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Nga Wahi Ipurangi

Digital Places

A thesis

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THE UNIVERSITY OF
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Abstract

The Waipā district, unbeknown to many New Zealanders, is home to some of the country's most significant historical sites and stories. As a Learning Experiences Outside the Classroom (LEOTC) educator, one of my roles is facilitating the understanding of these places and stories with school students.

Currently, historical sites of national significance in this area are geographically hard to recognise, and have little or no physical interpretation. The ability of students to learn at these sites relies heavily on the educator's oratory abilities. Recent development in mobile technology can now provide access to interpretive Internet-based content anytime, anywhere and this research investigates potential for mobile technology to be used as a tool to provide meaningful learning experiences that connect students to our unique history in the environment that these events actually took place.

This research compares different mobile learning methods' effectiveness in increasing student understanding and retention of social history content. A mobile learning (mLearning) programme was created for the purpose of this research, with the Internet-hosted content divided equally between 3 mobile learning methods and one presenter-based method.

Three groups consisting of Yr 5-6, Yr 7-8 and Yr 9-10 school students participated in the programme. Students completed multi-choice tests before, immediately after, and 4 months following the trial programme. The multi choice results were used to compare improvement in student understanding and retention. Focus group interviews were conducted immediately and 4 months after the trial and were used to explore student's metacognitive reflections of the learning methods used.

The results of the study suggest that the mobile audio method was the most effective at increasing student understanding of the learning content and also had the highest level of content retention. Results also suggest that environmental and technological distraction may have negatively influenced the effectiveness of the two visual mobile learning methods. Distraction may account

for the differences between the learning method's effectiveness suggested by the multi-choice testing. Focus group interviews indicate the importance of mobile learning in an authentic context.

Discussion around the reduction, and where possible, elimination of the identified distractions; appropriateness and feasibility of new programme development including: game/trail based mLearning; the importance of authentic contexts for Māori students; student involvement in design; student-centred methods; connection to the classroom; and the relevance of social media are explored.

This research provides a clear direction for future programme development, aligning with the Ministry of Education's LEOTC review priorities that emphasise raising student achievement for priority students; improving student engagement; and innovative, future focused learning.

Dedication

My thesis is dedicated to my wife Mandy.

Packing up and moving to the sticks with four little kids so your husband can write a thesis was not in the job description.

I owe you. Big time.

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Chapter 1 – Introduction

This chapter is an introduction to the study explaining the reasons behind why the research was conducted, the context in which the research took place and the background around how the research questions were developed.

1.1 What is LEOTC and Why is it Important?

“Learning Experiences Outside The Classroom (LEOTC) is a Ministry of Education curriculum support project. It contributes to curriculum-related programmes run by a range of community-based organisations for the benefit of New Zealand school students.” (MoE, 2013 p. 1)

I am an LEOTC Educator, working full time at Te Awamutu Museum situated in the town of Te Awamutu, running education programmes from the Museum itself and sites of historical significance in the Waipā District. When I was initially employed at Te Awamutu Museum as the sole charge educator I had only a vague understanding of the Learning Experiences Outside The Classroom (LEOTC) programme model. At that time I didn’t realise what a profound effect learning outside the classroom can have on students and the real value that these programmes provide in enhancing teacher’s learning programmes and providing students with opportunities to connect with the wider community. “Providers of LEOTC include zoos, museums, historic parks, art galleries, performing arts and science centres who hold significant resources and expertise used to enrich student learning within a unique Aotearoa/New Zealand context.” (MoE, 2013 p. 1).

In fact, it wasn’t until I began facilitating social history themed education programmes for Te Awamutu Museum that the huge wealth of unacknowledged, untold history connected to sites within Waipā District became evident to me. Nationally significant events that still shape the lives of those within this district and beyond happened at often unmarked sites with little or no interpretation. New Zealand historian James Belich also recognises the importance of the historical sites located within the Waipā District, describing the events connected to Waipā sites such as Rangiaowhia and Ō-rākau ‘as important to New Zealand, as the civil wars were to England and the United States’ (Belich, 1986, p. 15).

