; Battista, 2008)</td>
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<td></td>
<td>Can improve subject-specific and ICT knowledge, understanding and skills (Davey, 2007)</td>
<td>Logistiscs of collaborative mobile tasks may cause problems if not organised appropriately (Futurelab, 2006)</td>
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<td></td>
<td>Learning can be more personal (Loveless et al., 2008)</td>
<td>Technical problems may disrupt the cognitive process (Sharples, 2007)</td>
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<td>Can facilitate collaborative learning (Loveless et al., 2008; Attewell et al., 2010)</td>
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<td></td>
<td>Can increase performance and attainment levels (Davey, 2007)</td>
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<td>Helps maintain attention capacity, particularly for reluctant learners (LSDA, 2003)</td>
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<td>Facilitates different learning styles (Sharples, 2007)</td>
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<td>Can assist pupils in solving-problems (Wood et al., 2004; Facer et al., 2004)</td>
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<td></td>
<td>Makes learning active and participatory (Facer et al., 2004; Battista, 2008)</td>
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<td><strong>Pedagogical Factors</strong> (i.e. teaching strategies/techniques)</td>
<td>Acts as a tool to enhance learning (Huizenga et al., 2009)</td>
<td>More difficult to observe and monitor pupils outside of the classroom (Futurelab, 2006)</td>
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<td></td>
<td>Through the use of mobile technology teachers and pupils can lead by example (Kukulska-Hulme and Traxler, 2005)</td>
<td>Assessing m-learning tasks may be difficult if learning intentions are not recognised and communicated to pupils (McFarlane et al., 2007)</td>
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<td></td>
<td>Offers choice to teachers and pupils (McFarlane et al., 2007; Attewell et al., 2010)</td>
<td>Some pupils may be apprehensive about using mobile technology as a learning tool (McFarlane et al., 2007)</td>
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<td></td>
<td>Enables learning to take place outside traditional teaching venues (Economides and Nikolaou, 2008; Sharples and Roschelle, 2010)</td>
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<td>Different than traditional teaching tools (Economides and Nikolaou, 2008)</td>
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<td></td>
<td>M-learning can act as a virtual world where pupils can have relative safety and experience geographical locations and processes they might never have the opportunity to witness (Facer et al., 2004; Davey, 2007)</td>
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<td><strong>Practical Features</strong> (i.e. useful)</td>
<td>Adaptable (Economides and Nikolaou, 2008)</td>
<td>Designing, resourcing and creating m-learning activities can be time-consuming (Wood et al., 2004; Battista, 2008)</td>
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<td></td>
<td>Ease of resource development (Wood et al., 2004)</td>
<td>Sun glare on the screen may have a detrimental effect on the m-learning activity (Bradley et al., 2009)</td>
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<td>Improves neatness and presentation (McFarlane et al., 2007; Attewell et al., 2010)</td>
<td>Continued skill development needed (Sharples, 2007)</td>
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<td></td>
<td>Labour saving technology (Economides and Nikolaou, 2008; Attewell et al., 2010)</td>
<td>M-learning has yet to be embedded or supported on a large scale by educational authorities such as DENI (Stead, 2005; Keegan, 2005)</td>
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<td>Paperless (Economides and Nikolaou, 2008)</td>
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<td></td>
<td>Modifications can be easily made (PEP, 2002; Battista, 2008)</td>
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<td><strong>Professional Factors</strong> (i.e. teacher-based)</td>
<td>Helps professional development (McFarlane et al., 2007)</td>
<td>Teacher may be threatened by a feeling of less control (McFarlane et al., 2007; Sharples, 2007; Sharples and Roschelle, 2010)</td>
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<td>It can improve job satisfaction (McFarlane et al., 2007)</td>
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<td>Can minimise workload (Economides and Nikolaou, 2008)</td>
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<td><strong>Social Factors</strong> (i.e. link with mobile use in everyday life)</td>
<td>Allows pupils to work together (Loveless et al., 2008)</td>
<td>Issues of safety online and of security in carrying mobile devices (Becta, 2009b)</td>
</tr>
<tr>
<td></td>
<td>Cutting edge, modern and popular (Becta, 2004a, McFarlane et al., 2007)</td>
<td>Pupils may be distracted by additional mobile applications or by others if participating in group work (Wood et al., 2004; Battista, 2008)</td>
</tr>
<tr>
<td></td>
<td>Accessibility – up-to-date information anytime anywhere, e.g. mobility (Economides and Nikolaou, 2008)</td>
<td>Some pupils may feel isolated when using earphones (Burket, 2008)</td>
</tr>
<tr>
<td></td>
<td>Taps into the digital world pupils are already experiencing (Kukulska-Hulme and Traxler, 2005)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Interactive (Sharples, 2007)</td>
<td></td>
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<tr>
<td></td>
<td>Helps pupils prepare for life outside of school (Kukulska-Hulme and Traxler, 2005)</td>
<td></td>
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</table>

*Figure 2.1 is continued on the next page*
<table>
<thead>
<tr>
<th>CLASSIFICATION</th>
<th>BENEFITS</th>
<th>LIMITATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technological</td>
<td>Supports and delivers multimedia content (Sharples, 2007)</td>
<td>Some may be intimidated by using technology they know little about (Atewell, 2005)</td>
</tr>
<tr>
<td>factors</td>
<td>Small size of the device a bonus (Economides and Nikolaou, 2008)</td>
<td>Technical glitches can cause frustration and negatively impact on the learning outcomes (Sharples, 2007)</td>
</tr>
<tr>
<td>(i.e. device-centred issues)</td>
<td>Allows information to be easily manipulated, stored or transferred (Economides and Nikolaou, 2008)</td>
<td>Loss of connectivity can occur, e.g. internet or GPS (Facer et al., 2004)</td>
</tr>
<tr>
<td></td>
<td>Enhanced functionality (Economides and Nikolaou, 2008)</td>
<td>Regular charging can be a nuisance (Economides and Nikolaou, 2008)</td>
</tr>
<tr>
<td></td>
<td>Light weight and portable (Economides and Nikolaou, 2008)</td>
<td>Small screen size can be an issue (Economides and Nikolaou, 2008)</td>
</tr>
<tr>
<td></td>
<td>Easy to use (Economides and Nikolaou, 2008)</td>
<td>M-learning can be expensive and does require constant updating of equipment (Trinder 2005; Economides and Nikolaou, 2008)</td>
</tr>
<tr>
<td></td>
<td>Can be integrated with GPS technology (Economides and Nikolaou, 2008)</td>
<td>Limited memory and storage capacities can pose problems (Economides and Nikolaou, 2008)</td>
</tr>
<tr>
<td></td>
<td>Can support windows mobile operating systems, which makes navigation around the device more efficient (Economides and Nikolaou, 2008)</td>
<td>Existing applications are not easily integrated to mobile technology (Economides and Nikolaou, 2008)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pace of technological advance can demoralise some teachers and pupils (Traxler, 2009a)</td>
</tr>
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</table>

2.3 Mscapes: Assisting Mobile Learners

2.3.1 What are Mscapes and how can they Assist M-learning?

A place is a place. A mediascape is an experience. Mediascapes are rich in interactivity - full of sound and music, images and text, videos and animation, narrative and dialog, all embedded in the space where you’re standing (HP, 2008).

Designed by Hewlett and Packard (HP) Labs (HP, 2008), for mobile devices, the Mscape Player enables people to take part in located-based experiences for fun and/or educational purposes. To take part in a mscape a GPS enabled mobile device (e.g. personal digital assistant (PDA) or smartphone) is required and a set of earphones (Futurelab, 2006); which as Section 2.3.2 demonstrates can be costly in terms of both money and time when searching for a suitable device.

Until recently many m-learning activities (Davey, 2007; Burkett, 2008) have centred on the mobile device and used this technology simply to present audio-visual stimuli through a series of interactive prompts, all designed to elicit responses from pupils. The construction of a set of interactive triggers, requiring participants to respond as they moved around a defined space, helped to augment learning. As pupils made discoveries and observations in the real world they were then enticed to interact with the technology to help construct meaning. However, these research inquiries were somewhat limited; they did not use the full potential of the mobile device. As Section 2.2.4 highlighted there was an over reliance...
on participants to self-report by manually triggering the delivery of media, meaning the application behaved like a linear guided tour (Stenton et al., 2007). This exercise could easily have been conducted through other technology, such as laptops or notebooks, or even via traditional pen and paper in the form of a structured questionnaire.

The mscape application offers the user a far more involved and integrated experience than some of the aforementioned research inquiries. A mscape is,

....media rich, context-aware, physical, and mobile, and it can be social or personal as well. The media used can include images, video, audio, and flash interaction (Stenton et al., 2009, p. 99).

This description highlights the breadth and depth of the mscape application, in terms of content delivery and usability. It portrays mscape as a multi-faceted learning tool capable of reaching a variety of learners. What makes the mscape experience different from other media rich experiences delivered through mobile devices is the ‘logic that specifies the relevance it has to the physical situation’ (Stenton et al., 2007, p. 99). Mscapes superimpose our every day environments with a ‘digital canvas’ meaning locations are ‘geo-tagged’ with multimedia (Loveless et al., 2008, p. 346). By integrating global positioning systems (GPS) with mobile devices sensors can be used to trigger the multimedia. This means if a person walks into a specific space, then the device triggers the media according to the logic assigned to that space. Mscapes therefore are not reliant on self-direction and in fact logic may specify a behaviour that depends on the number of times a person walks into a space removing the feeling of a linear and guided tour (Stenton et al., 2007).

The versatility of content and the fact that the mscape is situated encourages participants to experience new interactions with their environment (Create-A-Scape, 2006). Mscapes also offer potential for independent and collaborative work (Create-A-Scape, 2006; Stenton et al., 2007), whilst making learning fun and improving digital literacy skills (Create-A-Scape, 2006). Research involving mscapes has demonstrated that pupils do enjoy experiencing them and making them (Futurelab, 2006). Loveless et al. believe that mscapes enables the creation of activities which afford ‘rich learning experiences’ (2008, p. 354). Futurelab (2006) and Loveless et al. (2008) also assert that mscapes cater for small groups or those wanting a personal experience as well as larger groups or those interested in collaborative learning. For Loveless et al.,

....mediascapes can be inherently integrative for pedagogy, curriculum and technology in a wide range of learning contexts (2008, p. 355).
Teachers however need to consider carefully a number of key issues before embarking on a mscape (Futurelab, 2006). They must determine the ICT literacy of the intended pupils and decide upon how many participants to include in the mscape activity. They must also determine who will resource and create the mscape as well as defining the learning intentions and clarifying if the activity is to be completed independently or collaboratively. The cost of the technological kit and amount of time available, amidst an already heavy teaching timetable, needs to also be taken into consideration along with the selection of a suitable and safe location for the mscape (Futurelab, 2006).

The cautions highlighted by Futurelab (2006) are not the only concerns facing teachers contemplating the use of mscales. Acknowledgement must be given to the fact that mscales were not designed specially for educational purposes. HP has targeted business, research, broadcasting as well as academic communities. Therefore the level of support and guidance will not always be pupil or teacher-centred. In addition, some teachers may have the desire to use mscales yet lack the necessary ICT competencies, particularly if scripting is required. Therefore designing mscales may require ‘....a new set of skills, techniques and artistry’ (Stenton et al., 2007, p. 102). The acquisition of these new skills and techniques may be costly in terms of time and money. For other mscape users based within the educational arena problems can surface in relation to obtaining and calibrating base maps for the activity (Loveless et al., 2007). The loss of GPS signal and other technical glitches, associated with add-on applications such as Flash, may also cause the application to freeze and to compound matters screen glare in bright sunlight can adversely affect the experience for users (Loveless et al., 2007). Although, mscales are still relatively new and uptake amongst 'early adopters' (Rogers, 2003) is still limited with just over 1000 downloads of the software worldwide in 2007 (Stenton et al., 2007) Loveless et al. (2007) do stress positive effects of the application. Through an evaluation of mscales, involving two educational authorities, one primary and one secondary school and one special school, Loveless et al. (2007), concluded that the effects on pupils' engagement, involvement, enthusiasm and motivation were constructive. They described pupils' experiences as 'enriching, engaging and eye-opening' (Loveless et al., 2007, p. 2).

2.3.2 The Technical Equipment

Small mobile devices can now offer comparable attributes to personal computers (PCs) and laptops. But the advantages offered by the more compact and lighter devices are their increased mobility and the fact that the majority of pupils are familiar with this technology.
This means that m-learning can encourage greater interactivity and help in the immediate transfer of knowledge (Kukulska-Hulme and Traxler, 2005, p. 2). However, due to the extensive and ever increasing range of handheld technologies it would not have been practical to review every device. Yet in terms of selection Trinder believes any decision will inevitability rely on the subjectivity of the researcher, ‘...what suits one person may not suit another’ (2005, p. 22). When designing an m-learning activity it is essential the correct mobile technology is chosen or else the activity and its ability to enhance learning may be compromised (Trinder, 2005; Waycott et al., 2005). The suitability and availability of the handheld device are the two most important factors when choosing which mobile technology to use (Economides and Nikolaou, 2008). With regards to availability this tends to be more of a practical concern and centres on issues such as access to and the cost of the equipment. Suitability on the other hand refers to the appropriateness of the mobile device to deliver the m-learning activity as it was intended (Economides and Nikolaou, 2008). In terms of suitability Trinder (2005) and Economides and Nikolaou (2008) stress that before embarking on any activity it is important to determine what functionality is required from the device. In other words the device must be fit-for-purpose. Figure 2.2 reveals some of the attributes Economides and Nikolaou (2008) believe are important when undertaking m-learning.

Choosing a SUITABLE Device: Key Attributes Required from the Mobile Device

![Fig 2.2]

Based on device characteristics and recommendations by Economides and Nikolaou (2008)
Once the key attributes have been reviewed researchers are then best placed to start focusing on suitable devices (Economides and Nikolaou, 2008). Kukulska-Hulme and Traxler (2005) highlight that a number of mobile devices exist such as video recorders, cameras, movie players, games consoles, e-books, personal organisers, music players, PDAs, smartphones and mobile phones. However, for researchers some of the aforementioned devices may not be suited to certain types of m-learning tasks. Educators, for example, may wish to do more than take pictures, play music or simply make telephone calls and some (Metcalf, 2006) highlight that the mobile phone often lacks the necessary functionality in terms of applications and memory compared to the smartphone or PDA.

For some (Metcalf, 2006; Economides and Nikolaou, 2008) there is a belief that smartphones are hybrid devices combining aspects of mobile phones with basic computing capabilities, similar to a PDA. To some extent this is true; smartphones offer all the usual attributes of a typical mobile phone but it combines an operating system, much like a PDA, which allows for a standardised user interface and a greater number of applications to be stored and utilised (Economides and Nikolaou, 2008). However, at the time the Mscape activities were taking place (January-April 2009) smartphones were still quite recent and developmentally had some way to go to provide the same cost efficiency and application benefits as the PDA (Metcalf, 2006; New York Times, 2009) or present day smartphones. Smartphones also tend to have a smaller screen than the PDA which can reduce the visual experience for pupils and finally they offer increased risks by providing access to phone facilities (Economides and Nikolaou, 2008).

After reviewing literature surrounding the suitability of devices two important conclusions began to emerge. Firstly, most reviews of handheld devices for m-learning stemmed from the technical side. Further research is clearly needed to,...

investigate the educational advantages and disadvantages of using handheld devices from the educational and pedagogical side (Economides and Nikolaou, 2008, p. 20).

Secondly, the PDA began to materialise as the more suitable device for having the functionality to host mscapes. PDAs are multifunctional and have sufficient memory allowing users to store and use a range of computer programs. They are not as versatile in terms of storage capacity, memory application and program availability as a desktop or laptop but they are more advanced in these areas than a mobile or smartphone (Economides and Nikolaou, 2008). PDAs also tend to have an advanced operating system and usually do not have the facility to make phone calls. Other positive features that PDAs offer are the larger screen size, compared to the mobile phones, most also have GPS facilities and the
reliance on touch screen functionality which helps boost greater user interactivity (Kukulska-Hulme and Traxler, 2005). In terms of the iPAQ a number of mscape-based inquiries (Facer et al., 2004; Wood et al., 2004; Reid et al., 2007; Quinn and Cartwright, 2009) have specifically targeted this PDA for its enhanced functionality, portability, compatibility with Mscape Player, Flash and larger screen which offered increased interactivity for users. The appeal of the iPAQ was further enhanced for these inquiries because it acted as a contained device that could be set up to prevent pupils from accessing email, the internet, making calls or sending or receiving texts.

2.4 Do Theories on Learning Apply to M-learning?

A review of the literature indicates that there is currently a lack of m-learning theories (Sharples, et al., 2007; Sharples, et al., 2009), but recent developments suggest that new theories are being formulated (Muyinda, 2007; Traxler, 2009b). Sharples et al. (2005; 2007) and Traxler (2009b) advocate that there is a need to re-conceptualise learning for the mobile age. Sharples et al. (2005; 2007) have however suggested four pre-requisites for the formulation of an m-learning theory. Firstly, a distinction needs to be made between what is special about m-learning and other types of learning. Second, attention needs to focus on how mobile technology can support learning outside the classroom. Thirdly, any m-learning theory needs to embrace contemporary accounts of practices that make learning successful and the fourth pre-requisite is that m-learning must take account of the ‘ubiquitous’ use of personal and shared technology. These pre-requisites, and in particular the last one, negates Keough’s (2005) pessimism about m-learning being severely impeded by ever changing mobile technology.

According to Muyinda,

\[\text{In the absence of concrete theoretical underpinnings for m-learning, existing theories can be harnessed to provide a rich learning experience in m-learning (2007, p. 99).}\]

Naismith et al. (2004) during their review of m-learning literature have considered new practices involving mobile technology against existing learning theories such as behaviourism, constructivism, situated, collaborative, informal and lifelong learning, and learning and teaching support theories. The behaviourist learning theory advocates that learning has occurred when it can be observed from the learner’s actions. Essentially learning should invoke a stimulus and a response (Naismith et al., 2004). In m-learning this could be a question or activity presented on the screen of the mobile device and the learner
required to make a decision or sequence of actions to successfully fulfil the goal. The constructivist learning theory has a different perspective on learning. It centres on activities in which learners actively construct new ideas or concepts based on both their previous and current knowledge. Mobile devices have proven that they can assist learners in their quest for knowledge and help 'construct' new meanings. This can be done through downloading information or interacting with activities delivered through the mobile device to problem-solve and achieve a series of goals. M-learning also allows learners to use the mobile device as a tool which helps them construct knowledge autonomously or through collaborative efforts. The 'Savannah' research project by Facer et al. (2004) is an example of a constructivist learning experience (Naismith et al., 2004) - see Section 2.2.4.

Current assertions by Sharples et al., (2007; 2009) have built upon the constructivist theory. They argue that context is a central construct of m-learning along with exploration and conversation, which are the means by which individuals come to understand the world and enhance their knowledge. For Sharples et al., (2007; 2009) the context is an artefact created and continually modified by individuals as they interact with others, their surroundings and everyday tools, which includes mobile technology. Exploration is the search for information and answers and this is best achieved through conversation and interaction with others. Therefore for Sharples et al., (2007; 2009) mobile technology is a social constructivist device that helps create and modify the context whilst also assisting the learner to explore and interact with others as they construct knowledge; hence learning is not device-centred instead m-learning becomes embedded into the fabric of everyday life (Sharples and Roschelle, 2010).

Situated learning looks specifically at learning within an authentic context and culture. According to Naismith et al. (2004) mobile devices are well suited to context-aware applications simply because they are available in different contexts. Therefore learners can draw on those contexts to enhance the learning activity. The example provided by Naismith et al. (2004) is the use of mobile devices in museums and galleries to provide extra information on exhibits. With regards to collaborative learning theory this focuses the promotion of learning through social interaction. A telephone call between two people or a discussion about the information delivered through the mobile technology is an example of social interaction which could enhance learning.

The informal and lifelong learning theory emanates from the notion that learning can and does still occur outside of a dedicated and formal learning environment. There is no doubt that m-learning occurs outside of school-based environments as individuals engage with a
variety of mobile technologies all capable of extending knowledge and skill application. The final learning theory reviewed by Naismith et al. (2004) was ‘learning and teaching support’. This theory focuses on activities that assist in the coordination of learners and resources to allow learning to take place. Mobile devices have already infiltrated society to such an extent that they have already been used by teachers to record attendance, to review marks or they can simply allow teachers to manage their schedules (Naismith et al., 2004).

Clearly there is no one learning theory that is a perfect match for m-learning. Depending on the circumstances, context and goals, a mixture of approaches is needed. As Naismith et al. states,

*A blended approach to enable learning with mobile technologies is necessary as successful and engaging activities draw on a number of different theories and practices* (2004, p. 4).

### 2.5 Activity Theory

#### 2.5.1 What is Activity Theory (AT)?

AT originates from the work of Marxist philosophers as well as the writings of Russian cultural-historical psychologists Vygotsky, Leont’ev, and Luria (Engeström, 1999). According to Leont’ev (1978, cited by Aboulafia et al., 1995) AT, which has clear links within the constructivist learning tradition, emerged as a way to explain the developmental process where a person is shaped by and shapes their environment through activities. The basic concept of AT is that all human activities are mediated by culturally defined or created signs or tools. Through external interactions with these tools the internal mental state of the individual is transformed (Aboulafia et al., 1995). They believe that internal and external activities cannot be understood if analysed separately, because there are mutual transformations between these two kinds of activities. AT therefore focuses on understanding human activity and work practices whilst incorporating the notions of intentionality, mediation, history, collaboration and development (Nardi, 1996).

The foundation of AT is based on the assumption that human collective activity and individual mental processes are inescapably dependent on the social context of any given individual (Engeström, 1987; Prenkert, 2006). This belief led Engeström (1987) to formulate activity context as a network of different parameters or components that influence each other. See Figure 2.3.
Engeström’s (1987, p. 78) Model of the Structure of Activity Theory

![Figure 2.3](image)

Figure 2.3 is an over simplification of AT representing one depiction of AT by Engeström (1987), which encompasses the interrelationship between the seven key components and four higher order functions. The sub-triangles represent higher-order functions that arise from mutual relations among the seven components (Holt and Morris, 1993; Nardi, 1998). The ‘face’ of each sub-triangle represents an aspect of human activity: ‘production’, ‘distribution’, ‘exchange’ and ‘consumption’ (Youn and Baptiste, 2007). According to Engeström (1987) ‘production’ creates the objects, which correspond to the given needs or desired objectives. ‘Distribution’ divides the workload or activities according to social laws and ‘exchange’ relates to the social interactions involved with the previously agreed distribution of activities. Subordinate to these three dominant aspects is ‘consumption’ and this relates to the achieving of the objective and therefore satisfies the initiating need of the activity system. Thus ‘production’ can be viewed as the starting point, ‘consumption’ as the conclusion, with ‘distribution’ and ‘exchange’ as the interim processes (Engeström’s, 1987).

In the 1980s, the theory as modified by Engeström (1987), first began to be applied to human-computer interaction (HCI), and is now being applied to m-learning (Engeström, 1999). The model by Engeström (1987) initially had three basic components, the ‘subject’, ‘object’ and ‘tools’. This sub-triangle labelled ‘production’ is basically the Vygotskyan root-model of instrument-mediated relation between subject and object of action (Vygotsky, 1978). The ‘subject’ refers to the individual or pupil who is moving towards the
‘object’ which is the activity’s motive and the tools are the mechanism(s) which help mediate the activity. Engeström expanded upon Vygotsky’s (1987) earlier model with the lower part of the AT. This represented the collective activity system with the additional components having a mediating role in the execution and development of the activity (Waycott et al., 2005; Prenkert, 2006). The ‘community’ is taken to mean something other than the individual such as a class, school or wider society. The ‘rules’ can be the formal laws and procedures that guide pupils, teachers and the community or they can be the informal and implicit ways of doing things. The ‘division of labour’,

...refers to both the horizontal division of tasks between the members of the community and to the vertical division of power and status (Engeström, 1993, p. 67).

Finally, the ‘outcome’ is concerned with what the activity actually achieved. It is only at this stage, when an outcome has been reached, that true analysis and understanding of the different components can be made (Waycott et al., 2005).

Engeström (1999) and Nardi (1996) have noted that AT does not offer ready-made techniques and procedures for research nor is it concerned with predictions about human behaviour; rather, it is a conceptual tool. As a conceptual tool AT therefore must be adapted to each research inquiry and the focus should centre on the theory’s ability to illuminate the complex experimental unity of individual cognition and social activity (Nardi, 1996). Nardi (1996) states that for researchers to truly understand AT they need to define precisely the activity under investigation and then allow sufficient time frames to understand the internal and external actions of those connected with the activity. Nardi (1996) also recommends when using AT that researchers need to use a variety of data collection techniques including interviews, observations, video and other key documentation without undue reliance on any one to increase validity. Nardi (1996) also suggests attention should also be paid to broad patterns rather than on narrow episodic ones and empathy with the participants’ viewpoints is essential.

2.5.2 Critical Appraisal of Using Activity Theory for M-learning

‘Contradictions’ is the term given to misfits within the different components or activities of AT (Engeström, 1987, 1999; Nardi, 1996). They manifest themselves as problems but activity theorists do not see contradictions as problems but as sources of richness and development (Uden and Kumaresan, 2007). Activities are virtually always in the process of working through contradictions that subsequently facilitate change (Engeström, 1987, 1999;
Uden, 2007). For Uden (2007) her key concern is that AT can be misinterpreted by researchers not familiar with the activity system. There is also the issue that activity systems can become too complex, or there is a failure to identify between the levels of activity, making interpretation extremely difficult (Uden, 2007). Researchers must also realise that AT is a simplification of reality and that there are multiple activity systems at work around us everyday. ‘Outcomes’ from one may become inputs such as ‘rules’ or ‘tools’ for another (Uden and Kumaresan, 2007). An additional concern associated with AT surrounds the question of methodology. AT does not provide clear methods for how the insights it provides should be applied to m-learning. However Uden (2007) also asserts that for her the benefits in using AT for m-learning activities far outweigh the disadvantages providing the researcher acknowledges the limitations and remains vigilant.

In terms of benefits associated with the incorporation of AT, Waycott et al. (2005) believes AT enables researchers to appraise how learners use the technology. Of special significance is that AT is not so much interested in how the participant uses the technology but their interaction with this mediating device for learning. More specifically AT provides a mechanism to evaluate learners’ use of mobile technologies. For Uden (2007) traditional frameworks designed to investigate learning within classrooms would not be suitable whereas AT is adaptable and does not stipulate where the learning must take place. Like mobile technology AT it is not impinged temporally or spatially (Uden and Kumaresan, 2007). It would be appropriate therefore to analyse the construction phase of the intended mscapes through the lens of AT (see Section 3.4) and later use AT to also analysis how the pupils interacted with the mobile activities (see Section 4.2). Additionally the activity system does not exist in a vacuum nor is it a static framework. It is dynamic allowing for the unexpected which may come from within (internal contradictions) the system or from outside (external contradictions). AT also strives for an outcome and this outcome can then be used to instigate departmental, whole school or regional/national change.

AT is also a simplified conceptual framework allowing for the study of human practices. The activity system acknowledges that learning is fundamentally situated and socially mediated (Engestrom, 1987). This relates to Vygotsky’s idea that knowledge is constructed in a social context through social interaction and use of cultural symbols. Vygotsky’s (1978) Zone of Proximal Development (ZPD) therefore also has relevance to AT as it is through the interaction with other learners and teachers that the ZPD emerges (Uden, 2007). The mediating tool could be mobile technology. Another advantage of using AT is that the framework takes into account both individual and collaborative events.
M-learning is about learning-by-doing. It is about pupils getting a hands-on approach to learning. The very essence of AT is ‘activity’. In a similar vein to the last point AT encourages pupils to become active. It discourages a passive approach to learning. Mobile technology also requires engagement for learning to succeed and the adoption of the AT entices pupils to become more involved (Waite, 2005; Uden, 2007). A penultimate advantage of AT is that it stresses the importance of mediators to enhance learning. In conclusion AT also allows for historical events to be reflected upon and subsequently used to improve user interaction and promote more effective learning (Waite, 2005; Jones et al., 2007).

2.6 What can be Learned From the Literature?

The literature reviewed as part of Chapters 1 and 2 highlights that there is a statutory requirement by teachers to ensure pupils reach a required degree of ICT competence. Recent developments in ICT have demonstrated that mobile technology can assist in this endeavour and is already being utilised by a small number of educators ‘early adopters’ (Rogers, 2003) within all levels of education. Whilst not yet mainstream mobile technology has proven itself to be popular with learners and when used appropriately it has the potential to offer an array of benefits. What is not so clear from the literature is the extent to which mobile technology can enhance pupils’ learning above and beyond traditional learning methods. At present subject-specific literature regarding the ability of m-learning to enhance learning is still in its embryonic stage, helping to justify the need for inquiries such as this one.

In conclusion it is fair to surmise from the literature that changes in pedagogy will not be effective for pupils learning unless teachers are knowledgeable about the features of mobile technology. This is where the literature on AT is so important in forming a theoretical framework to investigate how mobile technology can be successfully integrated and embedded into the learning process. The next chapter will consider the methods needed to achieve valid and reliable outcomes to the study.
CHAPTER 3 METHODOLOGY

3.1 Introduction

Chapter 3 outlines the preparation and methodology used during this inquiry and begins by looking at the design of the research, which centres on action research. This involves considering the background to the study, the planning and the preparation undertaken. The construction of the mscapes activities is outlined within the context of Activity Theory (AT) and the sample used for the inquiry discussed. The methods of data collection will be investigated, explained and justified and in conclusion to Chapter 3 ethical considerations will be discussed along with appropriate reliability and validity issues.

3.2 Design of the Action Research Inquiry

3.2.1 Background to Inquiry

In planning this action research it became apparent that no one research methodology would adequately produce sufficient data in order to draw valid conclusions. Hitchcock and Hughes define methodology as,

....the whole range of questions about the assumed appropriate ways of going about social research.... Hence, a methodology is a broad yet complex array of ideas, concepts, frameworks and theories which surround the use of various methods or techniques employed to generate data on the social world (1995, p. 20).

At the epistemological level this research drew principally from an anti-positivist (subjective) approach, however positivist (objective) methodologies were also incorporated. Anti-positivists argue that an individuals' behaviour,

....can only be understood by the researcher sharing their frame of reference: understanding of individuals’ interpretations of the world around them has to come from the inside, not the outside (Cohen et al., 2007, p. 19).
Educational research is thus seen as more of a subjective rather than an objective undertaking however this does not mean positivist methodologies should be ignored. Providing educational researchers acknowledge the sensitivities associated with objective data they can utilise any data collected to help support and triangulate information derived through more subjective methodologies. From the outset it was clear that owing to a small sample size of 16 (see Section 3.3) a reliance on positivist approaches was inappropriate as most statistical-based research requires a sample size of 30 or more (Cohen et al., 2007). This did not mean however that statistics were discounted, simply that caution needed to be applied when statistical evidence was reviewed. Interviews, observations and other key documentation along with pupil assessment results were decided upon as the most appropriate data collection methods (see Section 3.5).

3.2.2 Action Research: A Defining Role for Teachers

Action research, characterised by its spiralling cycles, resurfaced in the UK during the 1970s through the work of Stenhouse and others and since then its influence has continued to grow (McNiff, 2000). A review of the literature revealed that a consensus does not exist regarding a suitable definition for action research (Hollingsworth et al., 1997; Cohen et al., 2007). To allow the researcher to proceed with the inquiry it was critical that a grounded and appropriate definition was obtained. A lack of clarity or fudging of this methodological framework would undoubtedly have had serious consequences for both the design and implementation of the inquiry.

Cohen and Manion define action research as,

\[ \text{A small-scale intervention in the functioning of the real world and close examination of the effects of such an intervention} \] (1994, p. 186).

In turn Harmer views action research as,

\[ \ldots \text{a series of procedures teachers can engage in either because they wish to improve aspects of their teaching, or because they wish to evaluate the success and/or appropriacy of certain activities and procedures} \] (2002, p. 344-345).
What is apparent from both the aforementioned definitions is that action research has an intrinsic flexibility which adapts well to research within schools. It is not unique to quantitative or qualitative methodologies although some (Bogdan and Biklen, 1992; Cohen et al., 2007) attest that when applied to a small sample size, its relationship with the qualitative data collection methods, such as interviews, observations and key documentation, becomes stronger.

Therefore, as a research methodology it can function at the individual class level, where teachers spend most of their time. This attribute can be seen both as strength of action research and a weakness. On one hand researchers, especially from the more positivist tradition of research, might view small-scale action research as too limiting and subjective. Whereas others, namely teachers, are attracted by this kind of micro-scale research aimed at trying to advance teaching and learning by means of procedural and empirical measurement (Sarac-Suzer, 2007).

Harmer's (2002) definition also promotes the idea that action research is utilised by teachers’ own desire for improving teaching and learning. The word ‘wish’ is used a number of times signifying an almost aspirational dimension for those embarking on this form of research. According to Sarac-Suzer (2007) this view of action research is compatible with teachers who are committed to personal development as a means to promote their pupils’ performance. This observation in the context of this inquiry corresponded closely with the values and beliefs of the researcher, although on closer inspection neither definition made direct reference to the reflective capacity that action research affords researchers nor to the role of participants in the research.

According to Cohen et al. (2007) it is Kemmis and McTaggart, who provide an all-encompassing definition. They state that,

*Action research is a form of collective self-reflective enquiry undertaken by participants in social situations in order to improve the rationality and justice of their own social or educational practices and the situations in which these practices are carried out. The approach is only action research when it is collaborative, though it is important to realize that the action research of the group is achieved through the critically examined action of individual group members* (Kemmis and McTaggart, 1988, p. 5).

The definition promoted by Kemmis and McTaggart (1988) demonstrates the breadth and depth action research offers teachers. Research may begin with one teacher looking at an issue but develops into wider social participation, which in turn enables meaningful reflection and
subsequent action. Kemmis and McTaggart’s (1988) definition suggests that a main priority of action research is about turning researchers into participants and about giving ownership and power to teachers (Mills, 2003). In other words people learn best and can reflect more fully when they become involved themselves (O’Brien, 1998). Action research is also about viewing everyone involved within the inquiry as participants, it dispenses with the notion of researcher and subjects. Essentially it empowers participants to contribute to the research findings in a collaborative and meaningful way (O’Brien, 1998), whilst not diminishing the role of the individual (Kemmis and McTaggart, 1988). Unlike in other disciplines the definitions also advance the notion that the researcher is not bound by objectivity, rather action research openly acknowledges the role of the researcher within the inquiry.

McNiff (1995), whose action research model helped structure this inquiry, stresses that for teachers involved in action research they not only need to establish a clear definition and understanding of this type of research but they also need to contemplate two main issues. The first being the link between ‘action’ and ‘research’ and secondly where the distinction lies between ‘action research’ and ‘reflection’. For action researchers in education the driving force is to ‘act’ upon the outcome of any research (Johnston, 1993). To do nothing after undertaking research, to fail to change pedagogy, undermines the validity of the research. Indeed Lewin himself stated there can be, ‘no action without research; no research without action’ (cited in Adelman, 1993, p. 7).

Looking at the second issue raised by McNiff (1995), Richards (2001) also states there is a need to distinguish between these two aspects but he suggests that a dichotomy should not exist. Instead a continuum should be recognised allowing researchers to take a blended approach combining action and reflection. Reflection is thought of as a process or activity that is central to developing practices (Loughran, 1996, cited in Leitch and Day, 2000). More precisely Loughran defines reflection as,


Thus, according to Leitch and Day (2000), reflection is associated with ‘thinking’ and centres on ‘problem-finding’ and ‘problem-solving’. Suter (2006) asserted that teachers who conduct action research are ‘reflective practitioners’ who can make important contributions to improvements in education. In the interests of completeness the researcher was conscious to
maintain a balance between reflection and action research rather than awarding exclusivity to one. True action research cannot take place in a vacuum devoid of reflection. According to Leitch and Day reflection is the ‘engine of action research processes’ (2000, p. 189) and for Elliot ‘action initiates reflections’ (1991, p. 23).

In an effort to maintain a balance between action and reflection and obtain another vital source for qualitative data collection the researcher kept a dissertation journal (see Section 3.5.2 and Appendix A for more information on the researcher’s journal) throughout the life cycle of the m-learning activities. The purpose of such a journal, within the contexts of action research, was not just to catalogue the chronological order of events but served as a mechanism to refine ideas, beliefs and allow for reflection (Janesick, 1999; Borg, 2001). Journal writing also had the unique advantage of offering the qualitative researcher yet another opportunity for triangulating data (Janesick, 1999), essentially it is,

...seen as a product – an ‘evidential store’ or ‘educational archive’ which provides a record of the researcher’s experiences during a project and which can be retrospectively analysed (Borg, 2001, p. 160-161).

### 3.2.3 A Framework for Action Research

Since Lewin numerous action research models have been developed most of which describe this methodology as a series of repetitive steps involving the implementation of a plan which seeks to change a particular situation for the better (Steketee, 2004). Steketee states that,

> While some of these models are more elaborate than others, each one describes the research process as a systematic, self reflective spiral of planning, acting, observing and reflecting (2004, p. 876).

These steps help form the basis of most action research models and are repeated until the situation under investigation has improved or the desired goals have been achieved. In this way ‘theories’ are not validated independently and then applied to practice. They are validated through practice (Elliott, 1981).

According to Steketee (2004) early action research models proposed by Lewin, Kemmis, Elliott and Ebbutt are too controlling, prescriptive and one dimensional. To become fully effective
within the multifaceted nature of classrooms McNiff (1994) developed a more flexible action research model able to cater for the dynamics of classroom life. Figure 3.1 highlights that McNiff’s (1994; 1995) model is extremely adaptable and can be viewed as a simplistic one cycle model or it can cater for more complex research. Steketee (2004) does however caution researchers to be disciplined when side issues occur otherwise the framework promoted by McNiff can become increasingly difficult to manage. In an effort to maintain a manageable methodological framework the researcher viewed the inquiry as one cycle of McNiff’s model. This did not detract from the inquiry nor mean the methodology involved was any less rigorous. It did however have the unique advantage of having a simple framework encompassing the entire process from conception to modification of practice. Any side issues that developed, which were not directly related to the inquiry, were not discarded but formed part of the broader conclusions.

Attention now turns briefly to McNiff’s cyclic model in terms of this inquiry. Section 1.2 has already exposed the first two, and closely aligned, stages of McNiff’s model. The ‘issue’ identified is the desire by the researcher to enhance GCSE Geography and the ‘solution’ proposed, as a mechanism to achieve this enhancement, is the inclusion of mobile technology. However, the ‘problem’ faced by the researcher, which is also the rationale validating this inquiry, is that a gap currently exists in the research literature concerning the impact of mobile technology on pupils’ learning within GCSE Geography. Following the proposal of a ‘solution’ comes McNiff’s (1995) third stage the ‘implementation’.

The remainder of this chapter relates to the implementation stage of McNiff’s (1995) model and within an ethical framework it elaborates on the design and creation of the m-learning activities, along with the methodologies involved in conducting the mscapes and collection of data. The ‘evaluation’ phase of the model, which centres on data analysis and discussions, is the focus of Chapter 4. This is where the findings from the inquiry are evaluated and possible explanations offered. The fifth stage, ‘modifying practice’, comes about after a reflection and recommendations have been made about the way forward. Chapters 5 and 6 of the inquiry summarise the inquiry’s key findings and clarifies how pedagogy has been modified for future teaching and learning. Chapter 6 also reflects on the action research with a view to identifying the benefits that the researcher gained and incorporates McNiff’s (1995) final stage, the ‘identification of a new problem’. This final stage refers to the recommendations for future
practice and the emphasis is that true action research does not end with the completion of one cycle. Action research should be a process that teachers are continually engaged in.

The Flexibility of McNiff’s Model of Action Research

McNiff’s Model based on ONE Cycle of Action Research

1. Identify a problem/issue
2. Imagine a solution
3. Implement the solution
4. Evaluate the solution
5. Modify Practice
6. Identify a new problem

The flexibility of McNiff’s Model permits action researchers to adapt the one cycle approach to a multi-spiral approach if necessary.

McNiff’s Model based on a Multi-Spiral Approach to Action Research

1. Identify a problem/issue
2. Imagine a solution
3. Implement the solution
4. Evaluate the solution
5. Modify Practice
6. Identify a new problem

Based on McNiff, 1994, 1995

FIGURE 3.1
3.2.4 Action Research for M-Learning: Benefits and Limitations

The literature revealed that action research into the use of mobile technologies in schools is increasing (Kukulska-Hulme and Traxler, 2005; Burkett, 2008; Becta, 2009a) as a model of qualitative research which stresses the need to change and improve human performance or action in relevant practical and social contexts (Kemmis and McTaggart, 1998),

....‘action research’ would thus seem to represent an important key to the integration of ICTs in education (Richards, 2001, p. 1).

Indeed the view of Richards (2001) has been echoed by others such as Somekh (1995, 2006), Burkett (2008), Attewell et al. (2010) and Selwood and Twining who state that,

Action research is vitally important with respect to the use of ICT in education.... (2005, p. 7).

They like Somekh (1995, 2006) and Attewell et al. (2010) have identified action research as being particularly well suited to the study of innovations and in particular the use of ICT in education. During recent research into the use of mobile technology for learning Attewell et al. discovered that 97% of those who took part in action research felt it,

....resulted in better embedding of mobile learning into teaching and learning (2010, p. 23).

For Somekh (1995) action research is about improvement therefore it is more likely to form the basis of recommendations that can be implemented easily in practice. The views of Somekh (1995), Selwood and Twining (2005) and Attewell et al. (2010) do not insinuate that researchers should accept action research without due diligence being applied to weighing up the advantages and disadvantages. Figure 3.2 highlights some of the advantages and limitations that the researcher contemplated before embarking on this action research inquiry. The symbolism of the scales is to signify that the researcher agreed with Selwood and Twining’s (2005) assertion that the benefits clearly outweigh the limitations.
Some Advantages and Limitations when Using Action Research

- Teachers are empowered and obtain more autonomy. Teachers who conduct action research are directly responsible for making decisions. They determine the issues/problems to be researched and they develop and implement the inquiry (McNiff, 2000).
- Action research provides a proven mechanism for engaging with change and improving pupil learning and enhancing teaching (Mills, 2003).
- Action research has a moral grounding as it should involve doing something to bring about social change for the better (McNiff, 1995).
- Improved communication can result from action research (Ferrance, 2000; Attewell et al., 2010).
- Action Research works "with" participants rather than "on" subjects. By doing so, it leads to a collaborative form of research which can enrich the findings and strengthen relationships between pupils and teachers (Doyle, 2007).
- Action research and reflection allow teachers to grow and gain confidence in their work (Ferrance, 2000; Attewell et al., 2010).
- Through action research, teachers gain a greater understanding of their own practice and the pupils’ behaviours. They are therefore empowered to make informed decisions about what to change and what not to change, link prior knowledge to new information, learn from experience and ask questions and systematically find answers (Fueyo and Koorland, 1997, cited in Mills, 2003, p. 10).
- Action research allows teachers to learn more about themselves, their pupils, colleagues and their organisation (Ferrance, 2000; Attewell et al., 2010)
- Action Research enables teachers to integrate theory and practice (Mills, 2003).
- Action research can improve teamwork, pupil achievement and morale amongst teachers (Elliott, 1991).
- Action research satisfies the desire of all teachers to increase the predictability of what happens in their classroom – in particular, to increase the likelihood that a given curriculum, instructional strategy or use of technology will positively affect student outcomes (Mills, 2003, p. 12).
- Action research enables professional development. Teachers gain expertise in research methods and effect change (McNiff, 2000, 2002; Attewell et al., 2010).
- Some researchers see action research as too small scale to effect any real change. The outcomes of research are really only relevant to the specific case study at that point in time.
- The experience of the teacher to competently carry out action research is also highlighted as a possible limitation. Many teachers may lack the skills to carry out an action research inquiry. This is of particular significance in relation to ethical issues. According to Nolen and Putten (2007) action research raises ethical issues which are not found in traditional research so teacher-researchers need to exercise great care and attention to detail.
- There is an expectation that action research inevitability brings about positive change. On occasion the research may in fact lead to no change or have a negative impact (Van Manen, 1990).
- Commonly found in action research writings is the view that this form of research should be for moral and pragmatic reasons. This is often not the case (Van Manen, 1990).
- Critics of action research sometimes point to excessive subjectivity on behalf of the researcher. Some researchers frown on self-indulgent or solipsistic inquiries (Ladkin, 2005).
- Teachers often do not have the time or funding to carry out credible action research inquiries.

NB: These are only some of the main advantages and limitations associated with action research.

FIGURE 3.2
3.3 Selection and Justification of the Sample

Class 11M consisting of 16 pupils was selected as an appropriate sample population. During 2008-09 there were 62 GCSE pupils in total (11M and 11N both had 16 pupils and 12P and 12Q with 14 and 16 pupils respectively). Class 11M therefore accounted for 26% of the total GCSE Geography population or sampling frame and was referred to as the 'experimental group' (Cohen et al., 2007, p. 108). The decision to exclude the Year 12 GCSE classes and Class 11N was largely determined by practical and logistical reasons. Throughout the selection process the researcher was sensitive to the inclusion or exclusion of each class and adhered strictly to ethical guidelines (see Section 3.6 for more information). Ideally it would have been beneficial to have included all four classes within the inquiry but as a researcher, with teaching commitments, timetabling constraints proved difficult to overcome. These constraints would have made it very difficult to meet with all pupils and conduct the m-learning activities. Further investigation also revealed that the Year 12 pupils had a substantial amount of the AQA (2008a) Syllabus still to cover, including the coursework component, which meant that there was little or no time available to participate with the inquiry.

With regards to 11N many of the same reasons preventing the participation of the Year 12 classes came to bear. Neither Year 11 class was scheduled for Geography at the same time nor was the researcher free when the 11N had Geography. To compound matters the second Year 11 Geography teacher delivered the topics in a difference sequence. As a result it would have proven extremely difficult to progress both Year 11 classes at the same time and in a uniform manner.

The choosing of one class above another or the decision to not include all classes meant that the sampling strategy used was a non-probability or purposive sample (Gonzalez, 2001). More precisely it was a convenience/opportunistic sample (Cohen et al., 2007). Opportunistic means it was not random but was chosen as the sample because the researcher’s access to this population was timetabled and practicable (Cohen et al., 2007). However, according to Cohen et al. (2007, p. 115) this is ‘unashamedly selective and biased’ behaviour on the part of the researcher and must be acknowledged and reasons for such a decision given. When acknowledged it allows an action researcher the opportunity to reflect on the sample population and add validity to the inquiry through the justification of their decision (Gonzalez, 2001). It also enables the researcher to be more mindful and,
Schön (1983) and Bassey (1984) argue however, that groups no matter how small may offer insights to which other teachers may relate. Borg and Gall go further stating that,

.... experimental methodologies require a sample size of no fewer than fifteen cases.... (1979, cited in Cohen et al., 2007, p. 102).

Therefore if we accept Borg and Gall's (1979) criteria within the contexts of this inquiry Class 11M do meet the necessary criterion to be used as a representative sample of a typical Year 11 GCSE Geography class. Furthermore, the size and type of the group allowed the researcher to include the participants in all phases of the research including the planning, action, observation and reflection (Cohen et al., 2007). In addition the researcher was familiar with Class 11M and their standard of work, which meant informed observations and critical reflection created from the m-learning activities could be made with creditable confidence (Cohen et al., 2007).

3.4 Applying Activity Theory to the Construction of the Mscape Activities

3.4.1 Getting Started with Activity Theory

Section 2.5 contained an overview of AT and highlighted some of the main advantages and disadvantages for researchers keen to use this framework to help interpret the mobile learning environment. The purpose of this section is to apply AT to the construction of two mscape activities and use the framework as a lens through which the processes and interactions involved with the creation can be clearly defined. Meaningful analysis of the m-learning activities will only be achieved through a thorough understanding of all the activities that were required to complete the m-learning tasks (Uden, 2007). AT offers researchers the opportunity to deconstruct reality and analyse learning both from the semiotic perspective and the technological (Sharples et al., 2005; 2007). Although, like Frohberg et al. (2009), this inquiry focuses on the semiotic layer and interprets technology as the enabler.

As the heading above reveals a decision was made, based on a review of relevant literature, to create two mscape activities. In the theme of Facer et al. (2004) one would be created by
the researcher with the pupils purely as recipients. The motivation behind this decision was to enable the researcher to have practical experience creating a mscape before expecting pupils to become involved with the construction (Jones, 2009). This not only allowed the researcher to empathise (Orzulak, 2006) more with the pupils by participating in a process that pupils were soon to be engaged in but it also ensured the initial mscape would include a range of media and build on good practice, as observed through other freely downloadable exemplar mscapes. The second mscape stemmed from the example of Wood et al. (2004) and the advice of Battista (2008); both of whom questioned the ability of the pupils to fully understand the m-learning exercise if they were not directly involved with establishing the intentions and constructing the activity. For them the focus was on following the entire learning process from conception through to conclusion, enabling pupils to construct deeper connections and meaning (Naismith et al., 2004; Burkett, 2008).

In terms of this inquiry the ‘subject’ primarily refers to the individual pupil studying GCSE Geography (See Figure 3.3). The ‘object’ relates to the development and embedding of new and improved practices which will enhance pupils’ learning experience (e.g. motivation and enjoyment) and performance (e.g. attainment) in Geography. The ‘outcome’ is extensive and focused on proving that mobile technology can enhance pupils’ performance in GCSE Geography as well as supporting collaborative and individual learning, whilst making learning interesting and enjoyable. An additional outcome unique to the researcher was the desire to promote and secure professional development. The ‘instruments’ are the tools which will support pupils’ learning activities in Geography. For this inquiry mobile technology in the form of a PDA acts as the main ‘instrument’ but other tools will be previous ICT knowledge and skills held by each pupil along with relevant research literature.

The ‘community’ refers to all the participants at the meso level, sub-groups (e.g. cliques within the experimental group) at the micro level and the whole school at the macro level. The ‘division of labour’ relates to the interaction and communication involved between the researcher, the pupils and other interest parties when distributing tasks. This component of Engeström’s (1987) model usually involves the horizontal division of tasks between members in a group as well as the vertical division of power and status. Finally the ‘rules’ refers to the control mechanism(s) that are set up, usually by the researcher, within the activity but can refer to mutually agreed practices established through collaborative interactions.
3.4.2 The Creation of the First Mscape through the Lens of Activity Theory

When designing an m-learning task the first step, according to Uden (2007), is to clarify the purpose of the activity and determine who the intended recipients are. This is a direct reference to the ‘object’ and the ‘subject’ components of AT. The object refers to the learning intentions and in terms of the first, rivers-based, mscape the intentions were taken straight from the AQA (2008a) syllabus, which was the topic the Year 11 GCSE Geography pupils were currently studying (see Appendix B). At a more specific level the object was to construct an mscape that offered the potential to enhance pupils’ knowledge and understanding of the long river profile, river features and processes. In terms of the ‘subject’ it had been predetermined that pupils would not have any direct involvement with the construction of first mscape (see Section 3.4.1 for the reasoning behind this). However, when viewed through AT this decision did not mean that the pupils had no influence on the creation. On the contrary the inference was that to design a suitable mscape it had to be appropriately customised to meet the needs of the ‘subjects’ (Section 3.3 provides more information on the sample population).

Once a topic was chosen, and in accordance with Uden’s (2007) suggestions, the next stage involved the creation of a plan outlining the intended mscape and in particular narrowing down the specifics and deciding which river features and processes the researcher wanted the pupils to learn. It was at this stage that the construction started to move towards the
‘instrument’ component of AT. In this example the instrument refers to any artefact or tool which helps to construct the mscape. Whilst the iPAQ 214 was the chosen mobile device (see Section 2.3.2 for more information), for delivering the mscape to pupils, AT helped to highlight that the PDA was not the main tool used for construction. The PDA was merely the mediating device that delivered the rivers information to pupils via the software programme Mscape Player. As part of the development of a rivers mscape a variety of instruments or mediating tools such as, relevant literature (see Chapter 2), exemplar mscapes and training regarding the Mscape Toolkit played their part in the construction process. In terms of exemplars the HP Mscape website (www.mscapers.com) provided access to a multitude of freely downloadable mscapes and in terms of training this was achieved through self tuition and assistance from Ulster Mediascapes, who provided initial mscape guidance.

The complexity of AT for the researcher as creator of the Thames Mscape became apparent at this stage. Although the training, the Mscape Toolkit, literature and mscape exemplars can all be viewed as mediating tools for the researcher there are definite overlaps with community and division of labour;

Each factor is connected to all other factors, symbolising the dynamic and complex interdependencies among them. A variation of one factor always has an impact on other factors (Frohberg et al., 2009, p. 310).

With regards to community the wider mscape group, through the provision of exemplars and online guidance, certainly played a part in helping to augment the researcher’s ICT capabilities. In turn the researcher’s enhanced ICT knowledge and skills acted as instruments in the formation of the rivers mscape. When looking at the division of labour it became clear that although the researcher was the principal person responsible for the creation of the mscape, assistance was sought from Ulster Mediascapes. In turn the combined efforts from the researcher and Ulster Mediascapes helped to create the main rivers mscape, which in turn became a key instrument designed to assist pupils to learn about river features and processes.

It was only after training and a review of relevant literature and exemplar mscapes that the initial plan, encompassing the learning intentions, could progress into a more detailed storyboard (see Appendix C). The River Thames was chosen as a suitable case study and its inclusion was justified by a number of reasons. The m-learning activity, like the Savannah Mscape from Facer et al. (2004), presented a unique opportunity to bring a famous and
previously inaccessible physical feature or environment to Belfast Grammar, albeit in digital format. Secondly, the Thames had all the relevant features and processes stipulated by the AQA (2008a) syllabus.

As previously highlighted a central ‘instrument’ or ‘tool’ in terms of creating the activity was the Mscape Toolkit. This toolkit had extensive functionality, which permitted the researcher to initiate the Mscape by importing a base map. The base map, which lies at the heart of every Mscape, originated as a jpeg (Joint Photographic Experts Group) image of Belfast Grammar and was obtained from Ordnance Survey of Northern Ireland (OSNI). The long profile of the River Thames was then superimposed over the school grounds using Microsoft ‘Paint’ and the new image converted into a Maplib file, suitable for uploading to the Mscape Toolkit. However, as others have discovered (Loveless et al., 2007; Battista, 2008; Jarvis et al., 2009), the importation and calibration of the base map was not without problems and required a high degree of competency in ICT.

Once the base map was successfully imported the next stage in the creation saw the importing of the relevant content into the Mscape Toolkit. The content comprised 189 jpeg images, 41 Mp3 (a third generation way to compress audio and video) audio files and one Flash quiz. Like the game-orientated Savannah Mscape, created by Facer et al. (2004), the purpose of a Flash quiz was to make the m-learning experience more challenging and interactive. Although the creation and modification of the content was time-consuming it was vital that the Mscape Toolkit could be used to manipulate these resources into an integrated and fully functioning mobile activity.

Through the creation of ‘regions’ and ‘speakers’ the Mscape Toolkit facilitated the allocation of all content to the appropriate location on the base map, although some understanding of the complexities of scripting was essential (Jarvis et al., 2009). The incorporation of the ‘groups’ function within the toolkit not only allowed certain pictures, slideshows and sounds to be linked but their delivery could be timed and choreographed to appear either at certain times or after a predetermined event had occurred (see Appendix D for the placement of the regions, groups and speakers). This meant the Thames Mscape was designed as an anchored linear Mscape, which meant it was not only attached to a specific location but that participants needed to experience the regions in a sequenced fashion. The reasoning for this was to simulate for participants a walk along the course of a river from source to mouth. Therefore, from a pedagogical perspective this ‘tool’ was providing the researcher with total control over the activity ensuring the river-based learning intentions were not superseded by the technology.
Once the Thames Mscape had been created, through the ‘instrument’ Mscape Toolkit, the concluding stages involved the testing and piloting of the mscape. Initial testing, simulating GPS, was undertaken on a PC but as Uden (2007) advises an important aspect of AT involves carrying out a pilot where the actual activity is designed to take place. This not only allows for the identification of ‘contradictions’, which might disrupt activity but it also brings us back to the notion of context and ‘community’. Community is not just about those who advised and helped create the mscape it also concerns the location and technical environment where the m-learning activity is destined to occur. In the end two pilots took place to ensure the mscape was accurate and functioning correctly. Present at the first pilot was a representative from Ulster Mediascapes, the researcher’s study supervisor and the researcher. Yet again the pilot represented a blurring of the boundaries when it came to analysing how the first mscape was created. The three individuals taking part in the first pilot were clearly part of the ‘community’ helping to prepare the mscape for pupil participation but the pilot also represented a ‘division of labour’. Each individual was asked to complete a semi-structured observational schedule providing feedback from the pilot; which revealed many issues with the mscape which urgently needed attention (see Appendix E for a summary of the issues identified via the observational schedules). In light of the number of issues requiring attention it was decided to hold a second pilot to ensure the modifications were successful.

The second pilot of the Thames Mscape took place mid January 2009, some three weeks after the first, and in addition to those present during the first pilot were two teachers from Belfast Grammar, one with an ICT background and another with a Geography background. The community helping to get the mscape ready for pupil participation was now growing and so too the amount of work being divided among those piloting the activity. Like the first pilot each person was asked to complete an observational schedule in an attempt to fine tune the mscape (see Appendix E for a summary of the main outcomes from the second pilot). The biggest modification to arise from the pilots was the necessity to include a pause button on the PDA. Due to the amount of information it was felt a replay button would serve only to extend the activity, making it less enjoyable. A compromise however, was to allow participants to pause the mscape allowing sufficient time to absorb relevant information.

It was only after the piloting and modifications had taken place that the final ‘outcome’, the Thames Mscape, was completed, ensuring all objectives had been fulfilled. At this stage the ‘subjects’ were formally invited to become participants and hence forth the control or
'rules' element of AT became significant. Conscious of the experiences observed by other mscape inquiries (Facer et al., 2004; Wood et al., 2004; Battista, 2008) m-learning tends to begin with the control originating from the researcher but as the task proceeds some aspects of control usually pass to the pupils (Sharples et al., 2007, 2005). One of the limitations Facer et al. (2004) observed was the fact that pupils tended to become disinterested when they were in their 'den' reviewing their performance and being primarily led by teachers. However, pupils became more motivated and involved when they were in control ‘roaming’ the Savannah. In light of these discoveries the researcher was keen to establish both formal and informal rules which would be acceptable and agreed upon by all participants, yet still correspond to the demands or ‘rules’ devised by the wider ‘community’ of AQA (2008a) and Belfast Grammar. As part of the design and creation process written introductory information was given to pupils. Initially the information explained what mscapes are followed by some rules/procedures to help pupils enjoy the activities safely, look after the equipment and manage their learning within a structured timeframe. Less formal rules, such as expected behaviour and how to engage appropriately with the technology were not officially conveyed to pupils. This decision was taken in an effort to elicit more favourable participant support rather than implying a hierarchical structure of authority. However these rules were discussed informally between the researcher and the participants.

Although the Thames mscape was now created and ready for pupils to experience a decision was taken to allow pupils to become familiar with mscapes, the equipment and allow a sense of ‘community’ to develop. The studies by Huizenga et al. (2009), Battista (2008) and Facer et al. (2004) only permitted pupils to experience the equipment on the day of the activity and both research inquiries later questioned this approach. Therefore in an attempt to familiarise pupils with the equipment they were invited to take part in a beginner mscape - ‘Stamp the Mole’. This activity not only provided an opportunity for pupils to become familiar with mscapes and the equipment but it also allowed them to experience GPS and enabled the researcher to begin making preliminary observations (see Appendix F).

3.4.3 The Creation of the Second Mscape through the Lens of Activity Theory

The main contrast between the Thames Mscape and the second mscape focusing on Ordnance Survey (OS) Skills, the next sequential topic, was the participation of the ‘subject(s)’ in the construction phase. Such an inclusion found support from research conducted by Battista (2008) and Wood et al. (2004); research that suggested pupils construct knowledge more effortlessly and gain a deeper understanding when involved with
the entire learning activity. It quickly became clear that the elements of ‘community’, ‘division of labour’ and ‘rules’ would be more prominent from the outset, compared to the first mscape. The Thames Mscape which initially focused on Engeström’s (1987) starting point, the ‘production’ or top triangle (see Figure 2.3), encompassing the ‘object’, ‘subject’ and ‘instruments’. Therefore this meant Engeström’s (1987) traditional starting point was not necessarily the lead component. Once the subjects became involved they needed time to assimilate the objectives, which was only made possible through the exchange of ideas and consumption of knowledge before tasks were distributed and production could proceed.