These events helped shape New Zealand into the country it is today, and continue to influence how the Waipā community evolves.

My own historical ignorance of these nationally important events astounded me, and the enforced historical education provided by my new vocation connected me to the Waipā District by giving me a greater understanding of the land. It is my aim as an LEOTC educator to help students to connect to where they live by helping them understand some of the nationally significant events which happened in these places in their community, because these events have influenced how our community is shaped today. As Nigel Prickett once advised, history hasn't happened within the pages of a textbook. It has taken place all around us (Prickett, 2002).

In 2006, Waikato University research into the effectiveness of LEOTC programmes found that they are more effective when students interact with different tools, objects and exhibits and when students link site and schoolwork experiences (Moreland, McGee, Jones, Milne, Donaghy & Miller, 2006).

These suggestions for increased effectiveness have been integrated into LEOTC publications such as the LEOTC Provider Guidebook, which has been produced by Ministry of Education to guide the delivery of effective LEOTC programmes (MoE, 2008). However Moreland et al. (2006) research also identified that more research is needed on: the way students learn at different sites; student processes of learning; and student short and longer-term retention of learning. In particular, their recommendations identified a need for more research that attempts to quantify students' gains through standardised tests, and on how experiences differ for different groups of students.

During research into new LEOTC programme development, it was the identification of these research opportunities that in part provided the motivation for this research project. It is the aim of this researcher to contribute research that fills some of the gaps identified by Moreland et al. (2006), with this research influencing my own and potentially others' development of effective LEOTC programmes in the future. It was also the aim of the researcher to create

new and exciting resources that could be accessed by teachers and students at sites that had no current interpretation.

1.2 Who accesses the LEOTC Programmes and Why?

At authentic sites of historical significance (as defined by the Ministry of Education) Te Awamutu Museum educators facilitate social history themed education programmes to over 4440 Year 1-13 students participate per year. The majority of the students who participate in Te Awamutu Museum's Waikato Wars Education Programme travel from outside the Waikato.

These groups are usually Yr 11-13 students incorporating this tour into an NCEA internal assessment for Level 1, 2 or 3. However since 2011, Yr 3-10 students between 7 and 13 years of age are incorporating visits to historic sites related to the Waikato Wars to bring a local perspective to understanding such issues as The Treaty of Waitangi. Additionally, tertiary students are also regularly attending as part of their cultural awareness papers. My own experience as a LEOTC educator indicates that running education programmes from sites of historical significance, where history has physically taken place, helps students of all ages to feel a sense of connection to the spot they are standing in, inspire their imagination to resurrect past events, and bring history to life as it were. This view supported by Sharples, Taylor, & Vavoula's (2007) research into the benefits of learning in an authentic context.

Teachers who access LEOTC programmes are generally looking for authentic experiences that are not able to be facilitated within the context of their own school grounds; educational programmes that assist children to make connections with their wider community and which provide context enriched experiences that leave lasting impressions on students.

1.3 How Programmes are Facilitated

Te Awamutu Museum's Waikato Wars Education Programme is a 2 hour learning experience offered to teachers for the learning benefit of their students. The initiation of a Waikato Wars education programme begins with a teacher making

contact with the museum educator. Once a date and time is negotiated, the teacher completes a pre-visit information form, which includes outlining to the educator the group's learning intentions. The knowledge of the group's learning intentions allows the museum educator to make some adaptation to the programme by customising the content to the group's learning needs.

In addition to the specific education programme, the educator provides pre and post visit resources that support the student's learning of the topic within the classroom context, however it is up to the classroom teacher whether these resources are used in class. On the day of the programme the museum educator guides teachers, students and parents around each historic site, providing activities and interpretation. Depending on the pre determined learning intentions, the locations in the programme may include historic buildings, museums, memorials, cemeteries, pā sites and redoubts. At each site the group relies mostly upon the museum educator to give a verbal interpretation of the events relating to the site. The verbal dissemination of programme content relies entirely on the oratory skill of the educator, and with the vast majority of information flowing in one direction, from the educator's mouth to the student ear, an educational environment where students are reluctant to contribute is often established within moments of the education programme starting (Cornelius-White, 2007).

As the educator is the gatekeeper of knowledge throughout the entire programme they cast themselves in the role of expert. The student's perception of the educator as the expert could trivialise the student's own prior knowledge and alternative perspectives, leaving them unlikely to contribute (Cornelius-White, 2007). The perception that the educator has all the right answers is compounded by limited opportunities for the students, parents or teachers to share their views. Opportunities for students, parents and teachers to contribute and question are limited by the often tight time schedule and limited question time at the end of each of the educator's presentations.

In the past, Te Awamutu Museum's Waikato Wars Education programme has received high levels of teacher and student satisfaction from both empirical and anecdotal measures. However I believe that although this programme works well

there could be the potential for it to work better, with there being a number of new learning avenues I hope to explore and find solutions to in this research.

1.4 Why Research

The method of running LEOTC programmes at sites of historical significance has been in place since the first Ministry of Education LOETC contract was awarded to Te Awamutu Museum in 1997 and has been seen as the most practical and effective method for increasing student learning around the Waikato Wars topic. I have outlined above some of my initial concerns regarding the current delivery of the Waikato Wars programme content, however as I began my investigation more concerns arose. These concerns are discussed below.

As the educator is the only source of programme content, the students' experience is mostly dependent on the educator. If the educator was inexperienced or having an 'off day' this may affect the content delivered to the students. Programme content provided by the educator may be used by the students for NCEA internal assessment, and coverage of certain content could be important for their assessments. Programme content could vary from educator to educator depending on their skill/experience level.

The educator talking is the predominant method of content transfer in the existing Waikato Wars Education Programme. However there is more than one way to learn, with learners often having a preference that may not necessarily match the educators' method of delivery (Dunn & Dunn, 1979). To provide for a variety of student learning preferences the content of the Waikato Wars education programme would be most effective if it was presented in a variety of ways.

Currently any learning associated with the New Zealand Wars education programme revolves around the educator, creating an educator-centred programme. Student-centred learning differs from educator-centred learning by the more active role of the student when compared to the teacher (Çubukcu, 2012). The potential for the Waikato Wars experiences to embrace a more learner centred approach, where the student is more in control of their learning,

may improve learning outcomes. Benefits of a student-centred model have been widely reported (Cornelius-White, 2007), and will be elaborated further in the following review of literature.

One of the criteria of a Ministry funded 'learning outside the classroom experience' is that it is primarily hands on and interactive (MoE, 2008). Although the NEW ZEALAND Wars programme is approved by the MoE, the current Waikato Wars education programme provides few opportunities for hands on or interactive learning.

The primary target audience for programmes are school students aged between 10 and 17 years. This generation has grown up with mobile technology and have been labelled the digital generation (Prensky, 2001), hence the presentation of learning content in a digital mode may increase student engagement, understanding and retention (Wang & Shen, 2011).

"All history becomes subjective; in other words there is properly no history, only biography" (Emerson, 1993, p. 7). There are many varying accounts of the events that took place during the Waikato Campaign of the New Zealand Wars, however education programme time constraints determine what content is included. The Waikato Wars programme content is comparable to relevant sections of the Cultural Areas of Significance in the Waipā District report published in 2011 (Luiten, 2011). This report was created with input from the Waipā Iwi Consultative Committee – Nga Iwi Toopu o Waipā – which includes representatives from hapū and iwi of the Waipā district (Luiten, 2011). Even though the version of events recounted in the education programme is generally accepted as the most correct, perhaps avenues where students, parents and teachers can contribute alternative and additional perspectives would lead to a more rounded retelling of the historical events.