It is important to stress that the differences in the construction process only came into effect whenever the pupils became involved with the OS Skills mscape. Prior to their involvement the instigation of the construction process remained the same. This meant that the researcher initiated the activity and began, as before, by focusing on the ‘object’ and the ‘subject’ (Uden, 2007). After all it was the AQA (2008a) syllabus, relating specifically to OS Skills, that would inevitably define the learning intentions and dictate the content of the eventual mobile activity (see Appendix B). At this stage pupils were invited to participate in the activity and the objectives of the AQA (2008a) syllabus presented to them. From a pedagogical perspective it was at this early stage that the ‘rules’ component of AT came to the forefront. A review of relevant literature (Sharples et al., 2005; Uden, 2007) and experience gained from the first mscape had highlighted the role mobile technology plays in helping to shift power and authority from the researcher to the pupils. At the outset pupils required ‘rules’, which provided initial guidance and instruction on how to begin constructing a mscape, they also needed a timeframe to make the activity manageable and most important of all pupils had to be aware of what OS Skills to include within their mscape. The AQA (2008a) syllabus provided the ‘rules’ regarding what OS Skill elements had to be included in the treasure hunt mscape and these centred on direction, map symbols and grid references.

In an attempt to entice the pupils and change their perception of OS Skills, associated with traditional lessons as ‘dull’, the researcher took the objectives and conceptualised a treasure hunt mscape. The decision to introduce a treasure hunt framework was based on the researcher’s previous experiences with the practical application of OS Skills and the purpose was to make the topic more fun and game-like such as was experienced during the mobile activities carried out by Facer et al. (2004) and Huizenga et al. (2009). This decision created a ‘rule’ by transforming the objectives into a task which would dictate pupil practices. The motivation behind such a decision was that treasure hunts are entertaining
and exciting and would require pupils to be imaginative and creative. Treasure hunts are also activity-centred and required pupils to incorporate problem-solving (Pritchard, 2004).

For practical and safety reasons and to make the experience more enjoyable the researcher instigated another ‘rule’ which split the class into three groups, two with five pupils and one with six. The decision to utilise groups came from the research literature, which in itself was viewed as a supporting ‘instrument’ for the construction phase. There were many examples (Davey, 2007; Facer et al., 2004; Wood et al., 2004; Battista, 2008; Huizenga et al., 2009) of where researchers incorporated a shared approach amongst participants. The argument was that this style of learning not only serves to divide the workload but affords pupils greater opportunities to construct knowledge with and through their peers, whilst still having the support and guidance from the researcher (Smith, 2006; Blatchford et al., 2008).

To advance the construction process the pupils also became active in determining the ‘rules’ of the activity. Through collaboration, a central tenet in the formation of rules, the pupils decided that the groups should have a leader and that each group would benefit from centring their mscape on the history of an old building associated with Belfast Grammar. The inclusion of three buildings, Fairbourne, Walton and The Lodge not only supplied appropriate names for each group but they served to make the mscapes more personal and fun whilst introducing a sense of positive competition (Huizenga et al., 2009). The decision to have group leaders was justified by pupils on the grounds they would enhance group responsibility (Blatchford et al., 2008) and facilitate more efficient communication between group members and the researcher (DfES, 2004; Blatchford et al., 2008).

With the OS Skill objectives presented to the pupils along with the formation of the rules and practices a number of supporting documents were produced for pupils. During the Thames Mscape a number of helpful information sheets had been created, and it was deemed appropriate once again, to clarify and embed agreed practices through the presentation of useful written information to pupils (see Appendices G and H for examples of the group-based information sheets). Contained within this useful information was guidance on how to access and utilise a secure, password protected, online support course created through LNI. Every pupil involved with the inquiry had access to an internet ready computer at home so no pupil was disadvantaged when it came to accessing the LNI course. LNI was viewed as an ‘instrument’ which improved communication amongst the ‘community’, allowing pupils to post questions, exchange ideas and resources and it aided in the effective ‘division of labour’. Through improved communication, tasks were more
easily agreed upon and resources uploaded for fellow group members, and the researcher, to securely view and download.

Building on the notion of ‘community’, pupils were initially invited to participate as an entire class. Then, as previously stated, a ‘rule’ was implemented splitting the class into groups in an effort to make the activity more inclusive, empower pupils (Wood et al., 2004; DfES, 2004; Blatchford et al., 2008) and distribute the workload fairly. Over time however, as pupils became more familiar with the task, the participants were introduced to the wider support ‘community’. This community not only involved a review of the online forums and some freely downloadable mscapes from the HP Mscape website but it also included Ulster Mediascapes conducting a familiarisation session with the main ‘instrument’, the Mscape Toolkit. After this demonstration pupils were encouraged to become part of the mscape community and download the relevant software and practise using it. The importance of being part of a support community was also emphasised to pupils and advantages of teamwork highlighted, therefore the participants were made to feel part of the complete learning process rather than just being recipients of the learning intentions (Attewell, 2005; Davey, 2007; Burkett, 2008).

After discussion, each group decided on a theme or story to drive their mscape and spark interest amongst participants. Once decided upon, the group leader was then better placed to help distribute the tasks, such as resource research and creation and base map construction. After all resources had been created pupils then reached a conscious decision, achieved through deliberation and compromise, on where the images, sounds and slideshows associated with the treasure hunt clues should be digitally placed on the base map of Belfast Grammar (see Section 4.2.2 for more information on the placement of clues for each group). In an effort to capture how pupils distributed the tasks and collaborated, forming their own working practices and rules, each group was required to construct a storyboard for the mscape (see Appendix I) and maintain a journal (see Appendix J) providing an insight into their mscape experience (Burgess, 1981; Janesick, 1999).

Like the Thames mobile activity, once the mscapes were constructed each had to be tested using the Mscape Toolkit on a PC, followed by an on-site pilot (Uden, 2007) to identify and eradicate any ‘contradictions’ or problems. After piloting their group’s treasure hunt each pupil recorded their thoughts on an observational schedule in an effort to catalogue issues requiring attention (see Appendix K, which summarises the main outcomes from each pilot). The pilots, which many other research inquiries failed to carry out or mention (Facer et al., 2004; Wood et al., 2004; Battista, 2008), was a central component or ‘instrument’ of
the creation phase and did add to the coherence of the ‘community’. It allowed for essential modifications to be carried out enabling the mscapes to function as they were intended, and under the key areas of ‘appropriateness of content’, ‘learning’ and ‘any other areas’ participants could comment on the OS Skills, helping to ensure the objectives were met and the outcome (the final m scape(s)) was achieved successfully.

3.5 Methods of Data Collection

3.5.1 Interviews

3.5.1.1 Reasons for using Interviews

Like fishing, interviewing is an activity requiring careful preparation, much patience, and considerable practice if the eventual reward is to be a worthwhile catch (Cohen et al., 1976, p. 82).

The analogy put forward by Cohen (1976) highlights the level of preparation required to use interviewing as a data collection method. For action researchers, who are often dealing with a small sample size, the use of an interview marks, according to Cohen et al. (2007), a move away from seeing inquiry participants as subjects to be manipulated in order to obtain data. Instead interviews are more personal and enable the interviewee to be seen as an individual who can help advance an inquiry through providing vital and rich data through conversations (Kvale, 1996). For Kvale an interview places human interaction at the centre of knowledge production and emphasises the social situatedness of research data.

Interviews are an intrinsic part of action research because they do not try to conceal the role of the researcher. Each idea, interpretation and piece of information is filtered through the eyes of the researcher. Interviews help to place the researcher within the inquiry, they endow them with a purpose and providing the researcher is vigilant for personal bias he/she should be able to let the interviewee speak for themselves in response to well thought out prompts (McNiff and Whitehead, 2005). Cohen et al. (2007) also focus on the concept of purpose. For them interviewers must be clear about the purpose or the reasons for conducting an interview. In the case of this inquiry interviews were seen as an adaptable and flexible instrument from which to gather a rich source of data efficiently (Lichtman, 2006). It was also decided that 16 pupils would be too few to conduct a quantitative inquiry whereas the volume and quality of data acquired from the interviews was more than
sufficient to validate an action research inquiry (Cohen et al., 2007). Interviews tend to be more personal than questionnaires, which in itself can generate more in-depth data, and they also provide unique opportunities for the interviewer to pick up on non-verbal communication as well as verbal. Furthermore, the interviewer may get the opportunity to ask interviewees to develop or clarify their responses.

It is important however, to bear in mind that interviews have limitations and that these can impinge on the quality of information gained. The researcher must be vigilant for bias creeping into the interview, which can occur if the interviewer becomes attached to a certain viewpoint (Sellitiz et al., 1962). There is also the issue of confirmation bias, whereby the interviewees may tell the researcher what the interviewer wants to hear (Lewis, 1992). Therefore in an effort to minimise bias researchers need to accept and acknowledge areas where bias may occur and be pre-emptive by creating a trusting and positive interview environment, which puts interviewees at ease and includes careful planning around location and timing considerations. If this is not achieved the interviewee might feel threatened, anxious or nervous and these negative emotions could affect the quality of data collected (Lewis, 1992).

3.5.1.2 Justification of the Types of Interview Used

Cohen et al. (2007) highlight that there are a number of interview types on offer to an action researcher. LeCompte and Preissle (1993, cited in Cohen et al., 2007) for example put forward standardised, in-depth, ethnographic, elite, life history and focus group interviews. Others put forward structured interviews (Lincoln and Guba, 1985, cited in Cohen et al., 2007), exploratory interviews (Oppenheim, 1992), semi-structured and group interviews (Bogdan and Biklen, 1992). The list does not end there but as Cohen et al. (2007) assert it is appropriate that researchers usually divide interviews into four main types: the structured, the unstructured, the non-directive and the focused interview.

Kvale (1996) believes that researchers must choose the one that is right for their inquiry, the one that is ‘fit-for-purpose’ (Cohen et al., 2007). On closer investigation the structured interview, the unstructured and the non-directive type of interviews did not appear fit for the purposes of this inquiry. The structured interview provides very little flexibility (Lichtman, 2006). Precise questions are determined in advance of the interview and the interviewer may not deviate from the scripted questions. There is no opportunity to ask for clarification of the response or follow-up after new and interesting comments are made by the interviewees. This kind of interview is more common in quantitative research or large surveys where it may be beneficial to limit the amount of data or keep it as closed as
possible (Lichtman, 2006). Lichtman (2006) recommends those involved with small-scale inquiries, where the aim is to get as much quality data as possible, should avoid this type of interview at all costs,

*This kind of interview is designed to eliminate the role of the researcher and to introduce objectivity into the situation.... I do not believe qualitative research is about objectivity....* (Lichtman, 2006, p. 188).

With regards to unstructured and non-directional interviews these too posed concerns for this inquiry. Neither is specially formatted and they remove a vast amount of control from the researcher. The direction the interview takes and the topics discussed are determined largely by those being interviewed (Cohen *et al.*, 2007). For those skilled in the art of interviewing this may appeal as they do not delimit the inquiry, rather they cast a wider net and hope for a rich trawl of information. Unfortunately there is no guarantee that they will get the quality data they desire and very often the transcription and coding are more time-consuming. Unstructured and non-directional interviews are often best when beginning a new research inquiry or when,

*...a researcher needs to explore a topic and define likely areas of importance*  
(O'Shaughnessy, 1995, p. 287).

Cohen *et al.* (2007) also point out that non-directional interviews provide interviewees with the opportunity to spontaneously express their subjective feelings. On one hand an action researcher may welcome this but in reality he/she must consider who the interview is directed at. If the interviewees are extremely knowledgeable in the area being considered and can articulate themselves well then an unstructured approach may work, at least in the early stages. However, in the case of this inquiry the interviewees are 15 and 16 year old pupils delving for the first time into the use of mobile technology in education. They may be familiar with mobile technology outside of school but to its use and application within school for the purposes of learning, they are relative novices who require help and guidance in an interview situation. Cohen *et al.* stress that it is important that researchers should attempt,

*...to understand the world of children through their own eyes rather than the lens of an adult* (2007, p. 374).

Arksey and Knight (1999) also indicate that it is important to establish trust when interviewing children and to put the child at ease as quickly as possible. For Arksey and
Knight (1999) the emphasis is on the need to communicate with children in an interview situation not to introduce them into a non-directional or unstructured environment which might make them feel uncomfortable and detract from the quality of information obtained during the interview. In a similar vein Pring calls for researchers to be careful when interviewing and he suggests the use of the semi-structured interview,

...otherwise there would not be the scope for those interviewed to expound the full significance of their actions (2000, p. 39).

As an action researcher the significance or the 'meaning' of what is done, in this case with the m-learning activities, lies in the ideas, intentions, values and beliefs of the interviewee. Therefore the semi-structured interview should be seen as a mechanism to unlock the wealth of knowledge that each interviewee holds. The semi-structured interview involves the preparation of an interview guide that lists a pre-determined set of questions or issues that are to be explored during the interview (see Section 3.5.1.4). In doing so the researcher embeds flexibility into the interview as the guide serves only to ensure the interviewer presents the same information to those being interviewed. The interviewer is free to pursue certain questions in greater depth and the advantage of the guide approach is that it makes interviewing a number of different persons or groups more systematic and comprehensive by delimiting the issues to be taken up in the interview. Critics of the semi-structured interview state that this approach does not allow for full confidentiality nor does it permit the interviewer to pursue issues of interest that were not anticipated when the interview guide was elaborated upon. Additionally the flexibility of the interview in wording and sequencing may elicit different responses from different persons, thus reducing comparability (Cohen et al., 2007). Within the context of this inquiry the semi-structured approach was chosen as 'fit-for-purpose' (Cohen et al., 2007) and the following section details how this type of interview was incorporated into the research.

3.5.1.3 The Interview Approach with Pupils

From the outset of the inquiry it was decided that all pupils should be involved with the interviews and this decision was made for two reasons. Firstly, to ensure all pupils felt included in the inquiry (Arksey and Knight, 1999; Bogdan and Biklen, 1992) and secondly, 16 pupils represented a workable number. Any less could call into question the validity of the data collected and in turn the inquiry (Borg and Gall, 1979). After carrying out an extensive review of the literature it was decided that after both m-learning activities focus group interviews, consisting of four pupils, would be used initially. These would then be followed by a large group interview targeting Class 11M and as a mechanism to allow for
expansion and explanations (Wellington, 2000; Cohen et al., 2007) on the initial interviews, a follow-up focus and whole class interview was scheduled for six months after the m-learning activities had ended.

Focus groups are a form of group interview,

*...though not in the sense of backwards and forwards between interviewer and group*

(Cohen et al., 2007, p. 376).

The reliance is on the interaction within the group meaning that the interviewees interact with each other instead of always with the interviewer. This creates a situation where the views of the participants can emerge instead of the interviewer’s agenda dominating (Cohen et al., 2007). It also establishes trust and makes the interviewees feel more at ease as they are accompanied by some of their peers. This is not to suggest that some children do not perform better in a one-to-one basis (Eder and Fingerson, 2003).

There are a number of advantages in using focus group interviews, as opposed to other data collection tools, providing the researcher is vigilant for bias and creates a trusting and positive environment (Sellitz et al. 1962). Cohen et al. (2007), Bailey (1994) and Robson (2002) believe the advantages of focus groups include:-

- flexibility of interviews;
- responses can be clarified;
- detailed explanations can be given;
- empowers participants to speak out in their own words;
- more personal than larger group interviews, structured and unstructured interviews and even questionnaires;
- generates data quickly and at low cost;
- can yield high quality information.

The research literature also alerts the researcher to be vigilant to their position when interviewing pupils. Eder and Fingerson (2003) suggest that a power status dynamic exists when an adult particularly the pupils’ teacher acts as the interviewer. Pupils can at times feel intimated by the presence of their teacher and present responses which they believe the teacher wants to hear or indeed feel reluctant to fully explain their points of view (Lewis, 1992). Lewis (1992) recommends that pupils need to feel at ease and be assured by the interviewer that their views and opinions are most welcome in whatever form they take and...
that they will be treated in confidence. According to Lewis (1992) and Cohen et al. (2007) focus groups also help children relax more when being interviewed by an adult. Within a group of peers, whom they know, they are made to feel at ease and may be less intimidated, particularly if the teacher ensures the interview is conducted in a constructive and encouraging manner.

According to Cohen et al. (2007) there is no set rule on working out the number of focus groups to use within an inquiry. However they do state that one group interview is insufficient, as the researcher will be unable to know with certainty if the views of the interviewees are unique or are representative of the wider experiential group. It was for this reason that it was decided to conduct a whole class (group) interview after each focus group. In doing so it ensured every participant got the chance to contribute and that triangulation between the findings of the focus group and whole class interview could take place. It also ensured a total of six group interviews were conducted as part of the inquiry.

On the question of focus group size there are both practical and substantive issues to consider. On the practical side, small focus groups run the risk of being less productive and more costly in relation to time. They are also more sensitive to dynamics among the participants (Cohen et al., 2007; Morgan 1988). On the other hand, Walker (1985) argues that larger groups may be harder for the interviewer to control, with a greater risk of shy people being squeezed out, subgroups developing and the quality of conversation deteriorating. At the larger end of the spectrum Ebbutt (1987) suggests nine to 15 is ideal for focus groups whereas others, such as Breakwell, (1990) recommend slightly less such as between six or seven or in the case of Waterhouse (1983) five participants. Barnes and Todd (1977), Morgan (1988) and Kreuger (1988) suggest four participants as best for focus groups, especially where the experimental group is in itself not too large. In the case of this inquiry, with an experimental group of 16, it was decided that four pupils with two extra pupils on standby, in case of absenteeism (Morgan, 1988), was the best solution.

When it came to deciding upon the composition of the focus group the literature revealed that no 'hard-and-fast rules' exist when choosing interviewees (Lewis, 1992). Most literature stresses the need to ensure the representative sample reflects as far as is possible the larger population and the interviewees are able to contribute in a meaningful way to the group discussions (Lewis, 2000). Since all pupils in 11M met the required criteria the decision was made to use random selection. This was to ensure fairness and avoided personal bias. A free to download random number generator (AbleBits, 2009) was used to objectively choose the four pupils who would take part in the focus group interview. During the Rivers m-learning activity Pupils 7, 9, 12 and 15 were randomly selected with Pupils 10
and 11 as standbys. For the treasure hunt activity incorporating OS Skills Pupils 2, 13, 14 and 16 were chosen with Pupils 8 and 11 as standbys. Finally, for the follow-up focus group interview, conducted six months after the initial interviews, Pupils 1, 2, 5 and 13 were selected with 14 and 16 as standbys.

Attention now turns to the use of the whole class group interview. Unlike the focus group considerations on the group number and composition were obsolete as the intention was to use all 16 pupils in Class 11M. Lewis (1992) asserts there are broadly four reasons why researchers would want to use (larger) group interviews:

- to test a specific research question about consensus beliefs;
- to obtain greater depth and breadth in responses that occurred in other interviews;
- to verify research plans;
- to enhance the reliability of interview responses (Lewis, 1992).

All of the above were relevant to this study and the use of whole class interviews aimed to enhance the reliability of not only the class interview responses but those made in the earlier focus group interviews.

Watts and Ebbutt (1987) state that unlike a focus group interview more in-depth discussions can develop in a larger group interview which may allow for ideas to be teased out. A group interview also enables participants to listen to others' views and have the opportunity to either amend theirs or possibly become stauncher in their beliefs (Lewis, 1992). Either way it forces participants to think more profoundly about their views. The feeling of participation can empower pupils enabling them to contribute in a more meaningful manner to the inquiry (Lewis, 1992). In the case of this inquiry the context of the class group was also more natural, less alien to pupils, as it consisted of a pre-existing group structure; one in which the pupils are familiar and comfortable with (Lewis, 1992).

Another advantage of the larger group interview according to Denscombe (1995) is the ability to check on the truth of participants' statements. This viewpoint corresponds with Lewis (1992) and Burgess (1984) with the latter emphasising the larger group interview offers some 'respondent triangulation' where events, actions and opinions are subjected to peer scrutiny and evaluation. It could be argued that many of these advantages could apply to the focus group interview and indeed this may be the case. However, by interviewing the entire experimental group it helped enrich the data collected, not just in the class interview
but also the initial focus groups, and therefore added to the legitimacy of the inquiry’s findings (Lewis, 1992).

Weighed against the advantages Cohen et al. (2007) urge caution when interviewing a large group. Like all forms of data collection there are limitations and the researcher needs to be aware of these so they can be avoided or minimised thereby strengthening the inquiry. Large group interviews operate differently to focus groups, the interviewer needs to be more skilful in ensuring that some participants do not become too dominating or use others in the group as camouflage to hide behind (Arksey and Knight, 1999). There is also a risk that some may be uncomfortable participating in such a large group therefore allowing their views to be overshadowed or distorted by others. This is what Cohen et al. (2007) call ‘group think’ which sees some pupils discouraged to speak out or elaborate fully on their ideas, instead they are happy to go with the majority or the one or two dominant participants. Lewis (1992) also comments on the problem with transcribing and coding responses in large groups as it becomes quite time-consuming and complex.

3.5.1.4 The Structure of the Interviews

The structure of the interview questions was determined by the main aim of the inquiry and the key research questions. After reviewing relevant literature, which recommended using under ten or 12 questions (Kreuger, 1988; Stewart and Shamdasani, 1990) nine were decided upon for the focus and whole class interviews held immediately after the mobile activities and 11 questions for the follow-up focus and whole class interview. See Figure 3.4 for an overview of the questions presented during the interviews.

Literature from Cohen et al. (2007) and Lichtman (2006) suggested sequencing the questions in a manner which would help the interview flow. As a result the first two questions from the initial interviews and the first from the follow-up interview questions were designed as ‘ice breakers’ (Lewis, 1992) to encourage pupils to open up. Questions 3-6 from the early interviews delved into the deeper issues at the heart of m-learning such as the benefits and limitations of mobile technology use along with its ability to support individual and/or group work. In a similar fashion questions 2-9 from the follow-up interviews also focused on the pros and cons of using m-learning but with the benefit of hindsight the questions were constructed to explore in more detail (Cohen et al., 2007) the specific role mobile technology played in attempting to enhance pupils’ Rivers and OS Skills knowledge and understanding. The remaining questions, for both the initial and follow-up interviews, helped draw the interviews to a close by asking pupils to look to the future and comment on the possible or potential use of mobile technology in Geography.
## The Interview Questions

<table>
<thead>
<tr>
<th>Questions Presented to Pupils immediately after each M-learning Activity</th>
<th>Follow-up Questions Presented to Pupils Six Months after the M-learning Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How did you feel when you used mobile technology to help you learn about Rivers/OS Skills?</td>
<td>1. On reflection did you enjoy using mobile technology to help you learn? (<em>If so why and if not why not?</em>)</td>
</tr>
<tr>
<td>2. If you had to describe your experience of using mobile technology in two-three words what would it be?</td>
<td>2. Was the experience of learning about Rivers through mobile technology better than classroom-based theory (i.e. textbook based learning)? (<em>Elaborate</em>)</td>
</tr>
<tr>
<td>3. Were there any benefits in using mobile technology to learn about Rivers/OS Skills?</td>
<td>3. Were there limitations in using mobile technology to learn about Rivers? (<em>If so what were they?</em>)</td>
</tr>
<tr>
<td>4. Were there any disadvantages or limitations in using mobile technology to learn about Rivers/OS Skills?</td>
<td>4. What aspects of Rivers did mobile technology help you understand the most? (<em>Be specific</em>)</td>
</tr>
<tr>
<td>5. Do you think the use of mobile technology facilitated independent (individual) learning?</td>
<td>5. Was the experience of learning about OS Skills through mobile technology better than classroom-based theory (i.e. textbook based learning)? (<em>Elaborate</em>)</td>
</tr>
<tr>
<td>6. Do you think the use of mobile technology facilitated group work (collaborative) learning?</td>
<td>6. What about limitations in using mobile technology to learn about OS Skills? (<em>If so what were they?</em>)</td>
</tr>
<tr>
<td>7. Do you think mobile technology should be used in the future to help pupils learn about Rivers/OS Skills?</td>
<td>7. What aspects of OS Skills did mobile technology help you understand the most? (<em>Be specific</em>)</td>
</tr>
<tr>
<td>8. Do you think mobile technology has a future role to play in GCSE Geography?</td>
<td>8. With hindsight did mobile learning facilitate independent or group work best? (<em>Elaborate</em>)</td>
</tr>
<tr>
<td>9. Would you like to see mobile technology being used more frequently in GCSE Geography?</td>
<td>9. What did you like least about using mobile technology in: (a) Rivers work? (b) OS Skills work?</td>
</tr>
<tr>
<td>10. In your opinion is the future use of mobile technology within GCSE Geography a certain and realistic option? (<em>Elaborate</em>)</td>
<td></td>
</tr>
<tr>
<td>11. What are your final thoughts about your experiences of using mobile technology in Geography? Or another subject? (<em>why?</em>)</td>
<td></td>
</tr>
</tbody>
</table>

The merits of adopting a semi-structured interview technique have already been discussed (see Section 3.5.1.2) but emphasis was continually placed on the necessity to maintain a common thread. By maintaining a similar set of questions the semi-structured interviews allowed for a high degree of comparability, increased consistency and made responses easier to code (Cohen *et al.*, 2007). After each question the participants were given the opportunity to respond (Kvale, 1996) but this is where a difference occurred between the focus group and whole class interviews. Because each class interview was held after the focus group the semi-structured nature of the interviews presented the opportunity to enhance participants' responses to the questions (Cohen *et al.*, 2007). After initial contributions had been made the IWB was used to anonymously reveal key comments from the preceding focus group interview. Pupils then had time to read the comments and were encouraged to give their views, of agreement or disagreement, on the focus group findings.
This approach of showing the comments only after the whole class had the opportunity to make their responses ensured that the focus group statements did not lead the opinions of other pupils in the whole class interview (Cohen et al., 2007). It also provided all pupils, and more significantly those who had participated in the focus group, the chance to elaborate on the statements.

3.5.1.5 Administering and Analysing the Interviews

Sections 3.5.1.3 and 3.5.1.4 revealed there was one focus group interview after both of the m-learning activities. Then one week after the focus group interviews the whole class interviews took place. The same format was applied when administering the follow-up interviews six months later. The reasoning behind this format was to use the whole class interviews as a mechanism to triangulate and hopefully validate the data collected during the focus group interviews (Burgess, 1984; Lewis, 1992; Denscombe, 1995). It was also decided that as it was qualitative data being collected, a separate pilot study of the interview questions was not necessary (Van Teijlingen and Hundley, 2001).

In terms of the initial focus group interviews these were held two days after the respective m-learning activities at an agreed time between all those involved and took place in a Geography classroom. The venue provided a familiar environment (Lewis, 1992) and the interim time period of two days allowed pupils to process their thoughts and form opinions on the activity; yet it did not allow too much time to pass where pupils' experiences could start to diminish. Then one week later, to allow for transcribing and coding of the data, the whole class interview took place and by this stage pupils had ample time to form and even reform their thoughts on the use of mobile technology for the purposes of learning. To make the pupils feel at ease the whole class interview was conducted in the classroom where 11M usually had Geography lessons, but pupils were encouraged to alter their seating arrangements to provide an environment more conducive to interviewing (Lewis, 1992; Lichtman, 2006). When it came to the follow-up questions the pupils were aware of the routine; the focus group was held in a free Geography classroom at a suitable and appropriate time with the class interview taking place in 11M's usual Geography classroom. Every opportunity was taken to ensure the interviewees felt valued and had an equitable chance to express their views (Lewis, 1992; Cohen et al., 2007).

Participants were recorded using an audio recording device and a video tape recorder, which were inconspicuously placed so as not to distract pupils (Lewis, 1992). Two forms of recording were used in case one malfunctioned or developed a technical glitch (Lichtman, 2006; Cohen et al., 2007) and the video recorder had the added incentive of being able to
record non-verbal communication as well as verbal (Lewis, 1992). The focus group interviews lasted between 26 and 28 minutes, whereas the whole class interview lasted between 34 and 43 minutes.

After the interviews each one was transcribed with paramount importance given to maintaining the integrity of the data (Lewis, 1992) - see Appendices L, M and N for examples of interview transcription. Next trends and patterns that reappeared within a single interview or among the various interviews were identified (Lewis, 1992). According to Cohen et al. this is where great tension in data analysis may occur,

...between maintaining a sense of the holism of the interview and the tendency for analysis to atomize and fragment the data.... (2007, p. 368).

Kreuger (1988) suggests that content analysis begins with a comparison of the words used by the interviewees in response to the questions. Then the researcher should move on to look at the emphasis or intensity of the comments followed by the consistency and specificity of responses (Lewis, 1992). Cohen et al. (2007) build on the ideas of Kreuger (1988) and Lewis (1992) and they recommend researchers,

- generate natural units of meaning;
- classify, categorise and order these units of meaning;
- structure narratives to describe the interview contents;
- interpret the interview data.

It is only after a detailed analysis of the interview transcripts that Cohen et al. (2007) advise researchers to code the data.

### 3.5.2 Researcher Observations

In addition to interviewing other qualitative research methods were open for this action research, and one such methodology is observing others (Lichtman, 2006). What made observations appealing and unique was that they offer the opportunity to gather ‘live’ data from naturally occurring situations (Cohen et al., 2007). This innate ability allowed the researcher to observe directly what was taking place in situ rather than relying on secondary accounts. According to Cohen et al. the strength of observation as a qualitative method for collecting data is that it has,
...the potential to yield more valid or authentic data than would otherwise be the case with mediated or inferential methods (2007, p. 396).

For Robson (2002) observations are useful because they allow researchers to distinguish between what people do and what they say they do as well as allowing researchers to step back from learning activities and reflect on events as they happen in real time. Observations are also useful when there may be a delay between recording the data and writing up the inquiry. So observation notes serve to refresh events, ideas and opinions (Cohen et al., 2007). Cohen et al. (2007) also suggest they offer flexibility to record not just events but behaviours, attitudes and other non-verbal communication.

Moyles (2002) views observational data as being sensitive to contexts and demonstrating strong ecological validity. This enables researchers to understand the context of programmes, to be inductive and to see things that might otherwise have been missed. Morrison (1993) refers to the ability of observations to gather data on the physical settings of the learning activity, the human interactions and the organisation of the teaching and learning strategies.

However along with the advantages of observations researchers are warned to be careful when forming opinions and creating links between events,

*What counts as evidence becomes cloudy immediately in observation, because what we observe depends on when, where and for how long we look, how many observers there are and how we look* (Cohen et al., 2007, p. 396).

Research by Adler and Adler (1994) encourages researchers to be aware of their privileged position as an observer and to work in a sensitive manner with participants. Observers should strive to avoid bias and shun attempts to lead the inquiry or influence the participants' actions to a point where the inquiry loses creditability. Instead the observer aims to catch the dynamic nature of events to see intentionality and to seek trends and patterns over time (Cohen et al., 2007).

If observations are decided upon, as in the case of this inquiry, it is then important that the researcher knows when the observations are structured, semi-structured and unstructured. The latter will be far less clear on what the researcher is looking for and therefore make the research job more difficult, especially at the analysis stage.
Throughout this inquiry the researcher was observing what was occurring. This began with the conception of the m-learning activities and continued throughout the development, implementation and aftermath of the activities. Structured observation, such as tick boxes schedules, were not necessary for this inquiry. They tend to suit more quantifiable inquiries where raw numerical data is desired from the observations. What was of benefit however was the semi-structured and unstructured observations made by the researcher. During the piloting of both mobile activities those involved, including the researcher, completed a semi-structured observational schedule (see Appendices E and F). These schedules served two main purposes. Primarily they allowed for the observations of the mobile activity in action before the main learning event took place but they also triangulated the researcher’s observations by combining other peoples’ perspectives. This added depth and breadth to the observations helping to fortify the inquiry’s findings (Lewis, 1992).

According to Banks (2001) images are another piece of a researcher’s armoury, along with field notes and other forms of knowledge. Pink (2006) goes further, she believes that photographs and video are not separate or additional paradigms but ‘part and parcel’ of contemporary methodological techniques. Research by Burkett (2008), mentioned in Section 2.2.3, found the use of video footage and photographs extremely useful when studying the impact of mobile technology on pupils’ learning. Therefore in response to this advice unstructured observations were also carried out as part of this inquiry, in the form of journals (see Appendix A) and visual data. These were designed to capture the events before, during and after each mobile activity. At times there was an attempt to semi-structure the researcher’s observations contained within the journals but essentially the emphasis was on recording the chronology of the key events, critical incidents (Cohen et al., 2007; Flanagan, 1949 cited in Cohen et al., 2007, p. 404) and the daily routines involved with the undertaking of such an inquiry. When these observations were made some appeared irrelevant but as the inquiry progressed and other data collection methods took place some observations increased in significance. In relation to the collation of visual evidence, photographs (see Appendix O for examples) and video recordings were made to help with later analysis and to later provide visual proof of trends and patterns (Lichtman, 2006).

3.5.3 Standardised Assessments

Standardised tests are typically designed to give a common measure of pupils’ performance. The number of pupils who can take the assessment can vary but they give teachers a common yardstick or ‘standard’ measurement. Teachers can then use these standardised
assessments to tell how well school programs are succeeding or to give themselves a picture of the skills and abilities of pupils.

For an action researcher the ultimate aim is to use the outcomes of the standardised assessments to provide positive feedback to pupils and to reflect on current pedagogy with a view to making amendments, if required, for future teaching and learning (McNiff and Whitehead, 2005). Although assessment and testing were not the focus of this inquiry it was crucial to the success not only of the inquiry but for pupil self-esteem that assessments did not over shadow the mobile activity. Nor did the researcher want a situation where the pupils viewed the tests as summative assessments with no chance for redemption or improvement. Efforts were made to ensure that when returned the assessments would be formative in nature and provide positive written feedback (Harlen and James, 1997). Although as Harlen and James (1997) state, the advantage of creating assessments from a formative perspective is that the data can be used for summative purposes if necessary. Results can be empirically documented therefore the test scores can be shown to have a relative degree of validity and reliability and can be converted into a grade.

Within this inquiry two standardised assessments were given to the participants. One of the assessments was based on Rivers and the other on OS Skills. For both assessments questions were taken from past AQA GCSE examination papers between 2004 and 2008. This ensured the questions were recent and pertinent to the AQA GCSE Geography syllabus. It also made sure the assessments were of a suitable standard for GCSE pupils because all questions had been subjected to internal and external standardisation procedures by AQA, thereby ensuring content and construct validity (Wiliam, 1992). A crucial point for this research was that the inquiry was designed to determine if mobile technology could enhance learning. Therefore at the heart of the inquiry had to be the syllabus and standards set by the examining body otherwise the activity and associated assessments would be of limited benefit to the pupils. Not only did the assessments need to be standardised based on past AQA papers but also the marking by the researcher had to be fair and equitable. This was achieved through the formation of appropriate mark schemes to accompany the assessments based on marks schemes from AQA (see Appendix P for an example of one of the pre- and post-tests along with mark scheme).

As a further mechanism to ensure the assessments were standardised the inquiry presented pupils with two opportunities to complete each assessment. Approximately one week before the Thames Mscape the pupils were given the Rivers test for the first time and approximately one week before the OS Skills mscape pupils undertook the OS Skills based
These tests were marked in accordance with the relevant mark schemes and instead of being returned with formative feedback to pupils were securely locked away (Harlen and James, 1997). Then about one week after each mobile activity the pupils got the same assessment to complete again. Pupils were not told that the same test would be given only that they had a test on Rivers or OS Skills based on past AQA GCSE papers (Harlen and James, 1997). The reasoning for such an assessment practice was to ensure comparability and in turn standardisation between the results of the two tests and to ascertain if the mobile activities helped contribute in any way to pupils’ learning. Acknowledgement however needs to be given to the fact that repeated testing alone can not ascertain if m-learning had sole responsibility for an increase in performance. Having seen the tests before, regardless of the fact that no formative feedback was returned between tests, or class preparation for the m-learning task in the interim period may also affect pupils’ performance. With regards to the formative feedback of the pre- and post-tests these were only returned to pupils immediately prior to each whole class interview. This allowed pupils to provide interview responses with a complete overview of their performance during each m-learning activity.

As a final standardisation procedure for the assessments the results were compared with the Yellis statistics (see Section 3.5.4) for Class 11M. This enabled the inquiry to not only establish if the m-learning activities had improved the pupils’ performances compared to their first attempt at the assessment but it also allowed for a comparison with the Yellis data. The hope was that the mobile activities would enhance pupils’ learning and help them achieve, in Year 11, a comparable or better grade to what they were predicted to get at the end of Year 12 in GCSE Geography.

**3.5.4 Yellis Results**

In September 2008 all Year 11 pupils took part in the Yellis value-added monitoring programme. Yellis is used by more that 200,000 pupils within 1,200 secondary schools (CEM, 2008; BBC, 2007) and the purpose of Yellis tests and assessments are to form a baseline for value-added measures. The assessments come in two forms; firstly a baseline test is taken by pupils and this is soon followed by an attitudinal questionnaire. The latter looks at pupils’ attitudes to school, particular lessons and homework, quality of school life, feeling of fear in school, home background and support for education from parents/guardians, career plans and aspirations for the future (CEM, 2008).
The benefits for Belfast Grammar being involved with Yellis is that by using a value-added system the school and more importantly departments are able to get GCSE subject predictions, set targets and make fair comparisons between their pupils and those in other schools. Within Belfast Grammar departments evaluate the Yellis data and identify those pupils who are low achievers or under-achieving. Targets are then set at departmental level to ensure these pupils are given additional help and support in an attempt to increase their performance.

The benefit for this inquiry in using the Yellis statistics for Class 11M is that it provides a benchmark or a prediction for the pupils' potential achievement in GCSE Geography. The results from the standardised assessments (see Section 3.5.3), created for this inquiry in conjunction with the two mobile activities, can be converted into a grade using the grade boundaries determined by AQA (2008b) for the Summer 2008 examination series. Once a grade is acquired it can then be compared to the Yellis predictions to see if pupil participation in the m-learning activities enhance their performance, made no difference or even had an adverse affect. See Section 4.4.1.7 for the Yellis data.

3.5.5 Additional Sources of Data Collection

Cohen et al. (2007) highlight the fact that researchers are often exposed to copious amounts of documentation and sources from which data can be collected. Some of the information will be very relevant to an inquiry's central themes, whilst some will have little or no impact. Nevertheless where possible researchers should always try to make use of additional information to support or help explain the main themes of their inquiry (Cohen et al., 2007).

For the purposes of this inquiry several pieces of key documentation were reviewed. As Section 1.3 revealed several Belfast Grammar ICT policies were reviewed. These policies were vital not only in helping to guide and plan the m-learning activities but in ensuring the activities were appropriately delivered and that any outcomes adhered to documented regulations. In addition to the ICT policies data was collected from pupil journals created by the pupils for the second Mscape. One group member from each of the three groups was tasked to keep and submit a journal of the Mscape creation process (see Appendix J).

Other sources of data included the Thames Mscape Quiz scores and for the second mobile activity postings from the LNI course (see Appendix Q) along with the pupil created storyboards (see Appendix I) also counted as additional data. All the aforementioned
information was useful in helping to illuminate and explain patterns and trends within this inquiry, but on the advice of Prior (2003) any information used was considered in conjunction with other data collected. According to Prior (2003) documentation is only 'part of the jigsaw' and Bailey (1994) warns they can be highly biased. Bailey (1994) also points out that most information and documentation was probably never meant to be regarded as research data therefore care needed to be taken when reviewing the information for this inquiry.

3.6 Ethical Considerations

...educational researchers should operate within an ethic of respect for any persons involved directly or indirectly in the research they are undertaking.... (BERA, 2004, p. 6).

The above statement from BERA (2004) served to remind the researcher that he held a unique and privileged position as an inside-researcher at Belfast Grammar (Nolen and Putten, 2007; Zeni, 1998). With this position came responsibilities and therefore a code of ethical practice needed to be established (O’Hanlon, 2003) based on relevant literature and in accordance with ethical procedures at Queen’s University Belfast (QUB). In October 2008 an Ethics Review Application was submitted and subsequently approved in November 2008 (see Appendix R) allowing the collection of data and interaction with participants to proceed.

As mentioned earlier one of the first ethical considerations was renaming the school where the inquiry was to be based. The fictitious name ‘Belfast Grammar’ was created protecting the organisation and all those connected with it (BERA, 2004; Cohen et al., 2007). In addition to the naming of the school anyone participating with the inquiry was also given a fictitious identity to ensure anonymity; such as the 16 pupils from Class 11M who were given a number between 1 and 16. As mentioned in Section 3.3 the other classes 11N, 12P, and 12Q were not selected as participants for the inquiry. This decision, based on the practical reasons outlined in the aforementioned section, was not made without due diligence being paid to the ethical concerns of such an exclusion.

Once the ethics surrounding the participants had been considered a written request was submitted to the Principal of Belfast Grammar requesting permission for the research to take place within her school (Cohen et al., 2007), see Appendix S. This letter not only
outlined the purpose of the inquiry but provided assurances that the organisation, pupils and employees would be treated with respect, afforded ethical consideration and their identity protected (Cohen et al., 2007). After receiving confirmation from the Principal that the research could proceed the selected pupils were invited to take part in the inquiry. This invitation was given in the form of a personalised letter to each pupil (see Appendix S) and a corresponding invitation was given to parents/guardians to read and sign (see Appendix S). This invitation outlined for participants the purpose of the inquiry and assured each individual that their views and contributions would be treated sensitively and in the strictest confidence. Respect and the importance of privacy were stressed and participants were reminded of their right to withdraw at any time without fear or repercussion (BERA, 2004; Lichtman, 2006). Pupils were also assured that the mobile activities were to be incorporated into their GCSE Geography scheme of work as opposed to being an add-on.

In accordance with BERA (2004) the pupils’ invitation letter was made slightly more simplistic and colourful than the parents/guardian version. This decision was made to make the purpose of the inquiry more understandable and attractive for pupils (UN 1989; BERA, 2004). The letters also served to offer pupils and parents/guardians a form of voluntary layered consent (Cohen et al., 2007). This meant if the participants did not wish to contribute to one aspect of the inquiry they could choose not to but still participate in the rest of the research (BERA, 2004). Emphasis was however placed on opting-in to the inquiry rather than out as pupils had to tick boxes if they wished to be included. This was viewed as a fairer option for participants. When the permission slips were returned only one pupil (Pupil 6) chose to opt-out of the focus group section of the inquiry, everyone else agreed to full participation.

Throughout the course of the inquiry care was taken to ensure a code of ethical practice was followed not just for the benefit of the participants but also for the researcher. Cohen et al. (2007) and BERA (2004) highlight that researchers have a responsibility to protect their own self-interests and ensure they do themselves no personal or professional harm, whilst conducting a research inquiry. Another area for ethical consideration was the collection and storage of data. During the mobile activities, the interviews, the assessments and the observations including the use of video, tape-recordings and photographs the researcher was conscious of the need to not only protect the participants privacy but also allow them to express their views freely (UN, 1989; BERA, 2004). The confidential and sensitive treatment of documents and data was stressed to everyone involved with the inquiry. Participants were also reminded that they were free to withdraw or abstain from any aspect
of the research, which caused them distress without fear of sanctions or penalties being imposed (UN, 1989; Cohen et al., 2007).

3.7 Reliability and Validity

The intention of this study is not to investigate every dimension of these often contested concepts but to highlight the important roles both play within research and focus on the specific elements relevant to this inquiry (Patton, 2002; Golafshani, 2003). According to Cohen et al. threats to validity and reliability can never be erased completely,

...rather the effects to validity can be attenuated by attention to validity and reliability throughout a piece of research (2007, p. 133).

Traditionally, validity centred on whether a particular instrument measured what it purported to measure (Messick, 1989; Wiliam, 1992) but more recently Winter (2000) argues validity in qualitative research might be addressed through the honesty, depth, richness and scope of the data collected, the participants, the extent of triangulation and objectivity of the researcher. Whilst conducting this inquiry emphasis was placed on the internal validity of the study (Cohen et al., 2007) and it was important that the findings could be sustained by the data collected. With regards to the external validity of the findings this aspect was cautiously approached. The generalisability of the inquiry’s findings would be frowned upon by positivist researchers. But as Lincoln and Guba (1985) and Schofield (1990) suggest, when qualitative methods are used to collect data the responsibility should not lie with the researcher to make their results valid by forcing them to be generalisable and transferable. The researcher should aim to provide a rich source of data with clear, detailed and in-depth descriptions on how the results were achieved. This then allows other researchers the opportunity to replicate the inquiry and they can decide the extent of generalisability (Schofield, 1990).

According to Lincoln and Guba (1985) ‘there can be no validity without reliability’ but when we switch our focus to reliability the debates about an appropriate definition within qualitative methodologies appears even more contested than occurred with validity (Winter, 2000). Bogdan and Biklen suggest that reliability can be regarded as,
a fit between what researchers record as data and what actually occurs in the natural setting that is being researched, i.e. the degree of accuracy and comprehensiveness of coverage (1992, p. 48).

Embodied in this citation is the idea of replicability of an inquiry's findings. This of course is very difficult with qualitative data such as interviews and observations. No two interviewers or observers will record exactly the same data. In a similar vein to when attempting to increase an inquiry's validity, action researchers must strive to present sufficient information to allow others to replicate or for similarities to be observed over time (Kirk and Miller, 1986). For Patton (2002) reliability and validity are inseparable with the former developing as a consequence of the latter.

With regards interviews, Cohen et al. refer to this form of data collection as,

...a flexible tool for data collection.... the researcher using interviews has to be aware that they are expensive in time, they are open to interviewer bias, they may be inconvenient for respondents, issues of interview fatigue may hamper the interview and anonymity may be difficult (2007, p. 349).

To avoid the interview unsettling the participants, and in turn affecting the validity and reliability of the data collected, the researcher was stringent in following agreed practices governing opportunistic sampling and semi-structured interviews. Both Cohen et al. (2007) and Gonzalez (2001) recognise that small opportunistic samples can be perceived to be biased. Therefore they claim researchers, through acknowledgment, need to remain alert for possible bias or limitations when conducting their inquiry. If researchers take a balanced approach to interviews, or indeed any data collection methodology, and treat the information with sensitivity and caution they can avoid extreme generalisability. This will in turn help to increase the inquiry's validity and make the findings more reliable (Gonzalez, 2001; Cohen et al., 2007). Borg and Gall (1979) also contribute to the discussion of the validity of the sample population and subsequent data collection in this inquiry. Their view is that providing 15 or more participants are involved, the findings are reliable and valid if conducted in accordance with accepted data collection methodology. During the interviews a conscious attempt was made to not lead the participants and every opportunity was given to allow pupils to express their views freely (Lichtman, 2006). This enabled the comments made by the interviewees to be explored further, helping to add depth and validity to the inferences made from the findings (Lichtman, 2006). Triangulation also occurred between the focus group findings and the whole class interviews which further added to the validity of the inferences and increased the reliability of the inquiry's
outcomes (Cohen et al., 2007). As a final precaution the interview transcripts were given back to those interviewed affording each participant an opportunity to amend any comments they felt had been misrepresented (Cohen et al., 2007). No pupil chose to amend any of their statements.

In terms of the two mscapes thorough planning, piloting and consultation with all relevant parties was carried out before pupils experienced the activities. This helped to ensure a consistent and structured approach to each mscape activity. By using source materials, primarily from GCSE based sources, the activities were pitched at the appropriate level for those studying AQA GCSE Geography. This meant that any outcomes of the inquiry could be valid for other researchers involved in or contemplating using similar learning activities. In terms of the observations Moyles (2002) believed that this data collection technique contributed to the ecological validity of any outcomes. The justification is that the researcher is able to see events in situ that they may have otherwise missed.

Another area which helped assure the findings of this inquiry are valid and reliable was the inclusion of the standardised assessments. By using past AQA GCSE papers this ensured the assessments themselves had content and construct validity and were a reliable measure of the pupils’ ability (Wiliam, 1992; Messick, 1994; Cohen et al., 2007). Then by giving each pupil two opportunities, one pre- and one post-mobile technology activity, to undertake the assessments this allowed for a fair comparison of the results and helped validate any upward or downward result being possibility attributed to the mobile activity. As acknowledged in Section 3.5.3 it was also important that the pre- and post-test results were not viewed in isolation, triangulation with other more qualitative data was required to try and determine the extent m-learning played in any change in performance. After all, repeated testing with the same test, class preparation for the mobile activity or a move towards more novel pedagogy such as being outdoors, being more informal or having greater control may have also affected pupils performance difference between the two tests. An additional area which enriched the inquiry was that the standardised assessment grades were compared to the Yellis predicted grades. The researcher was then able to make valid judgements based on assessment outcomes to reliably ascertain if the mobile activities had helped the Year 11 pupils reach their predicted potential grade. More specifically the comparison of the standardised assessment to the Yellis predictions was an attempt to add concurrent validity to the inquiry. This is where one instrument is compared to findings from another data collection instrument to test for correlation.
As an additional measure and to remove bias the findings from the interviews, observations, standardised assessments, Ye11is statistics and the LNI course were triangulated to help identify trends or anomalies (Wiliam, 1992; Cohen et al., 2007). All work and results published in this inquiry are accurate, complete and comprehensive to the best knowledge of the researcher at the time of submission. Attention has been paid throughout to consistency and uniformity in approach to increase reliability and ensure data was handled accurately and over generalising was avoided to increase validity.

### 3.8 Analysis of Data

Now that Chapter 3 has dealt with the methodology and explained in detail the parameters which guided this inquiry, Chapter 4 will analyse and discuss the results obtained through the data collection. This will include a look at a summary of the results gained from the focus group interviews, the whole class interviews and the researcher observations. It will also involve the results from the standardised assessments, Ye11is and other relevant data. Chapter 5 will outline the key findings and Chapter 6 will draw together conclusions relating to the key questions and offer recommendations for future mobile technology use within GCSE Geography.
CHAPTER 4 ANALYSIS AND DISCUSSION

4.1 Introduction

In the interests of clarity a thematic approach has been used to present the findings, which have been split into four sections. This avoided the inevitable repetition that would have occurred by looking at each data collection method separately. Through a thematic approach, the triangulation of the results was more apparent, giving greater weight to the findings. Section 4.2 analyses and discusses the pupils' response and participation in the mobile activities through the lens of AT. Sections 4.3 and 4.4 categorise and discuss the findings in terms of affective and cognitive factors respectively and finally in Section 4.5 the future of mobile technology within GCSE Geography is examined. Affective refers to the more emotionally-related findings, which have an equally important role to play in pupils' learning as the more instructional or pedagogically-based cognitive factors (Combs, 1982; Gorrell, 1992; Jones et al., 2007). The research discovered that affective and cognitive factors can be viewed both positively and negatively by m-learners. It should be noted that although Chapter 4 attempts to categorise and label many of the factors that impacted on pupils' learning, whilst undertaking an m-learning activity, clear-cut divisions did not exist. Many of the influencing factors were interlinked or interdependent.

4.2 Pupils' M-learning Participation Reviewed Through the Lens of Activity Theory

4.2.1 Analysis and Discussion of the Pupils' Participation in the First Mscape

As reflected in Section 3.4 an ideal starting point for analysis using AT are the 'object' and 'subject' components (Uden, 2007). In terms of the Thames Mscape the 'object' or learning intentions centred on the enhancement of pupils' knowledge surrounding the long river profile, key features and processes. The 'subject' as always referred to the involvement of each individual pupil and for the purposes of this analysis the focus was on how the pupils responded, behaved and participated in the activity.
In the immediate aftermath of the Thames Mscape the researcher noted, that the response from pupils was primarily positive. Most pupils felt they had not only experienced and ‘learned something new’ (Pupil 14) but had also ‘consolidated learning’ (Pupil 6) which had previously taken place in the classroom. Pupils were also able to reflect and recognise that learning had been hampered at times by ‘technological glitches’ (Pupil 11), the ‘cold weather’ (Pupil 12) and ‘unfamiliarity with the technology’ (Pupil 11). Criticisms were also levied at the ‘length of time spent conducting the activity’ (Pupil 1) and some questioned the ‘relevance of all the information presented’ (Pupil 6). At first these criticisms appeared detrimental to the intended objectives but further reflection, through the lens of AT, indicated that pupils were able to evaluate their performance and identify those issues which assisted learning and those which hindered it. This insight had not only relevance for the pupils’ understanding of Rivers but also for any future m-learning task.

In the spirit of true inquiry it would not have been sufficient to determine the success or failure of the Thames Mscape based solely on the researcher’s observations. The benefit of the AT framework is that it provided an immediate and early indication of how pupils participated and behaved during the activity; although valid and reliable conclusions could not be made until the data was analysed. Sections 4.3-4.5 further review and discuss all collated data and this enabled the researcher to triangulate his observations.

In terms of the ‘instruments’ used during the activity, AT helped identify a number of tools that assisted learning. The PDA, Mscape Player, Flash Player, the Thames Mscape and the River Thames were the main instruments used in helping to co-ordinate and drive the activity. Although, observation confirmed that the individual ‘subject’ also contributed to the pace and direction the activity took, in conjunction with the content and interaction with the aforementioned ‘instruments’. This finding corresponds closely to the conclusions drawn by Facer et al. (2004), Wood et al. (2004) and Battista (2008); that the use of location-aware interactive technology empowers participants and returns control to them. This is in contrast to other research (PEP, 2002; Steward, 2005; Davey, 2007; Burkett, 2008) which was often device-centred allowing little or no direction by the ‘subject’.

Closer analysis also revealed that the subjects brought their own ‘instruments’ to the task, in the form of their personal ICT competence and skills. Having the ability to understand the functionality of the technology and use it appropriately were discrete yet vital instruments in
helping to minimise contradictions. Occasionally though, pupils did experience problems with the instruments. Sometimes it was their lack of familiarity with the touch screen device or a technical glitch with the Mscape or Flash player that caused the subject’s experience of m-learning to grind to a halt. This however is where the wider support ‘community’, such as the researcher, was called upon to intervene and help the pupil re-engage with the activity. The notion of ‘community’ was also encapsulated through the empathy pupils displayed for one another as they assisted those in need by helping with the quiz or supplying missed information. In addition ‘community’ was also reflected through the physical and digital environments where the pupils experienced the activity. For many pupils this was a new experience, learning to differentiate between the real and virtual worlds, both of which contained hazards (e.g. steps, moving and stationary traffic, pedestrians and even miss-direction through inaccurate GPS interpretation or technical glitches), whilst also offering the opportunity to enhance learning.

The assistance pupils offered each other took many forms but AT highlighted the dynamic continuum that existed between the ‘subject’ and their role within the ‘community’. Some pupils (e.g. Pupils 2, 9, 15 and 16) chose to complete the activity individually with minimal assistance. They liked the isolation the technology afforded them, whereas others (e.g. Pupils 3, 7, 8, 11, 12 and 13) relished the opportunity to work collaboratively. For those who chose to work in groups the motivations were varied but nevertheless they bridged the ‘community’ and ‘division or labour’ components of AT. Some pupils (e.g. Pupils 8 and 10) liked to work with their friends to share responsibility. Other pupils (e.g. Pupils 12 and 13) were apprehensive using the new hardware and software seeking support from like-minded peers. For others (e.g. Pupils 7, 12 and 14) they realised that working as a group offered the most effective and efficient method to divide the workload and complete the activity and the integrated quiz. With the collaborative approach came a new power dynamic as ‘leaders’ and ‘followers’ jockeyed for position – see Sections 4.4.1.5 and 4.4.1.6 for more information.

After observing pupils in action it was clear that the Thames Mscape had a profound effect on the ‘rule’ component of AT. As mentioned in Section 3.4.2 the rules were important in creating the mscape but they were also important in helping it to function. As before, it was the researcher who instigated the mobile activity and provided basic verbal and written instructions in an effort to create a positive experience for pupils. The inclusion of a Flash quiz was also introduced as an indirect ‘rule’, as it compelled pupils to complete questions before proceeding.
However, once the activity began the mscape developed a momentum of its own as control of the activity transferred towards the ‘subjects’ (Sharples et al., 2007, 2005). With this shift came new, less formal, rules which enabled pupils to navigate their way along the Thames. We have already seen that some of these ‘rules’ formed through the practises pupils adopted, such as choosing to work individually or collaboratively. ‘Subjects’ also formed their own rules as they developed strategies or set deadlines for completing the quiz. For others (e.g. Pupils 8 and 11) their rule was to seek assistance whenever they encountered a problem, yet Pupils 2, 13, 14 and 15 attempted to work through their problems before asking for help, indicating the different levels of teacher dependence being revealed through this single task.

In terms of the ‘outcome’ this is harder to capture when only relying on AT as an analysis and evaluation framework. The purpose of AT is to provide a framework to help analyse the interactions and behaviours of subjects as they participate within an activity. AT is not designed to provide definite answers with regards the degree of success or failure of the activity (Uden, 2007; Uden and Kumaresan, 2007). As stated earlier the initial observation by the researcher indicated that the overall experience of the participants was positive, although there were some criticisms worthy of attention. However, it was only through a detailed analysis of all the collected data that a valid and reliable judgement could be made regarding the degree of success associated with the mobile activity – see Sections 4.3 to 4.5.

4.2.2 Analysis and Discussion of the Pupils’ Participation in the Second Mscape

The ‘object’ for the second mscape was to allow ‘subjects’ practical application of OS Skills through participation in an interactive game-like treasure hunt. Like the Thames Mscape, the researcher observed a positive response from the ‘subjects’ when engaged in the mscape activity. The vast majority of pupils believed that their knowledge and understanding of OS Skills had been enhanced through m-learning; a direct result from creating the mscape and from experiencing other msapes. A small number of pupils (e.g. Pupils 7, 9 and 10) however, were eager to point out that the 20 minute treasure hunts did not justify the weeks of construction and preparation, indicating their lack of awareness of the link between the learning associated with the construction and that of actual participant in the treasure hunts. Others (e.g. Pupils 8 and 11) felt completing all three treasure hunts one after another was tiresome, declaring that they would have preferred a week to experience all msapes.
A major difference between this second Mscape and the first was the ‘subject’ was required to be much more involved. Pupils had taken a greater ownership of the task through its creation, even though many did not like the construction phase. This enhanced sense of ownership empowered pupils allowing them to begin the activity with greater autonomy and control. The ‘subjects’ were much more aware of their place in the learning ‘community’ and accepting of their responsibility associated with this position. This central position now enabled pupils to make informed decisions more effectively. Pupils were less apprehensive and more attuned to the ‘instruments’ around them assisting their learning. In terms of the ‘instruments’ the PDA, Mscape Player and the treasure hunt Mscape were the main tools. The pupils’ ICT competence and previous knowledge and understanding of OS Skills were also vital tools because, without some understanding of mobile technology or OS Skills completing the activity would not have been possible.

Further analysis of this task also revealed that the school environment, also part of the ‘community’, could be classified as a learning tool. The school grounds were much more intertwined and an integral part of the digital activity than during the Thames Mscape. The latter saw the river superimposed over the school grounds, which bore no similarity or connection with the Thames. For the treasure hunts however the school environment was crucial for pupils attempting to successfully answer location-based clues to find the treasure - see Figures 4.1 to 4.3 which illustrate the layout of the three treasure hunts Mscape as designed by the groups.

In terms of ‘community’ this aspect of AT became more significant for the second Mscape. During the construction phase pupils developed a close bond with one another as they worked alongside their peers and distributed tasks in an effort to complete a learning activity. When it came to the Mscape pupils were accustomed to working in groups and most (e.g. Pupils 3, 4 and 12) continued as a team to complete the treasure hunts. There was a perception among some that through collaborative efforts and associated distribution of tasks the treasure could be located more efficiently. The team approach was common practice throughout the second Mscape, although some pupils (e.g. Pupils 8, 10, 15 and 16) did occasionally attempt to work independently as they competed with others to find the treasure.

AT was also useful in exploring the dynamics of ‘subject’ collaboration. Pupils 6, 12 and 13 were observed assuming a leadership role during the treasure hunts – see Section 4.4.1.6 for
**Fairbourne’s Treasure Hunt**

This treasure hunt centered on a fictional character called Mary Ann Dominic who needed to find missing treasure which her husband buried shortly before his death. Mary Ann discovered from her husband’s old diaries that he buried the treasure somewhere within the area which now constitutes Belfast Grammar. Mary Ann’s request is that anyone participating in the Fairbourne Treasure Hunt Mscape would help solve the clues and find the treasure.

When the introductory speech was finished the ‘Starting Point’ was highlighted on the PDA screen by a pin. While the speakers (map to the right) were constantly active ALL other regions (map to the left) were disabled until the preceding clue had been delivered. This helped prevent confusion.

As the region labels suggest clue one followed the Start Zone, Clue 2 followed Clue 1 and so on. Clue 5 acted as the last clue for the Fairbourne Group and it directed participants to the treasure site.

Once at the treasure site participants were asked to tap the appropriate button on the PDA screen to signify if they found or did not find the treasure.

NB: Fairbourne’s Storyboard (Appendix I) provides more information on the Treasure Hunt.

**The Lodge’s Treasure Hunt**

This treasure hunt incorporated the concept of school bullies. Rather than searching for gold or a priceless object, the Lodge group decided that participants of the Mscape treasure hunt would help Emily retrieve her lunch which was stolen by Carla, the school bully. The group also decided to put a time limit of 25 minutes on the treasure hunt otherwise the participants would have failed in their task and Emily would receive no lunch.

When the introductory speech was finished the ‘Starting Point’ was highlighted on the PDA screen by a pin. While the speakers (map to the right) were constantly active ALL other regions (map to the left) were disabled until the preceding clue had been delivered. This helped prevent confusion.

As the region labels suggest clue two followed the Starting Point, Clue 3 followed Clue 2 and so on. Clue 5 acted as the last clue for The Lodge Group and it directed participants to the treasure site.