The Waipā District Council, the Department of Conservation, the New Zealand Historic Places Trust, church groups and private landowners are some of the many different organisations responsible for the care, maintenance and interpretation of Waipā historic sites. Due to a variety of factors there is very little, or no, on site interpretation at many significant historical sites in the Waipā

District. Currently when teachers and students independently visit historic sites they often have trouble accurately locating the historic site, and have difficulty recounting events where there is little or no readily accessible public information on the topic.

Formulating a plan to address the issues outlined is the underpinning motivation behind the research discussed in this thesis.

1.5 Research Overview – mLearning

Since first witnessing museum based mobile learning while on vacation, I became interested in how mobile learning could increase student understanding at historic sites. I conducted some preliminary research into Mobile Learning (mLearning), and my initial investigation identified that mobile learning appeared to have the potential to address some of the issues that I had identified in Te Awamutu Museum's Waikato Wars Education Programme.

A requirement of Te Awamutu Museum's LEOTC contract with the MoE is that an advisory group of teachers is required to meet with the educator biannually to give feedback, support and guidance towards the future development of education programmes (MoE, 2008). The Te Awamutu Museum Advisory group comprises seven primary, intermediate and secondary teachers from rural and urban locations within the Waipā District. Two members of this group are Māori language specialists. In June 2010 the discussion at this meeting revolved around the integration of Mobile Learning into the future development of LEOTC programmes. Key themes to come out of this meeting were: issues regarding the capabilities of mobile technology; the involvement of iwi, hapū and other cultural experts; the quality and type of resources used; access for all students; and whether mobile devices would increase learning or be a distraction. All teachers involved agreed that M-Learning at Waipā historic sites provided exciting learning opportunities, with each of the key themes generated by the meeting warranting further investigation.

MLearning can allow students unprecedented access to information, where control over what, how and the way they learn is shifted from a teacher led to

student led emphasis. Giving students the information in a variety of media and allowing students to access the information in peer groups was the goal of this programme development. The question I had was: could mLearning be used at historic sites to enhance student learning?

In 2003 O'Malley & Fraser defined mLearning as any sort of learning that happens when the learner is not at a certain location, or learning that happens when the receiver takes advantage of the learning opportunities offered by mobile technologies. The first part of this definition relates to the type of learning that occurs in an unorthodox location, such as completing homework on the way home on the school bus. Such a task wouldn't necessarily involve mobile technology.

For the purposes of this research I have modified O'Malley & Fraser's (2004) definition to any learning that happens when the learner is not at a fixed location, where the learner takes advantage of the learning opportunities offered by mobile technologies.

According to Sharples, Taylor and Vavoula (2007) often up to three subsets of mobile factors need to combine to produce mLearning: the location of the learner; the connection to the learning materials; and the mobile device. Each of these subsets are discussed briefly in the following sections.

1.6 Learner Location

This study is focusing on learning that is taking place at 3 pre-determined sites of historical interest: Karangapaihou, The Catholic Mission of the Holy Angels, Rangiaowhia; St Pauls Anglican Church, Rangiaowhia; and Pā Site, O-rākau. The specific location of the learning within each site is to be determined by the participants.

1.7 Connection to Learning Material

The learning materials could be hosted on the learning device itself, however mobile technology development has meant the access to learning materials

stored on other networks, including the Internet, is becoming increasingly possible. Mobile devices can access a network connection using a variety of technologies, including wireless routers (Wi-Fi); connection to a 3G Mobile phone network; or tethering to another device that is connected to a network using a Wi-Fi or Bluetooth connection (Wang & Shen, 2011).

1.8 The Mobile Device

The definition of a mobile device can include laptop and notebook computers, but more recent mobile technology includes smartphones, tablets of varying sizes, E-readers and even music players with Internet capability (Wang & Shen, 2011).

As well as the capability to connect to and browse the Internet, mobile devices typically have front and rear facing cameras, touch screens, Bluetooth, Wi-Fi, GPS, media players, gyroscope controlled landscape and portrait modes, inbuilt speakers and microphone, inbuilt touch keypad, a long lasting lithium battery and, depending on the device, a plethora of other functions (Wu, Wu, Chen, Kao, Lin & Huang, 2012). This trial used tablets with both Android and IOS operating systems that had all the above features, with both devices having approximately 10 inch screens.

Mlearning with handheld mobile devices appears to have the potential to resolve many of the issues identified. Mobile devices have the ability to connect students, teachers and adults to more interpretive content than the Education Facilitator alone can present (Nouri, Eliasson, Rutz, & Ramberg, 2010). Mobile learning appears to present opportunities to access and add to information presented in different learning styles, from a range of perspectives and in a way that gives the learner more control over their own experience (Scott, Mandryk, & Inkpen, 2003; Naimie, 2010). The use of mobile devices may also have the ability to engage youth in a new and exciting way, in a language they are familiar with (Prensky, 2001) as well as producing unobtrusive content at currently interpretively sparse historic, culturally significant sites.

1.9 Project Aims and Research Questions

It was my hypothesis that mLearning is an avenue of educational engagement worth pursuing, and an investigation into its ability to resolve perceived programme deficits and increase student learning and engagement at historic sites forms the basis of this research.

I measured student understanding and retention of Internet based content delivered via handheld tablets at historically authentic sites. Understanding and retention of Internet based content was compared to the understanding and retention of content delivered by the educator. Additionally, and importantly, I investigated student perceptions of the effectiveness of their mobile learning experiences at the historic sites.

The two research questions that guided my research were:

Which method, delivered in an authentic context, was the most effective at increasing student understanding and retention of the Waikato Wars content?
And what were the participants' perceptions of the mobile learning experience?

1.10 Summary

In chapter one I have provided background information into the Ministry of Education's LEOTC programme and why LEOTC experiences are important. I describe the programme at Te Awamutu Museum, how the programmes are facilitated and who accesses them. I then moved into justifying why I created a research project for the Waikato Wars LEOTC Education Programme, gave a brief explanation of mobile learning, the benefits of mobile learning, what is a mobile device, and explained the general aims of the research project.

Chapter 2 – Literature Review

The thesis which guided the selection of literature for this Chapter was that mLearning will increase student learning at historic sites. The literature review is organised into 6 headings: an overview of mobile learning and the pervasiveness of mobile technology in the mobile age; an examination of the research into effective and ineffective mobile learning, anywhere, anytime learning and the importance of context; the impact of mobile learning on institutions, teachers and students; whether mobile learning is a social construct; and an examination of mobile learning content and frameworks.

2.1 Overview: More Research is Needed

In an overview of mobile learning research by Pachler, Bachmair & Cook (2010) they state that research into the use of digital and mobile tools to support learning inside and outside the classroom has steadily increased over the last ten years. Melhuish & Falloon (2010) believe that mLearning offers exciting possibilities for all those who wish to be unceasingly connected and active in the online world, for both work and pleasure. A meta study into mLearning by Wu, Jim, Wu, Chen, Kao, Lin & Huang (2012) found the majority of research into mLearning effectiveness was with tertiary students in an 'on campus' setting. This was followed by the New Zealand equivalent of primary school students, and then secondary school students. The study showed the majority of mobile learning research investigated the motivation, perceptions and attitudes of students toward mobile learning. Few of the 164 mobile learning studies that were examined, explicitly focussed on quantifiable data on positive increases to student learning. When the studies were examined for positive outcomes, 86% of the 164 studies were positive (Wu et al. 2012).