Once at the treasure site participants were asked to tap the appropriate button on the PDA screen to signify if they found or did not find the treasure.

NB: The Lodge’s Storyboard (Appendix I) provides more information on the treasure Hunt.
Walton’s Treasure Hunt

This treasure hunt centred on the fictitious and horrific story of Charles Morrow and his family. In a fit of madness Charles Morrow, a resident of Walton, murdered his wife and children. However, before young Jack was brutally slain he managed to make off with some gold coins and his precious teddy. The gold coins and the teddy lay where they were deposited on that fateful night nearly one hundred and forty five years ago. Participants of the mscape were given the challenge to find this treasure.

When the introductory speech was finished the ‘Starting Point’ was highlighted on the PDA screen by a pin. While the speakers (map to the right) were constantly active ALL other regions (map to the left) were disabled until the preceding clue had been delivered. This helped prevent confusion.

As the region labels suggest clue two followed the Starting Point/Clue 1, Clue 3 followed Clue 2 and so on. Clue 5 acted as the last clue for the Walton Group and it directed participants to the treasure site.

Once at the treasure site participants were asked to tap the appropriate button on the PDA screen to signify if they found or did not find the treasure.

NB: Walton’s Storyboard (Appendix I) provides more information on the treasure Hunt.

Speaker Key:

Speaker 1 (S1) = Church Bells
Speaker 2 (S2) = Windy Trees
Speaker 3 (S3) = Teddy’s Bears Picnic
Speaker 4 (S4) = Busy Street
Speaker 5 (S5) = Birds

Image provided by Land & Property Services © Crown copyright

Figure 4.3

more information. The treasure quest inspired these pupils to take up the position of group leader in an effort to find the treasure. The fact that these pupils were given the opportunity to take up a leadership role helped to boost confidence and enhance their experience, whilst at the same time assisting their peers. In contrast to the leaders the flexibility of m-learning allowed others (e.g. Pupils 2, 6, 7 and 16) to assume the role of ‘follower’ without attracting any negative stigma to this position. The ‘followers’ according to Pupil 2 were content ‘at times to follow along’ without feeling overwhelmed or undervalued because the pupils knew they could ‘become more involved whenever you wanted’ (Pupil 2). This discovery helped highlight the supportive ‘community’ and sensitivity surrounding the ‘division of labour’ that developed during the second mscape.

In relation to the ‘rules’ governing the second mscape there were similarities with the first mobile activity. The initial ‘rules’ of both mscapes originated from the researcher, although there was less of a requirement for formal rules for the treasure hunts due to the pupils’ familiarity with the technology and the tasks. Once the treasure hunts began the pupils were directed by the clues and format of the activity so these too can be classified as ‘rules’. 91
However, like the Thames Mscape, the pupils were involved in creating and modifying their own rules as the activity progressed. In practice we have already witnessed some pupils choosing to work independently or conversely collaboratively. Others introduced deadlines (e.g. Pupils 5 and 10) and some (e.g. Pupils 2, 13 and 14) encouraged leaders or distributed responsibility for different components of the task to various group members. AT helped to highlight the flexibility of m-learning in allowing pupils to become involved with the direction and establishment of rules.

As previously stated AT is not designed to provide a verdict on the 'outcome' or degree of success of a mobile activity (Uden, 2007; Uden and Kumaresan, 2007). What the framework did allow was the researcher to make a structured and detailed analysis of the activity, concluding subjectively that the treasure hunts had enhanced pupils’ learning. Sections 4.3, 4.4 and 4.5 build upon this view and objectively analyse and discuss the findings of the inquiry as presented in the data collected. Essentially Sections 4.3, 4.4 and 4.5 triangulate the shared outcomes from the two mobile activities and combine the findings to present more valid and reliable conclusions due to the dual perspectives assumed by the pupils. Figure 4.4, using a mirror image effect, is a diagrammatic representation of how the framework of AT helped culminate the shared outcomes.

Activity Theory when Applied to Both Mobile Activities

\[ \text{Mscape 1: The River Thames} \]

\[ \text{Mscape 2: Treasure Hunt} \]

<table>
<thead>
<tr>
<th>Instrument/tool</th>
<th>Subject</th>
<th>Object</th>
<th>Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community</td>
<td>Division of Labour</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Based on Engeström's (1987) model.

FIGURE 4.4
4.3 Affective Findings

4.3.1 Positive Factors

4.3.1.1 Fun and Enjoyment

For pupils m-learning was a new and novel medium from which they could learn and their enjoyment was evidenced through a number of sources. From the interviews pupils stated,

*I really enjoyed it....* (Pupils 6 and 12).

*It was good fun* (Pupil 10).

*It was more fun than normal lessons....* (Pupil 7).

These responses were representative of the views given throughout the interviews; with Pupil 2 emphasising the whole experience was ‘worth it’. In support of the research carried out by Davey (2007), Facer *et al.* (2004) and Naismith *et al.* (2004) observations made by the researcher were able to corroborate that pupils enjoyed the mobile activities and had fun. Figures 4.5 and 4.6 provide photographic evidence.

The researcher noted that,

*Participants were often heard shouting for joy when they got a quiz question correct. It seemed that the inclusion of questions captivated most participants.*
Several pupils referred to the m-learning activities as ‘game-like’ and some were heard singing along with the mscape music and laughing as they completed the task. These factors when combined with comments from the pupil-based journals and follow-up interviews, held six months after the mscape, helped prove that pupils did enjoy themselves. The Walton group claimed ‘It was very enjoyable...IMMENSE!’ and Pupil 5’s face lit up during the follow-up interviews declaring, ‘I really enjoyed it’.

For Pupils 1, 5, 11, 12, 14 and 16 their enjoyment was a result of breaking with the normal classroom routine, ‘of getting outside’ (Pupil 5), and ‘doing something different’. The word ‘different’ was used on a number of occasions and by many pupils; highlighting how pupils viewed this as a ‘new’ and ‘unique’ form of learning. During the follow-up interviews Pupil 14 described the experience as,

....different and better than normal lessons.

Pupil 10 elaborated stating that m-learning was,

Really different compared to other things we do.... No other class was doing this, it was unique.

Figures 4.5 and 4.6 suggest that it is the level of engagement afforded by m-learning that added to the enjoyability of the task and made learning fun. Figure 4.5 captures the immediate aftermath of the Thames Mscape but what the photograph fails to fully portray are pupils discussing their unreserved enjoyment for being mobile and free to move about during the activity. Figure 4.6 shows that Pupil 9 is highly motivated and engaged with the treasure hunt and having fun trying to discover the treasure before others in her group. For Pupil 9 the sense of positive competition was an incentive to try harder.

The Thames quiz was another important reason in making the activity fun for pupils. When pupils engaged with the interactive quiz they enjoyed the challenge. This enhanced engagement was also evident through the creative treasure hunt stories, which pupils developed, along with the presentation and hiding of the treasure. Walton in particular incorporated props (see Figure 4.7) to help make the experience more enjoyable and fun for all.
4.3.1.2 Interesting and Exciting

The research discovered that m-learning often excited pupils and sparked an increase in interest in subject matter to more significant levels than would have been expected under normal classroom conditions. During the interviews pupils asserted that the mscape activities developed feelings of:

*Fun, exciting and interesting* (Pupil 16).

*Excited because it was good to get out of the classroom and you learned better...I liked being active instead of just always listening to information* (Pupil 2).

*I loved it, for me it was exciting and something I had never tried before* (Pupil 9).

For the pupils their excitement and interest stemmed from the context in which they were working – the novelty of being active and getting out of the classroom to try something ‘new’ and ‘different’. Notably, Pupils 2, 3 and 10, made direct reference to the fact that they were excited or interested because of the inclusion of the mobile technology. Therefore by themselves the interviews did not provide conclusive evidence that pupils’ interest and excitement were elevated through the use of mobile technology. These feelings could have been primarily a result of the use of a new pedagogy independent of the secondary source – the use of technology.
For many the arguments could be that pupils’ interest and excitement were only short term emotive factors derived from breaking with the normal routine and being out of the classroom. Davey (2007) in his research did however conclude that the personalisation provided by technology did help to empower pupils and sustain interest levels. Combining the findings from the interviews with the other data collected a picture begins to form, in support of Davey’s (2007) findings. The pupil-based journals revealed that the mobile technology did have a role to play,

*It was all very exciting; everyone in the class couldn’t wait to get started and experience the mobile technology* (Fairbourne).

*We were excited and looking forward to getting started. The use of mobile technology made it different* (The Lodge).

The researcher’s journal and a review of the photographs also helped to support the fact that mobile technology did impact positively on pupils’ interest and excitement levels. The researcher noted that when first introduced to the equipment all pupils were excited and appeared very interested in the tasks. They valued the independence the devices provided, which helped to maintain their interest levels far beyond what would have been expected during a typical Geography lesson. In addition the level of engagement and effort pupils gave, particularly to the treasure hunt mscapes, were clear signs of their enhanced interest and excitement. Figures 4.8 to 4.10 provide visual evidence of the pupils’ interest and excitement.

Figure 4.8 shows pupils listening intently to the treasure hunt introductions. At this stage most pupils are excited and anxious to get started and the creative introductions produced by each group served to heighten interest levels and draw each pupil into the treasure hunt. The Fairbourne group can be seen in Figure 4.9 listening to and discussing a clue from The Lodge Treasure Hunt. Unfortunately what the photograph does not convey fully is the fact that pupils are engrossed with unravelling a clue, a clear sign of their interest. They are also excited and this is observed from their verbal and non-verbal communication with each other. Verbally the pitch and tone of their voices, as they shout out suggestions cutting across one another, demonstrates an anxiousness and rising excitement when they solved the clue. The last photograph, Figure 4.10, was taken immediately after the treasure hunts; it depicts a scene
where some pupils are still excited and reflecting on how they performed during the activities, whilst others are still interested and intrigued by the mobile devices.

4.3.1.3 Motivational and Inspirational

Evidence from the research literature (Facer et al., 2004; Wood et al., 2004; Davey, 2007) revealed when pupils engage with m-learning that this can motivate and inspire participants beyond normal parameters. Burkett (2008) and Attewell (2005) in particular witnessed pupils using mobile technology to construct knowledge for themselves as they analysed features they might have otherwise overlooked. According to Burkett (2008) and Attewell (2005) this interaction made learning not only active but motivational for participants.

Motivation and inspiration are not typical words used in everyday conversation by Year 11 pupils and as such inferences had to be made from the interview data,
It was good to try something different I would like the chance to experience it again....I thought it [the treasure hunts] was not as serious as being in a classroom. You did not feel under lots of pressure or stress (Pupil 5).

Using the technology outside makes you feel more engaged (Pupil 16).

The statements infer that technology motivated and inspired pupils because it was less stressful and more engaging than the norm. These statements were later supported during the follow-up interviews when Pupils 13 and 14 reiterated that technology was viewed as a facilitator and a less stressful way to learn. Pupil 10 described the whole experience as an ‘adventure’ providing a clear indication of the inspirational dimension associated with m-learning. In support of the interview findings the researcher also observed that the inclusion of the quiz during the Thames Mscape acted as a motivational tool for some pupils. For these pupils the desire was to obtain a high score, therefore they were encouraged to pay more attention to the information given via the PDA. This finding was evidenced through the discussions pupils held at the end of the mscape where they were keen to discover how others scored in relation to their own result.

The findings also revealed that the creation of the treasure hunts served to motivate and inspire most pupils but not all. This was most evident from Pupils 8 and 11 who at times appeared reluctant to get involved. Both these pupils at times became disillusioned at the amount of work they were expected to undertake and felt the workload was onerous. Only through discussion with other group members did Pupils 8 and 11 begin to see the potential of their input and become inspired to re-engage with the task. The personalisation of the three treasure hunts also helped inspire pupils, as they wanted to produce a first-rate mscape. This fact was reflected during the piloting of Fairbourne’s treasure hunt; Pupil 15 stated that she believed the treasure hunt, using mobile technology, would motive others and help them learn OS Skills better.

Fairbourne’s journal revealed that a shared sense of group responsibility for the ultimate success or failure of the activity also motivated and inspired pupils. This sense of responsibility coupled with a desire to produce the best mscape motivated the group into producing a high quality piece of work which in turn aimed to enhance learning. The researcher also observed competition in action. During the Thames Mscape pupils competed to get the mscape finished first and to achieve the highest quiz score. On one occasion during the second mscape two
pupils (see Figure 4.11) from the Walton Group even began to compete with others in their group in an attempt to discover the treasure first.

**Positive Competition within the Walton Group**

4.3.1.4 Increased Self-confidence and Self-esteem

For pupils, self-esteem centres on two key aspects or questions, ‘what am I like’ and ‘what can I achieve?’ (Head, 1999). For teachers therefore the role of self-esteem of learners is paramount to the success or failure of any learning task. Head (1999) also suggests that a pupil who views themselves as capable of achieving the end goal of any activity is often more likely to succeed than one who does not because they are secure and confident within themselves (Head, 1999). Therefore intertwined with self-esteem is the concept of self-confidence, which also rests on the learner’s innate value of themselves and therefore becomes equally important for teachers to consider as they strive to enhance the learning experience. During the interviews it became apparent that pupils appreciated the m-learning opportunities, for a number of reasons:

*At the end you put a lot of work in and you saw it was worth it. I felt better about myself*  
(Pupil 13).
...it really makes you feel good. I was introduced to a couple of different things, such as Audacity and I learned how to use it. I was proud of myself because I learned something new, not only for Geography but for other subjects (Pupil 14).

For Pupils 13 and 14 these interactions led to new discoveries, enhanced learning and developed the links with and between other subjects. Most importantly the pupils recognised they were involved from the creation of the mscape through to its completion. This empowered them and made them feel part of and take ownership of the task and their learning. In turn this made the pupils feel better about themselves, a trait that is difficult to instil and teach to pupils. According to Pupils 2 and 16,

When you completed the tasks you feel really proud or yourself because you have actually done it and got it right (Pupil 16).

It really did increase your confidence because when you figured things out you felt good about yourself (Pupil 2).

For these two pupils the feeling of pride came at the end. Self-confidence and self-esteem was therefore not just instilled within the pupils through the m-learning task but also through a recognisable achievement. This discovery corresponds closely to other research findings. LSDA (2003), Facer et al. (2004), Attewell (2005) and Burkett (2008) for example discovered that m-learning was a ‘vital’ tool in not only helping to enhance pupils’ self-esteem but in also improving pupils’ ICT skills. Burkett (2008) was intrigued to discover m-learning provided rich opportunities for working independently and in turn this appeared to develop pupils’ personal confidence. Davey (2007) asserted that the personalisation afforded by the mobile technology helped to increase self-confidence whilst improving more subject aware language. Once pupils reached a certain level where they felt they could communicate better with others this helped promote self-confidence further (Facer et al., 2004; Davey, 2007).

The discovery by Facer et al. (2004) and Davey (2007) relating to better communication promoting self-confidence was observed by the researcher during both the Thames Mscape and the treasure hunt activity. The sense of achievement and of communicating with each other, to either complete the Thames quiz or work out the treasure hunt clues, helped build and sustain pupils’ self-confidence and self-esteem. It was also observed that during both mscapes that pupils quickly became familiar with the mobile technology and task format. Both these facts
enabled pupils to become more confident and complete the task more efficiently. The second mscape activity also revealed that because pupils were involved throughout the task, including the creation, that they appeared to have a greater understanding of the activity and what was expected from them in terms of outcomes. Figure 4.12 shows Pupil 11 demonstrating self-confidence in the form of leadership to the rest of her group. At the start of the second mscape Pupil 11 displayed little leadership qualities and was content to sit back and let others take the lead. However as her confidence grew she developed sufficient self-esteem to eventually assert herself and on occasion take the lead in her group.

Pupil 11 Demonstrating Self-confidence in the form of Leadership

![Pupil 11 Demonstrating Self-confidence in the form of Leadership](image)

Pupil journals also expressed a sense of pride and increased self-confidence,

*We would like to use mscapes again as we felt we achieved something more and different than normal Geography lessons....It was really good to see the finished product (The Lodge).*

*Our mscape performed brilliantly!.... All the girls in our class loved it; they said it was the best one (haha!)....Everyone was delighted with our mscape's performance. We completed all three in very good times! (Walton)*

The integration of humour and confidence is self-evident from the reflective comments made by Walton. They clearly enjoyed the experience and viewed their participation as successful enabling their collective self-esteem to rise. This is a crucial discovery; the fact that the pupils
were aware that they not only completed the task but completed it well, a sign that they held the success criteria of the activity in high regard.

4.3.1.5 Raised Expectations

As pupils became more involved with the m-learning activities their expectations increased regarding what guidance and resources they received along with the extent of their involvement. Pupils also witnessed a rise in their own expectations. As they became more adept at using the technology pupils wanted and expected more in terms of learning outcomes. On occasion their desires were satisfied and on others they were not. Pupil 11 for example felt that,

...for how long it took [to create the treasure hunt] and what we did and the short time it [the actual treasure hunt] lasted I didn't like it.

Pupil 16, who was a strong supporter of the m-learning activities, also commented on the process/product imbalance stating,

On one hand it [completing the treasure hunt] was such a short time but it [creating the treasure hunt] was time-consuming to do. Loads of work was put in and at times it [the distribution of work] was unfair.

The notion of the tasks being time-consuming is the focus of Section 4.3.2.1 but in terms of pupil expectations there was a feeling that occasionally the level of input did not equate to the anticipated learning outcomes. Most pupils however did feel that the mobile activities provided them with a 'worthwhile experience' (Pupil 9) and it did raise expectations, in terms of what pupils want to know and understand from Rivers and OS Skills.

The researcher discovered that the longer the pupils experienced the mobile technology, the greater their expectations became, yet as Section 4.2 revealed the level of guidance required was reduced over time. With an enhanced familiarity with the equipment and learning outcomes pupils were able to work more independently either by themselves or from within a group. As one pupil stated,

Before embarking on the treasures hunts, experience from the first mscape had taught you that, you had to revise over OS Skills otherwise you might not get the clues (Pupil 9).
What the researcher was witnessing was technology affecting the interaction between the teacher and pupils. Initially this relationship was teacher-led but through a combination of increased familiarity, confidence and empowerment pupils instinctively took more control over the activities.

With regards to the resourcing of the second mscape pupils also showed signs of raised expectations. The Thames Mscape provided for pupils a benchmark of what was expected in terms of image and sound files. The subsequent treasure hunt journals revealed that strenuous efforts were made by participants to ensure their mscapes had good quality images and sound,

\[\ldots\text{we wanted to get it right and have great images and sound (Walton).}\]

Several pieces of audio had to be re-recorded at the pupils' bequest and images were regularly amended to make them more effective. In addition the pupils were more accepting of constructive criticism, from their peers and the researcher, regarding their resourcing of the mscapes.

In terms of individuals, the evidence highlighted, they valued a rise in their own expectations of what they could achieve. Previous sections have already outlined how the mscapes increased pupil enjoyment and made learning more fun, interesting and exciting. For many they were motivated through engagement with the technology. These positive affective factors, which are all interconnected, served to raise pupils' expectations. As Pupil 14 stated,

\[\text{It [mobile technology] gave me a better understanding [of OS Skills] because you got out of the classroom and you got to put it into action\ldots\text{The use of technology definitely helped me understand more and if used again I am confident it will make me better at Geography.}}\]

The researcher also noted that by the end of the second mscape several pupils (Pupils 2, 5, 9, 13, 14, 15 & 16) were eager to know when they would experience another mscape. These pupils felt that the use of mobile technology definitely boosted their chances of understanding geographical topics more, when used in conjunction with traditional pedagogy, than compared to traditional teaching strategies alone. Pupil 14 articulated this best when she stated,
If a balance could be found between the use of mobile technology and textbooks we would get the best from both [pedagogies] and this would help me understand [geographical] topics better.

4.3.2 Negative Factors

4.3.2.1 Boring and Time-Consuming

Phrases such as, 'It was time-consuming....' (Pupil 9) and '....it was boring' (Pupil 3), whilst subjective in nature, were common place throughout the course of the inquiry. Due to the timescale and level of commitment expected it was not surprising that pupils sometimes experienced negative sentiments towards the tasks. However, the investigation discovered that only three pupils (Pupils 7, 10 and 11) felt the entire experience was marred by boredom and a misappropriation of time. Pupil 11 felt that,

The amount of work our team put in was a lot. When I saw our mscape I thought are you serious? Is this what we sat and done? It was just too time-consuming and boring.

Only through an appreciation of why pupils classified the tasks as 'time-consuming' and 'boring' will future m-learning activities be more able to capture and sustain pupils' attention and raise their awareness of the variety of 'other' skills being developed. The interviews, researcher’s journal and pupils’ journals revealed that some pupils felt that too long was spent dealing with mscapes, which made the experience 'monotonous' (Pupil 8) and,

A bit boring towards the end (Pupil 9).

For others they believed that,

....we had covered most of the information [in earlier lessons] and there was too much detail (Pupil 12).

These statements reveal that at times the m-learning activities were accused of being repetitive and having too much content making retention, of key Rivers and OS Skills, virtually impossible. In extreme cases the time commitment and amount of information either presented on the PDA screen or required to create a mscape caused excessive stress and anxiety, as in the case of Pupil 8. The Fairbourne group and the researcher also referenced the fact that the entire treasure hunt activity took too long to complete,
We would describe creating an mscape as boring and time-consuming – this part wasn't fun.... In the future our group would like to simply do the mscape not create them! (Fairbourne)

...it was dragging on too long (The researcher).

Expanding on his viewpoint the researcher noted there was a genuine concern regarding teachers finding the time to cope with the workload. Pupils too shared this concern regarding their workload,

*It took a long time to make the mscape.... It was good to see it all together at the end but it did take a long time....I wouldn't mind doing another one in the future but I would do it differently. Get more and different people involved. I would make the groups larger and spread the work out more* (Pupil 13).

What was interesting from Pupil 13's comment was that although she felt the creation phase was boring and time-consuming she understood the activity enough to suggest workable alternatives for future mscape creation; such as enlarging the groups, spreading the workload or getting different people (levels of expertise) involved. Pupil 9 also had sufficient insight to ask, 'how does this relate to our Geography syllabus?' These were encouraging signs prompting future mscape users to think carefully about the role pupils should play regarding mscape design and creation in terms of learning about geographical concepts.

Pupil journals and the researcher's observations revealed that the searching for and creating the resources for each mscape was another time-consuming enterprise. The search often became laborious and detracted from the learning intentions. The Fairbourne group wrote,

*Some group members did...feel it was very time-consuming finding pictures and sounds to use in our mscape, particularly using Audacity to record sound.*

The interviews and journals also revealed that the chosen topics of Rivers and OS Skills were not fun to study for some (Pupils 8 and 11). According to Fairbourne,
Some group members didn't really like the topic of OS Skills. They believed had a different topic been selected they would have been more interested and the mscape would not have appeared to drag on as long.

However, this reason alone should not prevent teachers from incorporating m-learning into a topic. Both Rivers and OS Skills were compulsory GCSE Geography topics and no matter what topic is focused upon there will always be a chance that it may not appeal to pupils. For teachers the aim should be to take appropriate topics, which lend themselves to the inclusion of m-learning, and in conjunction with the pupils create a workable mobile learning activity.

4.3.2.2 Weather
As the inquiry advanced it soon became apparent that an activity designed to use technology outdoors would be dependent upon weather and this could have a real and perceived effect on human emotions (Denissen et al., 2008). The interviews revealed that during the Thames Mscape pupils believed the temperature was '....too cold' (Pupil 4) and according to Pupil 12,

*Being outside, having to use it outside in the cold was the biggest disadvantage for me. I liked it and enjoyed using it but did not like being cold.*

On January 28th 2009 the maximum temperature was 7°C (Metrological Office, 2009). The cold was clearly a real concern and had a negative impact on how the participants perceived the Thames Mscape. With hindsight the length of time spent outside needs to be monitored closely, particularly when there are adverse weather conditions. The researcher's journal also noted that the use of the touch screen PDA prevented the use of gloves and removed the luxury for pupils of putting their hands in their pockets. Many pupils complained of extremely cold and numb hands and admitted when they started to feel the cold they got frustrated, had less patience and lost interest in the activity. However, the follow-up interviews tended to negate the effects of the weather. Pupils 1 and 3 mentioned the need to consider the weather conditions but the extreme negative views appeared to have diminished. This discovery illustrates the fact that cold conditions were not detrimental, in the long-term, to pupils' learning.

The second mscape activity was carried on April 22nd 2009 and the weather forecast from the Metrological Office (2009) portrayed a much warmer day than January 28th with a maximum temperature of 15°C. The concern on this occasion came from the possibility of rain which would halt the mscape or bright sunshine which may have caused screen glare on the PDAs.
During the piloting of the treasure hunts both The Lodge and Walton groups discovered that screen glare did cause some inconvenience but by repositioning the PDA this problem was overcome. On April 22nd the sun did not cause any problems and neither did rain therefore the weather had no negative effect on the second mscape. The interviews do however give us an insight into the pupils' perception of the possible impact of weather conditions, which is not a concern in traditional teaching environments. On numerous occasions the pupils requested that any future mscape be held during the summer months when,

*The weather is much better* (Pupil 10).

*...you always want something to take you out when the weather is good* (Pupil 13).

### 4.4 Cognitive Findings

#### 4.4.1 Positive Factors

##### 4.4.1.1 Active Learning

Popularised by Bonwell and Eison (1991) active learning implies that pupils who become actively engaged with the material they are studying are more likely to recall information. This notion correlates closely with constructivism and as, Section 2.4 has already demonstrated, Naismith *et al.* (2004) assert pupils using mobile technology are actively helping to construct their own knowledge.

Analysis of the data immediately revealed that, like the research by Facer *et al.* (2004), the pupils of Class 11M did experience active learning. During the interviews pupils declared,

*I like learning by getting up and doing something not just sitting all the time as we tend to do in the classroom* (Pupil 16).

*It was good because you actually went out and did it....and had to figure things out for yourself* (Pupil 1).

These statements indicate that the pupils valued breaking with the normal routine of lessons and getting outdoors. What made the learning valuable for Pupil 1 was the fact that she got to put theory into practice. She was no longer in the classroom listening to a teacher or reading
from a textbook, Pupil 1 was actively involved in making meaning out of the Rivers or OS Skills theory. Success or failure of the mscapes depended on active engagement, a conclusion that was reinforced further by the follow-up interviews. Pupil 2 recalled,

...you got out of the classroom, you were not looking at a textbook. You were active and doing practical activities.

The view of Pupil 2 was supported by over a quarter of the class and is illustrated by Figures 4.13 and 4.14, which show pupils actively engaged in constructing their own knowledge.

**Pupils Actively Engaged in Constructing Knowledge**

![Individual Active Engagement](image1)

![Active Engagement through Peer Discussion](image2)

**Figure 4.13**

**Figure 4.14**

Figure 4.13 is a scene from the early stages of the Thames Mscape and shows a number of pupils actively navigating their way around the upper course of the River Thames whilst listening to and watching the on-screen instructions. In order to proceed to the next stop along the Thames and successfully answer the quiz questions each pupil had to actively participate using the PDA. In a similar vein Figure 4.14 shows pupils from the Fairbourne group attempting to find Walton’s treasure. They are actively searching for the treasure in the correct area while communicating with peers and seeking extra guidance from the PDA and GPS. Eventually their efforts led to success and the treasure was located. According to The Lodge’s journal it was the thrill of success coupled with,

...getting involved, getting active [which] made the mscape worthwhile.
4.4.1.2 Multifaceted Approach to Learning

An advantage of using m-learning is that it is extremely versatile and presents information to pupils through a variety of mediums. According to Pupil 8 the mobile activities had, 

...something for everyone. For those who liked sound there was the music, background sounds and spoken audio. For those who liked pictures there was plenty of colourful images and for those that liked to participate in the activity the touch screen PDA made the exercise fun and interactive.

Pupil 5 announced that she learned better through pictures and moving images rather than through static textbooks. Pupil 2 reiterated the views of Pupil 5 and declared that the mscapes had everything in terms of images, sound and action. Pupil 14 in turn summarised these thoughts,

I agree with Pupil 2. I think it [the mscapes] had all the factors that helped different people learn. You had the images and sound in front of you and you could control them by either pausing or replaying.

What most pupils agreed was exciting about m-learning, was the feeling of ‘control’ (Pupil 2) the technology afforded individuals. Having the earphones on provided a feeling of personalisation which empowered pupils to take responsibility for their learning. The images, sound, text and mobility were in contrast to a typical classroom scene where pupils learned through teacher paced instruction and static textbooks. The PDA offered pupils the chance to pause and even replay information that otherwise would have been lost within the single delivery in the classroom scenario. For others the multifaceted nature of the information meant that,

...if you missed some information...You could either get it from the picture or sound or vice versa (Pupil 2).

In other words the mscape offered more than one chance to hear or see the information. According to Faux et al. (2006) this personalisation of learning and enhancement of learner responsibility is one of the main reasons why teachers are and should be engaging with mobile technology. The interviews also revealed that the combination of sounds and images had chemistry together, particularly if the song was memorable. Pupils 3 and 4 believed that being
outside and having a lot of information delivered via the PDA made them pay more attention, whereas the follow-up interviews revealed,

"...if we are using a textbook you can look away too easily and become distracted" (Pupil 5).

4.4.1.3 The Mobile Device

This section looks at the advantages associated with pupils' pre-existing familiarity with technology, the functionality and portability of the device as an attraction and a changing culture enabling mobile devices to be seen as an effective teaching tool. The aptly named title from research by LSDA (2003), 'Mobile phones switch young people onto learning' fits with Prensky's (2001) assertion of pupils as digital natives. This research discovered that both these viewpoints are very real and the mere mention of mobile devices causes increased levels of anticipation and heightened excitement from pupils.

The researcher noted in his journal that when the pupils were invited to participate in this inquiry they were intrigued and eager to get started. The prospect of using mobile technology did not frighten or cause any pupils to feel anxious or fear that they might not have the ICT skills to use the device. Observations from the starter mscape 'Stamp the Mole' highlighted that pupils used the equipment with ease and no major problems arose. In fact the researcher wrote,

*The pupils handled the PDAs in a confident and familiar fashion and they accepted as normal the touch screen functionality. They were keen to move onto the Thames Mscape.*

When presented with the opportunity to respond through the interviews the pupils revealed that,

"...pupils are more familiar with mobile technology because they have mobile phones and iPods" (Pupil 7).

"...there should be a place for it [mobile technology]. It brings a more practical element into the subject and you get to experience what you are learning about. Pupils are already familiar with this type of technology so it can appeal to them on a level which textbooks and written notes cannot" (Pupil 15).

This familiarisation with the technology meant that not only were pupils quick to learn how to use the iPAQ but the technology appealed to them on a level that traditional teaching could not. The PDA lay at the heart of activities, supporting a multifaceted approach to learning through
the delivery of a variety of content ensuring ‘it had something for everyone’ (Pupil 8). By incorporating text, sound, images, video and animation the PDA catered for each individual pupil’s needs helping to give a personal experience. Pupils were also quick to realise the functionality and the potential of the PDA. No pupil had ever used the iPAQ 214 prior to the inquiry but knowledge of mobile phones and windows-based operating systems meant that they were able to navigate effortlessly through the onscreen options. This in turn helped boost pupil confidence and a desire to learn through this medium.

This research, like Davey (2007) and LSDA (2003), found that the portability of the device also attracted pupils,

*The PDA is slightly bigger than my phone but I didn’t mind that, it was still small enough to be light and portable yet large enough to see great images* (Pupil 2).

Another pupil revealed during the interviews that,

*The fact it [PDA] is small and light means you can take it anywhere – that’s exciting!* (Pupil 15).

In support of Pupil 15, Pupil 13 stressed during the follow-up interviews that the independence associated with controlling her own device was extremely welcome and empowering. The inquiry also discovered that pupils now clearly see mobile devices as having a major future role to play as a teaching tool. For them,

*....it is different and it’s not like sitting looking at old textbooks. Because it’s technology you want to learn more....So much of our lives has technology in it so by learning with technology it helps also improve our knowledge of technology. Pupils feel more at home with technology and would like to see more teachers use it* (Pupil 5).

### 4.4.1.4 Independent Learning

In answer to one of the main research questions of this inquiry the evidence agrees with the findings of Attewell (2005), Mobilearn (2005), Davey (2007) and Burkett (2008) that m-learning provides unique opportunities for independent learning. While some pupils (Pupils 3, 7, 10 and 11) expressed that at times the individual nature of the PDA and use of the mscape
made them feel lonely and anxious, all pupils conceded that there were ample opportunities to work autonomously - see Figures 4.15 - 4.17.

Pupil 9 was the staunchest advocator of working independently stating,

I was given the opportunity to work on my own and I was able to take in the information. I did not have anyone talking to me like I would have had in a classroom....I was in charge of my own learning and there were no real distractions.

Her statement correlates closely with the researcher’s observations and the findings from Burkett (2008) who stressed that the privacy afforded by handheld devices liberated participants and instilled a sense of responsibility and self-empowerment. For Pupil 9 the PDA was the focal point coordinating her learning and minimising distractions. Pupils 7 and 12 agreed, emphasising that the classroom was a constant source of distraction but the PDA compelled participants to concentrate more on their learning.

The pupils’ journals also highlighted that mobile technology facilitated independent learning,

A few in our group tried to do one or two of the treasure hunts by themselves. They said that they enjoyed this and felt they were more in charge (Fairbourne).

Regardless of why some individuals chose to work independently the outcomes of such a decision were captured through the various data collection methods. For some it was the sense
of responsibility (Pupils 2 and 16), for others it focused their attention (Pupils 7, 9 and 12), for some it made learning more personal (Pupils 1, 2, 5, 7, 9, 10, 12, 14, 15 and 16), it also provided pupils with the opportunity to go at their pace and ‘use your own initiative’ (Pupils 5, 10 and 15). Pupils 5, 9 and 16 believed the mscapes were self-contained meaning that the device afforded seclusion if desired. The follow-up interviews allowed Pupil 5 to consolidate her viewpoint and highlight that the device presented participants with a choice, to either work with others or work independently. Statements from Pupils 14 and 16 also revealed that for them the only way to fully understand OS Skills or river processes and features was to complete the activities independently. Then, just as Burkett (2008) discovered, empowerment often followed along with the ability to,

...articulate what I was doing better (Pupil 14).

4.4.1.5 Collaborative Learning

Teachers are often faced with a dichotomy between independent or collaborative learning. In agreement with previously referenced research (LSDA, 2003; Attewell, 2005; Mobileam, 2005; Davey, 2007; Burkett, 2008) this inquiry has discovered that m-learning can support and encourage both independent and collaborative learning depending on the task. The Thames Mscape, for example, may have been better suited to independent learning whereas the treasure hunts possibly suited collaborative learning. Both mscapes however offered the potential for autonomous or independent study.

The interviews and journals revealed that for some group work was not the preferred option. For these pupils,

I thought I had to do the work myself.... (Pupil 5).

When I met up with people we just started to talk and I stopped listening (Pupil 1).

The view of Pupil 1, regarding the distractions of working with others, was supported by Pupils 2, 12, 14, 15 and 16. There was also a perception that group leaders often had too much to do (Pupils 5, 13 and 14). Pupil 12 also pointed out that at times competition between pupils prevented group work from functioning effectively as some pupils wanted to complete the Thames quiz or the treasure hunts first.
With the exceptions of Pupils 9 and 15 however all other pupils stated that while there may have been elements of group work, which occasionally caused concern, on the whole they enjoyed the collaborative elements of the tasks. Figures 4.18 – 4.20 show pupils working together.

Collaborative Efforts

Pupils liked the group aspect because,

*The activity provided us with the opportunity to come together. We were all doing the same thing so it gave us something in common* (Pupil 7).

*I was happy to do it [treasure hunts] as a group* (Pupil 14).

The notion that everyone was doing the same thing at the same time also found favour with Pupil 12 as a reason why pupils liked to work in groups. Pupils 7, 12 and 13 asserted that it was better to work in groups because one person could miss vital information. Another reason why
group work succeeded was that the opportunity existed for pupils to naturally drift into friendship groups (Pupil 8). Pupil 10 and the researcher discovered that several pupils enjoyed the activities more when working with others; this made the tasks less laborious and time-consuming. Pupil 13 stated that through group work she was given the chance to get to know others in her class better, outside of the traditional classroom environment; an attraction that she very much enjoyed. The Thames quiz and the treasure hunts also encouraged collaboration as pupils attempted to solve clues as quickly as possible. According to the researcher’s notes and the views of Pupils 14 and 16 the fact that the treasure hunts had been created as a group made it natural for the activity to be carried out in teams. Finally, the journals of The Lodge and Walton revealed that because the groups for the second mscape were selected (fairly) randomly it made it more acceptable for pupils to work as a group.

Having identified the reasons for collaboration it is equally important to highlight the outcomes of using groupwork for future m-learning activities. There was clear evidence from the Fairbourne journal, even though there may have been internal group disagreements at times, that pupils realised collaboration and co-operation were an intrinsic part of the learning process. Disagreements were to be worked through and ‘compromises’ reached. The interviews and journals also revealed that greater care or monitoring needs to be made by the teacher regarding distribution of workload among the group. This will avoid some pupils becoming overworked or disillusioned and prevent others from shirking their responsibilities. The Walton group also demonstrated that a greater sense of solidarity came out of collaboration and like Naismith et al. (2004) the researcher noted that pupils worked together to help construct their learning. In turn this improved confidence and promoted greater use of subject-specific terminology.

It must be noted however that during the initial interviews pupils were more clear-cut when stating m-learning facilitated independent or collaborative efforts. The follow-up interviews identified a more blended approach, where pupils viewed m-learning as providing not just opportunities for individual or group work but also providing a choice of these strategies. The majority of pupils valued this and stated that during the mscapes,

.....the use of technology enabled both individual and group work to occur (Pupil 12).

4.4.1.6 Leadership Opportunities
Like Figure 4.12, Figure 4.21 supports the assertion that mobile technology provided leadership opportunities for pupils.
Leadership in Action

The photographs in Figure 4.21 provide visual proof of leadership in action and this leadership tended to stem from a real desire to complete the task successfully. The quest acted as a catalyst for some pupils to embrace leadership adding to their sense of achievement and enhancing their performance. Inspection of the researcher's and pupil-based journals revealed that several other motivating factors also encouraged some pupils to take on leadership roles. The researcher discovered the desire to help others struggling with the activities was a driving force. This gave confidence to the leader and reassured those receiving assistance. On other occasions the leader either naturally drifted into this role or in the case of Pupil 13 she retained the role she had assumed during the creation phase of the treasure hunt. A lack of progress or indecision or a request from peers were also identified as reasons why some pupils, when working collaboratively, chose to assert control and assume a leadership position.

From the pupils' perspective leadership had associated benefits and problems. For some pupils, particularly those who led a group during the treasure hunt escape activity, they became frustrated with the expectations placed on them and the workload they had to contend with (see
Section 4.4.2.2 for more details). The Lodge however welcomed the opportunity provided by the treasure hunt to,

.... share the workload. Different people could take the lead at times.

When leadership was viewed as a shared approach without the over-domination of any one individual, the task did appear to benefit from the leadership qualities brought by each individual.

4.4.1.7 Improved Performance and Pupil Attainment

Performance and attainment tend to be more quantifiable than qualitative in nature. Although before looking at the statistical evidence it is equally important to look at what the pupils and researcher thought was occurring in terms of pupils’ performance and attainment. In their journal The Lodge stated,

We would summarise our group’s performance of the mscape to be successful.... We would like to use mscapes again as we felt we achieved something more and different than normal Geography lessons.

Both Fairbourne and Walton echoed The Lodge’s viewpoint. There was a feeling of achievement of having created and completed something beyond traditional lessons. The interviews built on this discovery but also highlighted that pupils (Pupils 5, 8, 9, 13, and 15) felt their ICT skills improved alongside geographical knowledge. Figures 4.22, 4.23 and 4.24 also show the pupils’ sense of achievement as they completed the Thames and Treasure Hunt Mscapes. This self-reflectance and immediate ‘sense’ of achievement on completing the msc ape, also noted by the researcher, can be just as important as graded assessments.

The follow-up interviews allowed for pupils to reflect in more detail about their performance and attainment. In terms of Rivers the majority of pupils believed that m-learning boosted their performance. For Pupil 5 the technology helped her,

....associate specific features to the correct part of the river course.
Pupil 5 had found the mental mapping of where river features should be located more difficult before participation in the mscape. Pupils 1, 12, 13 and 16 also stated that the mobile activities helped create mental markers along the course of a river.

In terms of OS Skills the follow-up interviews also highlighted that practical application enabled pupils to understand this topic better. Pupils 2, 5, 11 and 14 indicated that their performance, in terms of successfully applying direction (north, south, east or west), improved. Pupils 12 and 13 believed they had attained a greater understanding of grid references and some (Pupils 2, 3 and 5) focused on being able to identify symbols more efficiently.

Davey (2007) and Burkett (2008) also discovered that m-learning promotes better pupil performance and attainment and when we look at the quantitative data collected as part of this study we begin to see real evidence that pupils' attainment in geographical topics did improve.
Tables I, II, III and IV and Figures 4.25 and 4.26 analyse the data collected from the pupils' pre- and post-Rivers and OS Skills tests.

### Table of Data: Pre- and Post-River Tests

| Pupil Number | Pre-Rivers Test % | Pre-Rivers Test Grade | Post-Rivers Test % | Post-Rivers Test Grade | Pre-Post Test % 
|---------------|-------------------|----------------------|---------------------|------------------------|----------------
| 1             | 78                | A*                   | 84                  | A*                     | +6             |
| 2             | 87                | A*                   | 97                  | A*                     | +10            |
| 3             | 70                | A                    | 78                  | A*                     | +8             |
| 4             | 51                | C                    | 73                  | A*                     | +22            |
| 5             | 60                | B                    | 76                  | A*                     | +16            |
| 6             | 30                | E                    | 49                  | C                      | +19            |
| 7             | 62                | B                    | 81                  | A*                     | +19            |
| 8             | 19                | U                    | 35                  | D                      | +16            |
| 9             | 41                | D                    | 51                  | C                      | +10            |
| 10            | 84                | A*                   | 92                  | A*                     | +8             |
| 11            | 22                | U                    | 43                  | D                      | +21            |
| 12            | 38                | D                    | 57                  | B                      | +19            |
| 13            | 89                | A*                   | 95                  | A*                     | +6             |
| 14            | 87                | A*                   | 87                  | A*                     | 0              |
| 15            | 89                | A*                   | 95                  | A*                     | +6             |
| 16            | 51                | C                    | 76                  | A*                     | +25            |

**TABLE I**

### Table of Analysis: River Tests

<table>
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<tr>
<th>Max</th>
<th>Min</th>
<th>Range</th>
<th>Mean</th>
<th>Mode</th>
<th>Median</th>
<th>Standard Deviation</th>
<th>Kurtosis</th>
<th>Skewness</th>
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**TABLE II**
Presentation of Data: River Tests

**Histogram Illustrating the Spread of Pupils' Pre-Rivers Test Results**

- Median = 61%
- Std. Dev = 24.7
- N= 16
- Negatively Skewed Distribution

**Histogram Illustrating the Spread of Pupils' Post-Rivers Test Results**

- Median = 77%
- Std. Dev = 20
- N= 16
- Negatively Skewed Distribution

**Boxplot of Pupils' Pre-Rivers Test Results**

**Boxplot of Pupils' Post-Rivers Test Results**

**FIGURE 4.25**
### Table of Data: Pre- and Post-OS Skills Tests

<table>
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<th>Pupil Number</th>
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**TABLE III**

### Table of Analysis: OS Skills Tests

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<td>16.1</td>
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**TABLE IV**
Presentation of Data: OS Skills Tests

Histogram Illustrating the Spread of Pupils' Pre-OS Skills Test Results

- Normal Distribution
- Mean = 36.9%
- Std. Dev = 12.02
- N = 16

Boxplot of Pupils' Pre-OS Skills Test Results

Histogram Illustrating the Spread of Pupils' Post-OS Skills Test Results

- Negatively Skewed Distribution
- Median = 67%
- Std. Dev = 16.1
- N = 16

Boxplot of Pupils' Post-OS Skills Test Results

FIGURE 4.26
Had all the pre- and post-test results been normally distributed, as opposed to only the pre-OS Skills test, it would have been appropriate to carry out a Related Samples T-test. However, due to the predominance of negatively skewed distributions it is inappropriate to carry out formal statistical analysis (Cohen et al., 2007). Nevertheless the tables of data and graphical presentations highlight a very clear trend. After undertaking the m-learning activities the post-test results show an increase in pupils’ attainment levels.

For the River’s test every pupil, except Pupil 14 whose high mark remained the same, performed better during the post examination. Pupil 16 registered the most significant increase of 25%, moving from a grade ‘C’ to ‘A*’. The average increase was 13.2% leading to 11 pupils improving their grades. As several pupils (Pupils 1, 2, 12 and 13) agreed,

....it [mobile technology] helped me understand it [Rivers] better (Pupil 1).

This increase in understanding enabled the pass rate A*-C to increase by 18.8% to 87.5% (14 pupils) and avoided anyone obtaining a grade ‘U’. The class median also increased significantly from 61%, a grade ‘B’, to 77% a secure grade ‘A’. In terms of consistency the participation in a m-learning activity also appeared to reduce the standard deviation (24.7% to 20%), helping to eradicate any extremes in the range of results.

In terms of the OS Skills, the pre- and post-testing revealed similar conclusions. Although the pre-test witnessed quite poor results, with a maximum grade of ‘C’ and a mean of 36.9%, the post-test observed a vast improvement. The maximum grade for the latter was an ‘A*’ with a mean of 61% and median score of 67%. This increase in attainment meant that the pass rate A*-C increased by 68.8% to 81.3% (13 pupils), with once again no pupil achieving a ‘U’. Pupil 3 observed the biggest increase in attainment moving from 33% (‘E’) to 76% (‘A*’) after completing the treasure hunt mscapes. In contrast to the Rivers post-test, where one pupil made no improvement, everyone improved. The average improvement was 24.1% leading to a significant improvement in the overall grade distribution.

After reviewing the tables of data and graphs it is obvious that during the mscapes being ‘.... active and doing practical activities’ (Pupil 2) and utilising technology to provide a ‘hands-on experience’ (Pupil 1) resulted in performance and attainment significantly increasing. Proof of this augmentation is further enhanced by the results from the Thames Quiz (see Figure 4.27) and the comparison of the pre- and post-test results with the Yellis data (see Figure 4.28).
# Thames Quiz Results

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<th>No. Of questions Attempted</th>
<th>No. Of questions Correctly Answered</th>
<th>No. Of questions Failed</th>
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<td>16</td>
<td>150</td>
<td>9</td>
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**FIGURE 4.27**

The researcher’s journal indicated that on occasion pupils’ quiz experience was slightly tarnished by technical glitches. However, most pupils viewed this part of the activity favourably. The results presented in Figure 4.27 illustrate that all pupils, except Pupil 1, achieved a score of 50% or more. The maximum score was 190 (95%) and the average was 143 (71.5%). The quiz questions were not standardised by AQA therefore it would not be valid to convert percentage scores into grades. This does not mean the scores are invalid; simply that caution needs to be observed when drawing inferences from the results. What we can state is that the quiz posed a degree of difficulty for pupils, because no pupil got all 10 questions correct, yet the researcher observed the quiz acting as a motivational and rewarding exercise for pupils when they answered correctly.

Figure 4.28 provides a valuable insight into the effects m-learning had on pupils' performance. The majority of pupils (14 pupils) underachieved in terms of the test taken before the OS Skills mscape. Only Pupil 13 achieved a grade higher than predicted by Yellis. Less severe but equally significant six pupils underachieved prior to the Rivers mobile activity, although eight
pupils did achieve better than predicted by Yellis. When we contrast these findings to the post-test results it becomes clear that a transformation clearly occurred with the pupils results equalling or surpassing their predicted grades in most cases (13 out of 16). Their knowledge and level of understanding improved in both post-tests and this was reflected in their enhanced achievement. After the Thames Mscape ten pupils achieved a higher score than predicted and we have already seen that they surpassed their initial test score. Three pupils scored in line with Yellis and only three underachieved. The post-OS Skills test when compared to Yellis also supported this trend. After completing the treasure hunts pupils had the ‘practical’ (Pupil 1) experience of using OS Skills to improve their grades. This was reflected in the fact that nine pupils obtained grades above their Yellis prediction, three were in agreement with Yellis and only four pupils underachieved. Of particular interest for future benchmarking was the fact that Pupil 13, an active and energetic pupil, overachieved on all tests yet Pupils 6, 8, 9 and 11, who tend to be easily distracted and perform poorly in written exams, had a tendency to underachieve.

**Comparison of Pre- and Post-test Results to Predicated Yellis Grades**

<table>
<thead>
<tr>
<th>Pupil</th>
<th>Yellis Predicated Grade</th>
<th>Pre-Rivers Test Grade</th>
<th>Post-Rivers Test Grade</th>
<th>Pre-OS Skills Test Grade</th>
<th>Post-OS Skills Test Grade</th>
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<tr>
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**Key.** Red = Above Yellis prediction  
Blue = Below Yellis prediction  
Green = In line with Yellis

When we take all the test, quiz and Yellis data together there is a clear pattern emerging that after taking part in m-learning pupils have a tendency to score well and achieve noticeably
better results than would have been achieved without the use of mobile technology. The difference in scores is dramatic and could not be a result of a second attempt alone – there must have been another factor impacting on the substantial increase – the mscape. This finding gives significant weight to the argument for educators to embrace mobile technology and utilise it with GCSE pupils in geographical topics such as Rivers and OS Skills.

4.4.1.8 Problem-Solving

Sections 2.2.3 and 2.2.4 highlighted that some of the previous research into m-learning discovered that through the use of mobile devices pupils had enhanced problem-solving capabilities. In agreement with these findings this inquiry also ascertained that problem-solving was a positive outcome of each of the m-learning activities. During both mscapes the researcher observed pupils enhancing their problem-solving skills either independently or collaboratively in conjunction with the technology. The technology provided the visual and auditory stimulus, allowed for information to be paused and replayed, which provided space and time for pupils to process information. Pupils were therefore better placed to solve problems and work through either the Thames quiz or the treasure hunt clues. Figure 4.29 shows some pupils either deep in thought or communicating with others in an attempt to solve a problem.

The pupil interviews also confirmed that the technology helped pupils develop their problem-solving skills. Pupils 2, 8 and 13 emphasised the importance of being able to pause and replay information to check their understanding at key intervals and solve their own problems. However Pupil 15 revealed the dual nature of problem-solving adopting a Vygotskian approach of working alone and with more knowledgeable others, declaring,

*It all worked together as one. You needed the technology to provide the clues and give hints. You couldn’t ask it questions so you chatted to others....* (Pupil 15).

*It was a fun process between pupils and the technology.... When you could solve a clue you discussed it within the group to get to the next part* (Pupil 2).

Both statements were made after the second mscape and focused on technology as a tool capable of assisting learning. It does not have ultimate control, this resides firmly with the pupil who can decide when she requires assistance from others. Pupil 2 also reiterated that the combination of interaction between pupils and technology was fun, indicating that enhanced
problem-solving not only stems from other positive attributes but also contributes to these attributes.

Independent and Collaborative Problem-Solving

4.4.1.9 Supports the Inclusion of Reluctant Learners

It would be fair to state that during this research there were no absolute reluctant learners. All participants contributed to the activities although on occasion some pupils, such as Pupils 8 and 11, did admit that they could have done more. During the interviews after the treasure hunts Pupil 8 stated,

*I didn't create enough work in my group...At times I got confused and lost and didn't know what to do....but you knew others were relying on you and you didn't want to let them down.*
This made me put the effort in – it and the fact I wanted to see what the finished product would be like.

Pupil 11 agreed with the latter statement and emphasised that when an activity extended over several lessons she tended to become disengaged and lose interest. However, she did stress that team spirit and a desire to engage with the technology in the final activity served as a reminder of her responsibility to reconnect and participate with her team. The researcher was also aware that at times some pupils were happy to sit back and allow others to carry the bulk of responsibility. Given time however, the allure of using the technology and of not letting classmates down always motivated these reluctant learners back into the action. In this sense, as LSDA (2003) discovered, mobile technology helped inspire reluctant learners and re-ignite pupil interest.

4.4.1.10 Develops Subject-based Knowledge

Initially the research evidence supported the notion that the m-learning activities extended pupils’ geographical knowledge and understanding but what was also discovered was that pupils’ ICT and historical knowledge were also enhanced. Section 4.4.1.7 has already shown that the use of technology did impact positively on pupils’ geographical attainment and pupils,

"...had to go to places. You had to use grid references to get to each place. You felt your success or failure depended on you getting it right (Pupil 14)."

Therefore m-learning was not just about attainment it also provided practical experience and allowed pupils to learn new, and update previously held, skills. Most pupils agreed that their knowledge of river features and processes along with OS Skills had improved significantly. During the follow-up interviews Pupils 1, 3, 5, 10 and 13 reflected that mobile technology allowed them to listen more attentively and that the interactive multi-media approach was preferable to using textbooks. Although, Pupils 3 and 13 were anxious to stress that technology did not replace textbooks but acted as a supplement. When questioned about OS Skills, during the follow-up interviews, similar responses were given. For Pupil 13,

"...you need the technology to allow you to use the skills, which enables you to completely understand."

This view was supported by others (Pupils 1, 2, 5, 10 and 16) with a consensus that m-learning presented opportunities for getting active and ‘learning through direct involvement’ (Pupil 16).
In turn this gave pupils an enhanced sense of responsibility for their learning but once again pupils (Pupils 5 and 12) emphasised the need to not abandon traditional teaching approaches completely. For them textbooks and classroom-based activities were just as important as using mobile technology as they acted as a point of reference and delivered information through pedagogies pupils were accustomed to and familiar with.

Extending beyond Geography the Walton group in their journal highlighted that through the treasure hunts,

\emph{We learned about history, about how to communicate better and our ICT skills even improved. Before the mscape most of us did not know what a jpeg was or how to create one. Now we can create pictures, sounds and even edit them.}

The researcher also noted that even after the conclusion of the mscape activity some pupils were overheard telling other pupils about the history of the school buildings. In addition both The Lodge and Fairbourne groups also believed that their m-learning experience had transcended across the subject divide into other areas. The key word used by Fairbourne was 'confidence'. For them they had acquired a greater belief in themselves and started to recognise more clearly their own geographical and ICT capabilities. These discoveries were also repeated in the interviews. According to Pupils 5 and 8,

\emph{I am really bad at computers but I had to learn how to record the speeches} (Pupil 5).

\emph{You got to learn how to use different technology and programs to help make the mscape} (Pupil 8).

Pupil 14 supported the notion that being introduced to new programs, such as Mscape and Audacity, encouraged pupils to take on responsibility for their own learning. Through familiarisation with these programs the pupils were not only able to produce and appreciated mscapes better but they also saw the benefit of their newly acquired knowledge for future use,

\emph{...I learned something new, not only for Geography but for other subjects} (Pupil 14).
4.4.2 Negative Factors

4.4.2.1 Too Much Content and Resourcing Concerns

Section 4.3.2.1 drew attention to the fact that pupils perceived some aspects of the m-learning activities to be time-consuming. Further investigation revealed that one of the reasons for this perception was the amount of content. Prior to pupil involvement an analysis of the Thames Mscape pilots revealed that the representative from Ulster Mediascapes had expressed concern over the amount of content being presented to the pupils via the PDA. While his views were taken on board and the content reduced, the reduction in content appeared to be insufficient. According to Pupil 12, commenting on the Thames Mscape,

....there was so much content.... you were just standing there and after a while got bored listening to so much information. You just shut down until the quiz question came.

Pupils 5, 11 and 16 echoed the views of Pupil 12 highlighting the fact that the excessive amount of information may have made the Mscape complete in the teachers’ eyes but caused processing problems for pupils who at times were left feeling ‘overwhelmed’ and ‘stressed’. In agreement with the LSDA (2003) findings it is important teachers find a balance when creating m-learning activities. The volume and flow of information to pupils needs to be carefully choreographed within the framework of an appealing activity or game. Pupil 12 did concede that the Thames quiz was a positive feature and ‘forced’ her to continually re-engage with the content.

Although contextually different and designed to be on a smaller scale than the Thames Mscape the treasure hunts also gave some pupils cause for concern regarding content. The key issues here were resource creation and modification. The pupils’ journals revealed,

At times some group members felt overwhelmed with the amount of content. Several sources often had to be used just to create one jpeg (Fairbourne).

There was content overload at times. We had to decide what to use and what to leave out – this was difficult (Walton).

The views of Fairbourne and Walton highlight that the resourcing of images and sounds, the subsequent creation and eventual amending of content resulted in pupils encountering an abundance of information. By the time pupils reached the final Mscape many were fatigued
suffering from content ‘overload’. Pupil journals and the researcher’s journal also revealed that the searching for and creation of the resources caused much concern and difficulty amongst pupils.

4.4.2.2 Creation Issues and Group Issues

Sections 4.2.2, 4.3.2.1 and 4.3.2.2 illustrated that some pupils viewed the creation of the treasure hunts negatively. For them the experience was time-consuming and stressful. According to some pupils,

....*it wasn’t doing justice for everything we sat and done* (Pupil 11).

....*there was no need for it* (Pupil 7).

These views were reiterated by all pupils and not just during the interviews but also through the pupil and researcher’s journals. The researcher noted that the manipulation of sound through Audacity involved a substantial time commitment and was particularly tedious for pupils. In turn The Lodge’s journal indicated that the whole creation phase ‘dragged’ on too long, which eventually contributed to the boredom some pupils felt. For the pupils in Walton they,

....*Enjoyed the whole thing except the making of it (That was hard-going)*!

Some of the reasons explaining why pupils disliked the creation phase have already been discussed, which highlights the fact that affective and cognitive factors are interrelated and interdependent upon each other. The aforementioned comment by Pupil 11 indicates that some pupils felt an injustice existed between the amount of effort they put into the creation process compared to the final mscape product. They did not appreciate that approximately eight weeks work could culminate in an activity lasting approximately 20 minutes. For others (Pupils 9, 13 and 16) the negative aspects of creation stemmed from the boredom that they felt when the workload became ‘time-consuming’ and ‘laborious’, for example when searching for and producing sounds and images. For most pupils, particularly Pupils 2, 14 and 15, it was the unfair distribution of work within each group that marred the creation process. Section 4.4.1.5 primarily focused on the positive aspects of collaborative work but on occasion problems did arise within groups. When an imbalance occurred in the workload pupils doing the most work felt upset and annoyed. As Pupil 2 stated,
Sometimes you had to do more work than others. That was unfair, at times some people just sat there and it was me doing most of the work.

In contrast those with minimal involvement often felt ‘out of the loop’ and ‘detached’ from the overall task. What the findings have shown is that pupils need to be given an equitable and fair distribution of work to promote positive learning, and as revealed in Section 4.4.1.5 careful monitoring by teachers is necessary to ensure this equitability.

It should be noted that while most pupils expressed a dislike towards mscape creation some pupils (Pupils 2, 13, 14 and 15) acknowledged the beneficial side to creation, as they took greater ownership of the task (see Section 4.2.2). According to The Lodge there was a positive side to the creation phase. For most pupils in their group the experience of creating a mscape was ‘new’ and ‘different’. In turn Walton viewed the creation processes as,

...very enjoyable. We all pulled together and worked hard as a team but looking back we put a lot of hard work into the mscape.

Therefore it is not as clear-cut as stating every pupil disliked every stage of the mscape creation, but as we have already seen careful management of the workload is essential to maximise the positive aspects of creation and to build teamwork skills.

4.4.2.3 Technical Problems

When using new teaching tools, particularly technology, for the first time there is a certain inevitability that problems will arise (Burkett, 2008). For some there was the fear of unfamiliarity with the equipment or of dropping the equipment (Pupils 1 and 11). For others it was the utilisation of the PDA that caused the anticipated technical issues. To begin with five pupils had problems accessing the Thames Mscape, which turned out to be related to a missing Flash Player application on the PDA and easily fixed. Although it did cause delays and tarnished the pupils’ initial experience of the mscape. Pupil 7 stated,

The fact that mine took about five times to start again was not good. Clearly there were some technological problems and at times these were time-consuming.

Unfortunately for Pupil 7 she also experienced problems with one of the treasure hunts but admitted that she was not too concerned as she could work alongside her group. This technical
problem was caused by the kiosk option not being selected on the PDA which meant when Pupil 7 accidentally touched one of the buttons it immobilised the treasure hunt. The researcher also noted that the SD (secure digital) card belonging to Pupil 2 appeared corrupted and had to be swapped with a spare one to enable her to complete the treasure hunts.

When completing the Thames Mscape Pupil 5 was frustrated by GPS drift, a fact supported by Pupil 13 during the follow-up interviews. This meant that when she arrived at some stops that the expected launch of the next slideshow or quiz did not happen. The end result was that Pupil 5 skipped over one question and was annoyed that she could not redeem the marks. Pupils 10 and 11 were also confused with how the GPS worked and in conjunction with Pupil 5 became frustrated with the occasional loss of signal.

More technical problems appeared to surface when creating the treasure hunts, particularly with getting the sound levels on the PDA just right. The pupil-based journals, pilots and follow-up interviews revealed that all groups experienced poor sound quality issues and ended up having to re-record their sound and constantly modify the PDA sound settings. This was extremely time-consuming and troublesome for pupils.

4.5 The Future Role of M-Learning

4.5.1 Future Use of Mobile Technology in Helping Pupils Learn about Rivers or OS Skills

According to the interview responses a number of pupils (Pupils, 3, 6, 7, 10 and 11) recommended m-learning should not be used in future to help pupils learn about Rivers or OS Skills. They justified their position by reiterating reasons such as boredom, time consumption, content overload and resourcing concerns, creation issues and technical problems. Interestingly they did not refer to the irrelevance of using mobile technology in Geography.

In contrast to the views of these pupils the reminder of the pupils asserted that mobile devices should be used. For them,

"mobile technology is a better way to go rather than textbooks and classroom-based work. You get pictures coming up and quizzes and it’s in your ear, whereas using textbooks means you have to read from books and that’s really boring" (Pupil 15).
...when you have the technology you have no choice but to listen because it is so personal
(Pupil 12).

Anything that can speed up learning or make it more interactive is welcome (Pupil 5).

The statement by Pupil 12 starts to shed some light on why the majority of pupils would like Rivers and OS Skills to retain some elements of m-learning. The ability of technology to make learning more personal is important for pupils. It empowers them and enhances their feeling of control. Pupil 9 highlighted,

In class you cannot pause the information but you could with the mobile activity.

Clearly the statement from Pupil 9 was focused on mobile technology but it is worth asserting that critics might suggest that her comment is an argument for self-managed learning that may or may not include m-learning. However, in support of Pupil 9 an elaboration was provided by Pupil 15 who indicated that the technology helped emphasise for her what had already been covered in the classroom. Pupil 9 followed this up by stating that m-learning ‘was a brilliant experience’ that could be useful for revision, a view that gained increasing support from Pupils 1, 13 and 14 during the follow-up interviews. Pupil 5 thought m-learning could be used occasionally as a substitute for absent teachers and Pupils 14 and 16 stressed the merits of skills enhancement,

When you go out then you practise using skills. It is better that way. You end up learning more than you actually thought you did. It also helped you find out what you know and what you don’t... (Pupil 16).

Pupils 1 and 2 were in agreement with the latter statement, during the initial and follow-up interviews. For them the real attraction was the ability to actively learn. In response to those who did not recommend the future use of m-learning for Rivers and OS Skills, Pupils 1 and 14 suggested a compromise. They proposed that mobile technology could be used for short topics. In doing so pupils would not feel overwhelmed with the technology and their brief encounter would minimise any potential limitations.
4.5.2 Future Role of Mobile Technology within GCSE Geography

Broadening out the potential future use of m-learning beyond Rivers and OS Skills the pupils’ views remained similar to the last section. Although Pupils 7, 10 and 11 were slightly more accepting of its potential for the future. They realised that m-learning was a reality and not something to be ignored. Pupil 7 echoed the views of many when she suggested the iPhone from Apple could be a strong enticement for pupil engagement. Pupil 11 recommended keeping m-learning 'plain and simple' ensuring it does not become the focus of the task but remains the teaching tool.

The main discovery from the pupils was their maturity in realising the inevitability of m-learning. They all accepted the use of mobile devices outside of school so it was not difficult to imagine their use within schools. This open-minded realism combined with their technological familiarity enabled pupils to acknowledge that the future of GCSE Geography would undoubtedly include m-learning (Pupil 9). To validate this majority view pupils stated that it would make future learning more ‘fun’ (Pupil 9), ‘enjoyable’ (Pupil 12) and ‘interesting’ (Pupils 6 and 8). Pupils 7, 13 and 15 highlighted the practical and interactive attributes associated with m-learning; for them learning could happen anytime, anywhere. Pupil 1 re-emphasised the usefulness of m-learning for GCSE Geography revision indicating that it did not have to be a one-off event but a teaching and learning resource which could be utilised throughout the two year course at the pupils’ discretion.

Of most significance regarding the future inclusion of mobile technology within GCSE Geography was the repeated referral to its impact upon stress levels. According to Pupils 2, 5, 9, 11 and 13 m-learning helped minimise stress as it was conducted ‘outside’ allowing for more ‘informality’ and ‘freedom’, enabled pupils to go at their ‘own pace’, and ‘choose whether to work independently or collaboratively’. Again it is important to acknowledge that the aforementioned descriptors provided by the pupils are not unique to m-learning. Clearly the pupils took part in a more informal learning experience outdoors, which provided then with a greater freedom and sense of freedom and control. Certainly participation in the m-learning task brought about these associations but teachers needs to consider the extent to which m-learning will benefit pupils and decide whether conducting a lesson outdoors or taking a more informal approach may bring about the same learning outcomes. Also as teachers it is important that we try to reduce stress as much as possible and m-learning has shown that it has the
capability to do this for some pupils. According to Pupil 9 when she was undertaking the mscapes she was 'not stressed' just 'calm and relaxed'. In turn Pupil 2 stated,

...learning can be stressful sometimes and you are always in the classroom so if you get out once and a while it would be good to ease up on the pressure.

The critical aspect for pupils was not to make m-learning 'tedious' (Pupil 2) for most there was an acceptance that classroom-based or a traditional approach to teaching was still vital and the foundation of new knowledge. However, where appropriate, m-learning could be introduced to help stimulate and enhance learning because, 'mobile technology is the future' (Pupil 12). The follow-up interviews enabled pupils to express their views beyond the arena of GCSE Geography and for eight pupils (50%) mobile technology is not confined to Geography. For these pupils m-learning is applicable to all aspects of life, which includes every academic subject as well as non-academic areas inside and outside of school, such as the President's Award (Pupil 5). As Pupil 5 surmised, you can take work home and, 'learn anywhere, anytime'.

4.5.3 Future Frequency of Use of Mobile Technology within GCSE Geography

When asked would they like to see mobile technology being used more frequently in GCSE Geography all pupils stated 'yes', including the pupils (Pupils 3, 6, 7, 10 and 11) who had earlier declared their experience was not positive. Pupils did take the opportunity to restate their dislike for the creation phase and stressed that in terms of frequency they were referring to the actual mobile technology activity.

For some they suggested m-learning should be used for revision purposes either at the end of each topic (Pupils 2, 15 and 16) or towards the end of Year 12 (Pupil 8). For others the recommendation was that mobile technology could be used to introduce all or some of the main geographical topics (Pupils 5, 8 and 11) indicating the perceived range of uses of m-learning – introduction or conclusion of a topic. Some pupils believed the factor determining the use of m-learning should not be the topics but the weather, revealing an awareness of the technical issues surrounding cloud cover, temperature and sunlight as well as GPS drift. Pupils 5, 13 and 16 proposed the incorporation of m-learning during the summer months when the weather was better. Pupils 7, 9 and 12 insisted that the frequency of m-learning should not be associated with geographical topics, revision or the time of year. They focused on the pedagogical
application of m-learning as they wished to see it used to help break the monotony of normal classroom lessons. Therefore they asserted m-learning should be sporadic and used when appropriate, relevant and necessary, either weekly or monthly to help stimulate Geography lessons. Pupil 8 even suggested incorporating m-learning into each end of term assessment, although this comment was not supported by others as they argued their final GCSE Geography exams would not incorporate mobile-based assessments.

Although a variety of opinions were given regarding how frequently m-learning should be integrated into lessons there was a common consensus. All pupils were united in the fact that there was a place for m-learning and that it should be included in the curriculum. According to Pupil 14, 'the key is to achieve a balance.' Like any teaching strategy pupils will get tired and bored if it is continually used and equally if it is used infrequently it may appear out of place and cause problems for pupils regarding technological familiarisation. The real task for teachers is to gauge when it is appropriate to use m-learning to help enhance pupils' learning. Mobile technology should not be used simply for its own sake (Becta, 2004a). Its role is to support teaching and learning and its inclusion should be based on its ability to augment and improve classroom pedagogy.
CHAPTER 5 FINDINGS

5.1 Introduction

The focus of Chapter 5 is to summarise the key findings of this action research inquiry and to highlight important discoveries, which may be of value to other researchers attempting to introduce m-learning into GCSE Geography. The role of Activity Theory (AT), as a suitable evaluative framework for m-learning, will also be critically reviewed in an effort to make it more effective when analysing activities involving mobile technology.

5.2 Summary of Findings

5.2.1 Affective Findings Summarised

In agreement with Jones et al. this inquiry discovered that affective factors played ‘... a strong role (both positive and negative) in harnessing technology for learning’ (2007, p. 17). For many pupils the break from the normal classroom routine, of doing something ‘different’ (Pupil 15) and getting outside to take part in a ‘game-like’ (Walton Group) interactive activity was all important. The novelty of enhanced mobility, experiencing something ‘new’ (Pupil 5) and having the choice to work with and through others empowered pupils and heightened their interest and excitement levels. Like Davey (2007) discovered, during his research, empowerment also stemmed from the personalisation afforded by the technology. Pupils became less stressed and highly engaged (Pupil 14) with the learning activities and not just because they liked something ‘new’ and ‘different’ (Pupil 5), which just happened to incorporate mobile technology, but because the two mscapes were an ‘adventure’ (Pupil 10). The Thames Quiz and treasure hunts, not the PDA, were the focal points. The PDA acted purely as an intermediary device bringing a colourful audio-visual experience to life. M-learning captivated the pupils’ imagination making the tasks fun and enjoyable, whilst serving to motivate and inspire.

In support of the findings of Attewell (2005), Burkett (2008) and others (CeLeKT, 2011; SCY, 2011) there was a recognition that m-learning did enhance the learning experience. When m-learning motivated pupils it allowed pupils to use the technology to construct knowledge for
themselves and become more aware of subject-specific content that they might have otherwise overlooked. This is a clear indication of the constructivist advantages m-learning offers teachers and pupils. The technology helped remove inhibitions and constraints that would often impede pupils effectively communicating with others and allowed for greater interaction, which in turn helped to motivate pupils. ‘Immense’ was used by the Walton Group to sum up their m-learning experience; which they later asserted meant that the treasure hunt mscape was captivating with big rewards not just in terms of geographical content and knowledge but also on the emotional side in terms of enjoyment and sense of achievement.

The inquiry revealed that technological familiarity played a vital role in helping to encourage and sustain participation and augment pupil self-confidence. However the inquiry also discovered that the longer pupils experienced the mobile technology the greater their familiarity and in turn their expectations became. With enhanced familiarity and confidence came a positive change in the teacher-pupil relationship. The traditional hierarchical power dynamic that often exists in classrooms disappeared and pupils became less demanding and reliant on teacher-led instruction and input. Pupils recognised their role and became more involved with setting personal targets, acquiring and modifying their own resources and judging their own performance. The technology however did not replace the teacher; it acted as a teaching resource helping to focus pupils’ expectations. This left pupils better placed to determine when and what assistance they required and when the activities were completed many pupils felt ‘proud’ (Pupils 14 and 16) of their achievement. Pupils emphasised that through interaction with the technology they discovered new things, associated with Rivers and OS Skills as well as learning how to create and edit images and sounds, which all helped to redefine their learning. By the start of the second m-learning activity most pupils knew what they required in terms of guidance, resources and commitment. There was no doubt that for some the workload was daunting, but as pupils became more familiar with the task(s) and the technology they were able to prioritise and work independently or collaboratively to achieve their goals.

In terms of participation pupils valued the personal choice offered by mobile technology to work either independently or collaboratively. When pupils had the opportunity to work together they acknowledged they were excited and motivated and this sense of shared responsibility became a strong encouraging factor. Peer involvement also led to positive competition and the development of close working relationships between pupils, particularly during the creation phase of the second mscape. Pupils became more attuned to what the learning intentions of the
activities were; this was most noticeable after the first mscape which helped set the benchmark in terms of the audio-visual quality. Pupils assisted each other in attempting to successfully create quality resources, complete the tasks and not let others in their group down. If pupils chose to work independently this personalisation helped to sustain interest levels, enabling pupils to develop more subject aware language and communicate better (Zurita and Nussbaum, 2004; Davey, 2007, Norris and Soloway, 2008). The research findings appear to correlate closely to a number of other inquiries (Facer et al., 2004; Davey, 2007; Burkett, 2008) which asserted that m-learning is a 'vital' tool in helping to enhance pupils' self-esteem and personal confidence. The key discovery however, is that when the pupils' self-confidence and self-esteem were boosted there was a positive feedback effect as this helped to also improve communication between pupils, which in turn promoted further self-confidence.

It is important to acknowledge that in terms of affective findings not everything was positive. Most pupils did admit that at times they became 'bored' (Pupils 7, 10 and 11) or felt the tasks were 'time-consuming' (Pupil 11), which made learning monotonous on occasion. These sentiments became more prevalent during the creation phase of the second mscape and centred on the 'tedious' (Pupil 2) and 'repetitiveness' (Fairbourne Group) of resourcing, creating, modifying and piloting the activities. Some pupils felt the time commitment necessary for participating in a m-learning activity was not realistic when compared to the demands from other subjects (Pupils 7 and 11).

The weather too gave rise for concern. Pupils appeared to get maximum benefit out of the tasks when they were conducted during fine weather. If the temperature was too cold, it rained or the sun was too bright causing screen-glare, these negatively impacted upon the learning process. Pupils were unanimous in their view that mobile activities, which take place outdoors, were not designed for completion during bad weather.

5.2.2 Cognitive Findings Summarised

Chapter 4 revealed that in terms of cognitive findings the versatility of the technology ensured audio-visual stimuli were presented to pupils through a variety of mediums, which they had control over. There was 'something for everyone' according to Pupil 8, which supported the research findings of Liu et al. (2003), Roschelle (2003) and Norris and Soloway (2008). For some the spoken word or written text was important and for others the music, images, video,
animation or interactive activity was the significant element which enhanced their learning experience. M-learning put the ‘control’ (Pupils 2 and 14) of the information and the ‘pace’ (Pupils 5, 10 and 15) of the exercise into the hands of the pupils. This personalisation empowered participants and allowed them to appreciate the differentiation between, the more ‘engaging’ (Pupil 16) m-learning and traditional classroom-based learning.

In a similar vein to what contributed to the affective findings the research uncovered that pupils’ cognitive learning processes also benefited from breaking with the traditional classroom routine and getting outdoors. At a practical level pupils appreciated the chance to put theory into practice and make their own meaning through application rather than conjecture. The thrill of success coupled with active participation made the inclusion of mobile technology worthwhile for many. The discovery, that breaking with the norm and using mobile technology outside of the classroom reveals, that not only did m-learning promote active learning but highlights that there is no clear cut boundary between affective and cognitive findings. Instead there is a complex interrelationship and interdependence of both, which illustrates the breadth and depth of m-learning as a pedagogical tool capable of appealing to pupils cognitively and emotionally.

Pupil familiarity with mobile and windows-based technology helped to support Prensky’s (2001) view of young people as ‘digital natives’. Pupils confidently utilised the ‘portable’ (Pupil 2) devices as they tapped into a pre-existing culture which intrigued and instilled within them a desire to learn. Because pupils were familiar with mobile technology they were not only motivated by its inclusion but the research discovered that they quickly processed the functionality of hardware and software. Learning, as asserted by Sharples et al., (2007), became more ‘personal’ (Pupil 12), which when combined with device familiarity helped promote pupil confidence.

Following on from the personalisation of learning the inquiry ascertained that m-learning facilitated independent and collaborative learning, which was a major discovery as it related directly to one of the key research questions. However, with hindsight caution had to be used when trying to determine the extent to which mobile technology enhanced independent or collaborative learning. As the inquiry unfolded it became clear that personal preferences and attitudes, teacher direction or lack of, task specifics and objectives and technological familiarity
and confidence all played an important part in determining whether pupils worked autonomously or collaboratively.

The research discovered that the ability to work autonomously liberated some pupils instilling a ‘sense of responsibility’ (Pupils 2, 5, 12 and 16) and self-empowerment not usually felt during classroom-based Geography lessons. For others technology was identified as a coordinating tool for learning and minimising distractions. Because the mscapes were self-contained this also enabled some pupils to dictate the pace of learning and use their own initiative; traits that appealed to both pupils and the researcher. The research also revealed that the task too determined whether individual or group participation occurred. The initial sensory overload that many pupils felt during the Thames Mscape appeared to favour independent learning as individuals came to terms with the equipment, the control over the flow of information and how to cope with the isolation associated with wearing earphones. Over time however some pupils did start to group together to help overcome technological and activity-based difficulties. In contrast to the Thames Mscape the treasure hunt task was designed to include group work, particularly at the creation phase. When it came to the m-learning activity the group mentality continued and many pupils completed the treasure hunts together. However, some pupils did choose to undertake parts of the mscape by themselves highlighting the in-built flexibility and motivational nature of m-learning.

Examination of the findings surrounding m-learning’s contribution to collaborative learning also revealed interesting results. When pupils worked together, there was often a bond, unlike traditional lessons, as they took shared responsibility for their learning. If one person missed vital information then another could assist. This in turn helped inspire and motivate pupils, ensuring the task did not become laborious and time-consuming. Within groups pupils were encouraged to make informed decisions and where necessary compromise. In agreement with Naismith et al. (2004) this promoted a greater sense of solidarity, confidence and improved use of subject terminology as pupils worked together to construct their learning. One pupil (Pupil 12) was quick to point out however that the decision to work independently or collaboratively stemmed primarily from the individual, in the absence of precise instructions from the teacher.

The research also revealed that stemming from a desire to complete the m-learning tasks successfully, opportunities to assume leadership roles emerged. Some pupils naturally drifted into leadership roles (e.g. Pupils 2 and 13) but for others (e.g. Pupils 14 and 15) there was a
genuine desire to help others who were struggling, either in terms of resource creation or task comprehension. Not everyone availed of the opportunity to lead but those who chose this route indicated that being a leader helped add to their sense of achievement, promoted ‘self-confidence’ and ‘self-esteem’ (The Lodge Group) and helped enhance their learning experience. However, the findings also suggested that teachers need to remain vigilant against some leaders who may on occasion feel overwhelmed with their workload.

With regards problem-solving, which related to the second key research question, it was discovered that the functionality afforded to pupils by the mobile device allowed information to be processed at a ‘pace’ (Pupils 5, 10 and 15) which suited them. Pupils were not overloaded with information. They felt ‘in control’ (Pupils 2 and 14) and when looking for answers did not suffer from shyness or embarrassment, which can often occur in a typical classroom setting when pupils do not understand something. Pupils soon discovered that a support hierarchy existed, which meant they could initially rely on the PDA by either replaying or pausing information. If pupils were still confused then most turned to their peers and then, if further assistance was required, to the researcher. For some, technology provided the ‘fun’ element helping to motivate and inspire pupils to solve problems. Most important of all the technology acted as an intermediary, offered pupils choice and time to reflect; choice to help decide when and where to seek assistance and time to clarify their thoughts to determine the best course of action.

In terms of mobile technology being able to enhance pupil performance in GCSE Geography most pupils felt they ‘achieved something more’ (The Lodge Group) than they would have expected to achieve from traditional classroom-based Geography lessons. Reference was made to the fact that the m-learning tasks not only enhanced geographical learning but also augmented ICT skills and contributed to historical knowledge. From a geographical perspective many pupils indicated that ‘practical’ (Pupils 1, 2 and 15) m-learning tasks allowed for ‘mental markers’ (Pupil 13) to be established, helping in the placement and identification of key features and processes, when travelling along the course of a river. This ‘interactive’ (Pupils 5 and 8) learning was also seen as more beneficial than traditional lessons, which were often viewed as ‘static’ (Pupil 5), limiting opportunities to practise direction (e.g. north, south, east and west), grid referencing or symbol recognition.
In terms of cognitive findings analysis of the pre- and post-Rivers tests revealed that after completing the Thames Mscape the number of pupils obtaining grades A*-C rose by 18.8% to 87.5% (14 Pupils). No pupil achieved a grade ‘U’ unlike the 2 pupils who had achieved this grade during the pre-Rivers test. In turn the median result increased significantly from 61% (grade ‘B’) to 77% (grade ‘A’) and a reduction in the standard deviation (24.7% to 20%) meant the range of results was less extreme.

The OS Skills pre- and post-tests witnessed an even greater improvement in pupil performance. The post-test revealed that 81.3% (13 Pupils) achieved a grade A*-C, which was a 68.8% (equal to 11 pupils) improvement than the pre-test grades. The average grade rose from an ‘E’ (mean 36.9% and median 38%) to a ‘B’ (mean 61% and median 67%) and according to Pupil 2 this was largely due to the fact that learning with mobile technology was more dynamic than learning with ‘static’ textbooks. However, caution needs to be applied when drawing conclusions about the extent to which mobile technology played in increasing the performance of both the Rivers and the OS Skills tests. As the collected data does not reveal the actual extent it is more prudent to state that in addition to possible enhancement in attainment brought about by repeated testing a combination of innovative technology (mobile and location-aware devices) and novel pedagogy (outdoor, ludic, self-managed and personal along with personal and collaborative) could have attributed to the increase in performance.

In addition to the pre- and post-test results the data collated from the Thames interactive Flash quiz and the comparison of the post-Rivers and OS Skills results to the predicted GCSE Geography grades provided by Yellis add further weight to the assertion that m-learning improved pupils GCSE Geography performance. After completing the Thames Quiz the mean score was 71.5%, and although not formally standardised by AQA the results do provide evidence allowing inferences to be made in relation to pupil performance. When looking at the Yellis data this positive trend in performance after using mobile technology continues to be substantiated. After the treasure hunt mscapes nine pupils achieved a higher score than predicted by Yellis, which was in contrast to only one after the pre-OS Skills test. Although less significant, the post-Rivers test witnessed ten pupils achieve a higher score than predicated by Yellis compared to only eight during the pre-test. For pupils it was the ‘practical’ (Pupils 1, 2 and 15) ‘hands-on’ (Pupil 1) ‘interactivity’ (Pupil 5) afforded by mobile technology which led to an improvement in their performance. The comparison of the post-test results to the Yellis data also had the added advantage of allowing benchmarking and targets to be
established by the researcher, particularly for the four pupils (Pupils 6, 8, 9 and 11) who tended to be easily distracted, which in turn negatively affected their performance.

In support of the findings by LSDA (2003) the inquiry also revealed that m-learning has the potential to support reluctant learners. For those (e.g. Pupils 8 and 11) who occasionally lost interest, either through boredom or task difficulty, the technology enticed the pupils to re-engage. This enticement coupled with a desire not to let their fellow classmates down highlights the intrinsic appeal mobile technology offers teachers and pupils.

A final positive cognitive finding was that the use of mobile technology assisted the development of subject-based knowledge. As revealed earlier, evidence exists in support of the claim that m-learning can increase geographical performance. The inquiry discovered that after participating in the m-learning tasks pupils had a better understanding of the long river profile, associated stages, features and processes. In terms of OS Skills pupils demonstrated through observation, verbal and written evidence that their knowledge was enhanced through the practical application of these skills led by mobile technology.

In addition to pupils’ geographical knowledge the research also uncovered that pupils’ historical and ICT knowledge improved. Their knowledge of the old buildings associated with the school grounds increased and because the history was local and relevant to pupils; this intrigued them and made pupils eager to learn. With regards to ICT skills pupils got the opportunity to use hardware and software associated with the mobile device. Pupils’ pre-existing knowledge of Word, Excel and Paint was not just reinforced but extended and they also got to experience Flash, Audacity and Mscape software. The opportunity afforded by m-learning for pupils to see and hear colourful and vibrant information whilst being active encouraged pupils to become more involved with their learning. This involvement boosted pupils’ ‘sense of responsibility’ (Pupils 2, 5, 12 and 16) and in turn helped them focus more and increase their understanding, knowledge and skills.

In contrast to the positive cognitive factors the research revealed several potential limitations associated with m-learning. Occasionally some pupils felt their learning was hampered by content overload, resourcing or creation concerns. When bombarded with a lot of content many pupils got bored listening or, as LSDA (2003) also discovered, ‘stressed’ as they became ‘overwhelmed’ (Pupils 5, 11 and 16) trying to make sense of the information. With regards
pupils’ concerns surrounding the acquisition and creation of resources, for the second m-learning task, this too caused pupils stress. The search for appropriate resources and the creation and modification of resources often proved ‘time-consuming’ (Pupil 11). In turn pupils frequently became fatigued with the resourcing of the m-learning task and began to question its relevance to their GCSE Geography learning. The questioning by pupils was not only directed to the resources but to the entire creation phase of the treasure hunts. An injustice was felt by many who argued that the effort they put into the creation did not equal the outcomes offered by participation in the resulting mobile task. Familiar words such as ‘time-consuming’ (Pupil 11) and ‘laborious’ (Pupils 9, 13 and 16) were used by pupils describing their experience of the creation process.

Another limitation revealed through inquiry was the fact that a workload imbalance sometimes occurred within the groups. When this happened pupils often felt frustrated and annoyed by the unfair distribution. In contrast those with minimal involvement also had concerns; they often felt ‘out of the loop’ (Pupil 11) and became disengaged with the task.

The final major barrier to the enhancement of pupils’ learning, in terms of cognitive findings, concerned the technical issues surrounding the use of mobile technology, as highlighted by Burkett (2008). For some pupils unfamiliarity with the device led to hardware and software induced problems. When incorrect buttons were accidentally pressed, the Flash player did not load, the Mscape software developed a glitch or if GPS drift occurred pupils tended to become confused and frustrated.

5.2.3 Future use of m-learning within GCSE Geography

The discussions in Section 4.5 revealed that pupils were realistic in their views surrounding the integration of mobile technology into learning. All pupils perceived the future use of m-learning within schools as inevitable as they reflected on the pace of technological advances within the wider community and they emphasised that schools are not immune from these technological changes and trends in society.

With regards to the future use of m-learning with Rivers and OS Skills most pupils voiced their support and highlighted the ‘personal’ (Pupils 9 and 12), ‘interactive’ (Pupil 5) and ‘brilliant experience’ (Pupil 9) associated with m-learning. Technology appeared more popular with
students than the use of 'static' (Pupil 15) textbooks and offered not just an alternative to traditional pedagogy but a way to augment what pupils already knew. There were however, some pupils (Pupils 3, 6, 7, 10 and 11) who were not keen for mobile technology to be utilised for the future study of Rivers and OS Skills. Boredom, time consumption, along with resourcing and content overload, creation issues and technical problems were simply too big of a concern for these pupils to justify recommending using m-learning in the future.

However, when it came to the future role of mobile technology within GCSE as a whole there was a realisation that m-learning was not something that Geography or any subject can or should ignore. Analysis and discussion of the findings surrounding the role of m-learning within GCSE Geography highlighted that mobile technology was 'interactive' (Pupil 5), tended to make learning 'fun' (Pupil 9), 'enjoyable' (Pupil 12) and 'interesting' (Pupils 6 and 8). Geographical learning could take place 'anytime and anywhere' (Pupil 5) making the inclusion of mobile technology within GCSE Geography more attractive. Of significance was the discovery that pupils recognised that m-learning reduced stress levels when it came to learning. 'Informality' and 'freedom' afforded by the mobile technology allowed pupils to work at their 'own pace' and choose whether group participation or individual initiative was best (Pupils 2, 5, 9, 11 and 13).

The overriding consensus from pupils was that m-learning had a definite future role to play in GCSE Geography but it was critical that m-learning should not become 'tedious' (Pupil 2), which forced pupils to consider the future frequency of m-learning. On this issue there was no agreement from the pupils; some wanted mobile technology to be used to introduce a topic, others wanted it to conclude a topic and for others it could be used for a key element within a topic or for test revision. Despite the differences in opinion there were two areas the pupils did agree on. Firstly, to avoid m-learning becoming monotonous a 'balance' (Pupil 14) with traditional pedagogical approaches needs to be considered and secondly, seasonality affects m-learning. All pupils agreed m-learning was better suited to spring or summer and not autumn or winter.
5.3 The Role of Activity Theory

As a model, AT did not supply any definitive answers to the key research questions (Uden, 2007; Uden and Kumaresan, 2007); instead, whilst striving for an ‘outcome’, it offered a structured framework which focused the analysis and interpretation of the inquiry’s findings. Teaching is essentially an interactive and social activity which at times can be complex to evaluate. When reviewing which affective and cognitive factors helped shape pupils’ learning AT allowed for a flexible format to be applied; a format which also acknowledged the importance of key factors and the role of the individual, within a social setting.

As a dynamic model AT did not exist in a vacuum. It acknowledged change and catered for the unexpected, such as was experienced by the treasure hunt groups creating new resources and modifying their mscapes on several occasions to get it functioning correctly. Another crucial advantage of AT was that it enabled the inquiry to focus on the technology as a mediator of learning rather than purely the interaction between the pupils and the PDA (Waycott et al., 2005). The latter, which was not the aim of this inquiry, would have moved the technology centre stage instead of treating it as a teaching tool designed to enhance geographical lessons. By treating the PDA as purely a teaching ‘instrument’ pupils were not fixated with the device; instead they either ‘exchanged’ information independently or collaboratively, within the ‘community’ guided by a set of ‘rules’ to solve problems and augment their learning experience.

The essence of AT is ‘activity’ and throughout this action research inquiry pupils were constantly active and interacting with one another, not just within the school or ‘real’ environment but also the virtual realm. The flexibility of AT ensured that all aspects of the m-learning activities were observed and available for a holistic analysis. An additional finding was that any data collected as part of this inquiry could be viewed through the lens of AT. This allowed for historical events to be reflected upon in a structured manner with a view to making m-learning more effective (Jones et al., 2007; Waite, 2005). In terms of practical ‘outcomes’ AT has allowed for the ‘rules’ of the m-learning activities to be scrutinised and the most prudent course of action may be to change some of these ‘rules’ if a similar m-learning activity was to be conducted in the future (see Section 6.2 for more information).

AT was not prescriptive nor impinged temporally or spatially (Uden and Kumaresan, 2007); it worked in tandem with action research, placing an emphasis on participation and engagement,
whilst allowing for a variety of data collection techniques to be included. Some traditional frameworks for analysing learning focus purely on the classroom, whereas AT offered greater freedom in the context of this inquiry. The 'exchanges', 'distribution', 'production' and 'consumption' aspects of AT, collectively referred to as the 'faces', took place inside and outside the classroom and involved the interaction between all the 'vertices'.

The inquiry revealed that unlike Figure 2.3, which portray the 'vertices' of AT to be equidistant forming four equilateral triangles, this is not necessarily how it works in reality. Over time and space the significance of each 'vertex' or component can increase or decrease distorting the 'face' of each equilateral triangle and changing it more often that not into a scalene one. The 'consumption' aspect of AT, which arguably lies at the heart of knowledge and therefore becomes the basis or cornerstone of the 'consumption' of m-learning, helps to illustrate the notion of a dynamic AT with scalene 'faces'. Figure 5.1 Scenario la illustrates that during the inquiry there were times when 'consumption' was negatively affected by the isolation or perceived lack of support given to some individuals. During the Thames Mscape Pupil 7 experienced technical problems with the PDA and felt left-behind and isolated as the rest of the class completed the task and accomplished the objectives. Alternatively if the 'subject' became too dominant in an effort to achieve the task objectives (see Scenario 1b in Figure 5.1), such as Pupil 11 became during the treasure hunts, then the rest of the group suffered. In the absence of constructive and inclusive leadership the 'community' became more isolated and the collective 'consumption' of knowledge through m-learning diminished. A third scenario was evident during the creation of the second mscape, when the 'consumption' of knowledge was often adversely affected by the 'subject' and the 'community' collaborating too closely at the expense of the learning 'objectives' (see Scenario 1c in Figure 5.1). When individuals struggled to comprehend or carry out the 'laborious' (Pupils 9, 13 and 16) tasks their misgivings often transcended into the group arena, where they occasionally found favour. This notion of task fatigue tended to have a negative impact on the activity as it usually prevented the task 'objective(s)' being effectively completed.

In terms of the 'exchanges' which occurred during the mscape activities the notion of the three 'vertices' ('rules', 'subject' and 'community') exerting the same degree of influence was also soon dispelled. At the beginning of the mobile activities the formal and informal 'rules' overwhelmed many of the participants. This served to drive the 'subject' and the 'community' closer together in terms of apprehensive 'exchanges' and distorted the focus of the tasks by
making the 'rules' take centre stage (see Figure 5.1 Scenario 2a). In a similar vein to Scenario 1b, where occasionally the 'subject' became too dominant, the over-dominance of one individual could adversely affect the 'exchange' of information and knowledge. Group members who tried to remain true to the formal and informal 'rules' tended to experience less 'exchanges', which resulted in a less enjoyable and successful task (see Figure 5.1 Scenario 2b). Occasionally a third scenario developed regarding 'exchanges', such as during whole class mscapes preparation. When the group mentality became too prominent the 'rules' associated with the task where often challenged and the voice of the each individual 'subject' became less audible (see Figure 5.1 Scenario 2c). This scenario led to a less productive 'exchange' of ideas and information as 'rules' were breached and individual initiative subdued.

The Main Scenarios Encountered during the Mscape Activities

Scenario 1a

Scenario 1b

Scenario 1c

Scenario 2a

Scenario 2b

Scenario 2c

Scenario 3a

Scenario 3b

Scenario 3c

Scenario 4a

Scenario 4b

Scenario 4c

I - Instruments/Tools
S - Subject
O - Object
R - Rules
C - Community
D - Division of Labour

C = Production
E = Exchange
P = Production
D = Distribution

KEY

Faces/Higher Order Functions

Isolated vertex / component

(NB: Can be a Positive or Negative force).

FIGURE 5.1

Scenario 3a in Figure 5.1 also illustrates that the 'production' aspect of AT was also an area for competition between the three associated vertices ('subject', 'instruments' and 'object'). When producing the treasure hunt mscapes Pupils 2, 14 and 15 stated that they felt over-burdened and isolated when left with the responsibility to complete the resources necessary for the mobile activity. Often when they began this 'production' phase they felt far removed from the eventual
‘instruments’ and the learning objectives. However as the PDA arrived and the mscapes took shape, these ‘instruments’ began to move the ‘subjects’ towards the ‘objects’ of the task. ‘Production’ also caused a dilemma for those pupils (Pupils 10 and 11) who understood the task and knew what the ‘objectives’ were but had little appreciation or comprehension on how to utilise mobile technology to achieve the ‘objectives’ (see Scenario 3b in Figure 5.1). There are also occasions when participants became too fixated with the instruments, such as the PDAs or resource creation for the treasure hunts. When this occurred the ‘subjects’ often lost sight of the learning ‘objectives’. This link was only re-established by participants stepping back from the instruments and re-focusing on the task (see Figure 5.1 Scenario 3c).

‘Distribution’, makes up the last ‘face’ of AT and it too was not exempt from internal tensions and change brought about by the associated ‘vertices’ - ‘community’, ‘division of labour’ and the ‘object’. After the initial treasure hunt group meeting the pupils, in a effort to realise the task ‘objectives’, often focused individually on their agreed or self-determined role. Unfortunately, this was at the expense of the ‘community’ and meant that for many (e.g. Pupils 2, 8, 14 and 15) teamwork and collaboration were not naturally associated with the ‘division of labour’. As the interviews and group journals revealed the unfair ‘distribution’ of work was cited by all three groups (see Scenario 4a in Figure 5.1). During the Thames Mscape Scenario 4b presented. Some pupils chose to join forces and divide the tasks to ensure the Thames Quiz was completed. Unfortunately, due to shared ownership, this meant for some that the ‘division of labour’ did not always work and gaps in knowledge resulted. Therefore in addition to the quiz not being successfully completed by many the overall task ‘objectives’ became harder to achieve as the gaps in knowledge also prevented pupils from fully understanding the river processes and subsequent features. The final scenario (Scenario 4c) observed during the course of this inquiry, relating to ‘distribution’, centred on the distraction that can become associated with the ‘division of labour’. Whilst trying to find The Lodge’s treasure the Fairbourne group decided to split the workload amongst the members and spent too much time deciding where responsibilities should lie. The rest of the ‘community’ (The Lodge and Walton groups) meanwhile had moved on and successfully completed the task ‘objectives’. Unfortunately for the Fairbourne group it took them longer to resolve the issues surrounding the ‘division of labour’ and rectify their mistakes.

At a higher-order level it also became apparent during the course of the inquiry that AT is much more than four isolated ‘faces’ each influenced by three ‘vertices’. In fact, as Frohberg et al.
assert (see Section 3.4 for more information), all six vertices of AT are in constant flux with each one not just directly impacting on the ‘face’ they are associated with but also having an indirect effect on the entire AT model and ultimately the ‘outcomes’. Section 4.2 in particular highlighted that during the Thames Mscape a dynamic continuum existed between all the components. Once the individual ‘subject’ became involved with the Thames Mscape they chose the extent of their involvement within the ‘digital community’ (i.e. level of engagement with Thames Mscape), the ‘physical community’ (i.e. their movement around the school environment) and the ‘social community’ (i.e. the amount of collaboration with their peers). The degree of interaction the ‘subject’ had with the ‘community’ was initially determined by the formal and informal ‘rules’ established both by the researcher and initial class discussions. However as time progressed the ‘community’ began to alter the ‘rules’ and forge new ones, particularly in relation to the degree of collaboration each pupil sought or the level of assistance they demanded from the researcher. As the mscape proceeded the ‘community’ and ‘subject’ in conjunction with the task ‘objectives’ acted as intermediate forces helping to determine how best to divide the workload by making sense of the ‘rules’ and deciding how best to use the ‘instruments’.

From a critical stance however several shortcomings of AT were identified during the course of the inquiry. In addition to not providing clear instructions for how the insights it reveals should be applied to m-learning the complexity of the real world was on occasion difficult to apply to the model (Uden, 2007). Researchers need to constantly remind themselves that AT is a simplification of reality and that multiple activity systems are at work around us (Uden and Kumaresan, 2007). Acknowledgement therefore needs to be given to the fact that the researcher’s interpretation of the real world in terms of the AT model may have differed from another observer. Critical events may have been overlooked or given too much or too little importance. When applying AT to this inquiry (see Figure 3.3 for a visual reminder) there was also the realisation that there was no direct reference to the teacher within this two-dimensional model; yet the role of the teacher was key to making the mscape work. This realisation highlights a major ‘contradiction’ or obstacle for teachers wishing to use AT to analyse and reflect upon a mobile activity. Some might assert that within AT the ‘subject’ could be both the teacher and the pupil as both can be viewed as participants or alternatively one activity system could look at pupils and another at the teacher, which would then allow for congruities to be explored. However, teachers (or educators) who undertake action research usually have a desire to work from within the same activity system and distinguish more clearly between the role of
the teacher and the pupils; in other words to differentiate between the pedagogical factors and
the pupils within their learning environment. Currently AT does not readily facilitate this
differentiation or acknowledge the role the teacher plays in linking pedagogy with the pupils
and their learning environment.

During both mscapes the researcher was not only a participant but a ‘driver’ and ‘facilitator’ at
the heart of the activities. The researcher did not assume a hierarchical role with the pupils but
was responsible for instigating the Thames and OS Skills Mscapes and was actively involved in
helping pupils identify, understand and become familiar with the ‘instruments’. The researcher
also encouraged the ‘division of labour’, helped define the ‘community’ as well as contributing
to the formal and informal ‘rules’ necessary for completion of the mscapes. In all occasions the
researcher played a central role alongside pupils, helping to guide them towards the ‘object(s)’
of the m-learning tasks. This shared responsibility meant the degree of control between the
researcher and the pupils was constantly changing. Yet when it came to analysing both mobile
activities, through the lens of AT (see Section 4.2), there was no platform for the researcher to
analyse the collective m-learning experiences from within the model nor suitably reflect upon
the control continuum as the degree of authority shifted between the researcher and the pupils.
Currently AT ousts teachers from the central position they assume when leading and facilitating
mobile activities and forces them to reflect on events from ‘outside’ the model with no
provision to clearly identify or analyse their unique role. This appears to go against the original
purpose of AT which centres on social interaction; which by its very nature is underpinned by
inclusion, flexibility and the need to identify and analyse all key components and links (Uden,
2007).

The role of the teacher is clearly an important one in terms of the learning process and the
subsequent activities that take place to enable pupils to achieve the intended objectives. AT may
need to be amended to better suit teachers involved with integrating m-learning into their
pedagogy. However caution must be observed; it was mentioned earlier that the seven
components of the model are all interrelated and not isolated as some might assume from an
initial glance at the two dimensional model. Any attempt to alter the AT model will
undoubtedly have implications for the positioning and interaction between all components.
Section 6.2 expands more on this issue and makes recommendations for AT use when analysing
m-learning.
CHAPTER 6 CONCLUSIONS

6.1 Introduction

Chapter 6 begins with a review of Activity Theory (AT), within the contexts of the inquiry, and the concerns raised in Section 5.3 are addressed in an effort to make the incorporation of AT within a school-based m-learning activity more efficient. In addition the key findings, which were discussed and summarised as part of Chapters 4 and 5 respectively, are consolidated and conclusions drawn in relation to the main aim of the inquiry; which centred on the ability of m-learning to enhance the learning experience for pupils within GCSE Geography.

An evaluation into the relevance and importance of this action research inquiry is undertaken and recommendations for the future inclusion of m-learning within GCSE Geography are proposed.

6.2 Activity Theory: Review and Justification of a Third-dimension

Section 5.3 highlighted some of the shortcomings of AT identified as part of this inquiry. In terms of making recommendations on how to resolve certain criticisms; such as, the complexity of the real world is too difficult to apply AT and the fact that the model does not offer any ready made instructions for teachers engaging with m-learning, these are general systemic issues within the model and beyond the scope of this inquiry. However, Section 5.3 did reveal that AT enabled the ‘rules’ of the m-learning tasks to be scrutinised and concluded that the findings from this inquiry should be used to amend some of the ‘rules’ to make future engagement with mscapes more effective and efficient. The ‘rules’ regarding group work and the creation aspect of the second mscape, for example, may need to be changed to ensure a more equitable and user friendly approach for pupils. In turn these amended ‘rules’ might act as ‘instruments’ for future m-learning activities.

Section 5.3 also illustrated that AT may be presented as four equilateral ‘faces’ combining to create one larger equilateral triangle (see Figure 2.3), but in reality this was a difficult balance to maintain. The pressures exerted by the respective ‘vertices’ created competing forces which usually resulted in scalene triangles giving a truer representation of reality. However, the
exemplars presented in Section 5.3 quite clearly illustrate that when a scalene 'face' existed the higher-order functions of 'consumption', 'exchange', 'production' and 'distribution' were impinged, which tended to diminish the participants' m-learning experience. Therefore to enhance m-learning someone, namely the teacher in school-based environments, needs to take responsibility for trying to avoid skewing and maintaining or re-establishing the equilateral 'face' of each higher-order function of AT. Only when this 'balance' is achieved can m-learning stand a chance of being truly enhanced for all participants.

There was also an argument in Section 5.3 that the current AT model makes no provision for the role teachers assume when delivering an m-learning task to pupils nor does it allow for an analysis of the dynamic interactions between teacher and pupils. In light of this contemplation the researcher began to question the possibility of giving the teacher a prominent place within the AT model to better suit school-based activities and help maintain the balance between the 'vertices'. 'Prominent' however, should not be misconstrued as meaning that the teacher assumes a hierarchical position within AT, determined by authority. On the contrary this inquiry has demonstrated that successful m-learning is best catered for when the teacher is centrally placed enabling them to observe and be approachable, whilst also facilitating the activity by guiding and supporting participants.

To give the teacher a central and unique position within AT meant that modifications to the original model would be necessary. Initially difficulties arose when trying to determine the best location for the teacher as a new vertex, whilst trying to also remain faithful to the original model and ensure any new vertex would also be equidistant from all others. If an extra vertex is added within the triangle then it upsets the equilibrium already established and places the teacher closer to some components than others; giving the impression that the teacher is not centrally placed to observe or support all aspects of the activity equally. If however, the teacher is placed outside of the large triangle then he/she can be positioned equidistant from the other 'vertices'. However, this approach introduces a number of new issues. Firstly, it turns a two-dimensional model into a three-dimensional pyramid, which is a massive transformation from the original model. Secondly, it compounds the notion of hierarchy by giving the teacher an 'outside' or 'pinnacle' position and thirdly, the only component to have previously merited existence outside of the main triangle was the 'outcome'. Therefore placing the teacher outside the other 'vertices' of AT appeared to go against the very nature of the model, which resisted
promoting components above others and sought only to separate the 'outcomes' from the main framework.

Although some researchers (Daniels, 2006) have analysed the role of the teacher and pupil within the contexts of AT, without introducing new geometrics, it was discovered in the context of this inquiry a three-dimensional pyramid, as opposed to as two-dimensional model worked as long as the teacher was placed in the centre of the pyramid containing the six existing 'vertices'. This concept ensured the teacher was equidistant from all 'vertices' and centrally located, yet without assuming an 'outside' or hierarchical position. Remaining true to the two-dimensional model the only component outside the pyramid was the 'outcome' of the activity (see Figure 6.1).

### Placing the Teacher at the Heart of the Activity Theory Pyramid

![Figure 6.1](image)

The recommendation to transform AT into a pyramid may have solved the issue concerning where to place the teacher but it gave rise to other concerns, particularly around the positioning of the 'faces' and 'vertices'. In Sections 2.5 and 5.3 it was argued that the 'consumption' aspect of AT is the corner stone of the consumption of m-learning. Therefore it is logical to use this face as the base or foundation of the pyramid. Closer examination also reveals that the 'vertices' associated with 'consumption' ('subject', 'community' and 'object') can be linked to the learning environment; in other words they provided the 'platform' from which learning can take place (see Figure 6.2). The sides of the pyramid are made up of the remaining three 'faces' which are equal in status but at the apex of the new model the 'vertices' of 'rules', 'instruments' and 'division of labour' are brought together. The placement of these three 'vertices' appear to complement each other as the apex symbolises the coming together of the
three components most closely linked to pedagogy. However, the positing of the ‘vertices’ in the new model is not an indication of a hierarchical relationship, with pedagogy sitting above the learning environment, but instead it illustrates the central role the teacher plays in helping to integrate pedagogy into the learning environment and vice versa.

**Distinctions within the Activity Theory Pyramid**

![Figure 6.2](image)

The re-shaping of AT into a pyramid provides a number of additional advantages for researchers, beyond the scope of the original two-dimensional model. Firstly, the three-dimensional model provides a greater sense of reality by providing an enhanced spatial awareness of the learning environment. Secondly, in the contexts of school-based learning, the teacher or educator now assumes a prominent position within the learning environment. The insinuation however is not that the teacher enforces a hierarchical authority rather that they lead, coordinate and instigate learning, but they do so in (eventual) partnership with the pupils. Therefore a control continuum radiates out in all directions from the teacher. The notion is that teachers initially have ultimate control on the direction that learning takes but as the teacher interacts with the participants the level of control asserted over the pupils, the instruments, the rules, the division of labour, the community and the eventual objectives will constantly vary.

In the case of this inquiry it was discovered that the more familiar pupils became with the technology the more responsible they became for their own learning, meaning the degree of control exerted by the teacher became less. M-learning helped pupils accept a form of shared responsibility. At times, for example, when pupils were dividing tasks up within groups they were content to take full control and direct this activity themselves. However, when beginning
the second mscapes it was the researcher that led the inquiry yet by the end of the task the learning outcomes were as a result of combined efforts by both the pupils and researcher. Another example of the control shift between the researcher and the pupils was regarding the rules. Both m-learning activities began with the researcher dictating the rules and practices, the tasks and setting the deadlines. However, as the m-learning tasks developed, and pupils displayed a greater understanding and appreciation for the task, the level of control began to shift away from the teacher. Eventually a form of agreed practice was established leading to collaboration in terms of setting deadlines and completing tasks. Figure 6.3 illustrates the new and enhanced recommendations for the three-dimensional AT model and brings together the ‘faces’ and ‘vertices’, including the ‘teacher/educator’ as the latest addition. It also emphasises more clearly the real dynamism and exchange of control that occurs through the interaction of the ‘vertices’, by acknowledging that it is difficult to ‘balance’ the ‘vertices’ in the form of an equilateral-sided pyramid. In reality the competition between the ‘vertices’ often means that the AT framework exist as a scalene-sided pyramid, representing the multiple interactions that take place while striving to enhance learning.

**Revised Three-Dimensional Activity Theory Pyramid**

This pyramid model represents the ideal scenario or state of learning which teachers should strive for - the four ‘faces’ are equilateral and therefore balanced. Under such conditions m-learning is greatly enhanced.

In reality however this ‘balance’ may be difficult to acquire or maintain. The blue shaded arrows represent the power shifts that occur between the six outlying ‘vertices’. These power shifts can result in the ‘vertices’ moving and therefore the three-dimensional AT model may exist at times as a scalene pyramid.

**FIGURE 6.3**

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By adopting this new approach to AT none of the benefits of the model are compromised. In fact the higher-order functions of 'production', 'distribution', 'exchange' and 'consumption' are more clearly seen as having very distinct roles to play in helping to reach the final outcome. Figure 6.4 is an updated version of Figure 4.4 which takes into account the recommendations of this inquiry. The mirror image is purely to illustrate the two m-learning tasks coming together to help provide the shared 'outcomes', which are essentially the combined findings of the two mscape activities as presented in Chapters 4, 5 and 6. In turn the findings have also helped formulate the list of recommendations which are presented within Section 6.6. These recommendations can in turn be fed back into any future AT pyramid allowing outcomes to modify 'rules', update 'instruments' and help make informed decisions surrounding the 'division of labour'.

**Activity Theory Pyramid Applied to Both Mscapes**

![Diagram showing Activity Theory Pyramid Applied to Both Mscapes](image)

Adapted from Engeström's (1987) two-dimensional model and incorporating elements of Figures 2.3, 3.3, 4.4 and 6.3

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**6.3 Key Findings: The ‘Outcomes’**

**6.3.1 The Key Research Questions**

6.3.1.1 Does M-learning Facilitate Independent and/or Collaborative Learning?

The evidence obtained through this inquiry supports the claim, made by others (LSDA, 2003; Attewell, 2005; Mobilearn, 2005; Davey, 2007; Sharples *et al.*, 2007; Burkett, 2008; Sharples...
et al., 2009), that m-learning does appear to facilitate both independent and collaborative learning. In agreement with the aforementioned research findings unique opportunities were presented to pupils, during both mscapes, to work independently and use their own initiative. Pupils came to believe that to fully understand the topic(s) under investigation individual initiative was not only an essential requirement but a mechanism to improve communication and increase the use of subject-specific terminology. The privacy afforded by the device helped focus pupils’ attention and provided them with an increased sense of responsibility. In turn this enhanced responsibility promoted self-confidence and self-esteem empowering individuals and allowing them to control the pace of the activity. Essentially learning became a more personal experience and the traditional teacher-pupil relationship, usually based on a hierarchical approach, appeared to have been replaced by a dynamic and shared responsibility.

This sense of shared responsibility was not just confined to teacher-pupil relations. When pupils worked together the inquiry confirmed, what Naismith et al. (2004) and Sharples et al., (2007; 2009) discovered from their research, that pupils also helped each other construct meaning as they took shared responsibility for their learning within a social setting. From a practical perspective the fact that all the pupils were participating in a new joint learning venture helped to promote participant solidarity. This solidarity ensured that pupils got to know each other better and worked together as a group to avoid missing vital information and achieve the learning intentions. Of significant importance was the discovery that m-learning was suitable for both independent and collaborative learning. The personalisation afforded by mobile technology ensured pupils were given time to choose whether they wished to work autonomously, within a group or to use a combination of both. This flexibility was seen as a positive attribute associated with m-learning as it gave pupils more control over their learning.

6.3.1.2 Does M-learning Support Problem-solving?

The findings of the inquiry support the notion that pupils’ problem-solving capabilities were enhanced, either independently or collaboratively, through the use of mobile technology. The technology acted as an intermediary, which stimulated pupils’ interest levels and allowed pupils to co-ordinate a variety of information at a pace which suited them. The PDA combined with the design and format of the two mescape activities motivated pupils to engage with the learning process and to find solutions to any problem encountered. However, an important outcome of the inquiry was the discovery that to be effective the mobile device needs to be integrated into existing teaching and learning and not treated as an add-on. After experiencing m-learning
pupils became attuned to the fact that technology acted as a stimulus for problem-solving but individual initiative and interaction with the environment, peers and teachers were also necessary.

It was clear that m-learning did support problem-solving but did not have ultimate control. The control resided firmly with the pupils and it was they who could decide when assistance, other than from the PDA, was required. This discovery correlates with the findings from LSDA (2003), Attewell (2005) and Burkett (2008) who discovered that m-learning not only helps pupils solve problems but initiates greater clarity allowing pupils to identify more clearly areas where they need support. As Facer et al. (2004) concluded m-learning does help pupils construct meaning and resolve problems.

6.3.1.3 Can Mobile Technology Enhance Performance in GCSE Geography?
The findings discussed in Sections 4.4.1.7 and 5.2.2 proved that in the contexts of this inquiry that the use of mobile technology did enhance pupils’ GCSE performance; both at the emotional and cognitive level. In terms of the emotional level the incorporation of m-learning took the ‘stress’ out of learning and made pupils more relaxed as they participated in a ‘fun’ and ‘exciting’ activity. Through empowered interaction pupils believed they had achieved something more than normally would have been expected, compared to traditional classroom-based Geography lessons. This enhanced sense of achievement was a significant discovery as it highlighted the potential of m-learning to increase confidence levels and create a positive mind set for pupils, which is critical for teachers trying to motivate and improve GCSE performance.

From a cognitive perspective the quantitative data revealed that after experiencing an m-learning activity the average grade rose from a ‘B’ (61%) to an ‘A’ (77%) for the Rivers mscape and from an ‘E’ (36.9%) to a ‘B’ (61%) during the OS Skills mscape activity. When combined, the results from the Rivers and OS Skills tests revealed that, there was an average increase of 18.7% in pupil attainment after utilising mobile technology. This meant that when the results of the Rivers and OS Skills standardised assessment were combined the A*-C pass rate was 84.4% (13 out of 16 pupils), a rise of 43.8% compared to the pre-mobile activity test results, with a pass rate A*-C of 40.6% (six pupils out of 16).

The data gleaned from the Thames Quiz also mirrored that of the post-Rivers and OS Skills tests. The mean test score was 71.5% (grade ‘A’) helping to support the assertion that m-
learning was adding value to pupils' GCSE Geography performance. This trend was also substantiated through the inclusion of Yellis data. The Yellis data provided benchmarking criteria and it was discovered that after using mobile technology 62.5% (10 pupils) over-achieved when studying Rivers compared to only 37.5% (6 pupils) prior to the inclusion of the technology. In terms of OS Skills 56.3% (9 pupils) over-achieved after m-learning had been experienced compared to only 6.3% (1 pupil) before. These values, combined with the Thames Quiz and pre- and post-test findings give a clear indication of the impact m-learning can have on performance within GCSE Geography. However, it is important to acknowledge that when quoting quantitative results the collected and triangulated data did not determine the actual extent to which m-learning improved performance. Other factors may also have had a role to play such as; repeated testing, being outdoors, doing something different, being mobile, experiencing a more informal education or the empowerment and personalisation gained through choosing when to work collaboratively or independently could also have impacted upon pupil performance.

6.3.2 Other ‘Outcomes’: Going Beyond the Key Research Questions

At the outset of the inquiry (see Section 1.6) it was decided that the inclusion of too many key research questions could be counter-productive as they may have biased the direction of the inquiry or allowed the researcher’s prejudices to taint the outcomes. It was acknowledged however, that an expectation existed that the findings would extend far beyond the core questions, therefore the purpose of this section is to summarise these additional findings.

Figure 6.5 provides an overview of all key findings, highlighting the fact that the outcomes of this inquiry far exceeded the core questions. However Figure 6.5 must be approached with caution as it attempts to place the findings into discrete boxes or categories, whereas in reality the findings were interrelated and interconnected with one another. For example when m-learning was fun it often boosted pupils’ interest levels and motivated them to perform better and in turn when pupils performed better this too helped to motivate, sustain interest levels and make learning fun. Therefore it is important that the reader remains aware that none of the findings discussed exists in absolute isolation to others and it is also important to acknowledge that factors other than mobile technology may also have contributed to findings. Being outdoors, preparing for the tasks in the classroom, working in a more informal environment,
feeling more in control of the flow of information and working with peers many all have helped to augment the findings (Section 6.4 will looks at this in more detail).

M-Learning: Key Research Findings

<table>
<thead>
<tr>
<th>Affective Factors</th>
<th>Cognitive Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Positive Factors</strong></td>
<td><strong>Positive Factors</strong></td>
</tr>
<tr>
<td><em>The use of mobile technology:</em>-</td>
<td><em>The use of mobile technology:</em>-</td>
</tr>
<tr>
<td>► Made learning <em>fun and enjoyable</em>;</td>
<td>► Made learning <em>active</em>;</td>
</tr>
<tr>
<td>► Promoted <em>interest and excitement</em>;</td>
<td>► Provided a <em>multifaceted approach</em> to learning;</td>
</tr>
<tr>
<td>► <em>Motivated and inspired</em>;</td>
<td>► Appealed to pupils through technological <em>familiarity</em>;</td>
</tr>
<tr>
<td>► <em>Increased self-confidence and self-esteem</em>;</td>
<td>► <em>Facilitated independent learning</em>;</td>
</tr>
<tr>
<td>► <em>Raised expectations</em>.</td>
<td>► <em>Facilitated collaborative learning</em>;</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th><strong>Negative Factors</strong></th>
<th><strong>Negative Factors</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><em>The use of mobile technology:</em>-</td>
<td><em>The use of mobile technology:</em>-</td>
</tr>
<tr>
<td>► Made learning sometimes <em>boring and time-consuming</em>;</td>
<td>► Was sometimes hampered by too much <em>content and resourcing concerns</em>;</td>
</tr>
<tr>
<td>► Was reliant on the <em>weather</em>.</td>
<td>► Had occasional problems with <em>creation issues</em> and <em>collaborative efforts</em>;</td>
</tr>
<tr>
<td></td>
<td>► Involved technological issues having to be overcome.</td>
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*RED = Related to Key Research Questions

Affective & Cognitive Factors helping to determine the future use of m-learning within GCSE Geography

The Future of M-learning within GCSE Geography

► Most pupils agreed that m-learning *should be used* to help others *learn about Rivers and OS Skills*, providing the negative factors (listed above) were addressed;

► Pupils acknowledged the inevitability of technological advances in m-learning and recognised the need for GCSE Geography to embrace any new developments;

► A balance regarding the frequency of mobile use within GCSE Geography is crucial to sustain pupils’ interest and enhance learning.

FIGURE 6.5
6.3.2.1 Affective Outcomes

In agreement with the research studies, referenced in Sections 2.2.3 and 2.2.4, this inquiry discovered that m-learning brought fun and enjoyment to the learning process. According to one pupil the whole experience was ‘worth it’ (Pupil 2). What made m-learning fun and enjoyable was the fact that the activities were ‘game-like’ (Walton Group), had colourful audio-visual stimuli and could be completed individually or collaboratively with friends. M-learning provided the opportunity to break with routine, to do something ‘different’ (Pupils 5 and 14), and get out of the traditional classroom environment.

Through a multi-sensorial approach pupils were ‘actively engaged’ (Pupil 16) in a task or ‘game’ (Walton Group) with real and definable outcomes. The task allowed for creativity and free movement, outside of classroom, and at times created a sense of positive competition as pupils attempted to get a high score in a quiz or find the treasure before anyone else. On reflection however, fun and enjoyment by themselves do not boost pupil performance in GCSE Geography but what they can do is enhance the learning experience and help create the correct mind set for pupils allowing them to become more focused and involved with the learning process. It is this heightened sense of involvement which can help contribute to improved performance.

A second additional outcome of the inquiry was the proof that m-learning has the potential to remove inhibitions and spark pupils’ interest and excitement levels. In support of Davey’s (2007) research the findings revealed through this inquiry add weight to the argument that the increase in interest and excitement was not solely due to the fact pupils were doing something different but that the personalisation and independence afforded by the technology helped empower pupils and sustain interest levels. This discovery means that m-learning offers educators the ability to not only increase pupils’ interest and excitement but it can maintain these effects longer compared to the traditional classroom setting. It is important to acknowledge that the design and format of the actual m-learning task also proved to be significant when it came to the affective outcomes.

The motivational and inspirational nature of m-learning was also witnessed during the course of this inquiry and reported by pupils in the interviews. Technology acted as an intermediary, enabling pupils to control the pace of the lesson and construct knowledge in a ‘more engaging’ (Pupil 16) learning environment. The format and structure of the m-learning activities, namely
the quiz and the treasure hunts, helped to motivate and inspire pupils. Some pupils were also attracted by the shared sense of responsibly when creating the treasure hunts yet for others it was the personalisation and ‘positive competition’ (Pupil 9) offered by the technology that motivated and inspired them to succeed at the tasks. The key finding therefore was that m-learning can motivate and inspire pupils but to sustain these positive traits the technology should not be the focal point. It should be used to co-ordinate a worthwhile activity which pupils value and can contribute to either independently or collaboratively.

A penultimate positive affective finding of the research is that when the pupils used m-learning there was a noticeable increase in their self-confidence and self-esteem; a finding that correlates closely to other research findings (Facer et al., 2004; Davey, 2007; Burkett, 2008). The effort pupils put into creating and taking part with the m-learning tasks provided many with a sense of accomplishment and pride. The technology increased self-confidence by empowering some pupils and providing leadership opportunities. This allowed pupils to feel part of and take a shared responsibility for their learning. In turn this enhanced awareness of responsibility helped promote greater self-esteem and provided the incentive to do better.

The final key positive affective outcome was that through the continued use of mobile technology pupils’ expectations were raised. Familiarity and confidence in using the mobile device was essential before pupils could begin to set themselves targets and make demands in an effort to successfully complete the learning intentions. Raised expectations did not exist in a vacuum; pupils acknowledged that the more they enjoyed an activity the more motivated they became and the more they wanted to engage with the learning process. When combined with technological familiarity these interrelated affective factors enabled pupils to prioritise goals and expect more from themselves and from the learning process. Pupils no longer simply felt recipients of information but also participants contributing to their geographical knowledge.

It is important to highlight that not all the outcomes associated with m-learning were seen as beneficial to learning. From a critical perspective pupils questioned the need to construct the activity, particularly when it was not a requirement of their GCSE Geography syllabus. Teachers need to gauge carefully how much input pupils have into the creation of the mobile activities, it should not detract from the subject content or the syllabus. Perhaps pupils could be given smaller sections to create, therefore minimising the potential for boredom and time consumption. As researchers we need to consider the value in the ‘process’ and be ever mindful
of the depth of learning being achieved by the pupils. However, it is important for pupils to be
given the opportunity to take ownership of some part of the creation and gain an insight into
how the activity functions. Teachers too need to be careful because if the burden of
responsibility falls entirely to them for mobile task creation then they too could struggle to cope
with the workload. Fortunately many mscapes are currently free to download from the internet
and these could assist teachers who decide to create their own, although there needs to be
detailed planning and preparation to ensure the task is not too burdensome nor the information
inappropriate.

With regards to the weather it became clear, as illustrated by Denissen et al. (2008), that
atmospheric conditions do have a real and a perceived affect on pupils’ emotions and in turn
how they view and engage with outdoor activities. The first m scape was undertaken in January
when the temperature was 7°C and for many pupils this was too cold. The coldness affected not
only the pupils’ ability to hold and operate the PDA effectively but also as the activity
progressed pupils begin to lose concentration as they became increasingly aware of the
accumulative affects associated with being cold for a significant amount of time. In the
immediate aftermath of the Thames Mscape the cold weather did prejudice some of the initial
feedback but over time the negative effects of the weather appeared to dissipate.

In contrast to the first mscape the second m-learning activity took place in April when the
temperature was a moderate 15°C. On this occasion the temperature was not a distraction but
the potential of rain and sun glare meant that the weather was never far from everyone’s mind.
During the treasure hunts the weather actually had a beneficial effect as no rain fell and pupils
were able to enjoy the sunshine whilst counteracting the glare by ensuring they positioned the
PDA screen away from the sun. This spring experience, which was in contrast to the winter
experience of the first mscape, enabled pupils to make an informed decision about when
outdoor m-learning activities should occur. For most pupils the conclusion was that m-learning
is best suited to the warmer seasons of spring and summer.

6.3.2.2 Cognitive Outcomes
Through investigation the research revealed that m-learning was active; meaning that pupils got
the opportunity to break with the normal routine of lessons and become actively engaged in the
material they were studying, making it more likely, as Bonwell and Eison (1991) assert, that
pupils would remember the information. The combination of the interactive touch screen PDA
and Mscape utility meant that from the start of the activity pupils were engaged with a personalized experience which demanded action from participants. The breadth and depth offered by the m-learning tasks ensured that pupils valued ‘getting involved, getting active’ (The Lodge Group). A further significant discovery was that while m-learning is active it gave a high level of control to participants. Pupils were able to determine the extent of their activity and pace at which they undertook each mscape.

The research also highlighted that the use of mobile technology allowed for a multifaceted approach to learning. Most pupils viewed m-learning as more dynamic than ‘static’ (Pupil 5) textbooks. The pictures, written text, animations, background sounds and spoken audio along with the touch screen interaction ensured there was ‘something for everyone’ (Pupil 8). This finding is significant as it supports Faux et al. (2006) findings that through a personal experience m-learning caters for a variety of learners by presenting a multitude of overlapping and corresponding media, which pupils can pace and control.

The mobile device also helped pupils learn about Rivers and OS Skills. Prensky’s (2001) notion of digital natives aptly describes how pupils welcomed with excitement the use of mobile technology. Familiarity with mobile and windows-based technology along with the size and portability of the device was discovered to boost confidence and heighten pupils’ interest and engagement levels. Pupils were eager to embrace the technology as part of the learning process, as it was a resource they had real experience with. In agreement with the findings from LSDA (2003) technological familiarity acted as an incentive and switched ‘young people onto learning’.

The research also revealed that the inclusion of m-learning created leadership opportunities for pupils. For some the quest of completing the task enticed them to embrace the role of leader but for others it was desire to assist classmates or frustration at the lack of progress or indecision within groups. For those pupils who actively led they not only experienced a rise in self-confidence and self-esteem but also helped reassure other group members who were in need of assistance and guidance. Also worthy of note was the fact that leaders were not always actively seeking this prominent role, some were reluctant and became a leader out of necessity rather than see their group struggle and possibly not complete the m-learning task. Some leaders also became frustrated at the unforeseen workload, particularly during the creation phase of the treasure hunts.
Like LSDA (2003) the research also highlighted that m-learning has the potential to support the inclusion of reluctant learners. Whilst the inquiry did not significantly suffer from reluctant learners one or two pupils appeared to ‘drift’ or lose interest temporarily. This disengagement by a small number of participants was usually associated with the creation phase of the second mscape when the workload became quite technical and laborious. However, these reluctant learners were often compelled to re-engage through a combination of factors. Firstly, the enhanced responsibility brought about by using mobile technology in a collaborative way meant that participants did not wish to let others in their group down. Secondly, the opportunity to use technology intrigued and motivated pupils serving to re-ignite interest in the activity and the learning process.

The last major cognitive outcome of the inquiry was that m-learning assisted the development of subject-based knowledge. Sections 4.4.1.7 and 5.2.2 have demonstrated that quantitative evidence exists proving that geographical attainment was enhanced through the incorporation of mobile technology into existing pedagogy. Pupils’ knowledge and understanding of river processes and features was significantly increased and so too their comprehension and practical experience of using OS Skills to help navigate and identify places and features.

Whilst not expected at the outset of the inquiry the research revealed that m-learning contributed to pupils’ historical and Information, Communication and Technology (ICT) knowledge. Both mobile activities were based around the school grounds causing pupils, particularly during the treasure hunts, to become more familiar with the history of their local surroundings and appreciate how events of the past resonate through to present day. In terms of ICT pupils were given the opportunity not just to increase their familiarity with mobile technology but to use a variety of software packages such as, Flash, Audacity, Mscape Toolkit and Player, whilst enhancing pre-existing Word, Excel and Paint skills. Having the opportunity to enhance geographical, historical and ICT skills not only promoted cross-curricular awareness but it also allowed pupils to take a greater responsibility for their own learning and determine their own individual priorities.

In contrast to the list of additional positive cognitive outcomes the inquiry also discovered that m-learning also has some limitations. Both mscape activities were criticised by pupils for having too much content, which meant pupils felt overwhelmed at times and either lost interest
and became bored with the activities or else became stressed as they realised they could not retain all the necessary information to successfully complete the task. Pupils also felt that the energy required to find and create resources for the second mscape was exceptionally time-consuming, laborious and boring. Pupils frequently became over-burdened and questioned the usefulness of resource discovery and creation in terms of enhancing their GCSE Geography. Pupils also questioned the workload imbalance which occasionally gave rise for concern within the groups associated with the treasure hunts. Some pupils felt they had to do too much whereas others admitted to becoming disengaged from the task and therefore having minimal input to the creation.

During the inquiry technical concerns also arose when using the mobile device. Unforeseen hardware and software problems, along with the loss of GPS or drift tended to diminish the m-learning experience and tarnish the excitement and enjoyment of using technology.

6.3.2.3 The Future

‘Inevitable’ was the word frequently used to describe the anticipated future integration of mobile technology into the learning process. Pupils highlighted that schools, as part of the wider community, are not immune to technological advances. Due to the popularity of mobile technology becoming increasingly more widespread and accepted it was the view of the inquiry’s participants that the interaction and personalisation afforded by m-learning virtually guaranteed its future use, but not just within Rivers and OS Skills but all geographical areas and at a wider level other school-based subject areas too.

Although pupils acknowledged that m-learning has limitations, such as content overload, creation issues and technical problems, they were realistic and keen to emphasise that the advantages outweighed any concerns providing educators approached m-learning in a purposeful manner and appropriately integrated its use into pedagogy. For most pupils, the interactivity and personalisation associated with m-learning was augmented by the ‘fun’, ‘enjoyment’, ‘interesting’ and ‘inspiring’ attributes presented by mobile technology. The opportunity to deliver geographical content ‘anytime and anywhere’, in a more informal and less stressful environment, made the inclusion of mobile technology not just inevitable but desirable.
With regards to frequency of use some disagreement existed between pupils. No overriding consensus on when was best to use m-learning could be agreed upon. Some wanted mobile technology to be used to introduce, conclude or test a topic, whilst others wanted either an entire topic or sub-topic delivered with the incorporation of m-learning. With regards to seasonality however all pupils agreed that spring and summer would be best rather than the colder and wetter seasons of autumn and winter. Of note however was despite the lack of agreement on frequency of use all pupils were already envisaging a time when the use of mobile technology was ‘inevitable’.

6.4 Did M-learning Enhance Pupils’ GCSE Geography Learning Experience?

The aim of this inquiry was to determine if the inclusion of mobile technology enhanced the learning experience for Geography pupils within certain aspects of their GCSE course. Sections 5.2 and Section 6.3 (particularly Figures 6.3 and 6.4) have summarised the key impacts on pupils’ learning identified through this inquiry. Weighing up the advantages associated with using mobile technology alongside the limitations this action research inquiry concludes that sufficient evidence exists to assert that m-learning did and can enhance pupils’ learning experience as they study elements within GCSE Geography. Like Davey (2007), who during his studies witnessed a 48% improvement in pupils’ understanding, this inquiry was able to convert understanding into increased performance. There was a 43.8% increase in performance when the combined Rivers and OS Skills post-test results were combined compared the pre-test results. However as Sections 3.7, 5.2.2 and 6.3.1.3 have all highlighted the findings of this inquiry cannot substantiate the extent to which m-learning increased performance. Clearly the use of mobile technology had a role to play but other factors too may have influenced performance such as being outdoors and moving about, being more in control of the pace and flow of information or simply it taking part in something different than normal Geography lessons.

Whilst the inquiry proved that pupils’ performance and attainment did improve after the use of mobile technology the enhancement of learning is not solely determined by increased achievement. This inquiry has shown that m-learning was able to augment positively a number of affective and cognitive factors which are all significant in helping to enhance the learning process.
Pupils were motivated and inspired by mobile technology, in their opinion more than through conventional teaching methods. Their self-confidence and self-esteem was inflated. Learning was made more fun and enjoyable, more interesting and exciting and because pupils were empowered through technology they were encouraged to take a greater share in their own learning. This in turn allowed pupils to elevate their expectations and personalise their learning. In addition m-learning incorporated a variety of multimedia ensuring, as Section 2.3.1 highlighted, it catered for a variety of learners. Pupils were offered a versatile approach to study Rivers and OS Skills and the inclusion of mobile technology made lessons active and participatory as opposed to teacher-led with pupils as merely recipients of information. M-learning also extended not only geographical knowledge but History and ICT knowledge and expertise. In support of Prensky’s (2001) notion of ‘digital natives’ m-learning tapped into the pupils’ technological culture and presented them with opportunities to lead, work independently or collaboratively and provide them with a mechanism to help solve problems. Reluctant learners were also included through the incorporation of mobile technology which helped pupils recognise that m-learning has a future role to play not just within Geography but other subjects too. Its influence was viewed as inevitable and welcomed by most, helping to reassert that in the contexts of this action research inquiry m-learning did enhance pupils’ learning. Pupils recognised the significant advances mobile technologies were contributing to life outside of the school environment. In fact since this inquiry began the advancement of android mobile technology has been frenetic. According to Cordock (2010) the android phone, such as the iPhone, has created a situation where the,

...level of computing power, connectivity and ability to run applications has never been seen before (2010, p. 64).

From a pupil’s perspective schools could not and should not attempt to remain immune to these new developments. Rather, teachers should embrace mobile technology and ensure pupils experience a ‘balanced’ (Pupils 2 and 14) approach, incorporating traditional approaches (e.g. textbooks, discussion, worksheets, testing, verbal instruction and written teacher notes) as well as m-learning.

In light of the research findings a note of caution does need to be added. Whilst Rollans (2007) assertion that ‘resistance is futile’ in terms of new technological advances into schools it is worth remembering that mobile inclusion does not automatically mean learning will be
enhanced (see Figure 2.1). In order to promote m-learning into mainstream education and reach the 'early majority' stage, of Roger's (2003) adoption of new innovations, educators must realise that pupils may be 'digital natives' (Prensky, 2001) but Passey's (2009) assertion that pupils also need to be 'learning natives' is equally important. Teachers need to be aware that unplanned, unmonitored and inappropriate content can actually be detrimental to pupils' learning experience. When negatively affected pupils tend to view technology and subject content as boring and time-consuming, which in turn causes many to disengage. Commitment, vigilance and determination are required from teachers' who choose to use m-learning.

At this stage it is important, with hindsight, to also highlight some limitations or issues, which must be taken into consideration by anyone thinking using m-learning in the future. These issues must be acknowledged in order to sustain the rigour and validity on which this small-scale qualitative action research inquiry is based. Although mentioned in earlier sections it is important to restate that, although the triangulation of the collated data discovered that mobile technology enhanced certain affective and cognitive elements of pupils' learning, the degree of enhancement by m-learning was beyond the scope of the data collected. Therefore it is necessary to clarify that m-learning alone may not have been responsible for the positive or negative enhancements. Further research would be required to determine of specific aspects associated with the innovative technology may have had a larger role to play, such as being mobile or experiencing GPS. Alternatively perhaps it was the new and different pedagogy, such as being outdoors, working collaboratively, experiencing a more game-like approach to learning and being able to self-manage the pace and flow of information which had a significant contribution to make to the affective and cognitive enhancements.

The inclusion of a control group, potentially Class 11N in the case of this inquiry, may have helped to add greater validity to the overall findings. After the coding, analysing and triangulating of the data from Class 11M, Class 11N could have been offered the opportunity to experience the m-learning tasks and further data collected. This could then have been compared to the initial findings from the experimental group. However, it is important to stress that owing to the timescale and size of this investigation the collection of large quantities of data from Class 11N may have been outside the remit of this inquiry and best suited to an extension exercise. Another suggested role for a potential control group could have been to give the standardised Rivers and OS Skills tests and then compare the results to the pre- and post-tests of Class 11M. This would have revealed if Class 11N scored closer to pre-test average from
Class 11M or the post-test average allowing a determination to be made about the likely impact of the preparing for or participating in m-learning. Furthermore, the inclusion of a control group would have allowed for repeated testing to have been validated. Class 11N could have been given two identical tests, a fortnight apart just like Class 11M were given for each m-learning task, and this may have helped to clarify whether the increase in performance could have been, in part, due to repeated testing with the same material, or the time spent by the pupils preparing for and taking part in the m-learning tasks.

Another issue which must be considered by anyone contemplating integrating mobile technology is that m-learning can be costly, prone to technical failures and time-consuming. Therefore some consideration as to whether similar learning benefits could be achieved by engaging pupils in another learning activity, such as developing and conducting an outdoors game-based investigation that did not involve mobile computer technology. This notion also reflects the views of Weeden (2000), Liu et al. (2003), Chang et al. (2003) and Roschelle (2003) who stress that before using mobile technology careful planning needs to be conducted to ensure the focus is the subject content and that any intended use of technology will actually benefit the delivery of the subject matter to a greater extent that other pedagogical alternatives. Section 6.6 takes a more in-depth look at some recommendations surrounding the use of m-learning in schools.

6.5 Action Research Evaluation: Was it a Suitable Framework?

This section builds on the fifth stage of McNiff's (1995) model and focuses on evaluating how useful action research was in helping formulate conclusions regarding the effectiveness of m-learning. Only after conducting action research was the researcher able to truly appreciate Hollingsworth's (1997) assertion that teachers hold an advantageous position when undertaking educational research and in particular with the introduction of new technologies (Selwood and Twining, 2005). The participatory nature of action research not only provided a unique insight into the impact of a pedagogical change but it also helped empower both the researcher and the pupils. This increased sense of responsibility enabled pupils to contribute to the research in a collaborative and meaningful way (O'Brien, 1998) yet without diminishing the voice of the individual (Kemmis and McTaggart, 1988).
In retrospect McNiff’s (1995) open-ended model did provide a suitable pathway for investigating the impact of m-learning. Its flexibility, as argued by McNiff (1994), was well suited to the complexities associated with introducing a new teaching strategy. Taking a one cycle approach helped maintain the focus and rigour of the inquiry and prevented side issues from dominating or detacting from the central theme. Yet any areas that were classified as side issues were not ignored they helped to form Section 6.6, which looks at future recommendations. To become creditable many of the recommendations would also need to be reviewed within the contexts of action research to prove or disprove their worth.

By undertaking this inquiry the researcher was also afforded the opportunity to forge links between theory and practice (Mills, 2003). Action research has facilitated professional development and provided the researcher with a mechanism to break away from the daily classroom routine and engage with change (Elliot, 1991). As Johnston (1993) asserted action research allows teachers to become more aware of the options and possibilities available to them. After completing a cycle of McNiff’s (1995) model the researcher is now better placed to follow the advice of Oja and Pine (1989) and reflect on teaching practice. This in turn has highlighted the need to avoid automatic assumptions about the use of technology. Instead there in now recognition for the need to make informed decisions based on self-reflection and pupil participation. Additionally there is also a realisation that ‘change’ is a ‘journey not a blue print’ and that you cannot manipulate every outcome (Fullan, 1999) but you can be prepared and guide more effectively how you respond to change and create a supportive environment (Catelli, 2000; Neapolitan, 2000).

Action research has helped highlight the fact that m-learning can improve teacher-pupil relationships. Through active observation and reflection action research revealed that m-learning made pupils more responsible for their own learning, therefore diminishing the hierarchical power structure that often exits between teachers and pupils. Pupils felt more at ease with the new balance of shared responsibility and were able to communicate more freely with the researcher which in turn created a more positive learning environment.

This action research inquiry also helped answer some of the criticisms levied at this form of research such as; the research being too small-scale, the lack of researcher’s expertise, excessive subjectivity and teachers not having the time or funding to carry out credible research. By contrast, after a review of appropriate literature, this inquiry was conducted in accordance with
accepted protocols and although a small number of participants were involved the breadth and richness of data collated enabled valid conclusions to be drawn and generalisations to be made for future similar projects (Lincoln and Guba, 1985; Schofield, 1990). In terms of excessive subjectivity the researcher was aware of his role and maintained a professional stance at all times. In reality the inquiry benefited from the inside role the researcher had as opposed to an objective perspective. Finally, timing and funding were certainly concerns but through dedication, efficient time management and linking with external bodies time and funding were not major obstacles.

As a reflective practitioner the researcher now acknowledges that constant (structured) evaluation is essential (O’Brien, 1998) and that change, especially with regards technology, is inevitable and necessary. Through this acknowledgement teaching and learning strategies can be improved and promoted more effectively. Failure to change and embrace m-learning isolates teachers from the highly technological world where all pupils function on a daily basis (Prensky, 2007). In the spirit of true action research, which does not end with one cycle, Section 6.6.6 concludes by suggesting possible new ‘issues/problems’. These issues could potentially form the basis of new research and signify the beginnings of another action research cycle.

6.6 Recommendations

After carrying out extensive research into the effects of m-learning it is appropriate to put forward recommendations for future ventures involving mobile technology. However as Section 3.7 highlighted some positive researchers may frown upon any generalisations and recommendations put forward from an inquiry involving only 16 pupils and one researcher. Instead the purpose of the inquiry was to obtain rich data that would immediately benefit the 16 pupils in Class 11M and be of use to the researcher for future GCSE Geography lessons. As an extension, and in response to the advice from Lincoln and Guba (1985) and Schofield (1990), the following recommendations are not designed to be generalisable, only to allow others to view them and if desired provide the opportunity to replicate the inquiry. Other teachers and researchers can then determine the usefulness of the recommendations and the degree of generalisability. This section focuses on some of the main bodies that can bring their influence to bear on the introduction and usage of mobile technologies within the school arena. Figure 6.6 highlights some of the main bodies for whom recommendations have been made. The purpose
of such an illustration is to emphasise that the successful integration of m-learning into schools is highly dependent on a number of bodies working together with clearly defined roles.

Key Bodies for Whom Recommendations have been Made

![Diagram illustrating key bodies involved in m-learning]

6.6.1 Governments and Departments Responsible for Education

In the case of this inquiry the recommendations are made to those in government and legislative roles with responsibility for a country's education. As Section 2.2.3 highlighted m-learning is currently being led from the bottom-up, by teachers who have a technological expertise and a desire to see new technologies integrated into teaching and learning. For m-learning to become sustainable within schools the determination of these teachers, who are currently advocating m-learning, needs to be matched or led from above as well. Only through this two pronged approach will more teachers be encouraged to integrate mobile technology.

The government minister with responsibility for education needs to become proactive and help lead the promotion of m-learning in schools. This will be only be achievable if the minister sponsors campaigns to publicise the benefits that m-learning can bring to schools. Provision must be made to develop support mechanisms for teacher training and provide access to relevant literature and resources. Support mechanisms, perhaps via online forums, could be
established for teachers and as a more extreme measure the use of m-learning could be made compulsory at some stage during secondary education. An alternative proposal could be that the minister might consider refining ICT standards for teachers, which would include minimum competencies for using mobile technology. In terms of immediate and practical steps, increased funding, for training and resources, and time allocation for Continued Professional Development (CPD) training would be the best incentive the government could provide.

For Departments of Education a priority must be to translate the government's vision into an easily understood working arrangement for educational authorities. Educational Departments therefore have a vital role to play through active participation and by creating and promoting realistic and pragmatic policies. Another recommendation for Departments of Education (such as DfE in England and DENI in Northern Ireland (NI)), in partnership with schools, is that it could provide exemplars of good practice for using mobile technology. In doing so departments charged with looking after education could illustrate for teachers how to manage this technology effectively.

6.6.2 Exam Boards

Since the focus of this inquiry was GCSE Geography the relevant exam board (e.g. AQA) dictates not only the subject content but can stipulate or suggest possible teaching and learning strategies. Currently AQA (2008a) makes no reference to m-learning and as Section 1.2.1 revealed it recommends teachers use ICT in accordance with the National Curriculum but avoids specifying where teachers could use ICT. Chapters 1 and 2 revealed that according to several sources (Weeden, 2000; Ofsted, 2004; Becta, 2004a; Davey, 2007) Geography is an ideal subject ripe for the introduction of new technologies. AQA, along with all exam boards, have an opportunity to seize the initiative and pioneer the integration of mobile technologies into mainstream education, moving m-learning into the 'early majority' stage and out of the 'early adopters' (Rogers, 2003).

In light of recent advances in ICT it is therefore appropriate for exam boards to review their approach to ICT and in particular m-learning. Due to the amount of content contained within the GCSE Geography Syllabus teachers may be reluctant to introduce new technologies. It could be seen by many as increasing their workload. Therefore a review of syllabus content is not just about integrating technology but about highlighting how it can minimise teachers'
workload. As a suggestion exam boards could provide exemplars of where m-learning may be used to potentially enhance learning. Resources could also be made available for teachers or pupils to freely download.

6.6.3 Whole School Level: with particular focus on Belfast Grammar

If m-learning is not supported at a whole school level it is clear that within schools its effects will be limited. M-learning requires not just commitment on behalf of individual teachers but it also requires time and funding which are more achievable when approached from a whole school perspective. The key recommendation for Belfast Grammar, but which could also be applied to all schools, is that the Principal needs to become a strong advocate of m-learning. Hopefully the findings of this inquiry may help to strengthen the Principal’s conviction that mobile technology has the potential to enhance pupils’ learning. The Principal's conviction then needs to be transferred into a vision that is easily communicated to all teachers and pupils.

The Senior Leadership Team (SLT) needs to become proactive and embrace m-learning and this is best done through leading by example. By incorporating an innovative spirit into the school ethos and supporting teachers who wish to utilise mobile technology the SLT can help broaden the appeal of m-learning. At a more precise level the SLT must become familiar with current literature highlighting the benefits of m-learning. Senior leaders also have a responsibility to interpret the ICT demands made by the Department of Education and other relevant bodies and help break these down into manageable objectives for teachers. One recommendation is that senior leaders could review the national curriculum or even the revised KS3 curriculum and provide examples where m-learning could be used to help fulfil some of the mandatory criteria.

Another recommendation is that the SLT needs to constantly monitor and modify the ICT policy, which in the case of Belfast Grammar is currently outdated. By focusing on m-learning as part of the whole school development plan the SLT would show a willingness to embrace new technology and demonstrate a commitment to its eventual integration within lessons. The key is not to become over ambitious but perhaps to initially target one or two teachers or subjects and review the effects of m-learning. These could then be discussed with the whole staff with a view to more or all departments becoming involved. At a practical level the SLT can help promote m-learning by providing CPD training, advertising relevant external courses,
offering extra time for interested teachers and securing funding for the necessary technology. Recognition and acknowledgement should also be given to those teachers who use mobile technology and help lead from the bottom-up. This recognition will not only help promote further use of mobile technology but also encourage others to become involved.

6.6.4 Departmental Level: with particular focus on Belfast Grammar

The recommendations contained within this section are directed at the Geography Department within Belfast Grammar but most could apply to any department within any school. The Head of Department (HoD) is the key at departmental level to securing the successful integration of m-learning. HoDs must be supportive to departmental members and encourage them to try out new technologies. This can best be achieved by leading by example and by publicising what is available in terms of m-learning. HoDs should work in partnership with their departmental members and share the workload in creating and designing m-learning activities.

Yet again funding is important. HoDs should allocate some of their annual departmental budget to purchase resources vital to m-learning integration. The Departmental ICT Policy should also be updated to reflect new mobile resources and new initiatives. Most crucially however departmental polices and funding allocation should mirror whole school initiatives. This highlights the need for HoDs to be forward thinking and help affect whole school issues.

6.6.5 Individual Teachers

For those teachers who are keen to use mobile technology to enhance Geography lessons the recommendation is to follow personal ambitions and for those who are hesitant to experiment with m-learning they should not be reluctant due to inexperience or the fear of increased workload or technical difficulties arising. If integrated and managed appropriately mobile technology can be used as a strategy to minimise teacher workload (Becta, 2004a) and in terms of technical issues Sections 4.4.2.3 and 5.2.2 revealed that during the course of this inquiry technical problems did occur. However the key for future m-learning tasks is to learn from past experiences and put safeguards in place such as having extra equipment on standby or having sufficient technical personnel present to deal efficiently with any problems. Piloting of the mobile activities needs to also be conducted and pupils too need to be briefed on what they can
do if technical problems arise. By following such procedures teachers are best placed to respond proactively and reactively to technical problems.

As stated by Weeden (2000) and reiterated in Section 6.4 by others (Liu et al., 2003; Chang et al., 2003; Rochelle, 2003) it is also important never to introduce m-learning for the sake of having used technology. Teachers must decide why they want to integrate mobile technology and ask themselves if the same outcomes can be achieved through cheaper and less time-consuming pedagogical approaches which are also less prone to technical failures. Teachers do require commitment, perseverance and above all planning. This will allow for real-time adjustments to be made to the activity as unforeseen issues arise. In addition to planning teachers need to enhance their monitoring of tasks involving mobile technology and offer additional support where necessary, whether they involve independent or collaborative learning. If collaborative learning is to form part of the task then teachers must not only observe pupil interaction but, as this inquiry has shown, educate pupils on shared group responsibility and put in place compromise procedures.

In response to concerns surrounding too much content and resources issues (see Section 4.4.2.1) the recommendation is that teachers and pupils should ‘exchange’ ideas, in the spirit of AT, which will help minimise participant disengagement and allow for ‘rules’ to be modified. This action will ensure that the views of all participants are taken into consideration alongside syllabus demands and that a fair and equitable distribution of work is adhered to by all. With amended ‘rules’ in play future m-learning activities can strive to negotiate a balance between content and resourcing and division of labour and enjoyment without compromising the objectives or learning outcomes.

During the inquiry it became clear that pupils questioned the need to construct the activity, particularly when it was not a requirement of their GCSE Geography syllabus. Teachers need to gauge carefully how much input pupils have into the creation of the mobile activities, it should not detract from the subject content or the syllabus. Pupils could perhaps be given smaller sections to create therefore minimising the potential for boredom and time consumption. This suggestion does however give pupils the opportunity to take ownership of some part of the creation and gain an insight into how the activity functions. Teachers too need to be careful because if the burden of responsibility falls entirely to them for mobile task creation then they too could struggle to cope with the workload. The key to success regarding m-learning is
gaining the confidence in using the technology. Therefore, the initial step should be to read up on what benefits mobile technology can bring to learning (see Figure 2.1) and to ascertain what ICT skills pupils have already secured from Key Stage 3 (KS3). A review of available and appropriate technology should also take place and once completed teachers need to experiment with the technology. If in doubt there are many examples on the Mscape website or the wider web illustrating how other teachers have integrated m-learning. Fortunately many mscapes are currently free to download from the internet and these could assist teachers who decide to create their own, although as highlighted earlier there needs to be detailed planning and preparation to ensure the task is not too burdensome nor the information inappropriate.

This inquiry centred on the mscape platform as a means for delivering m-learning. In light of this experience Figure 6.7 provides a logical step-by-step process for teachers wishing to create a mscape, but in reality it could be applied to any m-learning activity. What is advantageous about following the process established in Figure 6.7 is that not only does it take you from conception to evaluation of the mobile activity but it incorporates action research. It follows a typical cycle of McNiff’s (1995) action research model and in doing so allows teachers to reflect on and modify their practice. Figure 6.7 helps make the entire process manageable for teachers embarking on introducing m-learning into lessons. It deals with the core demands, resourcing and familiarisation issues as well as creating, piloting, modification and eventual delivery to pupils. It takes into consideration possible ethical issues and provides a feedback mechanism in the form of evaluation to assist future m-learning activities.

6.6.6 Other Interested Parties and Recommendations

As active participants pupils need to change the way they view learning. In an era where learning is changing and potentially occurring anytime and any place pupils should be more accepting towards new technology. They need to realise that life outside of school is now more demanding in terms of technology and working autonomously or collaboratively through mobile technology is providing important life skills, such as how to respond pro-actively and reactively to changing situations.

Parents too have a role to play. Not only should they be seeking to encourage and provide affordable mobile technology to children but their focus should be on ensuring their child is educated within a safe environment. With new technology comes new dangers and parents still
The Process of Mscape Creation

Creator's own perceptions of mobile technology as a teaching tool

Organisational (e.g. school) perceptions and support of mobile technology as teaching tool

Conception for mscape activity

Possible Modification

Equipment

Time Allocation

Training

Subject-specific resources (e.g. images, sounds, video, etc)

Possible Modification

Possible Modification

Possible Modification

Initial Creation

Consultation with Syllabus

Testing (Usually PC based)

Piloting in Situ

Introduction to intended participants

Run Mscape

Evaluation

FIGURE 6.7
need to be vigilant and take a keen interest in what their child is learning. In turn this interest and engagement will help boost enthusiasm amongst young people for m-learning.

Teacher training colleges should strive to educate and introduce trainee teachers to the benefits associated with m-learning. At present some teacher training colleges do introduce their students to mobile technology but this practice needs to be more widespread. Trainee teachers are ideal to target as they are at an impressionable stage in their career, therefore teaching colleges have a responsibility to ensure their students are kept up-to-date with new technologies. Most trainee teachers have a good background in ICT and mobile technology and have not yet settled into classroom routines which they find difficult or would be unwilling to change. Whilst on teaching practice trainee teachers have a reduced teaching timetable and their teaching college could provide them with the necessary technology encouraging them to experiment with m-learning.

The penultimate body where recommendations are directed to is Ulster Mediascapes. On a positive note this organisation is currently funded by the NI Assembly which is testimony to the latter’s commitment to encouraging new technologies. However, Ulster Mediascapes is not exclusively directed towards schools and due to the small-scale initiatives, which it is involved with, its influence is limited. Ulster Mediascapes has already proven to schools that it can deliver in terms of support, advice and resources. To become more effective one of two recommendations need to happen. Either Ulster Mediascapes must expand its influence within schools and bid for increased funding or alternatively DENI should create new organisations which can extend the work already undertaken in schools by Ulster Mediascapes. The last option is outside the control of Ulster Mediascapes but should act as an incentive to build upon the unique niche it currently holds within NI.

In conclusion recommendations are also made in terms of the potential for future research. Section 2.2.3 revealed that m-learning in schools was still very much in an embryonic stage (Beetham and Sharpe, 2007). Therefore research into the impact of m-learning needs to continue. Further research into the differentiation of devices could be reviewed; as the pace of technological advances means that each month witnesses new and improved mobile devices, particularly in the smart phone arena, being launched. The management and leadership of m-learning within schools is also another area ripe for future research and so too an investigation into the impact of socio-economic conditions on acceptance and use of m-learning. Research
into the involvement of pupils with the creation of m-learning tasks also deserves more attention and to help support this inquiry perhaps the research could be broadened out to take into account other schools.
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The Researcher’s Journal
The Thames Mscape

This journal was created during the planning, resourcing, creating, modifying, piloting, running of and aftermath of the Thames Mscape. The purpose of such a journal was twofold. To establish and catalogue a (linear) process for mscape usage in school and secondly to experiment with the Thames Mscape to make the next mscape (based on a treasure hunt) more effective and efficient.

August-September 2008 [Planning]
• As part of my EdD dissertation I decided to look at mobile technology as a teaching tool to help improve learning. After an initial meeting with my principal dissertation supervisor (Dr Jones), in early summer, I was introduced to Mscape as a mechanism for delivering m-learning in a school environment.
• I quickly decided that during the course of the 2008-2009 academic year I would focus on a GCSE Geography class and incorporate two mscape into the AQA geography Syllabus. The first mscape would look at the topic Rivers and allow for a systematic investigation of the upper, middle and lower course of a river.
• As this was my first mscape I felt it would be beneficial to use this first mscape as a practice for me. Through the creation and modifying processes I would become more familiar with the Mscape Toolkit. The pupils therefore were not to be involved in the creation of the first mscape only the recipients. They would however get the opportunity to help create the second planned mscape.
• I met with my dissertation supervisor and secondary supervisor (late August/early September) to agree upon a way forward and to begin work on an ethics application based on the proposed study to the Ethics Committee at Queen University.

October 2008 [Planning Continued & Resourcing]
• A review of the AQA (2008) Geography Syllabus was of paramount importance as this was to be the driving force behind any mscape. The topic Rivers was the obvious choice as it was the topic pupils would be studying between October 2008 and February 2009. My intended approach was to have the mscape ready for January 2009 and present it to pupils as they finished the taught element of the course.
• When reviewing the topic Rivers I decided to focus mainly on river processes (erosion, transportation and deposition) and river features. The plan was to present the long profile of a river which meant pupils would take an imaginary journey from the river’s source to its mouth, passing through the upper, middle and lower sections in a linear fashion.
• The River Thames was chosen as I wanted to provide a named example that the pupils had heard of but possibly never seen. The aim was to bring a river which normally would be inaccessible to the pupils and give the opportunity to experience this unique environment in a new and interesting way. The Thames was chosen because it is a well known river, it is the longest river in England and there are plenty of good resources on the River Thames.
• Time was spent downloading relevant rivers and Thames specific information from websites. I also research other audio-visual and written sources on the Thames. At this stage I was simply classifying resources as processes, upper course, middle course or lower course.
• I met with my dissertation supervisor and we discussed resourcing the Thames Mscape and the need to get familiar with the Mscape Toolkit.
• I downloaded the Mscape Toolkit and began to familiarise myself with its layout and functionality. This was a new piece of software to me so the best way I found to learn was to play around with it and download a couple of freely available mscape from the Mscape website (http://www.mscapers.com/). Through self-learning and interaction with exemplar mscape I was able to gain a brief insight into the potential of mscape as a mobile teaching tool.
• After reviewing the toolkit for seven to ten days I was able to compile a list of questions or areas of concern that I felt I was unable to answer and need further assistance with.

November 2008 [Resourcing & Creation]
• Received word from the University Ethics Committee that my proposed dissertation could proceed as planned.
• I submitted to the Principal of Belfast Grammar a letter requesting consent to carry out my research within the school. This letter outlined the purpose of the study along with the aims and letters of consent to be given to participants and their parents (see Appendix S).
• Contacted my dissertation supervisor with the view to getting some initial guidance on mscape.
• Following my request my supervisor gave me an email contact for Mr Smith from Ulster Mediscapes. I emailed Mr Smith and we arranged an initial meeting. Mr Smith also informed me of MscapeFest 08, which was a conference to be based at W5 in Belfast. It was scheduled for the 2nd and 3rd of December 2008 and aimed to provide a number of mscape workshops, which Mr Smith thought would be beneficial for me with regards to creating mscape for use with pupils.
• At our first meeting Mr Smith came to my school and introduced me to what Ulster Mediscapes was about. Through an audio-visual presentation, discussion and exemplar mscape
he showed me how to get started using mscapes and encouraged me to create a small basic mscape, transfer it to a PDA and go outside and try it. At this first meeting Mr Smith had a simple mscape created, based within my school grounds so we were able to talk a walk around the school and this was my first experience with a mscape through a handheld device. I had experienced mscapes on the PC using the tester function on the toolkit but nothing quite prepared me for the actual experience. It was unlike any traditional teaching tool. My senses were bombarded with sound and images, generated as I walked around with the GPS enabled PDA. Mr Smith also provided me with a PDA and external GPS card to experiment with my own mscapes. The meeting concluded with an agreement to keep in touch via email with a second meeting to be organised after the MscapeFest 08 Conference.

• Resources were sorted through and a detailed plan of what I wanted my mscape to show was created. I decided to create six stops along the Thames, two in the upper course, two in the middle course and two in the lower course. I then looked at what features and processes were occurring along the Thames at the six stops.
• I began work on the Thames Mscape. My first task was to import the relevant base map as a maplib file. This is the format used for the mscape map. This task, which at first appeared relatively easy, proved difficult to achieve. In the Mscape Toolkit you can import maps in three ways, 'import an existing map', 'create a new map' and use mscape map service'. The latter is the most straightforward but unfortunately the satellite image of Belfast Grammar was outdated, due to recent construction, and therefore did not suit the planned mscape. After several emails Mr Smith was able to obtain the detailed satellite image in jpeg format also the necessary co-ordinates based on the Irish grid system.
• My next problem was to superimpose The River Thames over the satellite image of the school. As I was bringing a new environment to the grounds of Belfast Grammar I had to create a reference point for pupils to follow. If I could not superimpose the Thames over the school's jpeg it would be too difficult for the pupils to navigate down the course of the river. Using the 'Paint' tool in windows I was able to place the image containing the relevant section of the Thames over the school. This image was then important into the mscape and co-ordinates added.

December 2008 [Creation Continued & Modification]
• 2nd-3rd December I attended the MscapeFest 08 Conference at W5, Belfast. This conference held workshops on mscapes for education, the use of flash in mscapes, how to use mscapes to communicate with the web and the use of sound in mscapes. In addition the conference provided the opportunity for invited guest speakers to demonstrate the mscapes they had created and for discussion with others at the conference. I found this conference extremely useful. I showed me the potential of mscapes and also reassured me that mscapes were still a relevantly new phenomenon and through perseverance and practice I would get the necessary skills and expertise to create my intended mscapes.
• I continued to work at fine tuning regarding resource formation for the Thames Mscape. My first step was to type out what I wanted the pupils to hear from me as they walked around during their mscpe experience. This audio was then recorded in Mp3 format using 'Audacity'. Microsoft Word was used alongside 'Paint' to create a series of linked jpeg images. Care had to be taken to ensure the resolution of the images was small enough to fit on a PDA screen (640X480). This was achieved through the use of 'ImageResizer', which is a Microsoft PowerToy for Windows XP. Once the images and speeches where completed I exported them into the Thames Mscape.
• I was the able to create slideshows within the mscape but then I ran into a set of new problems/questions, which I was unable to complete. In pursuit of the answers I had to contact Mr Smith. The outcome of this email was a second meeting on the 9th December between Mr Smith and I. Mr Smith showed me how to use the 'Playlist' command to prioritise which media I wanted to play and in what order. He also showed me how to tidy up my imported sounds, images and slideshows. This made navigating around the mscape a lot easier. With regards to enabling and disabling regions Mr Smith demonstrated how to group objects together which then allowed for hiding and disabling. With regards to the quiz Mr Smith took my ideas away from the meeting to think through the most appropriate way to integrate the quiz. At the meeting Mr Smith also raised two important issues. Firstly, that the superimposed River Thames appeared to be going through some buildings, which could affect the GPS signal and secondly, some of the slideshows were quite long. The longest in fact was around three minutes.
• Following the meeting I spent some time making the Thames Mscape more user-friendly and tidied up some of the directories. I group regions together and started to apply the slideshows containing the images and speech to the relevant regions. Mr Smith showed me how to use the script in the 'script pane' of the Mscape Toolkit to create commands to hide/unhide and enable/disable regions. I learned very quickly to keep checking my script for errors at regular intervals. This meant I would not spend a lot of time creating a mscape full of errors that were difficult to spot.
• With regards to the two issues raised by Mr Smith I realised that the only way to check for loss of GPS signal was to try the mscape out. I also ensured that none of the stops, fact points or question points which located inside the school. This was designed to minimise the potential loss of the GPS signal at key points. On the point of content I decided to ask my dissertation supervisor at our next meeting (16/12/08). My concern was I needed to cover the AQA (2008) GCSE Geography Syllabus in relation to river processes and features. I also reviewed all resources and ensured that pupils would not spend longer that approximately three minutes at any stop.
• Half way through December I realised it would be a good idea to have a step-by-step written plan for the second mscape.
• 16/12/08 I had a pre-Christmas meeting with my dissertation supervisor. The purpose of the meeting was to demonstrate the Thames Mscape and discuss issues surrounding this mscape. Two other issues
were discussed - my proposed timetable for January relating to the running of the mscape with the pupils and collection of data and secondly the second mscape was brainstormed.

• Several key issues were decided upon at the meeting with my supervisor. It was agreed to run two pilot sessions for the Thames Mscape, one on the 21st December 2008 and the second on the 6th January 2009. The former was to be myself and my supervisor and the latter to involve representatives with an ICT background, a Geography background and a Mscape background. The January timetable of events was also agreed upon and with regards pupil interviews we decided to give the focus group interview questions to the selected interviewees on the preceding afternoon. My supervisor also reminded me to ensure I carry out observations on the day of the mscape and use 16th pupils to help with this if necessary. The final issue discussed was the flash quiz. A decision was taken to request pupils also record their answers on paper as the quiz only provides an end score and provides no mechanism for retrieving how pupils answered the questions.

• On 17th December Mr Smith requested a meeting to go through the flash quiz that he had been looking at with a view to integrating it into the Thames Mscape.

• Monday 21st December – before first pilot scheduled for 2.30pm I ran the mscape by myself around 10:10am and it appeared to work fine. Three issues came out of my test. The second speaker ('Cry me a River') did not play, Site 5 (Teddington) was difficult to launch as there appeared to be GPS difficulties and thirdly there was no speech in the 'Meeting Point' region.

• Monday 21st December the first pilot was held. Present for this was my supervisor, Mr Smith and myself. During this pilot a number of issues arose and it was agreed that Mr Smith would return to the school on the morning of January 6th to help fix some of the issues. Then on the afternoon of the 6th it was decide to hold a larger pilot of the revamped Thames Mscape.

January 2009 [Modification Continued, Piloting & Running of Mscape]

• Over the Christmas holidays I devised a timetabled plan for mscapes 1 & 2 – the reason was to provide both myself and the pupils with a structure indicating clearly defined goals.

• Tuesday 6th January – Mr Smith helped modify the Thames Mscape to incorporate the changes we agreed upon in light of the first pilot. At approximately 2pm the second pilot got under way and present for this were, my dissertation supervisor (ICT perspective), Mr Smith (mscape specialist) and a Geography and science teacher. The aim of this second pilot was to identify any remaining problematic issues and to test the updated Thames Mscape. Appendix E summarises the main issues raised during the second pilot.

• It was also decided on the 6th of January that pupils would need some familiarisation of mscapes and the equipment before the actual running of the mscape on Wednesday 28th January. Friday 16th January was therefore scheduled for the mscape ‘Stamp the mole’.

• After Pilots 1 and 2 I felt it was a good idea to devise a brief information sheet that dealt with some appropriate items relating to The Thames Mscape, e.g. GPS, what buttons do, safety, what to expect, etc.

• Friday 16th January – The pupils got to experience the ‘Stamp the Mole’ Mscape. Throughout this activity myself and Mr Smith provided support and I made several observations – see Appendix F.

• 21/01/09 – 14 pupils completed the first Rivers test created from past GCSE questions. Two pupils were absent. The test appeared to suit the pupils and the time allowance was adequate.

• On Friday 23/01/09 pupils were given the ‘Helpful Information’ sheet to take home and read over. By giving it to pupils in advance of the 28th it was hoped the pupils will take the time to read it thoroughly to maximise their experience.

• In preparation for the Thames Mscape there were a few items to be undertaken immediately prior to the 28th January, such as emailing Mr Smith and Dr Jones with the final arrangements and timings of the event. Charging the equipment and copying the Thames Mscape to each PDA was also undertaken, along with preparing the final instructions for pupils. The school senior leadership team was reminded that a mscape activity was taking place on the 28th January and that access, via fire doors, to the school would be required. Advanced weather checks were carried out online and the forecast reports stated ‘cloudy and possibly foggy with a low chance of rain’. Audio-visual equipment was charged up and Year 14 pupils assigned to help with videoing and the taking of photos. Year 14 pupils were also invited to help out with gaining access to the school, the distribution and collection of equipment and the writing down of the quiz results at the end. The last piece of advanced preparation involved the creation of a check list of important issues to be dealt with on the 28th January (this can be seen below).

• Last minute instructions were given to pupils about the Thames Mscape on the 27th January during Geography class.

• The Thames Mscape took place as planned on the 28th January and Appendix E summarises the main observation I made (These were taken from direct observation, my written notes and from photos and video).

• After the mscape had taken place it became apparent to me that the first instinct of pupils when a problem arose (either technological or geographical) was to ask one of the adults supervising the activity. Clearly pupils were not overly confident with m-learning yet.

• After the activity I was conscious that because gloves could not be worn, otherwise the PDA might slip, pupils really experienced the cold.

• On Thursday 29th January a random number generator was used to select 4 pupils to participate in the focus group interview. The focus group questions were also given to the pupils and they were asked not to discuss their intended responses with each other in advance of the interview. It was also explained to the pupils that the focus interview was taking place two days after the mscape experience to allow for pupils to process their thoughts yet not allowing too much time to lapse in case views and opinions started to diminish.
Friday 30th January is when the focus group interview took place. Present for this interview were Pupils 7, 9, 12 and 15. It took place during periods 1-2 (9:05am-10:15am) and lasted approximately 28 minutes.

February 2009 (Aftermath of Mscape, e.g. Collation of Data)
- The focus group interview was typed up over the weekend (31st Jan-1st Feb 2009).
- Pupils were given the second Rivers GCSE test on Tuesday the 3rd February and this was marked that evening.
- On Wednesday 4th February all pupils were given an advanced preview of the interview question for the class interview scheduled for Friday 6th February.
- The class interview was conducted on Friday 6th February during periods 8-9 (1:20-2:25pm) and lasted approximately 37 minutes. All pupils were present. Before beginning the class interview pupils were given back their first attempt at the Rivers GCSE test and after two minutes later they were given back their second attempt. Overall 15 pupils witnessed an increase in their percentage, which equated into 10 pupils obtaining a higher grade. Only one pupil (Pupil 14) did not see her mark increase, it remained the same for both papers.
- The class interview was transcribed during Saturday 7th and Sunday 8th February.

This concludes the Thames Mscape Journal

The Treasure Hunt Mscapes

This journal was created during the planning, resourcing, creating, modifying, piloting, running of and aftermath of the treasure hunt mscapes. The purpose of such a journal was twofold. To establish and catalogue a (linear) process for mscape usage in school and secondly, to experiment with The Treasure Hunt Mscapes, to make any future mscapes more effective and efficient.

January 2009 (Planning & Resourcing)
- January was busy trying to complete the first mscape yet prepare for the treasure hunt Mscapes. At an early stage it was decided that written guidance should be given to pupils to help guide them through the creation of a mscape. In light of the first mscape I decided to begin the second mscape by redrawing the pupils’ attention to the following handout that they were in possession of:-

- “Introduction to Mscapes”

- “In addition the above mentioned handout it was clear the pupils would need extra support and guidance. Therefore the following handouts/information sheets were created:-

- “Our Involvement with Mscapes”
  The purpose of this handout was to provide pupils with a summary about our involvement in Mscapes. It also briefly explained what the second mscape would involve, namely OS Skills. It also provided pupils with a timetable of events for the second mscape.

- “How do you Conduct Group Work?”
  I felt it was important to get pupils to take ownership of the second mscape and one way to do this was to encourage pupils to have a say in how the groups were formed. My plan was not to have teacher imposed groups but I also did not want friendship groups being established. I therefore took the decision to discuss with pupils how to establish fair groups and provide guidelines for how groups were to conduct themselves.

- “Mscapes in Education”
  In the interests of full disclosure to pupils I felt it necessary to provide an overview of how mscapes were currently being viewed and/or used in schools and in particular Geography.

- “Mscapes getting Started”
  This handout was primarily to instruct pupils on what software is needed, where it can be downloaded and what to do with it.

- “What OS Skills to Include in Mscape?”
  To assist pupils in deciding what OS Skills to include in their mscape this handout was a reminder for pupils what OS Skills they could include.

- After discussion with Dr Jones I decided that to make it more interesting there would be three groups of about 5-6 pupils and each group would create their own Treasure Hunt Mscape based on the history of one of the old buildings on the school grounds. I therefore had to create two additional handouts unique to each group (six in total):

- A Historical Information Sheet about the building assigned to each group. (see Appendix G as an example)
- A task handout explaining in detail what steps pupils had to follow within their groups to complete the Mscape. (see Appendix H as an example)
- “Storyboard”
This was a template allowing pupils to create a storyboard for their group’s mscapes.

- After further consultation with Dr Jones we realised that I required a secure mechanism to allow pupils to communicate with each other. It quickly became apparent that the setting up of an online course through Learning NI (LNI) offered the best solution. It was secure because it required a password gain access, which meant no one other than the 16 pupils, Dr Jones and myself could have access. It also allowed separate groups to be set up in the ‘Workspace’ area so pupils could communicate with others in their group but not see the information belonging to any other group. In light of the decision to set up a LNI course two more handouts were created:
  - LNI & the Treasure Hunt Mscapes
    This handout was designed to inform pupils how to access the LNI course and how to use the relevant sections within the course.
  - Welcome to the Treasure Hunt Mscapes
    Once logged into the Treasure Hunt LNI course it was appropriate to include a diagrammatic introduction to the course and the activity.

February 2009 | Resourcing Continued, Introduction to Pupils & Pupil Planning!

- The second mscape was launched as planned on Tuesday 10th February. Pupils were given all relevant handouts and informed that they were to attempt logging into the LNI course during the February mid-term. They were also to scan over the handouts and a reminder was given that the handouts were also available within the LNI course should any pupil lose their copy. Groups were also finalised on this date.

- Over the mid-term two pupils logged into the LNI course but choose not to leave any comments in the discussions. The rest of the class did not log into the course. It was decided therefore to set one class a week aside from mid-February until the mscape was completed for pupils to go to an ICT room. This would allow pupils to utilise the LNI course and to become more familiar with the Mscapes Toolkit. On a positive note the pupils did read over the handouts given prior to the mid-term break.

- On Wednesday 18th February Mr Smith returned to the school to demonstrate the set up of a basic mscape and some functionality of the toolkit. During his 60 minute presentation he was able to demonstrate to the pupils how to:
  - Open the Toolkit from the Mscapes Library – by selecting ‘Create new Mscapes’;
  - Import a map;
  - Import a sound file;
  - Import a picture;
  - Create a region (either a circle or polygon) and assign sound and/or picture to these regions;
  - Utilise the speaker function;
  - Manipulate sounds, e.g. loop, length, volume and renaming;
  - Manipulate images, e.g. size, placement and purpose of hotspots;
  - Save a mscapes for the first time and then how to save on subsequent occasion (e.g. using different version numbers);
  - Re-open a mscapes and edit it.

During the presentation both Mr Smith and myself commented on the ability of the pupils to quickly understand what was going on. On one occasion Mr Smith was explaining how to add a sound to region. At the ‘Open’ command the pupils correctly identified the ‘Play’ option and when asked what to do with the sound ‘On exit’ they all choose ‘Fade out and stop’ rather than ‘Stop’. This clearly showed a level of understanding by the pupils beyond my impressions of their ability.

- Mr Smith also recommended that I check out a website by Tom Barrett (http://tbarrett.edublogs.org/)

Tom is currently a primary school teacher at Priestsc Primary and Nursery School, Sutton in Ashfield, Nottinghamshire, England. His website is more of a web blog and he outlines his approach to ICT within his classroom. What I found most interesting as I read through Tom’s blogs was that he had an opinion similar to my own. This centred on the idea that teachers need to must confront the world where pupils live. At present most pupils live with and experience technology constantly outside of school. For Tom this provided the very incentive to bring ICT into the classroom. For example Tom used the Nintendo Wii to support a numeracy lesson.

- On Friday 20th February pupils were taken to a computer room (B16) and given the opportunity to log onto the LNI course and leave a message in their group’s coffee bar section. This proved very useful as those who were not too sure how to navigate around the course could be shown how to do so by myself and their peers. Everyone got the opportunity to leave a message however I discovered that at times the course could become very tedious. Every submission to the discussion board required my approval before everyone else in the group saw it. This inevitably created a delay in groups carrying out their work but the only other option I had was to remove this function allowing pupils to edit and delete their comments. In the interest of the inquiry it was deemed unsuitable to do this. I wanted to capture the pupils’ first responses to topics and questions.

- During Geography class on Tuesday 24th February pupils were asked, within their groups, to start thinking about the treasure for their treasure hunt mscape in light of the old house/building they were representing.
Tuesday's work was continued into Wednesday 25th and each group had to finalise their treasure. At this stage they were unwilling to share with me the treasure they wanted to keep a secret, a sign that they were getting excited and involved in the activity. The following were undertaken on the 25th:-

- One person from each group was assigned to write the introduction speech/audio for the mscapes. This speech had to include three aspects - an introduction to the activity, an outline of what the lost treasure is and finally an invitation given to participants to help find the treasure.
- The base map was studied and groups given the opportunity to change or add digital items to it. On this date no group wanted to change the map although one group (The Lodge) wanted more time to think about this.
- Groups had to place their lost treasure - the idea was to work backwards from the end goal and this idea can from the pupils. They felt that they would at least understand what they were striving towards.
- For Friday 27th the number of regions each group wished to include within their mscapes had to be decided. It was suggested by me that between 4 and 6 regions would be best. Each region had to be assigned to one person in the group and a clue also had to be written. This meant pupils had to liaise with each other and decide which order the regions came in or would there be any order at all. Also should the clues be in a question, riddle or other format.
- An emphasis was also placed on OS Skills so as pupils would not forget the Geographical Theme of the mobile activity.
- The LNI course was also advertised to pupils again as a mechanism to continue today's discussion's and activities.

March 2009 (Continued pupil Planning, Resourcing & Creation)

- Whilst creating the generic base map in Paint and then uploading it to the mscapes toolkit I experienced several problems. The map would not function correctly in the Tester. I initially assumed this was because the image was too large at 233kb from 1mb it made no difference. Mr Smith's assistance was sought and it was discovered that even 233kb was still too large I had to reduce the image size, using Image Resizer, down to 135kb.
- Pupils were set the following tasks on Wednesday 4th March:-
  - Send final introduction speech to LNI course by 9pm on the 5th;
  - Upload the jpeg images to go with the intro speech by 9pm on the 6th;
  - Upload the written clues for each region by 9pm on the 7th;
- In addition each group was involved with the creation of their base map, uploading it to the mscapes and creating the regions. Groups were also asked to nominated two people to take charge of the speakers.

These two pupils had until Wednesday 11th to decide on the number of speakers, their location and make them relevant to the theme of the mscapes. They were also asked to obtain the necessary sounds in Mp3 format. The last section of the double Geography lesson looked at the creation of a pupil journal and a storyboard. One pupil from each group volunteered to write the journal and a second agreed to create the storyboard.

- As of yet (4th March) the LNI course has not proved to be much use. Pupils will only use it if there is a real need and so far there has not been. The novelty factor does not even appear to encourage the pupils.

Late March - April 2009 (Creation Continued & Modification of Mscapes)

- Between the 4th and 27th March pupils modified, resourced and began creating their mscapes. During early March it quickly became apparent that the mscapes would not be created by the 18th March and ready for piloting between the 18th-24th. To ensure pupils were given adequate time to complete their mscapes pupils were given the following deadlines on the 12th March as guidance:-
  - Mscapes to be completed by Friday 27th March and submitted to researcher for review;
  - Between Friday 27th March and Thursday 2nd April the researcher reviewed the three mscapes;
  - Piloting to take place Friday 3rd and Monday 6th March;
  - Mr Smith would review mscapes with researcher on Tuesday 7th April;
  - First OS Skills test would occur on 7th April;
  - Treasure Hunt Mscapes would take place on 22nd April
  - Focus group interview would take place on 24th April with those randomly selected informed on Thursday 23rd;
  - Second OS Skill test was scheduled for the 24th;
  - Pupil journals and storyboards would be submitted by Tuesday 5th May;
  - LNI course to be closed on Tuesday 5th May 2009.

NB: These new dates were agreed with approval from the pupils who were engrossed in the mscapes and wished to create an enjoyable treasure hunt.

- During the creation of the mscapes a number of interesting issues came to the surface. At the start all group members were willing to help out and play their part but soon one or two pupils were observed by the researcher as playing a minimal role, although no group member approached the researcher to report these pupils. The establishment of a group leader appeared to have a positive effect as these individuals took responsibility and delegated any work not completed to others. The variety of tasks involved in planning, resourcing and creating the mscapes allowed different pupils to play to their strengths and help others in their group to learn new geographical and ICT skills. This was most noticeable when it came to creating and editing sound with 'Audacity'.

• Sound proved the biggest problem for the groups. Jpegs were easily created but getting the sound at the correct volume, to be effective outdoors with the mscapes, and getting the timings corresponding to the jpegs proved difficult and tedious.

• When it came to the actually creating the mscapes a decision was taken by the researcher to ask for 2-3 volunteers from each group to help. It would have proven to difficult and time-consuming to involve everyone within the group and a number of pupils stated they were not keen to experience the ICT element involved with fine tuning the mscapes. Two volunteers came forward from each group and importing the generic base map the researcher reminded each group how to import content, create and place regions and speakers and design slideshows. Pupils were then allowed time to create their mscapes. Once the content had been imported, assigned to regions or speakers and located the researcher dealt with any difficult script or logistics needed to run the mscapes. This was not done in isolation the volunteers were allowed to watch what the researcher did.

• Around the 27th March the research began to notice some pupils were getting tired with the mscapes experience. When asked how they were getting on they replied they were now beginning to get ‘sick’ of the mscapes. ‘It was dragging on too long’.

• When submitted on the 27th March for review the mscapes were checked over for errors or issues that might detract from the quality of the mscapes. All three mscapes had only minor adjustments because the researcher had closely monitored and helped the pupils throughout the creation phase. Some changes involved the alteration of one or two clues that were judged to be too difficult, sounds were made higher and it was recommended that some jpegs should be redesigned to have a greater impact.

• The Walton and The Lodge mscapes were piloted by pupils on the 3rd of April with Fairbourne’s taking place on the 6th April. Appendix K provides details on each of these pilots but the next box summaries the key issues the pilots highlighted.

• During Mr Smith’s review of the three mscapes on Tuesday 7th April it was decided to re-record all speeches to ensure they came across louder. All speakers were to be reviewed also with a view to increasing their volume. Mr Smith also agreed that a playback button would greatly enhance the mscapes and so too would a less abrupt start. All mscapes simply started on load up and often the participant missed the introduction. A solution was to provide a brief overview of the equipment and then to request the participant tap the PDA screen to begin the treasure hunt.
• On Tuesday 21st pupils were given the 'Helpful Information' sheet to take home and read over. By giving it to pupils in advance of the 22nd it was hoped the pupils will take the time to read it thoroughly to maximise their experience.

April – May 2009 (Running of Mscape & Conclusion)
• The treasure hunt mscapes took place as planned on the 22nd April and Appendix F summarises the main observation I made (These were taken from direct observation, my written notes and from photos and video).
• Unlike during the Thames Mscape pupils were much more content to work either by themselves or within their groups. They now appeared to have the knowledge and skills (more familiar) to attempt most problems initially by themselves before calling on the teacher for help. It was apparent now that the relationship between teacher and pupil had shifted (positively).
• After the treasure hunts and even after the Thames Mscape pupils responded to questions with more subject specific terminology. They were clearly more confident in using the knowledge they had acquired during the mscapes. Also the activity benefited from some pupils taking the lead of occasion.
• Even after the mscapes activity pupils were overheard in the corridor telling other pupils about the history connected to some of the old school buildings.
• On Thursday 23rd of April the questions for the focus group interview were given to the four randomly selected pupils (Pupils 2, 13, 14 and 16). Pupils 8 and 11 were on standby. Also on this date the second OS Skill test was prepared.
• The focus group interview took place periods 1-2 on Friday 24th April and as planned Pupils 2, 13, 14 and 16 took part. During Periods 8-9 on Friday 24th the 16 pupils completed the second OS Skills Test. The transcription of this interview began immediately after school on the 24th and lasted until Sunday 26th April. The second OS Skills test was also marked between Friday 24th and Wednesday 29th April.
• On Friday 1st May, during double Geography (Period 8-9) the 16 pupils were given back both their copies of the OS Skill test and a mark scheme. They were given 1-15 minutes to look through the tests. Immediately after the 15 minutes period the whole class interview commenced. Everyone was present and the interview lasted just over 40 minutes. The interview was transcribed between Saturday 2nd – Friday 8th May.
• All storyboards belonging to each group and created by the pupils were submitted for collection on Friday 8th May. The following Tuesday (12th May) the group journals were also handed in.
• At this stage (Tuesday 12th May) the second mscapes were complete and the LNI course closed. The box below contains some information on the pupil usage of the LNI course.

Some Information on Pupil Usage of the LNI Course

- Walton = 22 items uploaded to help with mscapes creation.
  = 9 messages posted to the 'Coffee Bar' discussion and 1 to 'Getting Started'.
- Fairbourne = 47 items uploaded to help with mscapes creation.
  = 9 messages posted to the 'Coffee Bar' discussion and 2 to 'Getting Started'.
- The Lodge = 30 items uploaded to help with mscapes creation.
  = 10 messages posted to the 'Coffee Bar' discussion and 3 to 'Getting Started'.

• Coupled within self-esteem and self-confidence is raised expectations. By the end of the second mscapes several pupils (Pupils 2, 5, 9, 13, 14, 15 & 16) were eager to know when another mscapes would be integrated into the syllabus. These pupils felt that the use of mobile technology definitely boosted their chances of understanding geographical topics more when used in conjunction with traditional pedagogy, than compared to traditional teaching strategies alone. Therefore it could be said that mobile technology did raise pupils' expectations.

This concludes the Treasure Hunt Mscape
## Rivers Syllabus Information

**taken from the AQA (2008) Syllabus**

<table>
<thead>
<tr>
<th>Specification Detail</th>
<th>Guidance</th>
<th>Scale</th>
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<tbody>
<tr>
<td><strong>The earth's crust is modified by fluvial processes which result in distinctive landforms.</strong></td>
<td>Long and cross profiles, processes of erosion (hydraulic power, corrosion, attrition), transport (traction, saltation, suspension, solution) and deposition.</td>
<td>R/L</td>
</tr>
<tr>
<td></td>
<td>The characteristics and formation of waterfalls, gorges, meanders, ox-bow lakes, levees, flood plains and deltas.</td>
<td>R/L</td>
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<tr>
<td></td>
<td>Recognise and describe fluvial features on Ordnance Survey maps and photographs.</td>
<td>R/L</td>
</tr>
</tbody>
</table>

### The interaction between people and fluvial environments.

| River basin management issues — the causes and effects of flooding in river basins in the context of both LEDCs and MEDCs. | River basin management issues should be studied in the context of both LEDCs e.g. Bangladesh and MEDCs e.g. the European floods of the 1990s.  One case study from the MEDW and LEDW should be chosen to study the physical and human causes of flooding and the impact of the floods. TV news is a good source of up to date information. | R/L |
| | The short, medium and long term strategies used to attempt to manage the floods. | N/R/L |
| | Contemporary issues concerning use of 'hard' v 'soft' strategies and attempts to achieve sustainability. | N/R/L |
| | The social, economic, environmental and political issues that have an impact upon strategies and the values and attitudes of interested groups. | N/R/L |
| | Flood management should include efforts to prevent flooding and strategies used to ameliorate the impact. Candidates should be aware of how and why the methods used are different between the LEDW and MEDW and now currently there is a move away from hard engineering e.g. dams on the Colorado to softer approaches e.g. flood plain zonning, improved warning system. | N/R/L |
| | Opportunities to use ICT to research flood disasters and for students to present work. | N/R/L |
Geographical Skills Checklist

Candidates are required to develop a range of skills used in geographical study and enquiry (including the use of ICT), namely:

- select, use and develop a variety of techniques appropriate to geographical study and enquiry;
- identify geographical questions and issues and establish appropriate sequences of investigations;
- identify and collect evidence from primary sources (including fieldwork), secondary sources (including maps at a variety of scales, photographs, satellite images, statistical data) and ICT-based resources; and record and present it (including use of maps, graphs and diagrams);
- describe, analyse and interpret evidence, make decisions, draw and justify conclusions and communicate findings in ways appropriate to the task and audience;
- evaluate the methods of collecting, presenting and analysing evidence, as well as the validity and limitations of evidence and conclusions.

Section A of Paper One will always contain an Ordnance Survey map at either the 1:25 000 or 1:50 000 scale. In addition Section A may also include any of the skills noted below. Section B of Paper One may also examine the skills. All maps and charts will be provided with a key where appropriate.

Questions in Section A of Paper One will not require candidates to know specific geographical vocabulary connected with the teaching of the physical texts. For example, questions demanding description of relief from an OS map extract of a landscape of upland glaciation will not require candidates to be able to recognize and describe concepts such as drumlins, moraines or eskers. Geographical terms that 11 to 13 year olds should learn are detailed in the advice document and are not included in the list of skills to be examined through this paper.

11.1 Basic Skills

Labelling and annotation of diagrams, maps, graphs, sketches etc.
Drawing sketches from photographs and in the field.

Renew: most communication is through the written word; writing is the importance of good literacy skills.

Photography: candidates should be able to use and interpret aerial / oblique and satellite photographs of rural and urban landscapes.

11.2 Cartographic Skills

Add basic maps: recognizing and describing distributions and patterns of both human and physical features.

Sketch maps: draw, label, understand and interpret sketch maps.

Ordnance survey maps:

- 1:25 000 or 1:50 000 scale, recognize symbols, keys and field index grid references, straight line and winding distances; distance, area and calculate cross-sections, height and degrees of slope, simple contour patterns, patterns of vegetation and land use, patterns of communications; location, shape and pattern of settlements; different land use zones of settlements; wider human activity from map evidence; using maps in association with photographs.

11.3 Graphical Skills

Construct line, bar, scattergraphs and pie diagrams.

Complete a variety of graphs and maps including choropleth, isoline and proportional symbols.

Interpret a variety of graphs including those located on maps and topographical diagrams.

11.4 Geographical enquiry skills

Identification of geographical questions, issues, hypotheses.

Establish and follow appropriate enquiry approaches to include:
- identifying and collecting a range of appropriate evidence from primary (including fieldwork) and secondary sources;
- recording, processing and presenting the data collected;
- description, analysis and evaluation of the data;
- drawing conclusions;
- evaluation of the methods of data collection, the results and the conclusions;
- understanding and application of the geographical principles underlying the enquiry.

11.5 ICT Skills

The use of ICT skills to include:
- photographs and satellite images; (9.6)
- use of databases such as census and population data; (10.1)
- use of the Internet for example to investigate case studies of volcanic eruptions, floods etc; (9.1)
- extraction of information from video and TV programmes; (9.3)
- word processing, data presentation and analysis techniques; (10.2)
- use of spreadsheets and data handling; (10.6)
- research and presentation of coursework; (16.1)
Thames Mscape Storyboard

(As of 30th March 2000)

1. On start-up of The Thames Mscape the satellite image and quiz are initially disabled. The ONLY live content are the THREE introductory slideshows, which are added to the mscape as a 'playlist'. This means they automatically run consecutively after each other.

(i) Slideshow 1 = 'Start up'

**Speech:**
Please do not play the PDA audio. A satellite link has been obtained and your position will be tracked via GPS.

GPS is an acronym for Global Positioning System, but usually it is a Global Navigation Satellite System. It is the member of Earth orbiting satellites that transmit precise location and time information. These signals allow a GPS receiver to determine its exact location anywhere on the earth.

When you are using the PDA with the external GPS card, the buttons at the bottom left corner of the screen show your GPS status. Keep your PDA close to you at all times to maximise your interaction with the system.

**Timescale of Slideshow 1 (Start up) - lasts 45 secs**

1. 0:00-0:10
   - Opening Image
   - Slide 1: GPS Signal
   - Slide 2: GPS Satellite
   - Slide 3: Satellite Image
   - Slide 4: Satellite Quiz

2. 0:10-0:20
   - Slide 5: GPS Signal
   - Slide 6: GPS Satellite
   - Slide 7: Satellite Image
   - Slide 8: Satellite Quiz

3. 0:20-0:45
   - Slide 9: GPS Signal
   - Slide 10: GPS Satellite
   - Slide 11: Satellite Image
   - Slide 12: Satellite Quiz

(ii) Slideshow 2 = 'Equipment'

**Speech:**
To begin your virtual journey, you need to familiarise yourself with the equipment. Follow the instructions on the screen.

There are three main pieces of equipment:
- The PDA
- The GPS card
- The satellite image

First, you will need to familiarise yourself with each piece of equipment. Make sure you understand how they work together.

**Timescale of Slideshow 2 (Equipment) - lasts 55 secs**

1. 0:00-0:10
   - Slide 1: PDA Overview
   - Slide 2: GPS Card
   - Slide 3: Satellite Image
   - Slide 4: Satellite Quiz

2. 0:10-0:20
   - Slide 5: PDA Overview
   - Slide 6: GPS Card
   - Slide 7: Satellite Image
   - Slide 8: Satellite Quiz

3. 0:20-0:45
   - Slide 9: PDA Overview
   - Slide 10: GPS Card
   - Slide 11: Satellite Image
   - Slide 12: Satellite Quiz

(iii) Slideshow 3 = 'Go_to_start_zone' - lasts 75 secs

**Speech:**
Please follow the on-screen instructions.

**Timescale of Slideshow 3 (Go_to_start_zone) - lasts 75 secs**

1. 0:00-0:10
   - Slide 1: PDA Overview
   - Slide 2: GPS Card
   - Slide 3: Satellite Image
   - Slide 4: Satellite Quiz

2. 0:10-0:20
   - Slide 5: PDA Overview
   - Slide 6: GPS Card
   - Slide 7: Satellite Image
   - Slide 8: Satellite Quiz

3. 0:20-0:45
   - Slide 9: PDA Overview
   - Slide 10: GPS Card
   - Slide 11: Satellite Image
   - Slide 12: Satellite Quiz

4. 0:45-0:60
   - Slide 13: PDA Overview
   - Slide 14: GPS Card
   - Slide 15: Satellite Image
   - Slide 16: Satellite Quiz

5. 0:60-0:75
   - Slide 17: PDA Overview
   - Slide 18: GPS Card
   - Slide 19: Satellite Image
   - Slide 20: Satellite Quiz

See next page for timescale and images used during the slide show.
2a) Once the three introductory slideshows are completed the quiz and satellite image of the school grounds becomes live. This means that all the speakers now also become live - see Map A below for the location of 16 speakers.

2b) By way of summary and clarification it is important to note that when the base satellite map becomes live so too do the following:

- the quiz
- the speakers
- the regions (circles and polygon shapes)

While the speakers remain live throughout the miscape experience the quiz and regions, which have been overlaid digitally onto the base satellite image, do not all become live at once. They have been carefully choreographed and sorted into 'Groups' within the Miscape Toolkit, to become live as the preceding region is completed. Hence this ensures the linear nature of this miscape. Once completed participants cannot go back to previous regions.

Map B on the following page shows the location of each of the 'Groups' (quiz questions and regions) and Map C indicates the 'Out of Bounds Areas'.

Key to Regions

(1) R1 = Start Zone
(2) S1 = Thames Head
(3) FZ1
(4) Qp1 & S2 = Cricklade
(5) FZ2
(6) Qp2, Qp3 & S3 Wallingford
(7) FZ3
(8) Qp4, Qp5 & S4 Reading
(9) FZ4
(10) Qp6 & S5 = Teddington
(11) Qp7, Qp8 & FZ5
(12) Qp9 & S6 = Gmvesen
(13) FZ6
(14) Qp10 & FZ
(15) MP

Codes

R = Region
S = Site
FZ = Fact Zone
Qp = Quiz question
FZ = Final Zone
MP = Meeting Point
> = Automatically becomes live when preceding 'Group' is completed

Location of Regions

The 'Out of Bounds' regions were created on safety grounds. They provide a mechanism to alert participants when they are straying too far from the miscape's chosen path.

Participants will here: 'You are out of bounds please return to your previous stop' repeated on a continuous loop.
3. Once the base satellite map has become live the pupils are able to see their position, via the GPS tracking icon, on their PDA screen. Their task is then to go to the ‘Start Zone’^1, which is located at the northwest corner of the old Tennis Courts. Once at this location the Start Zone slideshow will begin.

(i) Slideshow = ‘SSStart Zone’

Speech:

Gong (Anglo) – The GONG you have just heard signals that you have entered a new zone. Let me begin by welcoming you to this virtual activity. I am delighted that you accepted the invitation to journey along the river Thames, from its source to its mouth. As you walk around Belfast Grammar you will be transported, using GPS, to the site of the Thames and will have the opportunity to interact with the natural environment.

The PDA will help guide you on your journey so all you have to do is to stick to the on screen instructions and follow the course of the river Thames, as it weaves its way through the grounds of Belfast Grammar. On occasion the satellite image on the PDA will highlight a point of interest or collection point – make sure to pass through this location otherwise you will miss vital information.

Throughout your journey, which will focus on the upper, middle and lower course of the Thames, you will experience the sights and sounds of this famous river and learn a little about its history. Please remember pay attention to all that you see and hear as you will be taking part in an interactive Rivers quiz throughout your journey.

Good luck with the interactive activity and I hope you enjoy your stroll along the Thames. You can now proceed to the first step, Thameshead, which should be highlighted on the satellite image of the school.

4. Once the Start Zone slideshow is complete Thames Head becomes live and appears with a labelled ‘pin’ on the participants PDA screen. Everything else on the base map (except the speakers) is disabled. Once at this location the Thames Head slideshow will begin.

(ii) Slideshow = ‘SS1 Thameshead’

Speech:

Gong: Welcome to Thames Head – the source of the Thames and the first stop of six along your journey. This site is located in the upper course of the Thames river basin and is about 1 mile from the village of Kemsley in Gloucestershire. You are approximately 100 metres above sea level.

The satellite image of Belfast Grammar that you see on the PDA has the river Thames superimposed over it. Please note that this is the main river it does not include all the tributaries. If it did it would look like the image now displayed.

You may be looking at the images of Thames Head and wondering where is the river? As with all rivers the source of the Thames begins with small trickles of water below the ground, often not seen by human eyes.

So how do we know the Thames begins here? The answer is simple, at certain times of the year, particularly when there has been a lot of precipitation, the water rises to the surface, making it visible for all to see. This surface water starts to form small rills, which in turn join together to make a small stream. Even through it may be a small stream this is still part of the mighty Thames.

Because water is not allowed visible on the surface at the source of the Thames a stone plaque was placed near where the river begins so visitors to the site, such as teachers, would know how important the site actually was.

Because of the lack of a constant surface stream in Thames Head there are few river processes occurring and in turn subsequent features. This does not mean there is little to see. The patterns that are now appearing on the PDA screen suggest that this rural environment soaks up all available precipitation and eventually surface runoff, throughflow and therefore provide enough water that the Thames appears as a permanent feature upon the landscape.

It is time once again to continue on your travels and remember keep alert for the interactive quiz. Feel free to come back and visit Thames Head at any stage.

You now have only another 215 miles to travel on your journey to the mouth of the Thames! On to site two Cricklade!
5) Once the Thames Head slideshow is complete Fact Zone 1 becomes live and appears with a labelled 'pin' on the participants PDA screen. Everything else on the base map (except the speakers) is disabled.

(i) Slideshow = ‘SSFact 1’ (begins on entry into this region)

Search:
Gong
As you continue on your journey this is a good opportunity to tell you some key facts about the River Thames.

- As well as being split into the upper, middle and lower course the Thames is often split in two. Thames-side part and the tidal part. Thames-side part of the Thames stretches 147 miles and falls some 105 metres from the source to Teddington, which is centrally your second last stop. The tidal part extends 86 miles downstream from Teddington to the river’s mouth.

Listen carefully as you travel downstream more facts about the Thames will be revealed.

Timescale of Slideshow (SSFact 1) - lasts 4.5 sec

6) Once the Thames Head slideshow is complete the first quiz question and the second site ‘Cricklade’ become live. Both appear with a labelled 'pin' on the participants PDA screen. Everything else on the base map (except the speakers) is disabled.

(i) Quiz Question 1 = ‘Q1P’ (begins on entry into this region)
(Initial Question worth 10 marks)

Question = In meters what is the height of Thames Head above sea level?

Answers = A - 210m / B - 150m / C - 110m / D - 90m (correct ans = C)

(ii) Slideshow = ‘SS2Cricklade PL’ (begins on entry into this region)

Search:
Gong
Welcome to Cricklade - your second stop. This site is still part of the upper Thames basin. Cricklade is a small town in north Wiltshire with a population of approximately 4,100 people.

The settlement of Cricklade began as a Saxon settlement and its name means ‘place by the river dining.’ It is situated about 85 miles southwest of London.

In contrast to Thames Head, the Thames at Cricklade is a tree river in all senses of the word. The river channel extends between 1.5 and 3.5 meters wide and is approximately 30 centimeters deep.

In any river there are three main processes at work - erosion, transportation and deposition. Each of these processes or a combination of these processes helps create river features. At Cricklade the dominant process is erosion and this wears away the river bed and banks. But how exactly does the river erode the bed and banks? The image now showing on the PDA screen illustrates how a river erodes.

See next page for timescale and images used during the slideshow.

(iii) Slideshow = ‘SS2Cricklade P2’ (automatically starts after SS2Cricklade P1 finishes)

Search:
Gong
By now you should have gathered that all river features are caused by the river processes but we are interested in what river features are present along the Thames near Cricklade.

1) The first feature we come across is V-shaped valley. The image on the PDA highlights that through vertical erosion the river has cut into the landscape forming a V-shaped valley. This valley will continue to deepen and the sides will also continue to widen out as a result of mass movement.

2) Interlocking spurs can also be seen near Cricklade. These are a series of hills or ‘spurs’ which fit together (interlock) like pieces of a jigsaw. The river has to wind its way around these interlocking spurs of hard rock. Once again the chief cause is erosion. As the river flows away from the source it begins to swing from side to side. Of course, it is still rapidly cutting downwards (vertical erosion). The river follows the path of least resistance, i.e. softer rock. The harder more resistant rock is left behind, i.e. the interlocking spurs.

3) Rapids are also to be found near Cricklade. These are areas of fast flowing turbulent water - caused by an uneven riverbed. They are formed when the river bed is made up of hard and soft rocks. The soft rocks are worn away more quickly, leaving the hard rocks sticking up into the river channel. If you look closely they are like a small staircase in the river channel.

4) The last major feature to be found in the river Thames at Cricklade are Pot holes. These are holes in the riverbed. They can be very small, for example the size of a 2 pence piece, or quite large, e.g. up to 1 m wide. Pot-holes form when rock fragments get caught up in ‘eddies’ (which are circular currents). As they are moved around and the process of abrasion ‘drills’ into the rock.

It is worth pointing out that all the river features we have seen near Cricklade have been caused mainly through erosion. In addition there were two other major upper course features that were not present near Cricklade - waterfalls and gorges. These two features were missing because these require large scale alternative bands of hard and soft rock. This does not occur around Cricklade.

See next page for timescale and images used during the slideshow.
7). Once the second Cricklade slideshow (S2CrickladeP2) is complete Fact Zone 2 becomes live and appears with a labelled 'pin' on the participants PDA screen. Everything else on the base map (except the speakers) is disabled.

(i) Slide show = ‘SSFact 2’ (begins on entry into this region)

Speech:
Long. You may be interested to know that there have been more than 100 fish species recorded in the Thames estuary over the past 30 years and from its source to the sea, it is estimated that the Thames carries some 300,000 tonnes of sediment each year. This is equivalent to around 110 Olympic swimming pools filled with sediment. An Olympic pool is 50metres long by 25metres wide and 2metres deep.

Timescale of Slideshow (SSFact 2) - lasts 28sec

8). Once the Fact Zone 2 slideshow is complete the second and third quiz questions along with the third site ‘Wallingford’ become live. All three appear with a labelled ‘pin’ on the participants PDA screen. Everything else on the base map (except the speakers) is disabled.

(i) Quiz Question 2 = ‘Q2p’ (begins on entry into this region)
(level 2 Question worth 20 marks)

Question = In metres approximately how wide was the Thames River at Cricklade?

Answers = A - 9m / B - 2m / C - 5m / D - 6m (correct ans = B)

(ii) Quiz Question 3 = ‘Q3p’ (begins on entry into this region)
(level 2 Question worth 20 marks)

Question = What main process caused the rapids to form near Cricklade?

Answers = A - Deposition / B - Transportation / C - Throughflow / D - Erosion (correct ans = D)

(iii) Slide show = ‘S3WallingfordP1’ (begins on entry into this region)

Speech:
Long. Welcome to your third step - Wallingford. You have now left the upper course of the Thames behind and have moved into the middle section of the river, even though you are still 458m above sea level.

Wallingford is a small market town with a population of approximately 7,000. It is about 50 miles west of London and was the place where William the Conquer crossed the Thames in 1066 during his successful takeover of England.

See next page for rest of speech, timescale and images used during the slideshow.
Speech:

The river channel at Wallingford extends between 10 and 25 metres wide and is approximately 90 cm deep. Erosion is still the dominant process but the emphasis is now on lateral rather than vertical. This means that the processes of hydraulic action, abrasion and corrosion are starting to target the river’s banks more than the bed. This fact helps to explain why the river has started to widen.

Timescale of Slideshow (S3WallingfordP1) - lasts 60sec

Welcome to Site 3

Wallingford

The River Channel

Lateral Erosion starts to dominate

(iv) Slideshow = ‘S3WallingfordP2’ (begins automatically after S3WallingfordP1 ends)

Speech:

At Wallingford the river features that become immediately apparent are meanders and the more open v-shaped valley. The interlocking spurs typical of an upland stream have virtually disappeared and a small floodplain has started to form.

1) If we look at the meanders first - we have to ask what are they and what causes them? Meanders are bends in a river course. Rivers rarely flow in a straight line they erode the softer rock and flow around the harder outcrops meaning the river will follow a winding path. In addition the uneven bed and banks can cause eddies or small circular currents to develop in the water. These eddies cause turbulent flow and can often result in the banks being eroded therefore creating a new meander or widening an existing meander.

If we look at a cross-section through a typical meander bend, such as those found near Wallingford, we discover the channel is asymmetrical in shape – meaning it is not a regular shape. The outside section of the meander bend is deeper than the inside bend - but why is this so? The deeper outside bend is caused by more erosion taking place than is occurring at the inside of the bend. The main flow of the water in the river channel erodes the bend on the outside of the bend is hit hard by the rapidly moving water. This water attacks the bank and erodes it mainly through hydraulic action and abrasion. Eventually the undercutting of the bank leads to an undercut and creates a unstable overhang above. After time and more erosion this overhang will collapse into the river and create a small river cliff.

If we turn our attention now to the slip-off slope which is cause by deposition on the inside of the meander we need to know how this was caused. As water approaches a meander some of it will move to the inside of the bend. The inside of the bend is a lot sharper and therefore forces the river to slow. As the river slows it loses energy and as a result damps or deposits any material it might be transporting downstream. Over time this deposited material accumulates and forms a gentle slope known as a slip-off slope.

See next page for rest of speech, timescale and images used during the slideshow.

Continuation...

This now concludes your tour of the River Thames at Wallingford. Onto Step 4 - Reading!
9. Once the S3 WallingfordP2 slideshow is complete the third Fact Zone becomes live. Fact Zone 3 appears with a labelled ‘pin’ on the participants PDA screen. Everything else on the base map (except the speakers) is disabled.

(i) **Slide show = “SS Fact 3” (begins on entry into this region)**

**Speech:**
You may be surprised to learn that the catchment area of the River Thames covers 10% of the land area of England and Wales and 25% of the population is within this area. The average rainfall for the catchment is 690mm per year. This is an amount of rainfall and as a result around 650,000 properties are at risk from flooding.

**Timescale of Slide show (SS Fact 3) - lasts 5 min.**

**FACT ZONE 3**
River Thames catchment area = 10% of England’s land area

- The average rainfall
- 690mm
- 300mm per year

10. Once the SS Fact 3 slideshow is complete the fourth and fifth quick questions along with the fourth site ‘Reading’ become live. All three appear with a labelled ‘pin’ on the participants PDA screen. Everything else on the base map (except the speakers) is disabled.

(i) **Quick Question 4 = “Q4p” (begins on entry into this region)**

*Level 1 Question worth 10 marks*

**Question** = The average rainfall for the Thames catchment area is?

**Answer** = A - 400mm / B - 510mm / C - 650mm / D - 690mm (correct ans = D)

(ii) **Quick Question 5 = “Q5p” (begins on entry into this region)**

*Level 3 Question worth 30 marks*

**Question** = What process occurs at the inside of a river meander, creating a slip-off slope?

**Answer** = A - Erosion / B - Deposition / C - Throughflow / D - Baseflow (correct ans = B)

(iii) **Slide show = “S4 Reading P1” (begins on entry into this region)**

**Speech:**
Gong ... Welcome to Reading – Step 4. This is your second and final stop within the middle section of the Thames basin.

Reading is a large town in England situated at 38 metres above sea level and located at the confluence point of the River Thames and River Kennet. Its population is around 144,000.

When you look at the photographs of the Thames as it meanders through Reading you will notice that the river is much wider than any of the previous steps. Its width can range between 30 and 40 metres and its depth varies between 1.4 and 2 metres.

Can you think why the river is much wider and deeper at Reading? Hopefully, you will have realised that the volume of water in the river channel has now increased significantly. All the water which has made its way into the river via surface runoff, throughflow and baseflow, from the source of the Thames, passes through Reading. Many tributaries have joined together making the river grow in size. With an increase in water volume comes more energy. This means the river can erode, transport and deposit more material - all the time changing the landscape over which it flows and encouraging more wildlife into the area.

At Reading erosion is still occurring but it is no longer the dominating force it once was. If you look closely at some of the images of Reading you will notice the water is not crystal clear. This means it is now using energy to carry a lot more material. Transportation is fast becoming the main process.
(iv) Slideshow = 'S4ReadingP2' (begins automatically after S4ReadingP1 ends)

Speech:
As with all our previous stops it is the interaction between the processes that shape the features of the river channel and surrounding land.

1) Meanders are still present at Reading and in fact will continue to get wider and bigger as we travel down the river. But there is evidence that the meanders are starting to migrate and that they are helping to create a wider flood plain.

How does the river help create a wider flood plain? The image that is currently being displayed on the PDA screen shows that as the river moves downstream the meandering river helps to erode the landscape and help level out or create a flat zone. This flat zone gets progressively larger as we move towards the mouth of the Thames. We call this flat zone the floodplain.

Meander migration can be slightly more complicated to comprehend. It often takes many years to occur therefore it is not noticeable to the human eye. It happens gradually, making it more difficult to see. The best way to understand meander migration, like the type at Reading, is to look back at historical satellite records and see if the meanders have moved position over time.

Onto Teddington but don't forget to visit the fact zones and quiz points!

Timescale of Slideshow (S4ReadingP2) - lasts 76 sec

1 - 0:7:24
2 - 0:7:29
3 - 0:06:29
4 - 0:7:23
5 - 0:48:39
6 - 0:50:46
7 - 0:50:46
8 - 0:1:54
9 - 0:55:29
10 - 0:44:44
11 - 0:1:76
12 - 0:1:15

11) Once the S4ReadingP2 slideshow is complete the fourth Fact Zone becomes live. Fact Zone 4 appears with a labelled 'pin' on the participants PDA screen. Everything else on the base map (except the speakers) is disabled.

(i) Slideshow = ‘SSFact 4’ (begins on entry into this region)

Speech:
"Going... The Thames is Tidal from Teddington and between Teddington to the mouth lie 29 bridges, compared to 75 bridges across the non-tidal Thames."

Timescale of Slideshow (SSFact4) - lasts 15 sec

1 - 0:1:10

12) Once the Fact Zone 4 slideshow is complete the sixth quiz question along with the fifth site 'Teddington' becomes live. Both appear with a labelled 'pin' on the participants PDA screen. Everything else on the base map (except the speakers) is disabled.

(i) Quiz Question 6 = 'Q6q': (begins on entry into this region)
(1 level 2 Question worth 20 marks)

Question = The main river process at Reading was?

Answers = A - Erosion / B - Deposition / C - Transportation / D - Mass Movement
(correct ans = C)

(ii) Slideshow = 'SSTeddingtonP1' (begins on entry into this region)

Speech:
"Going... Welcome to Teddington - your 5th and penultimate stop. You have now entered the lower course of the Thames and from here to the mouth the river is tidal. This means that the water level rises and falls in response to the tide changes in the North Sea. Tides remember being powered by the gravitational pull between the earth and the moon."

Teddington is in London, on the north bank of the River Thames. It is about 12 metres above sea level and notable for Teddington Lock, the longest lock on the River Thames at 200 metres long.

The Thames is about 90 metres wide at Teddington but because it is tidal the depth varies greatly. On average it is around 4 metres deep but can vary by up to 5 metres between high and low tides.

Deposition now becomes the dominant process. The gradient of the River Thames is very slight but the huge volume of water surges the water forward, down the Thames. The water is very discoured and you will remember from Reading that this is a sign that the river is transporting a vast amount of material. Many people think that a river just transports water, they often forget that the water carries a lot of particles. When the gradient is small the river often loses energy and is forced to drop its load. This does not mean that the processes of erosion and transport are unimportant nor occurring, it simply means that the main river features are largely caused by deposition.

See next page for timescale and images used during the slideshow."
(iv) Slideshow = 'SSTeddingtonP2' (begins automatically after SSTeddingtonP1 ends)

Speech: At first glance some of the typical river features may not be obvious at Teddington. This is because the river is flowing through an urban area and humans have altered the river and the land around the river. A closer look, however, reveals that white reedbeds are still noticeable, the floodplain is the most significant feature to be seen. It is the flat land on either side of the river where the buildings are now situated.

In fact it was the river that created such a perfect site for London, Britain's largest settlement with around 7 million people. Over thousands of years the Thames eroded the interlocking spurs and deposited materials helping to flatten the land. Then when the Thames flooded, which was a more regular occurrence than today, the silt and alluvium left behind by the flood waters helped to even out the landscape and create its flat fertile floodplains which now is the home to millions of people.

Because Teddington is tidal the river teams with life. The aquatic creatures range from the Barbel to the Torch and they in turn encourage other land based animals to make their home beside the river in order to be close to the food supply.

Now it is time to leave Teddington and head for our final stop – Gravesend. But don’t forget the Fact Zone and quiz point!
(ii) Quiz Question 8 = 'Q8p' (begins on entry into this region)
(level 2 Question worth 20 marks)

Question = What was the dominant process at Teddington?

Answers = A- Erosion / B- Deposition / C- Transportation / D- Mass Movement (correct ans = B)

(iii) Slideshow = 'SSFact 5' (begins on entry into this region)

Speech:
There is a 7 metre difference between low and high tide at London Bridge and the Thames has been frozen over at various times. The earliest recorded occasion being 1150AD.

Timescale of Slideshow (SSFact5) - lasts 17 sec

1. Once the Fact Zone 5 slideshow is complete the ninth quiz question along with the sixth site 'Gravesend' becomes live. Both appear with a labelled 'pin' on the participants PDA screen. Everything else on the base map (except the speakers) is disabled.

(i) Quiz Question 9 = 'Q9p' (begins on entry into this region)
(level 2 Question worth 20 marks)

Question = The Thames at Teddington can rise and fall by up to...?

Answers = A- 5m / B- 2m / C- 11m / D- 7m (correct ans = A)

(ii) Slideshow = 'S6GravesendP1' (begins on entry into this region)

Speech:
Welcome to your final stop, Gravesend. This site is where the Thames flows into the Thames estuary and then into the North Sea.

Gravesend lies virtually at sea level, about 7 metres high, and is situated on the south bank of the Thames. It is often referred to as the gateway to the Thames and its strategic position has meant that Gravesend has always played an important role in the life of the Thames, London and England.

If you cast your mind back to Cricklade you may recall the river channel measured between 1.5 and 3.5 metres wide and was approximately 30 cm deep. Gravesend by contrast sees an entirely different river measuring approximately 700 metres wide and is around 15 metres deep. Remember, like Teddington, the River Thames at Gravesend is tidal so the height will vary around 4-6 metres between high and low level.

Also like Teddington deposition continues to dominate the river processes as the river struggles to set its massive load in the sea.

See next page for timescale and images used during the slideshow.

(iv) Slideshow = 'S6GravesendP2' (begins automatically after S6GravesendP1 ends)

Speech: With regards to river features at Gravesend, many features are present at such as meanders, wide floodplains, and sandbars but notable lower course features such as how lakes, bradling and levees are missing. We must ask why would certain features be missing? The obvious answer is that not all features will be present along every river. Rivers are unique and they are always changing and as such will be different. However, if we probe deeper we discover that widespread lakes and natural levees are absent because of the Thames being so close to a large urban area. Humans now control all the land to the north and south of the Thames at Gravesend. If there were widespread lakes and levees humans have modified the environment by removing them or building over them. In some cases however natural levees have been replaced by artificial levees or walls. The purpose of such construction is to reduce the risk of flooding.

With regards to bradling this is absent due to the sheer volume of water passing Gravesend. Brading is where the river deposits enough material on the river bed allowing sediment to accumulate. Eventually small islands may form in the middle of the river. At Gravesend the tide and the large amount of river discharge prevents small islands developing. It keeps moving material that builds up preventing brading from becoming established.

See next page for rest of speech, timescale and images used during the slideshow.
Speeds:

Let us now where our attention to the river features that are present near Gravesend. We will now walk on the foreshores as we look at its formation in detail at other stops. It is enough to mention that it is present on either side of the river and home to millions of people. The most significant feature near Gravesend is the Nore Sandbank. This feature marks the actual mouth of the Thames. This is the point where it is said the Thames ends and the North Sea begins. But what is a sandbank and how does it form? A sandbank is simply an accumulation of sand and in the case of the Thames it builds up over the years to become visible. A sandbank makes the river more shallow and understandable ships must avoid the danger of running aground. To prevent this from happening the Nore Light is positioned on the sandbank, with a revolving light, to warn approaching ships to avoid all areas.

Sandbanks form when a river, carrying a lot of material, suddenly slows. This reduction in speed means there is a reduction in energy and the river is forced to deposit some or all of it. The deposited load can build up and eventually, as was the case at the mouth of the Thames, form a sandbank. But what caused the River Thames to slow enough at its mouth to form a sandbank? When the salt water from the North Sea meets the fresh water from the River Thames these two liquids initially do not mix very well. When the fresh water, carrying a lot of sediment, hits the salt water it is like an ice cream mixture. The river slows, loses energy and deposits a significant amount of its load. Over time the Nore Sandbank formed. Do not think of the feature as a permanent structure, it is not. It is constantly being modified by erosion and deposition.

You have now completed your visit to Gravesend and managed to travel some 215 miles. When you began your journey the Thames was a tiny stream but by now it is a large river. Before completing this activity you have just one more fact and question point to answer.

**Timescale of Slideshow (56 Gravensend #2) - lasts 200 sec:**

1 - 07:00
2 - 06:21
3 - 06:12
4 - 06:31
5 - 06:22
6 - 06:13
7 - 06:23
8 - 06:24
9 - 06:25
10 - 06:26
11 - 06:27
12 - 06:28
13 - 06:29
14 - 06:30
15 - 06:31
16 - 06:32
17 - 06:33
18 - 06:34
19 - 06:35
20 - 06:36
21 - 06:37
22 - 06:38
23 - 06:39
24 - 06:40
25 - 06:41
26 - 06:42
27 - 06:43
28 - 06:44
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30 - 06:46
31 - 06:47
32 - 06:48
33 - 06:49
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36 - 06:52
37 - 06:53
38 - 06:54
39 - 06:55
40 - 06:56
41 - 06:57
42 - 06:58
43 - 06:59
44 - 07:00
45 - 07:00
46 - 07:00
47 - 07:00
48 - 07:00
49 - 07:00
50 - 07:00
51 - 07:00
52 - 07:00
53 - 07:00
54 - 07:00
55 - 07:00
56 - 07:00

**Your Journey:**

The Thames was once home to sailing ships, river traffic, and the famous Thames Clipper. What are the features that you have just seen today?

**Don't forget to:**

Visit the FACT Zone & Quiz Point.
15) Once the SSGravesend/P2 slideshow is complete the sixth Fact Zone becomes live. Fact Zone 6 appears with a labelled ‘pin’ on the participants PDA screen. Everything else on the base map (except the speakers) is disabled.

(i) Slideshow = ‘SSFact6’ (begins on entry into this region)

**Timescale of Slideshow (SSFact6) - lasts 15 secs**

1 = 0:15 sec

16) Once the Fact Zone 6 slideshow is complete the tenth quiz question along with the ‘Finish Zone’ becomes live. Both appear with a labelled ‘pin’ on the participants PDA screen. Everything else on the base map (except the speakers) is disabled.

(i) Quiz Question 10 = ‘Q10p’ (begins on entry into this region)

(level 3 Question worth 30 marks)

**Question** = Which River feature is not found near Gravesend?

**Answer** = A - Meander / B - Floodplain / C - Leves / D - Sandbanks (correct ans = C)

(i) Slideshow = ‘Finish Zone’ (begins on entry into this region)

Speech:

**Well done you have reached the end of your journey**

1 = 0:26 sec

17) Once the ‘Finish Zone’ the last region, ‘Meeting-Point’ becomes live. This region appears with a labelled ‘pin’ on the participants PDA screen. Everything else on the base map (except the speakers) is disabled.

(i) Slideshow = ‘Meeting-Point’ (begins on entry into this region)

Speech:

**Welcome to the Final Meeting Point**

The Thames M scape is now complete but the base map remains active instead of being disabled. This allows the teacher to recheck any quiz scores if necessary before powering down each PDA.

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Thames Mscape: The Location of the Groups and Regions

**Key to Groups & Regions**

<table>
<thead>
<tr>
<th>Group</th>
<th>Codes</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1</td>
<td>R1 'Start Zone'</td>
<td>1. Thames Head</td>
</tr>
<tr>
<td>G2</td>
<td>S1 'Thames Head'</td>
<td>1. Thames Head</td>
</tr>
<tr>
<td>G3</td>
<td>FZ 1</td>
<td>2. Qp1 &amp; S2 'Cricklade'</td>
</tr>
<tr>
<td>G4 &amp; 5</td>
<td>FZ 2</td>
<td>3. Gp2, Qp3 &amp; S3 'Wallingford'</td>
</tr>
<tr>
<td>G6</td>
<td>FZ 3</td>
<td>4. Gp4, Qp5 &amp; S4 'Reading'</td>
</tr>
<tr>
<td>G7 &amp; 8&amp; 9</td>
<td>5. FZ 4</td>
<td>5. Gp6 &amp; S5 'Teddington'</td>
</tr>
<tr>
<td>G11 &amp; 12</td>
<td>7. FZ 6</td>
<td>7. FZ10 &amp; FinZ</td>
</tr>
<tr>
<td>G13 &amp; 14</td>
<td>8. FZ7</td>
<td>8. FZ10 &amp; FinZ</td>
</tr>
<tr>
<td>G15 &amp; 16</td>
<td>9. FZ8</td>
<td>9. FZ10 &amp; FinZ</td>
</tr>
<tr>
<td>G17 &amp; 18 &amp; 19</td>
<td>10. FZ9</td>
<td>10. FZ10 &amp; FinZ</td>
</tr>
</tbody>
</table>

**Codes**

- G = Groups
- R = Region
- S = Site
- FZ = Fact Zone/Region
- Qp = Quiz question
- FinZ = Finish Zone
- MP = Meeting Point
- ▲ = Automatically becomes live when preceding 'Group' is completed

**Location of Out of Bounds Regions**

The 'Out of Bounds' regions were created on safety grounds. They provided a mechanism to alert participants when they are straying too far from the mscape’s chosen path.

On entry participants heard ‘You are out of bounds please return to your previous stop’ repeated on a continuous loop.

**NB:** Although the course of the River Thames flows through the school building on a number of occasions no regions were located in these sections as GPS would have been lost once indoors. On the day of the mscape doors were opened to allow the pupils entry and exit at the relevant points.
Thames Mscape: Location of the Speakers

Key to Speakers

- S1_Birds
- S2_J_Timeland
- S3a_Birds_Stream
- S4a_Rapids
- S5_Stream
- S6_Birds_Stream
- S7_Traffic
- S8_Dog_Bark
- S9_Church_Bells
- S10_River_Traffic
- S11a_River_Boat
- _12_End_Song
- S8b_Train_Pass
- S11b_Cat_Horn
- S3b_Sheep
- S4b_Cows
Thames Mscape: Pilot 1

Issues Raised

<table>
<thead>
<tr>
<th>Key Areas</th>
<th>Comments by Pilot Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sound/audio issues</strong> <em>(e.g. Volume settings of music, background sounds, clarity of speeches, etc.)</em></td>
<td>- Cry me a river (Speaker 2) needs to play and be louder. - Speaker at Wallingford needs to be longer. - Speakers between Sites 2 and 3 are too loud. - Boatsounds near Gravesend need to be changed. It is too short and there tends to be too repetitive and can detract from the experience. - Fade duration should be added to make start and end of speakers less abrupt. - The speech for the ‘Meeting Point’ region needs to be included into the Mscape and the when pupils leave zone it show close and not repeat. ‘The End’ might be needed as an image.</td>
</tr>
<tr>
<td><strong>Clarity of PDA Screen</strong> <em>(e.g. can you see the image or were some images too small?)</em></td>
<td>- No significant issues raised concerned clarity of screen.</td>
</tr>
<tr>
<td><strong>Clarity of Instructions/Information</strong> <em>(e.g. relate to both visual and audio information?)</em></td>
<td>- We started the Mscape in a region that was out of bounds so the ‘Out of Bounds’ speech was constantly playing over the introduction. It would be a better idea to disable all speakers until user entered the Start Zone. - Integrate them more into actual path of Thames River. It can be confusing when user has to zigzag to fine positions. - Some of the speeches during the slideshows direct the reader to the next step but in reality the user has to pass through a fact point or question point before the next step. It is important to not confuse the user. Direct them to the next place they need to go to.</td>
</tr>
<tr>
<td><strong>Images</strong> <em>(e.g. were they ideal and of acceptable standard?)</em></td>
<td>- All images were appropriate, although some had typos and were obscured by the icons at the bottom right of the screen.</td>
</tr>
<tr>
<td><strong>Timing</strong> <em>(e.g. was the whole experience too short, too long or just right. Also did you feel any specific areas/stop along the way were too long or short?)</em></td>
<td>- It was suggested that a pause/play facility would be useful. Some of the slide shows had a lot of information and at times the image was gone before the user processed or reviewed all the data. If one button (the centre one in the PDA) was assigned to pause and the on second touch play the slide shows this would allow pupils to take in more from the Mscape.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Key Areas</th>
<th>Comments by Pilot Participants continued...</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hazards</strong> <em>(e.g. Did you witness any dangerous incidents as you walked through the school grounds? Did the viewing of the PDA screen create any danger to walking?)</em></td>
<td>- It was stressed that pupil need to be reminded to pay attention to their environment while they are walking. There is a few places where optional hazards exist if pupils were too engrossed in the slideshows. It was agreed that a few points such as safety and optional dangers, length of Mscape, how to operate zoom function and how to pause the Mscape show be verbally explained to the user before embarking of the Mscape. This was instead to add more instructions to the Mscape.</td>
</tr>
<tr>
<td><strong>GPS</strong> <em>(e.g. Did you lose the signal at any stage or did any other problems arise?)</em></td>
<td>- Need to re-pilot on the 8th January 2008 to see if the issue regarding GPS and launch of Teddington Zone occurs. It might to an idea to enlarge Teddington region.</td>
</tr>
<tr>
<td><strong>Equipment</strong> <em>(e.g. Any issues surrounding the carrying of the equipment, the earphones, the power to the PDA, the usability, etc.)</em></td>
<td>- It would be a good idea to disable all other PDA buttons to prevent users from accidentally pressing them and asking them away from the Mscape. The 'Kiosk' option in 'Device Settings' provides such a function but we may still need two buttons to remain live – e.g. pause/play and menu reveal. - Managing all the equipment was at times difficult.</td>
</tr>
<tr>
<td><strong>Appropriateness of Content</strong> <em>(e.g. Do you think it is suitable pitched at GCSE Geography pupils?)</em></td>
<td>- Content appear appropriate pitched at the correct level. It provided a good look at the long river profile, and tied in the AQA syllabus. - Mr Smith felt that there was a lot of content.</td>
</tr>
<tr>
<td><strong>Learning</strong> <em>(e.g. Do you feel you experienced any difficulty during your Mscape experience? Please discuss.)</em></td>
<td>- All participants felt they learned about river processes as they travelled along the course of the river. The information was structured and helped clarify the topic of rivers.</td>
</tr>
<tr>
<td><strong>Any Other Areas</strong> <em>(e.g. are there any other comments you would like to make about the Mscape experience?)</em></td>
<td>- It would be a better compromise to have the default zoom of the map set at a more detailed level and allow the user to zoom out if necessary. - Delete the two maps that are not used. - Two of the PDAs hosting the Thames Mscape appeared to stall around Site 2 (E Hicklade) – it appeared that the base map did not reappear after the last Slideshow. This needs to be resolved. - At the minute the GPS and menu icons can sometimes obscure some of the images from being fully seen. 'The Device Settings' option in the PDA offers a way to hide these icons but currently there is no way to make them reappear without rebooting the PDA. It would be useful to have a button function that would allow the menu icons to return in case debugging is required. - Mr Smith felt it would be a good idea to let pupils play 'Stamp the Hole' about a week prior to running the actual Thames Mscape. This would allow pupils to become familiar with the technology rather than simply seeing the technology on the day of the Thames Mscape.</td>
</tr>
</tbody>
</table>
# Thames Mscape: Pilot 2

## Issues Raised

<table>
<thead>
<tr>
<th>Key Areas</th>
<th>Comments by Pilot Participants</th>
</tr>
</thead>
</table>
| Sound/audio issues                     | - The following sounds/speakers are too loud:  
  1. starry_stream_birds  
  2. sheep_in_nature  
  3.答木_stream_lassie  
  4. cows_many  
  5. steam2  
  6. street_very_busy_busses  
  - A rumble to allow background sounds to dominate or become intrusive.                                                                                                                                                      |
| Clarity of PDA Screen                  | - Generally very good. When in direct sunlight it becomes a little bit difficult to see but since Mscape is due to run in January this should not be an issue.  
  - Small screen a benefit.                                                                                                                                                                                                |
| Clarity of Instructions/Information    | - The last few images of the Thames Head slideshow (St Thomas' Head) were slightly out of sync with the audio. To fix this, the timing of the last few images in the slideshow needs to be altered and two new images need to be added.  
  - On entering the Meeting Point zone we need to disable the map so no further audio or images appear after the short Meeting Point slideshow ends.  
  - Images very clear, relevant and tied in well with syllabus.                                                                                                                                                            |
| Images                                 | - Some images need to be altered due to typos. These images are:  
  1. REFloodplain_3  
  2. REFloodplain_4  
  3. REReeds & Migrate  
  4. TELArendement  
  5. GRBtowi_to_sandbanks  
  6. GRShip_13_gauguin  
  - Some images were difficult to see – due to font size and icons at bottom left.                                                                                                                                 |

## Key Areas

| Timing                                | - At times some of the slideshows were too long and it difficult to walk and pay attention. However, when you are attempting to balance an experience with syllabus content it is understandable and acceptable.  
  - Overall length quite good.                                                                                                                                                                                                  |
| QUIZ                                   | - The polygon for Quiz Question 2 needs to be enlarged to cater for those participants who walk further downstream.  
  - All participants liked the interactive quiz. They felt it made them pay more attention and integrated them more into the Mscape experience.                                                                                                                                 |
| Hazards                                | - The chosen path was very good and minimised potential hazards but participants should still be reminded to watch out for mobile and immobile hazards.                                                                                                                                 |
| GPS                                    | - No signal loss was experienced, although some participants were inclined to follow the course of the river with exactness. This often became tedious.  
  - The person icon that moves about the screen, in response to GPS, needs to be explained to participants. Also the 'Home' button which centres the screen on the person icon needs to be pointed out. |
| Equipment                              | - In some cases the headphones cut out and one person felt the lead was too long and could create a possible hazard.  
  - Very important to lock buttons as many participants often touched buttons they were not meant too.  
  - Orientation of the map on the PDA screen – many participants found it easier to turn the PDA around.                                                                 |
<table>
<thead>
<tr>
<th>Appropriateness of Content</th>
<th>Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>(eg. Do you think it is suitable pitched at GCSE Geography pupils?)</td>
<td>(eg. Do you feel your experience was an engaging learning experience? Please elaborate)</td>
</tr>
<tr>
<td>* The pitch was deemed to be very good. The Geographer who piloted the escape felt the content linked nicely into the specification and the materials were consistent and covered all necessary topics.</td>
<td>* All thought it was a fun way to learn – something different.</td>
</tr>
<tr>
<td>* Mr Smith still felt there was too much content.</td>
<td>* A balanced learning experience – content with fun.</td>
</tr>
<tr>
<td></td>
<td>* Images and materials were excellent.</td>
</tr>
</tbody>
</table>

Any Other Area(s) |
| (eg. Are there any other comments you would like to make about the escape experience?) |
| * Remove 'back' option for left button. |
| * At Step 5, Teddington, there may exist a possible bug in the escape. After the second slideshow at Teddington (SSTeddingtonP2) had finished the 'TIDeposition' image appeared on my screen and remained. This would need further investigation. |
| * There was an issue around Fact Zone 5. Again I think this my PDA. When I got to Gravesend the playlist appeared to revert back to Teddington and to Fact Zone 5. |
| * Once all amendments have been completed we need to remove the debugging option, which will remove this icon from the screen. |
| * One participant felt the lack of a river or even a small stream took slightly away from the experience. But they did state that this would not have been possible in the classroom either. |
| * A few stated that they thought this was an experience pupils would remember. |
Teacher-Researcher Observations During the Inquiry

Observations during Stamp The Mole - 16/01/09

- Pupils appeared excited to be getting out of the classroom and participating in the mobile activity – break from the norm.
- 14 out of the 15 pupils were present.
- Equipment did not pose any major concerns. The pupils handled the PDAs in a confident and familiar fashion and they accepted as normal the touch screen functionality. They were keen to move onto the next part of the session.
- Sound did pose a problem for some – this was soon rectified by either adjusting the volume within the PDA or on the headphones.
- Pupils followed the instructions given in Stamp the Mole and soon all were participating in the activity. It was interesting to see that they all went their separate directions. I was apprehensive that they would take the lead of the first pupil or stick together in friendship groups. This was not the case.
- Some pupils picked up on the key concept of the game and ensured their mole holes were not too far apart. They made a conscious decision to remember where the holes were and somehow had the game successfully completed. Others forgot where they had put the mole holes and found the GPS hard to follow on screen. Some even thought the mole holes constantly changed position and so did not expect the holes to remain stationary. The latter often failed to complete the game successfully and showed genuine disappointment to have failed the task. Some ran between holes and one girl walked briskly to each mole hole and tried to jump or stamp on the mole.
- All pupils said they enjoyed the experience and two could not believe that time had past so quickly.
- Another two discussed there were other games available on the PDA and requested to try these out. Therefore these two had a go at ‘Noughts and Crosses’.
- The following words and phrases were used by some of the pupils:- Excellent! Fun! enjoyable / better than normal class / the time went by so quickly / can we do something like this again?
- I was unaware until this morning that to run a escape the ipaq required certain ‘settings’ to be in place:-
  - Sound needed to be activated and this done through the speaker icon at the top right of the PDA screen.
  - The ‘Backlight’ facility must be turned off otherwise the screen can revert to a darker setting. This is achieved by following ‘Start’ – ‘Settings’ – ‘System’ tab – ‘backlight’ and then take the tick out of the relevant box. Please note there are three tabs at the bottom of the screen ‘Battery Power’, ‘External Power’ and ‘Brightness’. The ‘backlight’ facility needs turned off for both ‘Battery Power’ and ‘External Power’. Under ‘brightness’ both power scales need to be at the highest level (to the far right)
  - they have to be the exact same
  - To ensure the PDA does not power down when not touched you need to select ‘Start’ – ‘Settings’ – ‘System’ tab – ‘Power’ – ‘Advanced’ tab and take the tick out of the ‘turn off device if not used for’
  - Do the same for external power.

Teacher-Researcher Observations During The Thames Mcape: 28/01/09

- Many pupils formed groups of two or three – they disliked being isolated at different parts of the school and therefore choose to walk the course of the Thames together.
- Some pupils (Pupils 1, 9 and 15) were very content to work autonomously. They appeared to relish the empowerment that the e-learning task afforded them. After talking with the pupils they explained that this made their learning more personal and they enjoyed solving problems (i.e. the quiz questions).
- The longer the pupils used the technology the more confident they became. It was as if familiarisation with the iPAQ 214 was accelerated by the knowledge pupils already had of mobile technology and this in turn fed into the activity.
- At time some pupils helped each other out with the quiz questions – they shouted the correct answer back to those following behind or told others what the wrong one of the wrong answers were.
- Navigation for some became a problem. They found it difficult to orientate themselves and comprehend the how GPS worked. For some this was resolved by turning the GPS unit around. One pupil was trying to stay within the blue line on the PDA of the River Thames. This caused her to become very slow and unsettled as others raced ahead. After Quiz question 3 she soon realised to follow the pins not the river.
- Another pupil became confused when she had to go through the school – getting lost twice.
- The weather proved more of an issue than anticipated. It was dry but with a maximum of 7°C. The participants were outdoors for approximately 1½ hours and they felt very cold. For many it adversely affected their experience of the mcape and at the end they simply wanted into the warm school building.
- Most participants did appear to walk at a constant pace and after the first five minutes had become accustomed to the format of the mcape.
- Due to the repetitive structure of the mcape and the quiz most pupils by Stop 4 (Reading) felt good about what they were doing and had the confidence to proceed faster.
- Problems with sound were encountered by four pupils. For one their sound was very low throughout and for the other three they were disturbed by the bin collection lorry and the traffic on the nearby road as they approached Site 6. Gravesend. Difficulties in sound often lead to frustration as the mcape experience was interrupted.
- Five of the iPAQs did not have the flash player installed on them so they started when the quiz was launched. As a result Mr Smith had to take these five PDAs and install flash onto them. This caused a delay in some participants getting started and some appeared to become frustrated or lose interest as they had to restart the experience.
- The timescale of the mcape was judged correctly – lasting around 40 minutes. Although one or two pupils found it quite long and admitted to losing interest towards the end. They did clarify that this was also because of the cold – their hands got numb and they felt angry and lost patience easily. They just wanted the activity to end.
- The PDA provided space and time for pupils to process information at their own pace. This made it easier for pupils to make their own decision and respond to problems. As the task developed some pupils chose to tackle the quiz by themselves and others worked in pairs or small groups.
- The inclusion of the quiz appeared to act as a motivational tool for some pupils. The more questions pupils got correct the more the wanted to succeed and get a high score. Participants were often heard shouting for joy when they got a quiz question correct. It seemed that the inclusion of the question captivated most participants. One pupil however (Pupil 14) stated that she got a score of 140, yet she never seen or attempted any questions. The only explanation I can put forward is that she had selected ‘continue’ instead of ‘New Game’ when the quiz initially launched. In other word she retained a previous participant’s score.
- Passing comments made by some pupils to another as the passed them by appeared to motivate others into a period of increased action.
- On occasion some pupils felt compelled to help others and lead them through some of the quiz questions. This appeared to give confidence to the leader and reassured those receiving the help.
- The inclusion of speakers also appeared to get a welcome from the participants. They enjoyed hearing the sounds and one even began whistling to Justin Timberlake’s ‘Cry me A River’.
- Once inside and warmed up one pupil stated that she enjoyed the experience and wanted to know when she would get the chance to make a mcape.
- I felt the experience was worth while but took a lot of planning, preparation, creation time and last minute organisation. My concern was the ability of teachers to incorporate mcape into their teaching without too much time consumption or technical expertise.
• The fact that pupils got to design the entire mscape from start to finish served to both motivate and inspire. This had particular effect on pupils who at times appeared reluctant to get involved (e.g. Pupil 8 & 11). Also the desire not to let classmates down also served to get pupils to reengage.
• The creation phase clearly had a part to play in raising pupils’ self-esteem. Many of them were a lot more confident in using the equipment than compared to the Thames mscapes.
• The personalisation of each of the three mscapes helped to inspire pupils. They wanted to do well and produce a top class mscape.
• When the mscapes commenced the pupils grouped together and once each treasure hunt began most pupils tended to remain with their groups. Collaboration and shared problem-solving was seen throughout as pupils discussed the information whilst interpreting the clues. It was as if pupils were helping each other to construct their knowledge. This in turn led to better use by pupils of subject specific terminology.
• No pupil opted to undertake all treasure hunts by herself. This was clearly due to the set-up and background preparation for the task. It naturally lent itself to collaboration. However, some pupils (Pupils 4, 8, 9 and 10) did choose to spend some time apart from their group and they tried to find the treasure first. The later revealed that they liked the competition element.
• Some became too caught out in the ‘pack’ or group scenario that when the one person made a mistake several others also appeared to follow without real questioning.
• Many opportunities existed for some pupils to demonstrate their leadership qualities. Pupils appeared to take the lead for a variety of reasons – they had led their group through the creation phase, they got frustrated at the lack of progress or indecision, they were asked by their peers and naturally assumed this position.
• For the first (of three) mscapes some pupils found the orientation difficult.
• Because the kiosk option was not used to immobilise the buttons two or three pupils experienced technical difficulties as they accidentally touched the wrong button.
• One iP AQ experienced technical problems; however the pupil (Pupil 2) was able to still participate as she was completing the treasure hunt with others. The glitch was only temporary as a new SD card was inserted into the iP AQ and it worked fine.
• Walton introduced a teddy as a prop which help show their level of engagement. In addition all groups brought with them some form of treasure, such as golden chocolate coins.
• Verbal responses from the pupils’ indicated that they enjoyed the mscapes and thought they were fun, game-like and really got everyone involved.
• The Lodge Treasure Hunt appeared as the most difficult when it came to locating the treasure. Although, all pupils relished the opportunity to search for the treasure and persisted in their search.
• Success or failure of the task depended largely on the active engagement with the task.
• Many pupils equated the speakers with the clues. At times this was supposed to be the case but at others they were simply as background noise. Therefore some of the speakers caused confusion.
• Some pupils were heard singing and laughing as they completed the m-learning activity.
• Sense of achievement of working out the clues and discovering the treasure help bolster pupils self-esteem and self-confidence.
• The Thames mscapes pupils were able to use the PDA to help them solve problems. It was a tool and it allowed for information to be paused or replayed assisting the decision making process.
• Two pupils from the Walton Group became quite competitive with others in their group when undertaking Fairbourne’s Treasure Hunt. They raced ahead trying to the first to solve all the clues.
The photographs of The Lodge (above) were taken some 85 years apart and are some of the last remaining images of a building which was unfortunately demolished in 1996 for health and safety reasons. When first constructed the building was called Ormisdale but soon afterwards it was converted into a school called ‘The Lodge’. When the Belfast Grammar purchased the building they renamed it St. Catherine’s.

Before demolition the building was used mainly by the science department with the school’s staffroom upstairs. But as you will see this building is steeped in history - much more had taken place over the years within the confines of St. Catherine’s. Like its striking facade St. Catherine’s had been a grand school for ‘young ladies’, known as ‘The lodge’, at the start of the 20th century run the Principal Miss Rentoul. Perhaps you can remember your Year 8 History lessons where you were given a brief insight into the Lodge?

If not do not worry the following information will provide a recap on the history of The Lodge. Please note all the information and photographs come from The Lodge’s school prospectus, which is available through the Public Records Office of Northern Ireland (PRONI).
The Lodge is within a few minutes walk of the Antrim Road and Greencastle Trams.

The schoolrooms and bedrooms are comfortable, sunny, and well ventilated; and the house is in every respect arranged so as to ensure, as far as possible, the health and comfort of those residing in it. Since the establishment of the school no pupil has been prepared for or sent into any public examination, as it is the belief of the Principal that severe Competitive Examinations, public or private, are detrimental to true education, and entirely valueless to all girls except those intending to become teachers.

She is also convinced that the strain which preparation for examinations must of necessity involve is injurious to health in very many cases, and in some leads to permanent injury. Some sources have stated,

"Enforced resistance to epidemic diseases and tuberculosis may be mentioned as an example of the graver results of the system of educational forced feeding and examination at high pressure." (Sir John W. Moore, Dublin)

"I have seen many boys and girls whose health and eyesight have been permanently injured by their preparation for Intermediate Examination." (Dr. J. B. Story, Dublin)

The whole of the teaching of the school is under the daily supervision of the Principal, who personally tests at frequent intervals the progress of the various classes.

A report of the school work of each pupil is sent to parents at the end of every term, and also a weekly record of position in class, which parents are requested to examine and sign. Modern languages are taught as far as possible, conversationally, and music and needlework are given a prominent place.

In addition to the usual subjects of study, weekly lectures on Art are given by the Principal, and profusely illustrated by photographs or timelapse views of the works of great painters, sculptors, and architects.

From time to time lectures are delivered by University Professors and others on scientific and literary subjects, and former pupils occasionally read papers on various topics of interest, and are thus encouraged to maintain the connection with the school.

During the summer, excursions are frequently organised on Saturdays to places of historic interest such as Dublin, the Boyne valley, Greystones, etc., as well as shorter trips to places of note. Every opportunity is taken to enable the pupils to visit art or other exhibitions held in Belfast, as well as to attend good concerts and lectures.

During the winter informal musical recitals are given by pupils, to which occasionally their parents and friends are invited.

Arrangements are made to take those who desire to learn swimming to the baths every week.
Exemplar: Treasure Hunt Task

The Lodge: Treasure Hunt Task

Centring on The Lodge and incorporating OS Map Skills you must produce a short but enjoyable treasure hunt around the grounds of the school using a mediascape presentation driven by mobile technology.

Your teacher will have already provided you with a detailed timetable of events but to summarise – between the 10th Feb and 31st March 2009 you will plan, collect data (e.g. sounds and images), create, modify, pilot and finish your treasure hunt mscape.

To successfully meet your targets you must work together as a group and the group leader must work effectively and liaise with the teacher.

1. Meet with your teacher who will (verbally) go over your task and elaborate more on what you have to do. Read this handout and the ‘The Lodge Fact File’ thoroughly.

2. Brainstorm/discuss in your group what angle you wish to take with your treasure hunt, i.e. create an interesting story/introduction for your treasure hunt using one or more of the past residents’ (approx 10-15 lines). This is where you identify what the treasure is, how it got lost and how it may still lie within the grounds of the school – create an atmosphere of interest that will make participants want to find the treasure!

NB: These steps are essentially guidance and can be changed after group consultation and discussion with your teacher.

NB: Each point provides a brief outline of what your group should do. Where appropriate your teacher will elaborate on the key ideas.

3. Look at the Mscape software and some or all group members download it and install it on your home computer (if not already done so). Play about with it, download some of the freely available mscapes and try them out either on your personal computer (PC) via the ‘Tester’ or on a mobile device that has Windows Mobile and a GPS facility. Your teacher will direct you to suitable mscapes to download.

4a) The Basemap/Satellite image – Each group will be given a satellite image of the school grounds overlaid with grid squares. You will discuss this map with your group and teacher and decide whether your group wishes to introduce additional digital features (e.g. roads, rivers, mountains, volcanoes, waterfalls, barricades, etc). The satellite image is one of the first things that your mscape requires so we need to keep the map reasonably simple and decide on any additional features quite quickly – to help you see the next point.

4b) You need to walk around the school and see what is there and start to decide on what specifically you want or need to do. What sounds and images will you need? How will you use the school grounds? And finally remember this mscape should be about improving your understanding of OS Map Skills, whilst having some fun! So how do you successfully integrate Map Skills (e.g. symbols, direction, distance, height, etc)? This all needs to be discussed within your group.
4c. Eventually each group will be presented with their completed satellite image. You will use this image to plan your mscape. Think in terms of a *storyboard*. You may create approximately 4-6 regions in your mscape and place these digital regions upon the school’s basemap/satellite image. Each region will provide a number to reveal a 4 or 6 figure grid reference. Within each region you can have:

- Images
- Sounds
- Slideshows (combine one sound an image or images)
- But most importantly a clue – your clue(s) can be in a riddle format, or not, and should relate to OS skills and to items in the school grounds.

4d. *Speakers* – Your teacher will introduce you to the concept of speakers and you can decide if you wish to use them and if so how many and where they should be located? They too can be placed on your storyboard and they can include music that you like, music that is relevant to the mscape and/or sounds that are appropriate with your mscape theme.

5a. At this stage you should think about dividing different tasks up and using the group leader to organise this (e.g. one person per region or one person looking after the sounds or images?). Remember good team work is about listening to others and about working together not simply doing what you want to do. Your teacher will be a good source of help.

5b. Now your story board is complete the group should *collect* the necessary resources:-

*Sounds* – I would suggest using ‘Audacity’ to edit and create sound/speech. I would also recommend all sound files to be in MP3 format and less than 700KB. Audacity can be used to convert to MP3 but some times it requests an extension file (lame_enc.dll) – if this is the case and you do not understand what it is asking speak to your teacher.

*Images* – I would recommend two pieces of software, a free to download PowerToy from Microsoft called ‘Image Resizer’ and ‘Paint’. The latter is usually an accessory program in most computers and is the easiest way to create new images. Image Resizer from Microsoft is a useful program which allows you, as the name suggests, to easily resize your digital pictures. If you are using Image Resizer to change the size of images you usually want the ‘Small (fits 640 X 480 screen)’ option – this ensures the image fits appropriately onto the PDA screen.

6a. You have now completed your brainstorming, planning and resource collection. The focus should now turn to the actual mscape creation. Your group will meet at designated times with your teacher and begin to create a basic mscape.

Once you are happy with your resources and where you wish them to be placed you need to work out the logic of them – which sounds and images will participants hear/see first?
Are they the ones you want them to hear? Are the speakers in the correct position? Are the sounds and images appropriate? Do we need to modify anything? You might need to go back to the storyboard and re-edit.

6b. The creation of the mscape - All resources are placed digitally onto the satellite image of the school grounds. Please remember to save your work regularly and keep a back-up copy (maybe even two copies)!

7. Pilot your mscape – one or two group members will go out and see if the mscape works the way it should. Any glitches and/or amendments should be dealt with on their return.

8. Running the mscape – Wednesday 1st April is scheduled for the running of all three mscapes. Each group will get to participate in the three mscapes.

9. Each group will present the teacher with a detailed step-by-step journal explaining how their mscape was created (hardcopy and e-copy). Neat copies of the storyboard should also be included. It is therefore a good idea if one group member takes charge of this and keeps up-to-date information. The next two pages have a template for you to use with regards to a mscape journal.

Once the treasure hunt mscapes have taken place you will complete the second OS Map Skills exam (Friday 3rd April). Other events that will also take place are:
- Focus Group Interview (with 4 pupils = Friday 3rd April pl-2)
- Whole Class Interview (Wednesday 8th April)
240

Group Storyboards

1) Start Region
Hello and thank you for boarding the Mediascape virtual treasure hunt. Here you will encounter a number of clues and hints along the way in order to find the treasure that was hid many years ago in your school grounds. Remember, time is ticking so work around the course with speed. The first person to reveal the treasure will receive a prize but not just any old prize; believe me this prize is worth hunting for. Good luck and remember to watch out for hints and clues hidden along the way.

My name is Mary Ann Dominic and I’m here to tell my story although along the way I may need some help as I can’t find the treasure my husband buried many years ago. My memory is fading but hopefully with the clues I he left and your help we should eventually retrieve the hidden treasure.

Many years ago I used to live in a house around this area. I’m not sure if its still there look around and see if you can notice a quite peculiar building tall and wide in shape with a garden at the left hand side where I used to take the grandchildren out often for a stroll? Henry, my husband, once ran a school in Fairbourne for young boys but never allowed me much say in the organisation or running of the school. As Henry began to grow old he discovered he could no longer cope with the strain and stress of running a school but nevertheless he was determined to plunder on pretending he hadn’t a care in the world. Despite the fact he knew my love for kids he refused to let me take over the running of the school and it closed down in early 1940s.

Many years later Henry passed away and I was given the opportunity to reopen the school. However I decided to open an all girls’ school and soon this small school began to grow and grow. The problem is that as a school gets bigger and bigger it costs more and more money to run. This is why I need your help. You already know what a mean old man my husband was but that’s not the half of it. We used to be rich but when he died there was no sign of our fortune. Recently I have found his old diary and I think he buried our money somewhere on your school grounds.

Can you help me find it? To help me you just have to follow the clues that I found in his diary.

2) Clue 1 (Start Region)
Head to the heart of the school...the place where the pupils and new blood enter first!

3) Clue 2 (Clue 1 Region)
To find the next clue you need to head due south, approximately 5 metres, from the building that is now shown on the PDA. The symbol which represents the building will only last three more seconds...(pause for 3 seconds)...
6. Clue 5 (Clue 4 Region)
To locate your last clue you need to use a 4 figure grid reference. The first two digits are 06...that is 06. To work out the last two digits you need to listen carefully.
If you multiple these two numbers together you get 40...If you multiply these two numbers together you get 40. To help you why don’t you use the ZOOM function on the PDA screen to zoom out and see the grid references!

If you Multiply these two numbers you get 40
Why not use the ZOOM function!

7. Clue 6 (Clue 5 Region)
You are so close to finding the treasure. Only one more clue left! To find the treasure you need to be EAST of Fairbourne and SOUTH of the old wildlife garden. Search and you will find.

EAST of
South of the GARDEN

ONCE THE TREASURE REGION WAS ENTERED THE FOLLOWING SLIDESHOW APPEARED WAS LAUNCHED BY THE PDA

8. Treasure Region
Did you find the treasure?

If YES Selected
Congratulations you have successfully found the treasure. We hope you have enjoyed your virtual mediascapes tour.

Well Done!
You found the treasure!

If NO Selected
Sorry you did not find the treasure. You can always try again. Good luck!

Sorry!
You did not find the treasure!

If YES Selected
Participants had to tap the screen to indicate if they had or had not found the treasure. Once tapped this triggered a response from the mediascape application on the PDA.

Did you find the treasure?
Yes
No
The Lodge Story Board

Introduction Slideshow:
Welcome to the Lodge Treasure Hunt.

Emily is a student of the Lodge school for girls. On her way to school the school bully called Carla stole her lunch. Carla told her that her lunch has been hidden and that she would have to try and get it back. The bully and her friends have left clues around the school, but Emily is too upset to go look for it.

Now she is asking you to help her find it and if you do there will be a special surprise at the end, but you need to find it quickly. You only have 25 minutes and after this your time is up and you lose the treasure hunt.

Be careful and closely listen to the clues because the bullies will be watching you and will do everything they can to stop you.

GOOD LUCK!

See the next page for clues, 3, 5 and the treasure region.

Clue 2 Slideshow:
Well Done! You have now reached the second stopping point. Now you will receive your second clue.

This is where everyone thinks is the principle building of the school. Go to the outside of this building which has the grid reference 07__. The last two numbers are the answer to 9x6.

Clue 1 (Starting Point) Slideshow:
To find the next clue, you need to be outside the place where you might play a basketball match. 07 is one of the coordinates of the grid reference you will have to work out the other one, using your map.

Once the introductory slideshow is complete the map becomes live and the starting point is highlighted on the PDA.
The Lodge Story
Board Continued

Clue 3 Slideshow:
Well done. To find your next clue head north by north west to books and belongs are kept. You will hear lots of girls talking.

Clue 4 Slideshow:
You are now at the fourth stopping point. I know you are now run-off your feet after collecting your books. Why not sit down and have something to eat.

To help you further I will give you the first three digits of the four figure grid reference needed to find the next clue. The first three digits are 085....that is 085.

To get the last number think of who wears the black jumpers!

Clue 5 Slideshow:
You are now at the canteen and very close to discovering the treasure. To help you on the final leg of your journey I will give you two clues which will help assist you in finding the treasure.

Firstly, look at image “B” on the PDA screen. You need to be near this type of vegetation.

Secondly, in the Thames Mscape a song played here, the key word is “played”. This is where the treasure can be found.

Good luck

Treasure Region Slideshow:
Did you find the treasure yes or no?

SEE THE NEXT PAGE to discover what happens when YES or NO are selected.

On route to the Treasure region there are two addition regions where the pupils here the following audio, ‘well done, keep going you are nearly there’.

Once participants enter the treasure zone the following occurs.

CLUE

CE

085

"PLAYED"
The Lodge Story
Board Continued

Participants had to tap the screen to indicate if they had or had not found the treasure. Once tapped this triggered a response from the Mediascape application on the PDA.

If YES Selected
Congratulations you have found The Lodge’s treasure. This now concludes The Lodge’s Mediascape. We hope you have enjoyed it and had fun.

If NO Selected
Sorry you were unable to find the treasure. This now concludes The Lodge’s Mediascape. We hope you have enjoyed it and had fun.

CONGRATULATIONS!
You found the Treasure

SORRY!
You were unable to find the Treasure
1. On Start up - The following happens before the map becomes live on the PDA Screen... (e.g. There is an acquiring GPS image & speech followed by information on the equipment. Then participants are asked to tap the screen to begin. Once tapped the introduction to the treasure hunt begins, see the next box.

2. Introduction - In 1865 there was an engineer who lived in the Walton building called Charles Morrow. He had 3 children, Rosie, Jack and Peter who were all under 10. One night as Charles came in from a late night out with his friends in the local bar he became vicious and abusive towards his wife. As the children heard thuds and silent screams from below their bedrooms they slowly went out into the hall and crept down the stairs to find Charles kicking and punching their mother. Her cries echoed through the house and suddenly stopped. Her body lay still on the floor not moving and as Rosie let out a gasp Charles turned and seen his 3 children watching this horrific event, then quickly turned against them. Charles attacked his poor children but young Jack escaped with golden coins of his mother's bedside cabinet and his teddy bear. As he ran down the path leading to his freedom from his psycho father a gun shot was fired and Jack hit the floor and just like his mother, he died, but almost instantly. His coins and teddy are still lying on the grounds near Walton, which are worth today more than they ever where back then. Find it and it's yours.

3. Clue 1 (Region 1) - To hear your first clue stand facing Walton... You could walk but you're in a rush, maybe you should take the bus. Follow the path in a south - westerly direction and go past the cars. Here is a clue: The first two numbers in your four figure grid reference is half a dozen. The second two numbers are five and two.

4. Clue 2 (Region 2) - Go around the corner past the cow ahead... Just keep going. When you hear the sound chime look around that open space, see what's staring you right in the face.

Once the Introduction is finished the map becomes live and Region 1 is highlighted with a pin on the PDA screen.
5). Approach to Clue 3 - On approach to clue three two things and to encourage participants to keep going and assure them they are on the correct path:
- A chime as stated during Clue 2.
- A short speech stating 'keep going you are nearly there'

6). Clue 3 (Region 3) - Looking around, what do I see? Nothing is there, but what could there be? On my way to say a prayer hoping something will be there. I walk towards the ringing bell and this is where my teddy fell.

7). Approach to Clue 4 - On approach to clue four participants can hear church bells. This was referred to in Clue 3 and helps reassure that the correct path is being followed.

8). Clue 4 (Region 4) - Follow the path and walk straight ahead, go just past the place where you will get fed.

9). Clue 5 (Region 5) - You have finished your meal now walk straight ahead on grid reference 080563. Turn down the lane where I found great pain.

SEE NEXT PAGE for the Treasure Region
ONCE PARTICIPANTS ENTER THE TREASURE REGION THE FOLLOWING SLIDESHOW APPEARS ON THE PDA

**10. Treasure Region:** Did you find the treasure yes or No?

- **If YES**
  - Congratulations speech
  - Congratulations you have successfully found our missing treasure and completed our mscape!

- **If NO**
  - Sorry!!
  - You lost!!

Participants had to tap the screen to indicate if they had or had not found the treasure. Once tapped this triggered a response from the mscape application on the PDA.
Group Journals

FAIRBOURNE JOURNAL

Introduction to Mscapes

Our teacher gave us the opportunity to use mscapes by letting us participate in stamp the mole and the Thames Mscape games. Before we went out to take part in the games our teacher and Mr. Smith explained to us how to use the equipment and how to play the mscape games. It all appeared very exciting; everyone in the class couldn’t wait to get started and experience the mobile technology.

Group Formation

Our teacher randomly chose the groups, in which we had to create our own mscapes using ordinance survey skills. Most people like this as it was a fair way to choose the groups, however some clearly would have preferred to be with their friends.

Introduction to Mscapes 2 and Brainstorming

We were introduced to our second mscapes by our teacher. He explained that we would be creating our own mscapes based on a treasure hunt. We were told how we would be carrying out this task and we got some ideas and tips to help us. We came up with clues and treasures to make our mscape treasure hunt. Everyone was really looking forward to the task it was something new and different.

Formation of Story/Treasure Hunt

As a group we agreed upon our story. The aim was to make the treasure hunt appealing to those who took part. Therefore we decided to tell the fictitious story of Mary Ann Dominic who needed to find the fortune buried within our school grounds by her late husband. To help her succeed in finding the buried/lost treasure the plan was to encourage participants to help. Everyone within the group enjoyed creating this story and connecting it to an actual building still present within our school grounds. We were in charge of making the mscapes attractive to participants. Therefore we were responsible for the ultimate success or failure of the treasure hunt.

Mscape Software

Our group became familiar with the mscape software when Mr. Smith came to the school to help us. He, along with our teacher, taught us how to make up some parts of the treasure hunt and he explained what we would be doing with the mscapes. It did appear a bit daunting and technical for some in our group but everyone was still keen to keep going.

Satellite Image of the School

We were provided with a blank satellite image of our school and asked to create regions for clues. When we walked around the school, it gave us some good ideas that we could use for clues for our mscaping. We had a look around to see what parts of the school could be used in our clues to make up the mscapes to lead to the treasure. At times there was disagreement with where to place the clues but in the end we all agreed, with a bit of compromising.

Speakers, Sounds and Images

It was easy enough to get sounds and images, although it took a while trying to sort out what pictures and sounds should go with the clues. Some group members did however feel it was very time consuming finding pictures and sounds to use in our mscapes, particularly using Audacity to record sound. We needed to re-record some of our audio as it was great first time around.

Creation of Mscapes

Some group members didn’t really like the topic of OS Skills. They believed had a different topic been selected they would have been more interested and the mscapes would not have appeared to drag on as long.

It was very hard and time consuming trying to make the mscape treasure hunt. There was a lot of work to do for it, and it was hard to actually stay focused and work on it because it began to get boring as it dragged on for ages. At the start we were keen but there was so much to do.

At times some group members felt overwhelmed with the amount of content. Several sources often had to be used just to create one jpeg.

LNI was not very helpful. Yes it provided a secure area to chat to others but most of use did not use it. It was much easier to text or emails to other group members. Emailing was also a quicker way to swap files. We didn’t really see the point in LNI!

Pilot of Mscapes

This was vital in ensuring the final treasure hunt mscape worked as it should. When we had everything finished we ran a pilot and were amazed to find several glitches that would have prevented a participant enjoying our mscapes fully. Many of the sounds were too low or even too high. Clues 2, 5 and 6 were a bit difficult to follow so we decided to revamp these, along with enlarging some of the clue regions to make them easier to locate. Two people thought the treasure hunt was too short but eventually agreed that this was down to them knowing in advance where the clues where. It was only at this stage that we were able to truly appreciate the structure and guidance that our teacher had given us.

Running or Mscapes

Our mscapes went well. We managed to sort out all the problems thanks to the pilot and it worked well on the day. Our mscapes was good and we were happy with it, but I thought it could have been much better because we put so much work into it. I think this why a few people lost heart at the end. The mscapes were enjoyable and we were all familiar with mobile devices, but so quick to do considering the amount of time and effort it took to create them.

Pupil 2 did experience technical problems for one of the treasure hunts. This didn’t really bother him as she could work also others in the group until the problem was fixed.

After Mscapes

A few in our group tried to do one or two of the treasure hunts by themselves. They said that they enjoyed this and felt they were more in charge. We felt more confident after the mscapes to recognise our own geographical and ICT strengths and weaknesses.

As a group we worked well together, and the task went well. However the work wasn’t split evenly between everyone. The leader of the group and some other people did most of the work, but altogether our group was good and managed to complete the task well. I don’t think our group enjoyed the creation of the mscapes. It took too long and there was too much work for it.

We would describe creating an mscapes as boring and time consuming; this part wasn’t fun. The actual mscapes however was fun and everyone seemed to enjoy it. In future our group would like to simply do the mscapes not create them!
**The Lodge Mscape Journal**

Introduction to Mscape

We were introduced to Mscape by our teacher in class. We were given the opportunity to be introduced to the equipment by playing a game called Mscape and by doing the Thames Mscape. We were given handouts by our teacher which gave us a lot of information on Mscape. We were also told about websites which were relevant and were shown different software to download. At first we were a bit overwhelmed, but our teacher had everything organized and planned, which meant we were given small amounts of information at a time.

We were then introduced to the second Mscape, also in class. This time we met our teacher telling us information about it, giving us more handouts and showing us examples of how to make an Mscape.

Group formation

The groups were randomly formed by our teacher and then we were told our groups. Most people did not mind this as it was fair and we all knew each other so no one was worried about being in a group with people they did not know. No one would have asked to be in a different selection system.

Introduction to Mscape 2 and Brainstorming

Our teacher told us we were going to create our own Mscape. Initially most group members were apprehensive as they still had no real understanding of what a Mscape was. We had a demonstration on what a Mscape was and how to go about creating an Mscape. The brainstorming session that our teacher did was getting things done on pieces of paper and discussion in our group. This helped to remove the panic. We were excited and looking forward to getting started. The use of mobile technology made it different.

Formation of story/treasure hunt

Our group agreed on a story by brainstorming ideas on a piece of paper and then forming them together to make a story. The basis of the story was that a young girl had her hands stolen by the school bully and was lost around the school. I think the story would appeal to the participants of the Mscape because it was to do with school and they would not relate to it. We used techniques such as making the dice as interesting as we could so the participants would not get bored of it and would get drawn into the story.

Mscape software

Our group became familiar with the software by downloading it at home and trying it out. There was plenty of time to become familiar with the software because when we downloaded it we had 24 hour access to it.

Satellite Image of the School

It was not difficult or time consuming to agree upon the base map for our Mscape because we all agreed on the location. We settled on our base map because we felt it was the perfect place to do our Mscape and it fitted in with the story.

Around the School

On our walk around the school we found some very good places to put our dice, although we had to negotiate with the group to ensure that no one had too much input into where the dice would be placed.

Storyboard

At the request of the teacher all groups were asked to complete a storyboard which would represent the plan of Mscape. The storyboard helped because it helped keep us in track of what our story line was and kept us in order so we did not get confused or repeat ourselves.

Speakers, Sounds and Images

It was not too difficult to get the sounds but recording the voices turned out to be a bit of a problem, a problem which we overcame by re-recording and in the end a Year 9 pupil had to be dedicated to help with the voices. What our group found was that some people were good at images and some better at sounds. This meant anyone got to do their share.

Creation of Mscape

Our group's experience of creating the Mscape was that it was something new. We did find it difficult at some parts but we fixed the difficult parts and it turned out like what we planned. Our teacher followed a logical plan and we always knew what was expected from us. There were no surprises although it was time-consuming and hard work at times.

Pilot of Mscape

The things that came out of our pilot were that we got ideas of what we had to change and where certain things of the Mscape should go and where some things shouldn't go. We all found this (plotting) very useful and to realise some of the dice (2, 4 & 5) were too difficult and the volume of the sounds and spoken word attention because some were too low or too high. We also though our treasure might be too hard to locate or our props needed to be rebuilt.

Running of Mscape

Our Mscape worked fine on the day and there were no unforeseen issues. Everyone in the group found the PDA easy to use. The participants of the Mscape enjoyed it and the only issue they had was that it was sometimes hard to locate the next clue. They said that the sound and the images worked fine and came up as they should have. We were happy with our Mscape performance. It was really good to see the finished product; it was like a computer game only we were moving about.

What we like the most was the chance to find the dice and getting involved in getting active made the Mscape worthwhile.

After Mscape

We would summarise our group's performance of the Mscape task as successful. The only issue that did spoil our day was that some people were not doing as much as others. The group got over this problem by themselves and everyone was doing the same amount of work and the work.

There were also opportunities for individuals to extend their own ICT and historical knowledge and skills as well as learning about OS Skills.

Most of our group felt that their understanding of OS Skills improved dramatically. The opportunity to try out grid references and compass directions for example was definitely better than learning in a classroom. We would like to use Mscape again as we felt we achieved something more and different than normal Geography lessons.

Overall the group did enjoy the Mscape activity. The only thing we did not like was the length of time it took to make the Mscape; it dragged on for quite some time. The experience of creating the Mscape was new and different from previous work we had done, but it did drag on too long and get a bit boring after a while. Apart from that it was a good overall experience.
Walton: Mscape Journal

The purpose of this journal was to keep an account of how we created our Mscape from an onset through to completion.

Introduction to Mscape

- We were introduced to this by Mr. Smith and our teacher, with 'Stamp the Mole'- a fun enjoyable Mscape game. Everyone really enjoyed this - it was different. We couldn't wait to continue.

Group Formation

- The groups were formed randomly by our teacher on the computer. The outcome was three groups Walton, Fairbourne and The Lodge. There were 5-6 in each group. We all agreed this (random selection) was a fair way to create the groups.

Introduction to Mscape 2 and Brainstorming

- We were introduced to Mscape creation it by Mr. Smith. He showed us basic skills on how to use the Mscape software.
- Our teacher introduced us to the Mscape theme which was a treasure hunt. Everyone in our group liked this theme and was excited about getting started.
- We decided on our treasure and the positioning of the six regions where our clues were going to be heard.

Formation of Story/Treasure Hunt

- Firstly, we looked at the background of Walton and its past residence. It was a family of 5 and the father killed the mother and the two children and the other escaped but the father found him and shot him.
- Because it is a unique storyline.
- We used a murder theme to enthral the audience and make the treasure hunt fun.

Mscape Software

- Mr Smith and our teacher made us familiar with the Mscape software telling us what we would need and where we could download it.
- Most of us liked the idea of LNI but in reality it was easier to text, email, swap USB pens or just talk to others in the group. The LNI course was quite basic and time consuming and a bit confusing.

Satellite Image of the School

- Our teacher gave us a blank copy of the school grounds and told use to use this as the 'playground' for our treasure hunt. Within the school grounds we were free to choose our own sites.
- We quickly decided upon 5 clue regions along with an introduction and a treasure region.

Around the School

- We discovered that our school was huge but we so agreed upon suitable locations for our clue regions.
- The Mscape activity also enabled most of us to learn about a small bit of history associated with our school.

Storyboard

- At the start we though a storyboard would be a waste of time but in the end we could not have completed the treasure hunt Mscape without it. It made everything clear and allowed use to see what the finished Mscape should look like. But it was a lot of work!

Speakers, Sounds and Images

- We all agreed that this activity was not just about learning Geography. We learned about history, about how to communicate better and our ICT skills even improved. Before the Mscape most of us did not know what a jpeg was or how to create one. Now we can create pictures, sounds and even edit them. Audacity was brilliant and so simple to use.
- To get sounds for speakers we surfed the web but this was time-consuming and difficult to find what we were looking for - we wanted to get it right and have great images and sound.

Creation of Mscape

- It was very enjoyable. We all pulled together and worked hard as a team but looking back we put a lot of hard work into the Mscape. Our teacher kept us on target and continually offered support and guidance. However we liked to try things first by ourselves before rushing to the teacher. If someone in the group had a problem or got stuck someone else was usually able to help them.
- There was content overload at times. We had to decide what to use and what to leave out - this was difficult.

Pilot of Mscape

- The sound was too low.
- The clues were all mixed up and went off at different times.
- And the songs were all jumbled up too and sometimes the images.
Running or Mscape

- Our mscapes performed brilliantly!
- All the girls in our class loved it; they said it was the best one (hahah)
- Everyone was delighted with our mscapes performance. We completed all three in very good times!

After Mscape

- The actual treasure hunts could be changed for future use to allow pupils to do them as an individual. All that is needed is the teacher to tell pupils to do it individually and perhaps time participants. This would introduce competition and make everyone want to be the first person to do it by themselves and in the quickest time.
- A couple of us tried to find the treasure in one of the mscapes before others in our group.
- IMMENSE!
- The group functioned well together- we all pulled together as a team.
- Everyone enjoyed talking and working with others. We all felt we had become better communicators
- Our group enjoyed the whole thing except the making of it (that was hard-going!)
- STRESSFUL.
## Pilots: Treasure Hunt Mscape
### Fairbourne Group: Issues Raised

<table>
<thead>
<tr>
<th>Key Areas</th>
<th>Comments made by Group Members</th>
</tr>
</thead>
</table>
| **Sound/audio issues**              | - Audios were too low.  
- Sound of the speakers need revamped (reduce speaker at Clue 1 – it is too loud and speaker at church too low).                                          |
| **Clarity of PDA Screen**           | - No real problem encountered.                                                                                                                                  |
| **Clarity of Instructions/Information** | - Some clues were difficult to follow, e.g. clue 2, 5 and 6.  
- Some ended before anyone had the chance to take the clue on board.                                |
| **Images**                          | - If some of the clues are changed the images may also need to be changed. So too the timing of the images.                                                    |
| **Timing**                          | - Some found it quite short but did stress they knew where each stop was.                                                                                     |

### Hazards
- No real hazards but there is a need to reiterate to participants to be careful when fully engrossed in the mscape for stationary and mobile obstacles.

### GPS
- GPS was fine

### Equipment
- Volume was a concern. At times some sounds were too low.

### Appropriateness of Content
- Fine, pitched at the correct level.

### Learning
- Most pupils felt they did learn and reinforce OS skills. Pupil 15 believed it would motivate others helping them improve their OS Skills

### Any Other Area(s)
- Two pupils felt the pilot was very useful in allowing them to fully understand how their weeks of effort had now been transformed into a fun and exciting activity.  
- Enlarge Clue one area.  
- Widen Clue 4 (at tennis courts).  
- Widen treasure area.
# The Lodge Group: Issues Raised

<table>
<thead>
<tr>
<th>Key Areas</th>
<th>Comments made by Group Members</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sound/audio issues</strong></td>
<td>- All audio was too low. They need to be increased.</td>
</tr>
<tr>
<td>(eg. Volume settings of music, background sounds, clarity of speeches, etc)</td>
<td>- Some of the speakers were too high and some too low, e.g. the basketball was too loud, and a glitch occurred with the Queen song.</td>
</tr>
<tr>
<td><strong>Clarity of PDA Screen</strong></td>
<td>- Glare from the sun did cause some minor irritations.</td>
</tr>
<tr>
<td>(eg. are the images clear or were some images hard to see?)</td>
<td>- Clues 2, 4 and 5 need changed they are too difficult.</td>
</tr>
<tr>
<td><strong>Clarity of Instructions/Information</strong></td>
<td>- Mscape would benefit from repeating the clues or having the information delivered more slowly.</td>
</tr>
<tr>
<td>(eg. relate to both visual and audio information?)</td>
<td>- If clues are revamped then images will need to take these changes into account.</td>
</tr>
<tr>
<td><strong>Images</strong></td>
<td>- Fine</td>
</tr>
<tr>
<td>(eg. were they relevant and of an acceptable standard?)</td>
<td>- Need to focus more on OS and problems.</td>
</tr>
<tr>
<td><strong>Timing</strong></td>
<td>- Participants will need to be reminded about dangers as they walk around.</td>
</tr>
<tr>
<td>(eg. Was the whole experience too short, too long or just right? Also did you feel any specific areas/ends along the way were too long or short?)</td>
<td>- - GPS was fine</td>
</tr>
<tr>
<td><strong>GPS</strong></td>
<td>- No real issues, except the long lead of the earphones.</td>
</tr>
<tr>
<td>(eg. Did you lose the signal at any stage or did any other problems arise?)</td>
<td>- Content was appropriate with only a few images needing replaced.</td>
</tr>
<tr>
<td><strong>Equipment</strong></td>
<td>- All pupils believed they learned something both from a Geography and ICT perspective.</td>
</tr>
<tr>
<td>(eg. Any issue surrounding the carrying of the equipment, the earphones, the power to the PDA, the usability, etc.)</td>
<td>- Locating the treasure hard to locate need extra prompt that will satisfy participants that they are going in the right direction.</td>
</tr>
<tr>
<td><strong>Appropriateness of Content</strong></td>
<td>- Do you think it is suitability pitched at GCSE Geography pupils?</td>
</tr>
<tr>
<td>(eg. Do you think it is suitability pitched at GCSE Geography pupils?)</td>
<td>- - All pupils believed they learned something both from a Geography and ICT perspective.</td>
</tr>
<tr>
<td><strong>Learning</strong></td>
<td>- All pupils believed they learned something both from a Geography and ICT perspective.</td>
</tr>
<tr>
<td>(eg. Do you feel you experienced quality learning during your escape experience? Please elaborate)</td>
<td>- Locating the treasure hard to locate need extra prompt that will satisfy participants that they are going in the right direction.</td>
</tr>
<tr>
<td><strong>Any Other Areas</strong></td>
<td>- Any other issues you would like us to make note of about the escape experience?</td>
</tr>
</tbody>
</table>
### Key Areas

<table>
<thead>
<tr>
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</table>
| Sound/audio issues                    | - All audio was too low. They need to be increased.  
- Some of the speakers were too high and some too low. They need to be worked out in situ.                                                                                                             |
| Clarity of PDA Screen                 | - Glare from the sun did cause some minor irritations.                                                                                                                                                                         |
| Clarity of instructions/information   | - Information was clear but hampered by three issues. Firstly the low volume, secondly there was no way to repeat the clues and thirdly the escape began immediately before most pupils were ready.  
- Some of the clues were too difficult, e.g. clue 4.                                                                                                           |
| Images                                 | - Images were mainly fine but some appeared at the wrong time and some have little relevance or assistance value, e.g. a the teddy bear at clue 3 was not appropriate.                                                                |
| Timing                                 | - Was fine not too long or too short.                                                                                                                                                                                             |
| Hazards                                | - No real hazards but there is a need to reiterate to participants to be carefully when fully engrossed in the escape for stationary and mobile obstacles.                                                                           |

### Key Areas

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<tr>
<td><strong>GPS</strong></td>
<td>- GPS was fine</td>
</tr>
<tr>
<td><strong>Equipment</strong></td>
<td>- No real issues with the equipment other than the volume but this may not have been due to the equipment.</td>
</tr>
<tr>
<td><strong>Appropriateness of Content</strong></td>
<td>- Content was appropriate with only a few images needing replaced.</td>
</tr>
<tr>
<td><strong>Learning</strong></td>
<td>- Most pupils felt they did learn and reinforce OS skills – better than what they would have expected from classroom based work.</td>
</tr>
</tbody>
</table>
| **Any Other Area(s)**                 | - It was difficult when having to use grid references to see the co-ordinates on the extremities of the base map.  
- A glitch occurred at the end of the escape – the 'Did you find the Treasure image' disappeared before any pupil had the chance to touch the screen.  
- After Clue 2 needed something extra to assure participants they are going in the right direction.  
- Treasure region needs slightly enlarged.  
- Pupil 2 stated that, 'The PDA is slightly bigger than my phone but I didn't mind that it was still small enough to be light and portable yet large enough to see great images.' |

(eg. Did you lose the signal at any stage or did any other problems arise?)

(eg. Any issue surrounding the carrying of the equipment, the headphones, the power to the PDA, the usability, etc?)

(eg. Do you think it is suitable pitched at GCSE Geography pupils?)

(eg. Do you feel you experienced quality learning during your escape experience? Please elaborate)

(eg. are there any other comments you would like to make about the escape experience?)

(eg. were they relevant and of an acceptable standard?)
The interview took place on **Friday 30th January 9:00-9:45am**. Present at the interview were Pupils 1, 2, 3, 4 and myself. Duration approx. 28 minutes.

**Res. - Res: Researcher**

**1.** How did you feel when you used mobile technology to help you learn about Rivers?

**Pupil 9** - I felt it was interesting and unique and a better way to learn than compared to the classroom. But it was time consuming for example when you got lost or you could not find your way and you needed an adult to help you. This made it fiddly and if an adult was not nearby this made it more difficult.

**Pupil 7** - I thought it was really good, I thought it was a lot less boring than sitting in a classroom and listening to a Res. constantly talking to you. It was more fun than normal lessons and you were able to be outside doing it yourself instead of just having to sit there. I liked the active part of the activity.

**Pupil 12** - I really enjoyed it, I liked getting out of the classroom but I thought that we had covered most of the information and there was a bit too much detail. It was like learning what we had already covered. I would have got more out of it if the information was new and slightly less detailed.

**Pupil 15** - I thought it was good because it showed you real life pictures of all the features we were learning about. But like Pupil 12 we already knew a lot of the rivers information. The Thames Mscape gave too much detail.

**Res.** - Any other comments you would like to make at this stage or we can move one and come back at a later stage.

**All Pupils.** - No let's move on.

**2.** If you had to describe your experience of using mobile technology in two-three words what would it be?

**Pupil 15** - I thought it was unique and interesting and it was easy to get use to using the equipment. It had the enjoyment factor.

**Pupil 12** - I would say very enjoyable. I was fun to use.

**Pupil 7** - I thought it was really different and good fun. It was something new and detailed.

**Pupil 9** - I loved it, for me it was exciting and something I had never tried before. Like the others interesting, and fun come to mind.

**3.** Were there any benefits in using mobile technology to learn about Rivers?

**Pupil 12** - I think seeing things on the screen, the pictures, it benefited you. You knew what you were looking at and it helped you understand more when you saw the pictures and heard the information at the same time. As you were going along you fully understood where you where going.

**Res.** - So you had no problems with the navigation?

**Pupil 12** - No.

**4.** Were there any disadvantages or limitations in using mobile technology to learn about Rivers?

**Pupil 7** - The fact that mine took about five times to start again was not good. Clearly there were some technological problems and at times these were time consuming. However, I thought it was very good, there was no major issues that I did not like about it.

**Pupil 9** - I thought it was really annoying that you could not rewind certain parts because if you missed a part then you could not get it back.

**Res.** - You mentioned you liked getting to see pictures and hearing sound but if I may ask you for clarification. In the classroom you often get to see pictures and hear sound, what's the difference?

**Pupil 12** - I know in class you see pictures and hear sound but I left it was more enjoyable because... I don't know how to explain it correctly... but it was more alive, more real, more realistic because you were out of the classroom.

**Res.** - Any other benefits you can think of?

**Pupil 12** - Not at the minute.

**Pupil 15** - I thought it was good because you do not have to travel to the different rivers you can just do it from your school. You can learn how to map read and use navigational tools. Like Pupil 12 I felt the technology help make the topic you were learning, like rivers, more real and it easy to use.

**Pupil 9** - I thought it was easy to use and the images were really easy to understand and you were able to do it on your own so it was fun.

**Res.** - You had no problem doing the activity on your own?

**Pupil 9** - I would prefer to do it on my own.

**Pupil 7** - I thought it was good because when you had to listen to the facts you really had to listen to them because afterwards you had a quiz. So it made you listen more and learn it because you knew you had to answer questions.

**Res.** - So the bringing in of a quiz or an activity or game made you listen more?

**Pupil 7** - Yes

**Res.** - A couple of you mentioned the sounds and images, the fact that you were getting these at the same time as opposed to a static textbook - was that more realistic or better?

**Pupil 7 & Pupil 9** - Yes

**Res.** - Pupil 15 you mentioned that it was easy to get use to. Why was this?

**Pupil 15** - Because everyone is used to using technology, like mobile phone, outside of school it was like bring those skills into school.

**Res.** - So you felt school was tapping into technology and skills that existed outside of school?

**Pupil 15** - Yes.
Pupil 12 - Being outside, having to use it outside in the cold was the biggest disadvantage for me. I liked it and enjoyed using it but did not like being cold.

Res. - So weather is an important issue to consider when participating in an outdoor mscape?

Pupil 12 - Yes.

Res. - So if it was at a different time of the year it might have been more enjoyable?

Pupil 12 - No. I have to stress it was enjoyable, just cold.

Res. - Did the technology or timing or the mscape cause any problems for you Pupil 12?

Pupil 12 - It was a disadvantage that there was so much information. But the information was good, such as the facts, but you were just standing there and after a while you just got bored having to stand there and listen. You just shut down until the question came.

Res. - So when the quiz questions came up you perked up and paid more attention?

Pupil 12 - Yes.

Pupil 15 - Nothing really much different from what has already been said but you cannot use the technology if it was to rain. And sometimes it (technology) is unreliable and does not work.

Res. - On the day of the Thames Mscape the weather and technological issues seemed to be significant for some pupils and indeed for some of you who are here today. You have now had two days since the mscape has this time lag altered your opinion in any way?

Pupil 15, Pupil 12 - No.

Pupil 15 - Yes there were some technological issues and it was cold but was worth getting out of the classroom for an activity like this.

Other Pupils - (Agreed with this statement).

Do you think the use of mobile technology facilitated *group work* (collaborative) learning?

Res. - I am interested to hear what you say here because groups did develop as you walked around the school.

Pupil 15 - No I did not.

Pupil 7 - Yeh, I joined up with others.

Pupil 12 - So did I. I was with Pupil 8 most of the time.

Res. - Why?

Pupil 12 - I don't really know. I think partially because of listening to the information so much. You sort of get bored and you come together. Ours (Pupil 12's and Pupil 8's) was going at the same time so we could help each other with it.

Res. - By help you mean with the quiz questions?

Pupil 12 - Yes.

Res. - The fact that you and Pupil 8 appear to be good friends did that have any bearing on you both joining in a friendship group or do you think you would have joined up with anyone else nearby?

Pupil 12 - If it had have been anyone else I think I would have joined up with them it was just Pupil 8 was close by.

Res. - There are a couple interesting strands developing. Some participants are admitting they did form groups but others did not. How did mobile technology help those who joined up? Was there a sense of unity like we are in this together so let's join up or was it something else for those who joined up?

Pupil 12 - As each quiz question came you felt that you could help each other. As you were listening to it if someone didn't pick on something but the other person did you could help each other.
Pupil 15 - It did not facilitate it for me as much as independent learning. It did facilitate it a little bit because I saw people joining together but I chose to do the activity by myself. Therefore for me it gave me the choice and I chose to use the technology to help more with independent learning as you were mainly working by yourself.

Res. - Was there anyone near you that you might have choose to join with for the activity?

Pupil 15 - Yes there was people near me and some were good friends but I chose to do the activity by myself. I was happy enough.

Res. - Do you naturally prefer individual group work as opposed to group work Pupil 15?

Pupil 15 - No I like both.

Res. - What about the rest of you would you be naturally one or the other (i.e. independent learner or group learner)?

Pupil 12 - I probably like group work the best but the activity gives you the choice so it caters for all.

Res. - Pupil 9 what about you?

Pupil 9 - I did not think it facilitated group work it was designed to be carried out individually. I actually thought that you had to do it by yourself. But there was one time I did ask someone about a question. I was worried about time and did not want to be the last one so I was trying to catch up a bit.

Res. - Did the quiz instil in people the need to work together to get as many right as possible or did competition lead to people not sharing answers?

Pupil 12 - There were people who wanted to get the highest so they did not want to tell people their answers but others were happy to help out.

Res. - Pupil 7 what about you?

Pupil 7 - I did take part in a group. Because after a while the information was sometime quite long I got bored and I did not always pick up the information so I joined up with Pupil 1 and she was able to help me.

Res. - This boredom issue that you suggest drove you to join with Pupil 1 - What caused the boredom?

Pupil 7 - I found it really boring listing about rivers, whether I was in the classroom or outside. I don’t really find it interesting.

Res. - Do you think mobile technology should be used in the future to help pupils learn about Rivers?

Pupil 7 - The mobile technology is a better way to go rather than textbooks and classroom based work. You get pictures coming up and quizzes and it’s in your ear, were as a textbook means you have to read from a book and that’s really boring. The mobile technology is more fun and in my opinion should be used in future to help pupils learn about rivers.

Pupil 12 - I agree with Pupil 7, because sometimes when you read from a textbook in school you go off course a bit and think I cannot be bothered reading that were as when you have the technology you have no choice to listen to it because it is so personal. You are focusing on it so it helps you learn.

Res. - Did anyone use the pause facility? Did it help?

Pupil 9 &

Pupil 7 - Yes.

Pupil 9 - In class you cannot pause the information but you could with the mobile activity.

Pupil 15 - The technology helped emphasise to me that what you learn in the classroom, which can be a bit boring, is real.

Res. - You are using this word ‘real’ what makes it more real than a textbook?

Pupil 15 - You had so much interaction with the activity. I was following the course of the river and you have a lot of information to handle and to complete a quiz.

Res. - Did anyone find extraordinary or nothing too unusual that your position was tracked in real-time by GPS?

Pupil 9 - I didn’t think about it.

Pupil 15 - I thought it was very good.

Pupil 12 - I liked it.

Pupil 7 - It was fun.

Res. - Is there anything you would like to add about mobile technology being used to help future pupils learn about rivers?

Pupil 9 - Yeh, I thought it was a brilliant experience and you got a lot of usual facts out of it. More than I would have got in the classroom.

Res. - Are there any parts of the mobile technology that you would not like to see used to help future pupils learn about rivers?

Pupil 12 - If the topic Rivers has already been taught to pupils then shorten the mscpe.

Pupil 7 - The time of year, maybe hold the activity when it is not as cold.

Do you think mobile technology has a future role to play in GCSE Geography?

Pupil 15 - I think there should be a place for it. It brings a more practical element into the subject and you get to experience what you are learning about. Pupils are already familiar with this type of technology so it can appeal to them on a level which textbooks and written notes cannot.

Pupil 12 - I agree with Pupil 15 because people of our age are use to this technology outside of school it is easy and more enjoyable to use inside school. You would look forward to using it if you knew it was on the syllabus.

Res. - If you knew in Year 10 that mobile technology would be used at GCSE level would this affect you subject choice at GCSE level?

All

Pupils - Yes.

Pupil 9 - Yes it does because it was fun and it cleared things up you did not understand in the classroom. The quizzes are like tests but when you are outside you are not stressed you are relaxed but when you are going in to do a test you are all stressed. Outside you are calm and relaxed.
Res. - Is that because you feel more in control of your learning?

Pupil 9 - Yes.

Res. - Would it be fair to say mobile technology enhanced your learning or did it give the same information as would have been delivered in the classroom?

Pupil 9 - I learned more from it.

Pupil 12 - I definitely learned more.

Pupil 7 - I think it (mobile technology) was a lot better because some people might not like to sit in a classroom and learn about certain Geography topics. Some people just want to be outside, walking about, and they are more familiar with mobile technology because they have mobile phones and ipods.

Res. - For the Thames Mscape we used a HP iPaq 214 as our mobile device. Eventually the plan is mobile phones may run the mscape. Would mobile phone devices appeal more to you or was the iPaq fine?

Pupil 7 - I would like something like the iphone.

Pupil 15 - I don’t think it would matter.

Pupil 12 - They would do the same thing.

Res. - But do you think the mobile technology you experienced surpasses traditional lessons and the Interactive White Board?

Pupil 9 - Definitely.

Res. - At what point would too much of something, such as mobile technology, sicken you?

Pupil 12 - If you had it every class it would sicken you.

Pupil 9 - If you had it at certain parts of each topic, not huge sections it would be good. Too much of something would soon start to feel like we do now about normal lessons.

Pupil 7 - If it was put in at the correct place I would always find it useful.

Res. - Before we finish off I would like to give you the opportunity to say anything else that you want to say.

All Pupils - No. I think we said what we needed to.

Res. - Thank you for taking part in this morning focus group interview. This now terminates the interview.
The interview took place on Friday 1st May 1:20-2:25pm. Present at the interview were Pupils 1-16 and myself. Duration approx. 43 minutes.

Res. - Res.-Researcher

1. How did you feel when you used mobile technology to help you learn about OS Skills?

Pupil 5 - It was really good.
Res. - Which one did you like?
Pupil 5 - Walton.
Res. - What made it stand out?
Pupil 5 - There clues. They were good.
Res. - Pupil 9?
Pupil 9 - It was good but a bit boring after doing three of them.
Res. - Pupil 7 what about you?
Pupil 7 - I thought it was ok but in some of the groups their treasure was really hard to find.
Res. - Did you find out anything new about OS Skills?
Pupil 7 - Not really.
Res. - Was it just going over what you already knew?
Pupil 7 - Yes.
Res. - Pupil 8 what about you, how did you find it?
Pupil 8 - Stressed. I kept getting lost.
Res. - I saw you on the day heading off and trying the activities by yourself. When you got lost did that start to upset you?
Pupil 8 - Yes.
Res. - How did you get around that?
Pupil 8 - I got help off Mr Coyle. He helped me with the grid numbers.
Res. - Pupil 15?
Pupil 15 - I enjoyed it and thought it was good fun trying out everybody’s, but wherever you got to your own I did not enjoy it as much.

Pupil 10 - Yes it was fun until the end. It got boring doing your own one.
Res. - Pupil 6 any comments?
Pupil 6 - It was alright until you got to your own and then I did not like it any more.
Res. - What about the creation element of the mscape?
Pupil 1 - I didn’t really like it. I didn’t enjoy it.
Res. - Would rather simply be a recipient of an mscape?
Pupil 1 - Yes.
Res. - Pupil 11?
Pupil 11 - I dragged out far too long. It was just too boring it wasn’t fun. It wasn’t a fun topic at all.
Res. - How would you have liked to use mobile technology then?
Pupil 11 - Just give us a go. If you (the researcher) had have created one.
Res. - So get the teacher to create it and the mscape last for one or two classes you would be happy?
Pupil 11 - Yes. It was just far too long and too much work to do.
Res. - What about if a different topic had been used?
Pupil 11 - No there was just too much work to do.
Res. - Let’s have a look at what the focus group participants stated.

Focus Group Comments Projected onto IWB

Pupil 2 - “Excited because it was good to get out of the classroom and you learn it better……you are outside of the classroom you are not looking just at a page. I like being active instead of just always listening to information”.
Pupil 14 - “I thought it was useful because it helped me get a better understanding of the different skills. You had to use the map and symbols to figure out where to go”.
Pupil 13 - “It was good because you got to use the grid references and compass points as opposed to just looking at them from a textbook”.
Pupil 16 - “I liked it because you got to do it outside with your friends instead of sitting in class and not being able to talk”.
Res. - Any of those states stand out?
Pupil 4 - Yes the statement by Pupil 14. I felt it was important to get out and practice what we covered in class. The mobile activity helped me understand the topic better.

Pupil 12 - I agree with Pupil 4 you learn better when your get the chance to actually practice what you learn. The technology helped me do this.

Res. - Pupil 14?

Pupil 14 - I agree with all of the statements. I liked the activities and I enjoyed getting outside.

Res. - Anyone else like to comment before we move on?

All Pupils - No.

If you had to describe your experience of using mobile technology in two-three words what would it be?

Pupil 3 - I thought it was boring.

Res. - The whole creation and/or the mucape activities?

Pupil 3 - The creation of it. The activity was ok.

Pupil 5 - I thought it was really new. I liked it.

Res. - Pupil 9?

Pupil 9 - I liked the creation but it would have been better if it did not go on as long. I really enjoyed the experience.

Pupil 7 - I think the creation part dragged on a bit but the actual bit were we were out doing it (the treasure hunts activities) was really boring.

Res. - So you were happy with the creation?

Pupil 7 - Yeh it was ok.

Pupil 11 - I did not like the idea of going outside. It bored me a bit.

Res. - So would you rather be in the classroom?

Pupil 11 - No I wouldn’t rather sit in the classroom. It was just a bit boring going out and standing with the wee thing (PDA). Every time I got confused I cracked up. The leads and all was hard to deal with. I did see the point in it.

Res. - What do you mean?

Pupil 11 - The amount of work.

Pupil 8 - It would have been better if you were on your own or something. If it was just for you it would have been better. You knew everyone was doing the same.

Res. - So Pupil 8 you felt that it was a disadvantage when people completed the activity in a group rather than by themselves?

Pupil 8 - Yes.

Res. - Pupil 10, two or three words.

Pupil 10 - I thought it should have been more like a competition. I thought everyone was going to get all competitive and all but we never.

Pupil 16 - Different. I thought it was fun.

Pupil 2 - Time consuming but it was interesting.

Pupil 13 - It was unique but a bit frustrating when creating it. I didn’t like that part.

Res. - If we now have a look at what the focus group participants stated.

Focus Group Comments Projected onto IWB

Pupil 16 - “Fun, exciting and interesting”.

Pupil 13 - “Fun, different and interesting”.

Pupil 14 - “Fun, enjoyable and different”.

Pupil 2 - “Exciting, fun and worth it”.

Res. - Any comments?

Pupil 12. They all state fun. I agree with that.

Pupil 15 - It was fun.

Pupil 11. It might have been fun at one time but by the end it had lost its appeal.

Pupil 6 - I agree with Pupil 11. It went on too long and I lost interest.

Pupil 5 - It was good to try something different I would like the chance to experience it again.

Pupil 13 - It was nice to be part of something new and different.

Were there any benefits in using mobile technology to learn about OS Skills?

Res. - This is not just about the benefits of using mobile technology but more specifically to help you learn about OS Skills.

Pupil 1 - It was good because you actually went out and did it, for example when you got the grid reference clue. I thought that was good because you were actually doing it and had to figure things out for yourself.

Res. - So did you feel it add to your knowledge of grid references or was it simply repeating what you already knew?

Pupil 1 - It added because you were doing it yourself.
Pupil 14 - I thought it was good to get out of the classroom and I agree with Pupil 1 that it was a benefit that you got to do the grid references yourself.

Res. - Pupil 3?

Pupil 3 - I thought it was good the fact that you got to go outside, this made it different.

Pupil 5 - I thought it (the treasure hunt activities) was not as serious as being in a classroom. You did not feel under lots of pressure or stress. We are also use to mobiles and all so it was familiar.

Res. - Pupil 15, what Pupil 2 of skills do you think you picked up to do with OS?

Pupil 15 - Using the grid references because it is different than applying them on a page. I wasn’t too good at them (grid references) but then I got practice and now I understand them better.

Res. - Any other skills?

Pupil 15 - Remembering the symbols.

Res. - What about for direction? Did anyone find it useful?

Pupil 7 - No I did not find it easy for direction. For some of the treasure clues you had to work out direction. We could not find where the direction was or east or whatever.

Res. - I will show you now the focus group statements.

Focus Group Comments Projected onto IWB

Pupil 14 - "It gave me a better understanding because you got out of the classroom and you got to put it into action. It was a change from reading out of a textbook. You had to go to the places. You had to use the grid references to get to each place. You felt you success or failure depended on you getting it right".

Pupil 13 - "We got to go outside and do the work ourselves, like the compass direction. You had to learn where north was for 'you' (i.e. yourself) instead not having an interest ...It made the learning easier and I enjoyed the mscape".

Pupil 16 - "Being outside and doing things for yourself. Whereas if you are in the classroom you can copy from others and often just get a mark. Using the technology outside makes you feel more engaged".

Pupil 2 - "You learnt more because you had to use the OS Skills yourself and put them into action. When you are sitting in the classroom it is too easy to depend on others".

Res. - Are there any you agree or disagree with?

Pupil 11 - There all much the same as everyone has been saying. Everyone is saying because it is different and you get to go outside. I really disliked it.

Res. - It didn’t appeal to you?

Pupil 11 - It was good but for how long it took and what we did and the short time it (the treasure hunt) lasted I didn’t like it.

Res. - So for you the end did not justify the means?

Pupil 11 - No I didn’t see the point in it.

Res. - Pupil 8?

Pupil 8 - Pupil 16. The bit about doing things for yourself. It was independent it a way but I ended up following other people just because they were in my group. I think if I had have done it properly it would have been a really good experience.

Res. - You would have liked the opportunity not to follow other people, such as staggered start time?

Pupil 8 - There was some independent work though.

Res. - Pupil 9?

Pupil 9 - It helped me learn about direction, such as going north. In class 1 was confused about direction but the activity helped me understand it better. It was a worth while experience.

Res. - Would anyone want to agree or disagree with the last statement by Pupil 2? It focuses on the getting outside and actually doing the work as the big benefit.

Pupil 11 - No because you had to learn the stuff before you had to put it in (into the mscape). The creating part was probably more learning because you had to know what you wanted and how to do it.

Res. - So for you, you learned more from the creation than from the actual treasure hunt activity?

Pupil 11 - Yes.

Res. - Anyone else?

Pupil 8 - You got to learn how to use different technology and programmes to help make the mscape.

Res. - So Pupil 8 you are bringing in that you did not just learn about Geography and OS Skills but also about ICT skills particularly mobile technology.

Pupil 8 - Yes.

Pupil 14 - It is important that teachers allow pupils to experience different ways to learn this activity did just that. It might not suit everyone but well worth a try.

Res. - Were there any disadvantages or limitations in using mobile technology to learn about Rivers?

Pupil 7 - Mine did not work.

Res. - The mscape on the PDA?

Pupil 7 - Yes. I got to do the first one but after the first one it (the mscapes) stopped working.

Res. - Pupil 9 any problems?
Pupil 9 - A bit boring towards the end.
Pupil 5 - I worked fine no real problems.
Res. - Pupil 6 and aspects that you did not like?
Pupil 6 - Going outside.
Res. - Generally outside or what about learning in action. Does that appeal in any form to you?
Pupil 6 - Not really.
Res. - Pupil 13?
Pupil 13 - I thought it was alright. Mine worked ok.
Res. - Those at the back any comments?
Pupil 8 - The people who left the treasure on the floor. They sometimes made it hard to find.
Res. - This made the activity harder?
Pupil 8 - Yes trying to find the gold coins.
Res. - What about during the creation - any disadvantages?
All Pupils - NO RESPONSE
Res. - Did the creation go on too long?
All Pupils - Yes
Res. - Who did not like the actual event on the day?
Pupil 7, Pupil 6 & Pupil 11 - Put up their hands to signal they did not like participating in the mscape treasure hunts.
Res. - Let’s see what the focus group said.

Pupil 13 - “It was good to see it all together at the end but it did take a long time. But I suppose when you saw it at the end it was worth it”.
Pupil 14 - “I agree with Pupil 13. It was really long to make the mscape and sometimes I was left to do the work and it was frustrating”.
Pupil 2 - “I think the same as Pupil 14. Sometimes you had more work to do that others. That was unfair, at times some people just sat there and it was me doing most of the work”.

Pupil 16 - “Sometimes you put so much work into things and at the end they did not work out the way you wanted them to. Such as pictures as sounds that would not work properly. Apart from that it was very good”.
Res. - (As a prompt after no initial response) Pupil 16 is quite interesting. The idea that you put quite a lot in but often the end does not justify the means. That’s back to an earlier comment by you Pupil 11.
Pupil 11 - Yeh it wasn’t doing it justice for everything we sat and done.
Res. - What about Pupils 13 – the optimistic viewpoint?
Pupil 16 - Yes it was good to see the finished product.
Res. - Is there anyone that would love to rewind the clock back and say ‘No I would not have participated’ or ‘having known what I now know I would not have signed up for it’?
Pupil 6, Pupil 11, Pupil 3, Pupil 10, Pupil 9, Pupil 7 - All put up their hands signifying that with hindsight they would not like to have undertaken the treasure hunt mscape task.
Pupil 11 - I would have liked to do it but if we had have got the idea given to us or the mscape handed to us.
Res. - That’s the idea of you simply being a recipient of the mscape?
Pupil 11 - Yeh.
Pupil 3 - Even if it was broken down over different classes, just because we got parts of it as a homework I didn’t like it.
Res. - So did it become monotonous for you at the end?
Pupil 3 - Yes.
Res. - Any other comments?
Pupil 9 - It was the creation that I didn’t like. The actual treasure hunts were not too bad, in fact they were fun, perhaps not three in one day in future. The creation however dragged on. I saw no real benefit in creating the mscape, how does this relate to our Geography syllabus?
Res. - Pupil 9 has a good point we should only use technology if it helps us learn what’s on the syllabus. The creation was so time-consuming and there was no need. All we needed to experience was the finish treasure hunts.

51. Do you think the use of mobile technology facilitated independent (individual) learning?
Res. - Did the task and activity help you learn by yourself?
Pupil 8 - I don’t know what you’re asking?
Res. - I am asking is there any part of the entire activity such as the creation or on the day of the treasure hunt mscapes that you felt the mobile technology helped you learn?

Pupil 8 - The speeches but I was devastated that my voice was reading out the information on the day.

Res. - Someone mentioned in the focus group, and you will see it in a minute, the idea of learning about the software such as Audacity or image software.

Pupil 5 - I am really bad at computers but I had to learn how to record the speeches.

Res. - How did you feel when you achieve this?

Pupil 5 - Good, but let down some parts were not used.

Pupil 8 - I wasn’t shown how to use Audacity but when me and Pupil 5 were using it I enjoyed using it.

Res. - What about on the actual day when you were out with the PDA did it anyone learn? Was it sufficient for you to use the handheld computer to learn or did you need other people?

Pupil 11 - I did not like the way other people were there. The fact that other people were there you could depend upon them. It’s like what Pupil 8 said if you were by yourself you would have to focus more.

Res. - Pupil 10?

Pupil 10 - I did the first one by myself and went off and found the treasure.

Res. - No problems?

Pupil 10 - There was a bit of a problem trying to find the treasure.

Res. - Let’s see what the focus group participants said.

Focus Group Comments Projected onto IWB

Pupil 13 - “I did work by myself and learnt a lot. But I also worked with Pupil 15 and Pupil 5”.

Pupil 16 - “You got to learn things when making the mscapes and the first mscape we did (i.e. the Thames Mscape) you even learned something that you would not have grasped in class”.

Pupil 14 - “I thought it helped me get a better grasp of grid references and then identify the symbols. I was able to identify the symbols quicker (than in the classroom) … We worked as a team and worked together but I liked also working by myself”.

Pupil 2 - “You had your own PDA so you felt you were responsible for you’re learning and getting to the next part yourself. Sometimes you where at a different part of the clue that others so you had to move ahead and you got to use the GIS Skills by yourself”.

Res. - Pupil 14 stated that it gave her a better grasp of grid references. She was able to go off by herself with the mobile technology and learn independently. Is this a fair statement?

Pupil 5 - Yes because it is so much different than actually learning from a textbook. You have to go out and you know you are wrong if you do not hear the next clue. Also in class maybe you don’t want to ask (the teacher).

Res. - So you do not have the same degree of shyness when outside with the technology?

Pupil 5 - Yes.

Res. - Any other comments?

Pupil 9 - I like to learn by myself but this activity was geared more towards the group approach. That’s why so many people completed the tasks as a group. It could however be changed to make it more independent therefore allowing those who want to learn by themselves to have a go.

Res. - Change, how?

Pupil 9 - Time how long it takes to complete the treasure hunts this will make people want to do it by themselves.

6b) Do you think the use of mobile technology facilitated group work (collaborative) learning?

Res. - You actually created the mscapes in a group and on the day of the treasure hunts appeared work together as a group. Did anyone like or not like the group aspect?

Pupil 5 - In case someone does not do the work.

Res. - Let’s look at the creation aspect - did everyone feel there was an equal distribution on work?

Pupil 12, Pupil 2, Pupil 15, Pupil 16, Pupil 1 A & Pupil 14 - No

Res. - How many of you feel there was (an equal distribution of work)?

All Pupils - (No Hands up)

Res. - Most people who felt they ended up doing more than they should - any comments.

Pupil 5 - The group leaders got too much.

Pupil 10 - The people who got too much could have easily said, ‘we have too have too much’. Then we could have spread it more but they never said.

Res. - Do you think a better way around this issue is to enlarge the groups so as there are more people to spread the work out or perhaps spend more time discussing how groups work? Or would the latter point be a waste of time?

Pupil 10 & Pupil 11 - A waste of time.

Pupil 11 - It would just drag it out more.
Pupil 15: It might be better if the teacher assigned the work.

Res.: So you would be happy with the teacher stating, 'I want you to do this, this and this'?

Pupil 13, Pupil 3, Pupil 11, Pupil 6 & Pupil 7: Yes.

Res.: Is there anyone who felt the group work was really beneficial, they learned something or even learned something about themselves? Such as natural born leader or they Pupil 4oped up when things weren't being done.

Pupil 13: I worked with other people that I normally would not have worked with before.

Pupil 8: That's what I also liked about it.

Res.: Pupil 16 what about you?

Pupil 16: You got to learn that you could actually work in a group, whereas before you maybe thought you couldn't. You also found you could get along with people you didn't know very well.

Res.: No one ever came to me to say there was a major problem within the group. Is that a fair statement?

All Pupils: (Nod their heads in agreement)

Res.: If you go to the day of the mediascape now. Why did most of you decide to go around and do them (the treasure hunts) as a group?

Pupil 4: I though you wanted it that way.

Pupil 11: That who you did the creation part with so you felt comfortable and familiar these people.

Res.: Those who broke away, Pupil 8 why did you do this as opposed to work within a group?

Pupil 8: One person going that way and another going a different way so I just wanted to do it by myself. I didn't find the treasure (laughs) I still needed a bit of help.

Res.: Here's what the focus group stated.

Focus Group Comments Projected onto IWB

Pupil 16: "You worked in a group to actually create it and then when you where out doing the activity you were in a group. At some stages you may have been ahead or behind others but it was largely done as a group...I have learned how to work in a group and how to communicate better."

Pupil 13: "We worked in a group to find the treasure and it was good to work in a group with people you know. You also got to know people better."

Pupil 14: "Yes -- I was happy to do it as a group... When creating the mscape I learned that when nothing was being done I went ahead and did it for the group. Although this often frustrated me and caused a lot of pressure.

(If it would have been good to have) larger (group) so you could spread the workload".

Pupil 2: "I liked the group work. When you were in the classroom the group worked well at times and when outside it was helpful to work with others. When you worked as a group you could help each other more, compared to just working by yourself".

Res.: A lot of what you have said came through in the focus group.

Pupil 8: I didn't create enough work in my group.

Pupil 5: Neither did I.

Pupil 8: There far smarter than me and all. If I had have made a conscious effort to go and do something then I would have went and done it and possibly enjoyed it more. I was dependent on everyone, they were just working away.

Res.: It's not to do with smartness some like to led, some sit back and some don't do it one purpose but they are waiting for a person to Pupil 4 up and say, 'do this for me'.

Pupil 8: That's me.

Res.: What about the statement by Pupil 2?

Pupil 12: Yeh I agree.

Res.: Let's have a show of hands. How may people felt on this activity working in group helped them learn more than they believe they would have learned working by themselves.

All Pupils except Pupil 1 & Pupil 11: (Hands up in agreement with the Res. Statement)

Do you think mobile technology should be used in the future to help pupils learn about OS Skills?

Pupil 8: Yes because it was good.

Pupil 5: Yes but only for bits and pieces.

Pupil 11: I was good in the end but not worth all the creation.

Pupil 2: Yes because learning things in class sometimes means nothing but when you are outside you can learn better. It is because it is a practical thing.

Res.: Pupil 9?

Pupil 9: If it was only one mscape then yes but not everything we did.

Pupil 3: It does help you understand more if you do it as a practical.
Res. - Any other comments before we move on to look at the focus statements? Would anyone not like to see it used in the future?

Pupil 10 - No. Why would you want to use it to learn stuff.

Res. - You feel mobile technology did not really have anything of value to offer you? Was there nothing good at all?

Pupil 10 - No - except for the treasure maybe (all pupils laugh).

Res. - Here's what the focus group said.

Focus Group Comments Projected onto IWB

**Pupil 14** - "Yes I think it gives pupils an experience of how to use the different map skills".

**Pupil 16** - "You learn in the classroom but you don’t really know how to use the skills. When you go out then you practice using the skills. It is better that way. You end up learning more than you actually thought you did. It also helped you find out what you know and what you don’t know’’.

**Pupil 2** - "It definitely should be used again because you are not sitting looking at a page. When you are out there you are thinking what do I need to do and you are practicing what you have and are learning. It is therefore helpful to learn from’’.

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**Pupil 2** - ‘’the first mscapae did not work. It was not a big issue as I was working with my group so could follow along and still take part and I knew I could do the next one’’.

**Pupil 13** - "I would prefer prepared mscapae that you could download and just go out and do. When doing the treasure hunts they helped with compass directions and symbols’’.

Res. - The comments displayed have been split. The slightly more negative comments are at the bottom and the more positive at the top. Pupil 13’s comment is similar to an earlier comment about just having mscapae available for downloading.

Pupil 11 - I would rather have a quiz.

Pupil 8, Pupil 2 & Pupil 7 - Yeh me too.

Pupil 8 - Like a slide show or something.

Pupil 11 - Just a quiz.

Res. - Did you not see the treasure hunt as quiz as you went around?

Pupil 11 - I didn’t see it. I saw it as boring I did not see the point in it, whereas if it was a quiz you could have guessed yourself. You could have done this better by yourself.

Res. - You felt you want more of a fun element?

Pupil 11 - Yes. One of the groups had a time thing in theirs and it made you go around quicker.

Res. - Any other comment displayed that you wish to comment on? Pupil 1?

Pupil 1 - The Pupil 2 one where you actually are going out and doing it rather than sitting looking at a page. Whenever you are doing it, I cannot really explain… whenever you are looking at a page you get bored and don’t want to do it but whenever you are out doing it is more exciting.

Do you think mobile technology has a future role to play in GCSE Geography?

Pupil 11. - No but maybe if you had it on a mountain or something it would be so fun… if you had clues and had to try and work you way around.

Res. - So you want to go out on location?

Pupil 11 - Yeh. If you still got to go outside and experience it yourself but not with the mobiles. I kept clicking on all the wrong buttons, that was so annoying.

Res. - But would you want the devices?

Pupil 11 - I couldn’t really understand the map. I just moved around until the person (GPS icon) moved.

Res. - Pupil ??

Pupil 7 - No not really I found it boring.

Res. - Pupil 2?

Pupil 2 - Yeh because learning can be stressful sometimes and you are always in the classroom so if you could get out once and while it would be good to ease up on the pressure.

Res. - Pupil 15 what about you?

Pupil 15 - Yeh I thing it should be used again but not as much of the creation. Perhaps if the teacher could create it.

Res. - Pupil 14.

Pupil 14 - I think once and a while and only if you were the recipient. I would not want to create another one.

Res. - 1 mobile technology going to go away in your eyes or do you think GCSE is going to see more of this creeping in?

All Pupils except Pupil 6, Pupil 11 & Pupil 3 - More

Pupil 5 - I think it should.

Res. - Why Pupil 5?
Pupil 5 - If you think about how much schoolwork is about computers you have to do all your coursework on the computer and research and research. So it is all moving towards computers.

Res. - Pupil 11 I am coming back to you again about this mobile technology. If the mscape worked on the iphone would that appeal to you compared to the iPaq?

Pupil 5, Pupil 2, Pupil 14 & Pupil 12 - Yes.

Pupil 11 - It would be good but I would prefer it without the technology. Plain and simple is sometimes the easiest. I would be easier if you had a poster (page) and had to answer a question and then move onto the next one and keep going. All that (the mobile technology) there is no need for it.

Pupil 8 - An actual (normal, i.e. minus the mobile technology) treasure hunt would have been good.

Res. - Let's see some of the focus group comments.

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Focus Group Comments Projected onto IWB

Pupil 2 - "I wouldn't want too many topics incorporating mobile activities. It could become too much. Maybe about a quarter of the topics...It is about finding a balance and not making it too tedious".

Pupil 14 - "I like the way you learn the same things from mobile technology as from the classroom, but it is a more fun way than the classroom".

Pupil 16 - "Possibly little bit once a year. Perhaps at the end of the year".

Pupil 13 - "It is best used for revision in purposes, especially when it is sunny...You need the theory first. I would like to go to the actual place where the mscape is based. This would make it more real".

Res. - What about Pupil 14's statement about it being a more fun way to learn?

Pupil 11 - It's not really.

Pupil 5 - It just depends if you like technology or not.

Pupil 3 - Yeh I agree with Pupil 5.

Res. - Am I correct in assuming by this stage you are all now more definite about liking or disliking the use of mobile technology to help you learn? Pupil 10 you were possible the only one during the first mscape to not particularly like technology but now it appear more would agree with you.

Pupil 4 - I think so.

Pupil 10 - Me too.

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9.) Would you like to see mobile technology being used more frequently in GCSE Geography?

Res. - I don't think anyone here would like to see another mscape drag on as long as the treasure hunt activity. Do you want to see it every topic?

Pupil 15 - Yes

Pupil 14 - Yes

Pupil 5 - Yes at the end of each topic.

Res. - To revise?

All Pupils except Pupil 11

Pupil 10 & Pupil 7 - Yes

Pupil 11 - You could have one at the start and the end to see you general knowledge.

Pupil 8 - I think it should be used at the start and the end because it might like the tests we did see if we have improved.

Res. - Are you only taking about one or two classes at the start and/or the end and none of this creation?

All Pupils - (Register their dislike for the creation phase).

Res. - Anyone just want the use of mobile technology once a year or every other topic or possibly leave it until the end of Year 12?

Pupil 5 - There should be one at the end of the year before your summer tests.

Pupil 8 - I should be part of the test.

Res. - Pupil 16?

Pupil 16 - I would be good for revision possibly every term.

Res. - At what point does this become tedious, meaning you have had a enough of it? How many classes?

Pupil 12 - About four.

Pupil 11 - When you kept coming into class and saw mscape (on the whiteboard) you were like... (gestures disproval) and homework - no.

Res. - So once it started moving into homework it lost some of its appeal?

Pupil 14, Pupil 15, Pupil 2,
Pupil 8 - I didn’t do any homework (laughs).

Res. - Let’s move onto the focus group responses to question 9.

**Focus Group Comments Projected onto IWB**

<table>
<thead>
<tr>
<th>Pupil 2</th>
<th>“It really did increase your confidence because why you figured things out you felt good about yourself”.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pupil 11</td>
<td>The amount of work our team put in was a lot. When I saw our mscap e I thought you were serious. Is this what we sat and done?</td>
</tr>
<tr>
<td>Pupil 6</td>
<td>I didn’t like it.</td>
</tr>
<tr>
<td>Pupil 8</td>
<td>The songs made me feel good.</td>
</tr>
<tr>
<td>Pupil 11</td>
<td>The songs were the best part of it.</td>
</tr>
<tr>
<td>Pupil 12</td>
<td>I liked the songs.</td>
</tr>
<tr>
<td>Res.</td>
<td>Anyone feel their ICT skills improved.</td>
</tr>
<tr>
<td>Pupil 5 &amp; Pupil 8</td>
<td>Definitely yes.</td>
</tr>
<tr>
<td>Res.</td>
<td>Another question is that ‘you all learn differently, did the mobile technology allow for that?’</td>
</tr>
</tbody>
</table>

**Focus Group Comments Projected onto IWB**

<table>
<thead>
<tr>
<th>Pupil 2</th>
<th>“It was good it had everything in it like sounds and pictures and you had to move about”.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pupil 14</td>
<td>“I think it had all the factors that helped different people learn. You had the images in front of you and then you have the audio as well”.</td>
</tr>
<tr>
<td>Pupil 16</td>
<td>“It was all there for people who like different things”.</td>
</tr>
</tbody>
</table>

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Pupil 8 - Pupil 13. It’s what I think.
Pupil 15 - Pupil 13 is exactly what I think. It should be used for revision at the end of each of the topics.
Pupil 3 - Pupil 13 the second statement. I don’t really like OS Skills.

**Focus Group Comments Projected onto IWB**

<table>
<thead>
<tr>
<th>Pupil 14</th>
<th>“I would only want to do it once and a while because it is a different way of learning and I am not yet really used to it. At the end of a topic, once you have learned most of it, therefore it is just like a recap for revision”.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pupil 13</td>
<td>“...just for revision at the end of each of the seven main geographical topics”.</td>
</tr>
<tr>
<td>Pupil 13</td>
<td>“It would have been good to create the rivers one, were you what learn the facts in advance. The OS Skills one would have been better just to do the activity rather than the creation part also”.</td>
</tr>
<tr>
<td>Pupil 2</td>
<td>“To have it at the end of each topic would be good, for revision purposes. We could also use it in the middle of a harder topic to help”.</td>
</tr>
<tr>
<td>Pupil 16</td>
<td>“I would not like it at the end of every topic because it would get boring and people would see it as a test. Once a year to recap over everything would be like a treat, just box it all into one”.</td>
</tr>
</tbody>
</table>

Pupil 8 - Pupil 13. It’s what I think.
Pupil 15 - Pupil 13 is exactly what I think. It should be used for revision at the end of each of the topics.
Pupil 3 - Pupil 13 the second statement. I don’t really like OS Skills.

**Focus Group Comments Projected onto IWB**

<table>
<thead>
<tr>
<th>Pupil 8</th>
<th>Pupil 17?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Res.</td>
<td>Like Pupil 3 the second one of Pupil 13. Because you can learn stuff first so you can know what you are doing.</td>
</tr>
<tr>
<td>Res.</td>
<td>Out of the focus group interview other issues arose which I am calling ‘Additional Info’. So how did the use of mobile technology make you feel about yourself? We will let you see some of the pupil statements.</td>
</tr>
</tbody>
</table>

**Focus Group Comments Projected onto IWB**

<table>
<thead>
<tr>
<th>Pupil 13</th>
<th>“By creating the mscap e you saw how ideas come and you learned how to do it. At the end you put a lot of work in and you saw it was worth it. I felt better about myself”.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pupil 16</td>
<td>“When you complete the tasks you feel really proud of yourself because you have actually done it and got it right”.</td>
</tr>
<tr>
<td>Pupil 14</td>
<td>“...it makes you feel good. I was introduced to a couple of different things, such as Audacity and I learned how to use it. I was proud of myself because I learned something new, not only for Geography but for other subjects”.</td>
</tr>
</tbody>
</table>

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Pupil 8 - Pupil 13. It’s what I think.
Pupil 15 - Pupil 13 is exactly what I think. It should be used for revision at the end of each of the topics.
Pupil 3 - Pupil 13 the second statement. I don’t really like OS Skills.

**Focus Group Comments Projected onto IWB**

<table>
<thead>
<tr>
<th>Pupil 12</th>
<th>It had something for everyone.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pupil 4</td>
<td>You had to listen but the clues also appeared as text or pictures. I liked this.</td>
</tr>
<tr>
<td>Pupil 13</td>
<td>So did 1.</td>
</tr>
<tr>
<td>Pupil 2</td>
<td>Yeh if you missed some information you could either get it from the picture or sound or vice versa. Or you could hit the replay button on the PDA, that was useful.</td>
</tr>
<tr>
<td>Res.</td>
<td>Ok and the last question to come from the focus group interview - What about problem solving? How did mobile technology help?</td>
</tr>
<tr>
<td>Pupil 13</td>
<td>It did help solve problems on the day by giving you the clues.</td>
</tr>
<tr>
<td>Pupil 12</td>
<td>But it was the others in our group that chanted and solved the problems, not the technology directly.</td>
</tr>
<tr>
<td>Res.</td>
<td>So the technology for you Pupil 12 was a facilitator in helping to solve problems rather that the chief reason.</td>
</tr>
</tbody>
</table>
Pupil 12 - Yes.
Pupil 15 - It all worked together as one. You needed the technology to provide the clues and give hints. You couldn’t ask it questions so you chatted to others in your group.
Pupil 2 - It was like a Pupil 4-by-Pupil 4 process, but a fun away to do it.
Res. - Any other comments.....If not we will look at what came out of the focus group interview.

**Focus Group Comments Projected onto IWB**

| Pupil 2 | “It was good. When my first mescape did not work I could still help group figure out the clues. Looking at and listening to the PDA helped solve the clues as well as working with other people”.
| Pupil 13 | “Once of the clues we only had two of the four figure grid references but after a while we were able to replay the clues and work together to solve the clue. Everyone did a little bit”.

Pupil 8 - It helped me with the clues.
Pupil 2 - Pupil 13’s point. When you could solve a clue you discussed it within the group to get the next part.
Pupil 13 - Working together was what solved the clues.
Res. - Any other comments?
Pupil 10 - It was an adventure.
Res. - To conclude who would never like to see a mescape being use again?
Pupil 6, Pupil 7, Pupil 10, Pupil 11 & Pupil 3 - (Agreed with statement by putting their hands up)
Pupil 5 - I actually like learning with the mescape.
Res. - Would that be a fair statement for the rest of you who did not have you hand up?

All Pupils except Pupil 6, Pupil 7, Pupil 11 & Pupil 3 - Yes.
Res. - Thank you and this now concludes our class interview.
The interview took place on Monday 30th November 23:35-1:35pm. All pupils were present at the interview except pupils 4, 8, 9 and 18. Duration approx. 34 minutes.

Res - Res - Researcher

13. On reflection did you enjoy using mobile technology to help you learn? (If so why and if not why not?)

Pupil 7 - I did not mind it, I thought it was OK. But over all I did not enjoy it.
Res -

Pupil 10 - No I did not enjoy it.
Res -

Pupil 10 - I don't like technology.
Res -

Pupil 10 - I remember from earlier interviews you expressed similar views. So your views have changed?
Res -

Pupil 10 - No. I really don't like it.
Res -

Pupil 13 - I did not like technology at all.
Res -

Pupil 10 - Why?
Res -

Pupil 10 - I don't like technology in general.
Res -

Pupil 10 - Let's have a look at some of the statements from the focus group interview:

Focus Group Comments Projected onto IWB
Pupil 2 - "Yes because you get out of the classroom you were not looking at a textbook. You were active and doing practical activities. It also made you learn more and made you more willing to learn more."

Pupil 5 - "I agree with Pupil 2, getting outside and doing the activity was better than just sitting looking at a textbook and getting bored. We are using technology everywhere now so we are more used to it and more familiar with it."

Pupil 13 - "I liked it. It was good to get out of the classroom. You had the information right in front of you and it was more interactive than a textbook."

Pupil 7 - "I liked doing the activity but didn't like the creation aspect. I also liked it when you got out of the classroom."

Pupil 16 - I agree with the statement about not sitting in the classroom looking at a textbook.
Res -

Pupil 12 - "I agree with Pupil 7 about not looking at a textbook or because you were getting to use mobile technology?"
Pupil 1 - I agree with the statement about not liking technology or not.

Pupil 11 - I just did not like technology at all. You were scared to touch it or something.
Res -

Pupil 11 - Do you have a mobile phone?
Res -

Pupil 11 - Yes but it's broke!
Res -

Pupil 6 - I wasn't keen on it all.
Res -

Pupil 6 - Why not?
Res -

Pupil 5 - I really enjoyed it.
Res -

Pupil 16, Pupil 2, Pupil 1, Pupil 13 & Pupil 14 - (Agreed with Pupil 5).

23. Was the experience of learning about Rivers through mobile technology better than classroom-based theory? (i.e. textbook based theory/learning?)

Pupil 13 - It was but you needed to know the textbook theory first. I liked using the technology.
Res -

Pupil 16 - I preferred going outside and doing it rather than just sitting looking at a textbook. Sometimes textbooks are boring.
Res -

Pupil 5 - I liked going out using the technology because if we are using a textbook you can look away too easily and become distracted. But when you are on your own with technology you listen more.
Res -

Pupil 14 - Did you get the feeling of technology made you learn?
Res -

Pupil 5 - Yes. Otherwise you missed information and got things wrong.
Res -

Pupil 14 - Pupil 7, back to you, textbook or technology?
Res -

Pupil 14 - Both. I liked textbooks but the technology did force you to listen and made learning easier, less stressful. If a balance could be found between the use of mobile technology and textbooks we would get the best from both [pedagogy] and this would help me understand geographical topics better. After all we are familiar with the textbook approach, it's what we know.
Res -

Pupil 14 - So you found technology took away the stress of learning?
Res -

Pupil 14 - Kind of.
Res -

Pupil 7 - Both also but I don't really like either of them.
Res -

Pupil 13 - I agree with Pupil 7. But may be again with textbook and move onto technology just as we did.
Res -

Let's review the focus group statements.
Pupil 1 - "You could not cover all the information via mobile technology you therefore need to initially use the textbook."

Pupil 11 - "I didn't feel like I was learning anything. If it was in textbooks it is easier to learn."

Pupil 13 - "It just depends if you like technology or not, if you are in it then you would have enjoyed it but if not then you would not have found it any good."

3 What aspects of Rivers did mobile technology help you understand the most? (Be specific)

Pupil 10 - "The long river profile"

Pupil 7 - "Nothing - nothing more than the textbook."

Pupil 3 - "It did not help with anything specific"

Res - Pupil 5?

Pupil 5 - "The river features - the way you saw the features moving rather than just static diagrams. This helped me visual it more."

Pupil 12 - "It helped me understand better where you expected to find the features. I now have a clearer understanding where each feature is supposed to be."

Pupil 1 - "Yes I agree with Pupil 12"

Res - Any other comments?... If not then let me recall th key statements from the focus interview.

Focus Group Comments Projected onto IWB

Pupil 1 - "When you where outside you needed to know the basic information from the textbook. If we did not know the textbook information we would have had no idea where to start on the escaper."

Pupil 13 - "I think it was as good as you were going to get without going to a river. But in Pupil 5 used you still need all the background knowledge from the textbooks to follow the escaper."

Pupil 5 - "When we were doing it the river features because it was like walking along from the upper to the lower course. It was better, than a textbook, in helping you associate specific features to the correct part of the river course. By walking along the river it made you remember it more."

Pupil 13 - "The technology helped to learn better where the feature should be. Now when you have a test it is easier than with textbooks to think back to where you where on the escaper when you saw the feature."

Pupil 1 - "When you where going along a river it was good to see the features."
5. Was the experience of learning about OS Skills through mobile technology better than classroom-based theory (i.e. textbook-based learning)?

Pupil 1 - Some of the skills are quite difficult to learn so it was good to try them out.

Pupil 13 - I think you need the technology to allow you to use the skills, which then enables you to completely understand. It was much better than looking at OS Skills through a textbook. You learn better through practice.

Pupil 2 - Technology - because you had to learn to do it yourself. When looking at a book it can be hard to understand but when you are out there you have to put the skills into practice.

Res - Anyone else?

Pupil 16 - I enjoyed getting active and learning through direct involvement. I had responsibility for my learning.

Res - The focus group used.

Focus Group Comments Projected onto IVB

Pupil 2 - "Yes because you got to carry it out yourselves. It was hard to understand via textbooks but when you were forced to do it yourself you had a better chance of understanding OS Skills... You have to actually put your skills into practice."

Pupil 5 - "I think OS Skills is not just about learning information, it is a skill which you have to put into practice by going out and having to use it. Then when it comes to a test it is easier to recall the information."

Pupil 13 - "The fact that you had to do it - like with the treasure hunt. You wanted to successfully get to the end. You also need a hands-on approach with skills if you want to fully understand them."

Pupil 1 - "It was very practical and helpful to understand it better."

Res - Pupil 10 was an advantage over the textbook, getting out having to participate with the OS Skills?

Pupil 10 - If I wasn't honest it was good for OS part.

Pupil 11 - I liked going out and doing something but I would have preferred to do it without the technology. You do not need technology to do OS Skills.

Pupil 3 - I found the textbook easier because it is there in front of you.

Res - Any other comments?

Pupil 12 - Technology is good for revision. To allow you to practice what you have already learned through textbooks. Therefore both textbooks and technology are important.

6) What about limitations in using mobile technology to learn about OS Skills? (If so what were they?)

Pupil 16 - I don't think so. I enjoyed it.

Res - Pupil 5?

Pupil 5 - I do not think there is any because OS is skill based so for direction and symbols you would need a hands-on approach. You learn more when you have to get to a place. You become more active to get there so you would use technology to help.

Pupil 1 - It was all good.

Res - Anyone else?

Pupil 7 - I did not like the creation part of the OS escape. There was no need for it.

All Pupils - (Not in agreement)

Res - From the focus group we discussed the following.

Focus Group Comments Projected onto IVB

Pupil 5 - "I don't think there was any. I really enjoyed doing OS skills from the mobile learning activity. I didn't get it in class during normal lessons. I had to always flip back through my notebook to find the answer to questions. What you were doing the escape you had to actually think what direction do I need to go? Rather than having the only option to look back through notebooks. Therefore I do not think there were any limitations."

Pupil 2 - "I think the same. I don't believe there were any limitations. Because it was a skill you had to do it yourself. Therefore I believe you need technology to help with OS Skills."

Pupil 13 - "Sometimes we lost the GPS signal."

Pupil 1 - "The same as has already been said was good and you needed to go out and do the activity."

Pupil 5 - "It (the creation) took a long time. We put so much effort into the creation, which made us tense. However that was six months ago and you realise every topic goes on for a long time so it makes sense that we now look back and think it was not that bad. It was really good."

Pupil 13 - Sound was problem at times.

Res - Why?

Pupil 6 - Because you often struggled to hear it.

All Pupils - (Restrict their dislike for the creation phase)

Pupil 13 - It used your ICT skills and now I can do things with a computer that I was unable to do before the creation. But I did not really enjoy the creation.

Res - Did they all justify the means?
Pupil 13 - No.

7. What aspects of OS Skills did mobile technology help you understand the most? (Be specific)

Pupil 11 - Direction.

Res - Why direction Pupil 11?

Pupil 11 - It was like what Pupil 5 said. Competition forced you to decide where north or south was so as you could successfully complete the treasure hunts.

Pupil 14 - I though it was good for direction.

Pupil 5 - I was good for symbols. You needed direction to get the place but the place may have had a symbol, which you also needed to know.

Pupil 2 - Yes it was good for symbols you learned to identify symbols faster.

Pupil 12 - It also helped for grid references.

Pupil 16 & Pupil 13 - (All agree with Pupil 12).

Res - How is what the focus group interviewees stated.

Focus Group Comments Projected onto IWB

Pupil 2 - "Direction - when you look at it on a page you think you understand it. But when you are outside and the map tells you where to go you have to get it right. You have to learn it when you are doing it."

Pupil 5 - "I learned to match the symbol to the real thing."

Pupil 13 - "It (map) really helped me with grid square references. You had to do it to get to the next clue - that motivated you."

Pupil 5 - "If there had been a question about distance in the map it would have helped."

Pupil 3 - The symbol comment (Pupil 5). I helped me with those but nothing else.

Pupil 1 - I think technology helped you with OS Skills in more way than you first think. By actually practicing the skills you are learning a lot.

Res - Any other comments?

8b. With hindsight did mobile learning facilitate independent or group work best?

Pupil 11 - Group. We created treasure hunts as a team and if one person did not do their bit then everyone else was let down.

Res - Do you not feel you had any work to do by yourself?

Pupil 11 - You did.

Res - So actually what you are saying is that the use of technology allows both independent and group work?

Pupil 11 - Yes.

Res - Pupil 2.

Pupil 2 - Both. When you are out with a group doing the task you can get help from others but equally you can choose to do the work by yourself. Competition is the main reason why people would have undertaken to complete the map on their own.

Pupil 13 - Group work for the creation of the second map but then individual for actually doing both maps. You had your own headphones and a sense of competition encourages people to work by themselves.

Res - Pupil 16?

Pupil 16 - I also think it does both. You could work independently but you could choose to work with others if you wished. I was doing work at home but you felt responsibility to bring it in on time otherwise everyone else in your group was let down.

Res - Some of the focus group comments are

Focus Group Comments Projected onto IWB

Pupil 2 - "I think it does both. When you were in a group you helped each other but if you were doing it independently you were competitive about it and you wanted to get it done before anyone else."

Pupil 5 - "I thought it helped independent work more. Once you had completed the creation of the treasure hunt map as a group you were then on your own, the computer forced you to work on your own. It gave you the competitive feeling and this motivated you to get the answers right and not just follow anyone else."

Pupil 13 - "The creation was definitely group work because you would not have been able to do it by yourself. But I think the use of the technology was independent because you only had one set of headphones and the device was in your hand. When people stated over to you it often got confusing."

Pupil 1 - "I think both as well because whenever you were doing it (the treasure hunt map) you worked as a group but you worked independently when you went out and did the maps. You tried to get the answers yourself without anyone else's help because you wanted to learn yourself."

Res - Anyone describe the activities were totally geared towards independent learning?

Pupil 5 - When you were out there with the headphones on it was easy to do the activity by yourself. Plus you often had to think what if I follow someone and I get it wrong? Therefore I tended to prefer independent work but there was no escaping group work either.

Pupil 10 - At the start of the second map group work was essential as it made it more fun rather than boring. But I think independent dominated when doing the task.
Pupil 12 - I think most people would state that the use of technology enabled both individual and group work to occur.
Res - Any others?

9. What did you like least about using mobile technology in:
(a) Research work?
Pupil 16 - I liked it so I don’t know.
Pupil 7 - I did not think it was good fun.
Pupil 11 - The amount of information was not good, for either escape. It would have been better in smaller segments.
Pupil 3 - The weather for the first escape was not good. It was too cold.
Res - If there are no other comments we will look at what the focus group interviewees said.

Focusing Group Comments Projected onto IWB

Pupil 5 - “When looking at the Thames there was some unnecessary information. There was a strange fact about the number of swans on the river each year or something like that.”
Pupil 13 - “There was a button to allow you to repeat the information. If you missed the information then you had to guess the answers to the questions. Other than that it was good.”

Pupil 1 - I agree with both the statements.
Pupil 3 - Me too.
Pupil 11 - I remember the strange facts not the important ones.
Res - Any other comments? ... If not we now turn to OS Skills.

(b) OS Skills work?
Pupil 2 - The creation because it took forever.
Pupil 6 - I feel the same. It took too long to do.
Pupil 5 - I enjoyed most aspects because you were doing it yourself like making up the story for the treasure hunt. But the creation did go on for too long. If you had more help with the creation it would have been easier.
Res - Pupil 14 what about you?
Pupil 14 - The creation took too long it would have been better if the creation had not lasted as long. Like Pupil 5 it would have been better if the creation was done for us.
Res - Let us look at the focus group statements.

Focusing Group Comments Projected onto IWB

Pupil 2 - “It was really precise so if you moved in a different direction the whole thing (screen) would move also and you would have to try and get back on track again.”
Pupil 5 - “...sometimes you lost the signal and this was confusing...”
Pupil 13 - “Lost the creation phase.”
Pupil 1 - “It did not really help you with sketch maps...”

Pupil 13 - Do you see the sketch maps comment? It is true for now but in the future you will be able to draw sketch maps using the stylus and possible computerized sections.
Pupil 12 - The signal was definitely a problem at times.
Res - Any other comments?

19a In your opinion is the future use of mobile technology within GCSE Geography realistic or not? (Elaborate)

Pupil 11 - No, I felt it slowed me down. If you could do it in a short time it would be good for the experience but if not then just leave it. For me it was just a complete time wasting.
Pupil 10 - While I am not a fan of technology I know technology is becoming big business so I do believe it will increasingly be used in schools.
Res - Are you suggesting there is an inevitability with mobile technology?
Pupil 10 - Yes.
Pupil 1 - Technology is definitely coming but I would like to see it being used more for revision rather than learning anything from.
Pupil 3 - Without a doubt technology will be used more. Anything that can speed up learning or make it more interactive is welcome.
Res - Anyone else? ... If not I will re-phrase the focus group statements.

Focusing Group Comments Projected onto IWB

Pupil 2 - “...yes because Geography is a skill too which requires practical work. Technology helps with this and it makes pupils more cooperative as you get out of the classroom.”
Pupil 5 - “Geography is a subject that you will use in real life like the President’s Award when you use OS maps. I definitely think it will be used because technology is everywhere now. Not just Geography will use it other subjects like Home Economics. It will be a very good way to learn as we can relate to it more and therefore learn more.”
Pupil 13 - "It was really good for revision but some topics like settlement I am not sure if you could use the technology. Technology is coming so much I can definitely see it coming in."

Pupil 1 - "I can see it coming in because mobile technology is so big nowadays."

Pupil 14 - I agree with Pupil 13 for revision. It gives you a bit of a break from the classroom.

Pupil 5 - I agree with Pupil 5, because I used the statements. Geography is a good subject for mobile technology. But Pupil 11 has argued. A lot of pupils of my age might not like technology because mobile technology only came in when we were older. For pupils who have been used to technology from a very young age these are the people that will want and benefit from mobile technology.

Res - Any other views?

Pupil 12 - Mobile technology is the future. Technology continues to get smaller and more mobile.

11. What are your final thoughts about your experiences of using mobile technology in Geography or another subject?

Pupil 14 - It was different and better than normal lessons. You got out of the classroom and it didn't help me with revision.

Pupil 1 - I did not like the creation but I did like the practical hands-on experience.

Pupil 6 - Not a big fan of the technology but do agree it would be useful for revision.

Res - Pupil 2?

Pupil 2 - I thought it was different but I do not think it should be used all the time. Just for short time periods.

Pupil 16 - It was useful for revision, providing it was made for you.

Res - So far we have short periods of time for revision and no creation.

All Pupils - (No agreement)

Res - Let's look at the focus interview comments.

Focus Group Comments Projected onto IWB

Pupil 2 - "...it is really helpful especially in subjects like Geography, were there are practical topics. It would be really good to get out and do activities it makes you more willing to learn, more enthusiastic."

Pupil 5 - "I really really enjoyed it and think it should be used more in the future. I was also able to combine technology with PE, History and Maths as well. It would help you concentrate more on the problems. You could take the work home and learn anywhere anytime. Were as with textbooks you usually have to keep them in school."

Pupil 13 - "I really like the interactive whiteboards except you have your own individual device. I can see it being brought into other subjects but I really didn't like the creation of it (the treasure hunts escaped). If it was just given to you, you could go away and work at it."
Collage of Photographs

Working Collaboratively

Working in Pairs (TH)

Teamwork (TH)

Collaboration (TH)

Walton Group Work Collaboratively (TH)

Working Together: Discovering the next Site (TH)

Pupils Enjoying the Start of a Treasure Hunt Mosaic (OS)

OS - OS Skills Mosaic Photos
TH - Thames Mosaic Photos

OS - OS Skills Mosaic Photos
TH - Thames Mosaic Photos

Listening to the Information (TH)

Getting Started (TH)

Decision Time: First Quiz Question (TH)

Individual Initiative (TH)

Following the Instructions Closely (OS)
Exemplar of Rivers Test and Mark Scheme

SECTION A: KEY TERMS

1. Complete the following table by adding the correct key term or definition in the space provided.

<table>
<thead>
<tr>
<th>Key Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Banks&quot; or River</td>
<td>The vertical sides of a river channel.</td>
</tr>
<tr>
<td>Banks</td>
<td></td>
</tr>
<tr>
<td>Mass Movement</td>
<td>Through weathering and erosion, valley sides are worn away and the material is removed downslope via gravity.</td>
</tr>
<tr>
<td>Mouth</td>
<td>The place where a river enters the sea.</td>
</tr>
<tr>
<td>Base Flow</td>
<td>The lateral or sideways movement of water through the rocks (geology).</td>
</tr>
<tr>
<td>Traction</td>
<td>The process of transportation whereby large rocks are rolled along the river bed.</td>
</tr>
<tr>
<td>Confluence Point</td>
<td>The point where two or more rivers/streams/tributaries join.</td>
</tr>
<tr>
<td>Tributary</td>
<td>A small stream that joins the main channel.</td>
</tr>
<tr>
<td>Erosion</td>
<td>The wearing away of the Earth's surface through movement, e.g. wind, water, ice.</td>
</tr>
<tr>
<td>Pothole</td>
<td>A river feature formed when river particles erode/drill into the bed of a river creating a depression or hole. Usually found in the upper part of a river.</td>
</tr>
<tr>
<td>Braiding</td>
<td>When a river loses energy it deposits material. In the lower section, where a lot of sediment is carried by a river, depositions can accumulate on the river bed and form a blockage or small island - this is braiding.</td>
</tr>
</tbody>
</table>

APPENDIX P

Instructions

- Write in black ink or black ball-point pen.
- Maximum marks for this paper is 37.
- You will be marked on your ability to:
  - present relevant information in a clear and systematic way;
  - ensure the text is legible and that spelling, punctuation and grammar are accurate;
  - use specialist vocabulary where appropriate.

Based on past AQA GCSE questions

SECTION A

Key Terms
Answer ALL Questions

SECTION B

River Processes and Features
Answer ALL Questions

Based on Summer 2008 Grade boundaries for AQA GCSE Geography

<table>
<thead>
<tr>
<th>Grade</th>
<th>A*</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>U</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>73%</td>
<td>64%</td>
<td>54%</td>
<td>45%</td>
<td>34%</td>
<td>29%</td>
<td>0-28%</td>
</tr>
</tbody>
</table>

Total Mark /37

Percentage

Grade Equivalent

Pupil Number: ______________________

Date: ____________

Definitions

2 mks = detailed def.
1 mks = less detailed or answer containing many SPG errors
0 mks = incorrect def or no def, given.
2). (a) Study Figure 1, which shows part of a meandering river.

(iii) Explain how the features of a meander are formed.

(i) In the box below, draw and label a cross-section from A-B through the meander.

3 marks for the shape – clearly asymmetrical in the right direction, at least two correct labels, e.g. slip-off slope, river cliff, deeper, faster water, shallow water, etc. Accept alternatives, e.g. point bar deposits, river bluffs, flood plain if evident on section. Process or features accepted. Labels must be clearly legible. Water-level not essential.

Plan = max 2.
Reversed B-A = max 2 for cross-section, unless the reverse section has reversed B-A clearly expressed, then max 3.

3). (a) Study Figure 2 which shows some features of the lower course of a river.

(4 marks)
(ii) Explain, with the aid of a diagram(s), how levees are formed.

<table>
<thead>
<tr>
<th>Level 1 (1-2 marks)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic statement, limited sequence, e.g. the river floods and lays down silt that builds up into levees. May not be a diagram or if there is it is likely to be of limited use in the answer.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Level 2 (3-4 marks)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear statement and more idea of sequence and vocabulary, e.g. when the river floods onto its floodplain, the speed is reduced and silt is deposited. More is deposited on the river banks and after several floods it builds up into high banks called Levees. Diagram likely to be clear but with perfunctory labels that do not add significantly to the account. (Max Level 2 if no diagrams).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Level 3 (5-6 marks)</th>
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</thead>
<tbody>
<tr>
<td>Answer may consist of heavily annotated diagrams only or a combination. Account is detailed and in the correct sequence. Candidate recognises the finer details, e.g. the reasons for greater deposition on the river banks, rather than further away; the importance of coarse material being deposited first, the need for a river carrying a large load and for repeated flooding for their formation.</td>
</tr>
</tbody>
</table>

END OF QUESTIONS
Examples of LNI Postings

Overview

<table>
<thead>
<tr>
<th>Course</th>
<th>Pupil Number</th>
<th>Number of Posts to discussions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fairbourne</strong></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>1</td>
</tr>
<tr>
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<td>4</td>
<td>1</td>
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<tr>
<td></td>
<td>14</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>2</td>
</tr>
<tr>
<td><strong>The Lodge</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Walton</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fairbourne

Discussions

- Coffee Bar
- Getting Started
- Image Issues
- Sound/Audio Issues
- The Storyboard
- Creating the Narrative

<table>
<thead>
<tr>
<th>Coffee Bar</th>
<th>Getting Started</th>
<th>Image Issues</th>
<th>Sound/Audio Issues</th>
<th>The Storyboard</th>
<th>Creating the Narrative</th>
</tr>
</thead>
<tbody>
<tr>
<td>11/02/09</td>
<td>11/02/09</td>
<td>11/02/09</td>
<td>11/02/09</td>
<td>11/02/09</td>
<td>11/02/09</td>
</tr>
<tr>
<td>Mr Butler</td>
<td>Mr Butler</td>
<td>Mr Butler</td>
<td>Mr Butler</td>
<td>Mr Butler</td>
<td>Mr Butler</td>
</tr>
<tr>
<td>9 total</td>
<td>2 total</td>
<td>0 total</td>
<td>0 total</td>
<td>0 total</td>
<td>0 total</td>
</tr>
</tbody>
</table>

6 discussions created by researcher:
- Coffee Bar - 2 posts
- Getting Started - 2 posts
- Rest of discussions - 0 posts

NB: see below for quality of posts.

Getting Started Discussions

- How to get Started (The Researcher, 24-02-2009 09:32)
  What does your group need to do to get started?

- Clues (Pupil 15, 26-02-2009 16:14)
  boy im writing the 2nd due to i was wondering what is the 2nd and 3rd region in our
  treasure hunt?
The Lodge

Discussions

6 discussions created by researcher:
- Coffee Bar - 10 posts
- Getting Started - 3 posts
- Image Issues - 2 posts
- Other discussions - 9 posts

Not suitable for quality of posts.

Coffee Bar Discussions

- Re: Registering (The Researcher, 11-02-2009 13:29)
  Hi Folks! Now that you have got this far please reply to this posting and introduce
  yourself to your group.

- Re: Registering (Pupil 6, 20-02-2009 14:10)
  &on... Hihi :) .

- Hello (Pupil 14, 17-02-2009 17:41)
  Hi :) This is Pupil 14.

- Re: Hello (The Researcher, 18-02-2009 20:47)
  Well done Ciara - you are the first to post a comment!

- Hey Girls =] (Pupil 4, 20-02-2009 14:10)
  Hey Girls (&i) Mr B =] i got logged on :D Hope we have a good wee time Have Fun =]
  Pupil 4.

- Heyy (Pupil 1, 20-02-2009 14:10)
  Heyy everyone (i got on]

- Heeey:( (Pupil 7, 10-03-2009 18:20)
  Heeeyy Everyone and Mr.B (i finally got on!!!

Getting Started Discussions

- How to get Started (The Researcher, 24-02-2009 09:33)
  What does your group need to do to get started?

- What are we doing? (Pupil 14, 25-02-2009 18:20)
  Hey.
  We didn't get to decide where our chosen going to go and we didn't get to decide who was going to
  work on which task. Write back please.

- Let's GET STARTED THE LODGE (The Researcher, 09-03-2009 07:30)
  Come on The lodge group - We need to get moving on the uploading of resources. You are falling behind the
  other two groups!
Walton

Discussions

6 discussions created by researcher:
- Coffee Bar: 8 posts
- Getting Started: 1 post
- Rest of discussions: 9 posts

Neelor: see below for quality of posts

Coffee Bar Discussions

Re: Registering  (The Researcher, 11-02-2009 12:57)
Hi folks. If you have made it this far please leave a short introductory message.

Re: Re: Registering  (Pupil 12, 20-02-2009 14:08)
Hello ar :) tis mag an here! :)

Re: Re: Registering  (Pupil 19, 20-02-2009 14:09)

Re: Re: Registering  (Pupil 2, 20-02-2009 14:10)
Hey sir!!

How's it going? It's Pupil 2 here! Really looking forward to using the M scape but not the os test!!!

Re: Re: Registering  (Pupil 10, 20-02-2009 14:10)
Dla Dait...

Tá mé ar an Mscape, agus bheadh cráic go hombad again.
Memorandum

To: Ryan Butler
From: Ethics Committee
Date: 6 November 2008
Distribution: Course Coordinator – Caitlin Donnelly
Supervisor – Pamela Cowan, Colette Murphy
File
Subject: Ethics Approval

The School of Education Ethics Committee has reviewed your proposed study as submitted and has granted approval for you to proceed.

- It is important to ensure that you follow the procedures outlined in your submission. Any departure from these must be discussed with your supervisor, and may require additional ethical approval.

The Committee wishes you every success with your research.
Examples of Consent Letters

Getting the Principal's Consent

The Principal
Belfast Grammar

15th November 2008

RE: Consent for EdD dissertation research to be carried out at Belfast Grammar

Dear Sir/Madam,

As part of my studies for the Doctorate of Education (EdD) at the Queen’s University of Belfast under the supervision of Dr Pamela Cowan and Dr Collette Murphy, I am hoping to research the use of mobile technology within GCSE Geography as a mechanism to help enhance pupils’ learning experience. The inquiry will centre on my Year 11 Geography class (11T/1G1) and will integrate into the GCSE Geography course rather than augment it. Riven and Map Work Skills will be the two topics which the inquiry centres on. All activities will be timed to coincide with the Geography Department’s scheme of work and pupils’ test results and YELLIS results will be used to help assess pupil performance.

I would be grateful if you would endorse the decision to conduct this research which will not only contribute to my continuing professional development but also provide the Geography Department with new resources to encourage pupils in becoming more independent and/or collaborative learners where appropriate.

In accordance with proper ethical guidance pupils will be invited to participate in the inquiry and written consent requested from pupils and their parents/guardians. A copy of the pupil consent and parental/guardian consent letters are attached. Both are asked to tick a number of boxes granting a layered form of consent which relate to different stages or events within the inquiry. Where pupils and/or parental/guardian permission is not granted the pupil(s) will not participate in the event or stage of inquiry that they have opted out of. Pupils will however still participate in the normal classroom teaching activities.

For pupils who give consent and are granted permission by their parents/guardians to participate in this inquiry they may be asked to participate in a focus group interview. The focus group interview will involve approximately five pupils and the aim is to record the interview using either an audio capture device or a video recorder. For logistical reasons the focus interview may need to be scheduled outside of normal Geography lessons, which means pupils might have to be withdrawn from one or two lessons. If this is the case I will approach each teacher in question and explain why pupils will be absent and ensure adequate time and resources are provided to allow for any work missed to be copied up. After the focus group interview the intent is to play the recording back to the rest of the class and to record the whole class response to the questions and the comments made by their peers. The latter ensures that all pupils in the class get the opportunity to contribute and this form of data triangulation increases the reliability and validity of the inquiry by proving a rich source of information. A draft copy of the anticipated focus group interview is attached – please note that Map Work Skills (March-May 2009) will be looked after the topic Rivers (January/February 2009).

It is vital that participants’ privacy is protected, so anonymity will be ensured by:

- Giving the school a different name in all data, recording and published work.
- Each child’s real name will not be used in the data, research or published work. They will be assigned a unique number/letter with their identity known only to themselves and me.
- All interview recordings will be stored securely in a locked filing cabinet with myself as the only key holder. Electronic data will be stored securely on my personal computer which has password protected access. All paper based and electronic data will be destroyed following the research’s completion.
- Only Dr Cowan, Dr Murphy and I will have access to the data which will be used for research purposes alone.
- If photographs are used in the inquiry steps will be taken to ensure neither the school nor the participants are identifiable.
- Using Learning NI as a secure password protected environment which will allow pupils to get guidance, instruction and hold discussions with classmates online.

Each pupil’s participation is voluntary; they are free to withdraw from the study at any time, without consequences. There are no known risks, discomforts or inconveniences associated with participation in this research study. No one will be obliged to answer any questions which she finds objectionable or makes her feel uncomfortable. The findings will be published as a student dissertation and is subject to clearance by the General Research Ethics Board of Queen’s University. On the issue of online communication the pupils will adhere to the school’s internet policy and the Learning NI course will be monitored by me during and after normal school hours for the duration of the inquiry. The school’s Internet Policy and other key documentation (whole school and departmental) may be used in connection with the inquiry. However at no stage will any documentation originating from the school bear any reference to the school.

Finally, should the scope or focus of the inquiry change or should I need to interview additional pupils or colleagues I will seek permission from you before doing so.

If you have any questions about this project please speak to me or if you would like to speak to my supervisor, Dr. Cowan, she can be contacted at and Dr. Murphy at

Thank you,

R. Butler
Getting the Pupils’ Consent

BELFAST GRAMMAR

Dear ________________.

You are being given the opportunity to take part in an active research inquiry which will investigate if the use of mobile technology within GCSE Geography can help enhance your learning. The research, centring on Rivers and Map Skills will give you the chance to use a Personal Digital Assistant (PDA) and being mobile should allow you to experience a new and exciting way to learn as you actively engage with up-to-date technology.

The research is part of my studies for the Doctorate of Education at the Queen’s University of Belfast (QUB) and this letter is to invite you to participate with the inquiry. Your views and opinions are important and will help to shape the final outcome of the inquiry.

All activities and assessments will be integrated into the pre-existing GCSE Geography scheme of work ensuring that the inquiry does not add to your workload. The aim is to provide an alternative and hopefully more enjoyable and fun way to learn. Completed assessments and YELLIS results will be used to help assess your performance.

If you agree to take part in the inquiry you may be asked to take part in a small focus group interview consisting of approximately five pupils. This focus interview will be recorded using either an audio capture device or a video recorder. After the interview the intent is to play the recording back to the rest of the class and to record the whole class response to the questions and the comments made by your peers. You will not be obliged to answer any questions which you find objectionable or makes you feel uncomfortable. The whole class activity ensures that everyone in the class gets the opportunity to contribute and this helps to strengthen the inquiry. Please be assured that any recordings will be treated with the strictest confidence and the only people who will have access to the recordings are:

• Your Geography Class (when they view the focus group interview)
• Your Teacher (Mr Butler)
• Two supervisors from QUB

(St Pamela Cowan and Dr Collette Murphy are supervising the research inquiry)

The recordings will only be used for the purposes of this inquiry and will be securely disposed of when the inquiry is complete. The following steps provide more details on how your privacy will be protected.

Steps to Protect your Privacy

• Your real name will not be used in the data or published work. You will be assigned a unique number/letter with your identity known only to yourself and Mr Butler.
• All interview recordings will be stored securely in a locked filing cabinet with Mr Butler as the only key holder. Electronic data will be stored securely on a password protected computer. All paper based and electronic data will be destroyed following the research’s completion.
• Learning NI will be used as a secure, password protected, environment which will allow you to get guidance, instruction and hold discussions with classmates online.
PUPIL CONSENT FORM

Pupil Name: _________________________________ Class: _________________________________

Please read the following information carefully and answer the questions below by marking the appropriate box.

<table>
<thead>
<tr>
<th>NO.</th>
<th>QUESTIONS</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I am happy to take part in this research. I have read the pupil’s consent letter and understand that if I have any further questions about the inquiry I can asked Mr. Butler.</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>2</td>
<td>I’m happy to be recorded with my friends when we are being interviewed about our work.</td>
<td>☐</td>
<td>☑</td>
</tr>
<tr>
<td>3</td>
<td>I don’t mind if photographs are taken as I know neither I nor the school will be identified from the photographs.</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>4</td>
<td>I understand that my privacy will be well looked after. Any information I provide will be securely locked away.</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>5</td>
<td>I am happy for the information I provide to be used for Mr. Butler’s research project and journal or conference presentations.</td>
<td>☑</td>
<td>☐</td>
</tr>
<tr>
<td>6</td>
<td>I know that I can withdraw from this study at any time.</td>
<td>☑</td>
<td>☐</td>
</tr>
</tbody>
</table>

Pupil Signature: _________________________________ Date: _________________________________

Only Dr. Cowan, Dr. Murphy and Mr. Butler will have access to the data which will be used for research purposes alone.

If any photographs of participants are used in the inquiry Mr. Butler will ensure neither you nor the school is identifiable.

None of the data will appear on your school records.

Your participation is voluntary, you are free to withdraw at any time without consequences. Every pupil in your class will get a copy of this letter and your parents/guardians will also be invited to sign a consent letter.

The Principal, has approved this research, which will enrich your experience of GCSE Geography and give you the opportunity to interact with cutting-edge technology. The findings will be published as a student dissertation and is subject to clearance by the General Research Ethics Board of Queen’s University.

If you agree to participate in this research inquiry I ask that you tick all relevant boxes and sign the accompanying consent form and return it in the envelope provided as soon as possible. Your signature on this form tells me that you understand the procedures involved. Please keep this letter for your information.

Where pupil and/or parental/guardian permission is not granted, you will not be participating in the focus group interview or whole class interview. You will still participate in the normal classroom teaching activities.

If you wish to find out more about this research inquiry or have any questions please contact Mr. Butler.

Thank you.

R. Butler
Getting the Parental Consent

Belfast Grammar

Dear Parent/Guardian,

As part of my studies for the Doctorate of Education at the Queen’s University of Belfast (QUB) under the supervision of Dr Pamela Cowan and Dr Collette Murphy, I am hoping to research the use of mobile technology within GCSE Geography as a mechanism to help enhance pupils’ learning experience. For the purposes of this inquiry mobile technology primarily refers to the use of a Personal Digital Assistant (PDA). The research will focus on Rivers and Map Skills. Through active participation the inquiry should provide new learning opportunities for pupils who will be able to experience a hands-on approach by engaging with up-to-date technology. Pupils will also be able to express their thoughts on all the topics covered either in person or via a secure online environment within Learning NI. Learning NI is supported by C2K who provide and monitor all computer hardware and software within the school. This online environment is a password protected area where only those directly connected to the study (i.e. your child’s Geography class, Dr Cowan, Dr Murphy and I) have access.

The inquiry will centre on your daughter’s GCSE Geography class and will integrate into the AQA GCSE Geography syllabus rather than augment it. All activities will be timed to coincide with the Geography Department’s scheme of work and pupils’ test results and YELLIS results will used to help assess pupil performance.

If your child participates in this research, she may be asked to take part in a small focus group interview consisting of approximately five pupils. This focus interview, lasting approximately one hour, will be recorded using either an audio capture device or a video recorder. The focus interview may be scheduled outside of normal Geography lessons, which means your daughter might be withdrawn from one or two lessons. If this is the case I will approach each teacher in question and explain why your daughter will be absent and ensure adequate time and resources are provided to allow for any work missed to be copied up. After the interview the intent is to play the recording back to the rest of the class and to record the whole class response to the questions and the comments made by their peers. The latter ensures that all pupils in the class get the opportunity to contribute and this form of data triangulation increases the reliability and validity of the inquiry by proving a ‘rich’ source of information. Please be assured that, with the exceptions of my dissertation supervisors at QUB and myself, no one outside of your daughter’s Geography class will have access to the recorded data. The following paragraph elaborates further on how your daughter’s privacy and anonymity will be protected and that all collated information will be treated in the strictest confidence.

It is vital that the privacy of those who participate in this project is protected. Here is how your child’s privacy will be secured.

- Her real name will not be used in the data or published work. She will be assigned a unique number/letter with her identity known only to herself and me.
- All interview recordings will be stored securely in a locked filing cabinet with myself as the only key holder.
- Electronic data will be stored securely on my personal computer which has password protected access. All paper based and electronic data will be destroyed following the research’s completion.
- If any photographs of participants are used in the inquiry I will ensure neither your daughter nor the school is identifiable.
- Learning NI will be used as a secure, password protected, environment which will allow pupils to get guidance, instruction and hold discussions with classmates online.
- Only Dr Cowan, Dr Murphy and I will have access to the data which will be used for research purposes alone.
- None of the data will appear on your child’s school records.
- Your child’s progress will be assessed in the normal way i.e. by responding to series of exam type questions.

Your child’s participation is voluntary; she is free to withdraw at any time without consequences. The parents/guardians of every student in your child’s class will receive this letter and pupils will also be asked to sign a pupil consent letter. The pupil consent letter is designed to invite pupils to engage with the inquiry as active participants rather than as subjects required to perform tasks. Their views and opinions are important and will be encouraged.

The Principal, has approved this research which will benefit the Geography Department by integrating more ICT into the subject’s delivery. There are no known risks, discomforts or inconveniences associated with participation in the research study. Your child is not obliged to answer any questions which she finds objectionable or makes her feel uncomfortable. The findings will be published as a student dissertation and is subject to clearance by the General Research Ethics Board of Queen’s University.

If you agree to let your child participate in this project, I ask that you tick all relevant boxes and sign the accompanying consent form and return it in the envelope provided as soon as possible. Your signature on this form tells me that you understand the procedures involved and that you allow your child to participate. Please keep this letter for your information.

Where pupil and/or parental/guardian permission is not granted, the pupils will not be participating in the focus group interview or whole class interview. They will still participate in the normal classroom teaching activities.

If you wish to find out more about this research inquiry or have any questions, please contact me at school on or Dr Pamela Cowan can be contacted at or Dr Collette Murphy at .

Thank you.

R. Butler
Parental/Guardian Consent Form - Please read the following information carefully

I allow my daughter to participate in the aspects of the study identified below. Please TICK ✓ your agreement with each statement as appropriate.

☐ I have read and retained a copy of the information and I have had any questions answered to my satisfaction.

☐ I understand that my daughter is being asked to participate in a research project which will look at the use of mobile technology within GCSE Geography as a mechanism to help enhance pupils' learning experience.

☐ I consent to my daughter being interviewed as part of a focus group about her experience of the mobile learning activities. If this interview means that my daughter will miss one or two lessons (approximately one hour) I understand that adequate time and resources will be provided to allow for any work missed to be copied up.

☐ I understand that my daughter may be interviewed in a whole class situation, with other class members, about her experience of the mobile learning activities.

☐ I consent to photographs of my daughter being used within the research. I understand that neither the school nor my daughter will be identifiable from any of the photographs used.

☐ I understand that on occasion my daughter will be working in a secure online course, within Learning NI which is supported by C2K, and is only accessible by their username and password supplied by C2K.

☐ I understand that, in compliance with Belfast Grammar's School Child Protection Policy, the only adults who have usernames and passwords to access this online course have undergone police clearance.

☐ I understand that the findings of this research will be published as a student dissertation subject to the General Research Ethics Board of Queen's University, Belfast.

☐ I understand that there are no known risks, discomforts or inconveniences associated with participation in the research study.

☐ I understand that confidentiality will be protected by appropriate storage and access of data and by the removal of my child's name from the data. I am also aware that all data will be securely disposed of once the research inquiry is complete.

☐ I understand that my daughter can withdraw from the study at any time, without consequences.

☐ I understand that I can contact Mr Butler with questions about the study via the school office or Dr Pamela Cowan at the School of Education, Queen's University Belfast, at or Dr Collette Murphy at 02890373300.

☐ Should the opportunity arise I grant permission for any information taken from my daughter to be used for further publication (i.e. beyond dissertation publication - e.g. journal article) or for conference presentation.

Pupil's name (please print): ____________________________________________________

Name of parent/guardian: (please print): ___________________________________________

Signature of Parent/Guardian: ____________________________________________________

Date: ____________________________