The use of tablets by primary and secondary students for mobile learning is a relatively recent educational technology shift, with its benefits for primary and secondary education a fledging area of research. The previously mentioned meta-analysis by Wu et al (2012) showed that out of the 27 primary school

mobile learning focused research trials recorded, two thirds of the mobile devices used were PDAs, with the other third of devices used being mobile phones, laptops and digital cameras. The same analysis showed that out of the five research trials aimed at secondary school aged students, three used mobile phones, one used PDAs and one laptop computers (Wu et al, 2012). However the mobile device landscape changed when Apple released the iPad in March 2010 (Apple, 2010). The iPad, a new kind of tablet computer, spawned the tablet market (Murphy, 2011), with its popularity with general consumers most recently demonstrated by the three million iPad 4 and iPad Mini devices sold in the 3 days after their November 2012 release date (Apple, 2012). Wu et al (2012) predict that as tablets become more popular in the education sector, primary and secondary mobile learning research will shift towards tablet computers.

A summary of research into the effectiveness of LEOTC programmes has identified high levels of involvement, interest and enjoyment documented by qualitative measures, but identified a lack of quantitative assessment into whether LEOTC experiences increase student learning (Moreland et al, 2005). The Ministry of Education's 2013 criteria for the redevelopment of the LEOTC programme includes an emphasis on LEOTC programmes that raise student achievement, support learning for Māori and Pasifika students, and emphasise innovative, future focused learning.

The unrealised potential of new mobile technology, an absence of quantitative LEOTC research and new MoE priorities for LEOTC lay a foundation for new research to address these issues. This research project aims to contribute knowledge towards these identified gaps in current research.

2.2 A Mobile Age

Defining mlearning

Since the recognition of mobile learning in the late 1990s, there has been no single mobile learning definition (Walker, 2012). Traxlor (2008) observed that attempts to define and categorize mobile learning tend to compromise the very attributes which make it different from traditional learning. Similarly, Woodill (2011) believes that the attributes of mobile learning that make it so hard to

define, are the same ones that make mobile learning such a personalised learning experience for each individual.

In 2000 Clark Quinn published one of the first mobile learning definitions, defining mobile learning as “the intersection of mobile computing and e-learning: accessible resources wherever you are, strong search capabilities, rich interaction, powerful support for effective learning, and performance-based assessment ... e-learning independent of location, time and space (cited by Woodill, 2011). Similarly Moses (2008) focuses on a connection between electronic learning - eLearning, and mobile learning defining mobile learning as: “a form of e-learning that involves the use of a mobile device to produce an anywhere and anytime learning experience to cater for the needs of different learners and augments their formal learning experience” (Moses, 2008 pg. 24).

Other mobile learning theorists reject the strong connection between mobile and eLearning as any link between eLearning and mLearning brings preconceptions containing possible restrictions around what an mLearning experience can involve (Woodill, 2011).

Disagreement over what constitutes mobile learning has led to the categorisation, and re-categorisation of mobile learning definitions (Walker, 2012). In 2007 Mike Sharples, one of the earliest pioneers of mobile learning, suggested four guidelines when developing a mobile learning definition. These were: Identify how mobile learning is different to other learning, embrace learning environments outside the traditional classroom, base mobile learning on successful teaching and learning pedagogy, and take into account the ubiquitous nature of the mobile device (Sharples, Taylor & Vavoula, 2007, p. 13).

In the same publication Sharples et al cited Niall Winters 2006’s four broad mobile learning categories, which were:

- *Technocentric* – where the mobile learning is learning to operate the portable device itself;
- *Relationship to e-learning* – where mobile devices allow the extension of e-learning away from desktop computer;

- *Augmenting formal education* – where formal learning is complemented by mobile learning devices; and
- *Learner-centred* – where the learner takes advantage of the learning opportunities offered by mobile technologies, and the learning does not have to occur in a fixed location and instead occurs wherever the learner is located (Sharples et al, 2007).

In Sharples, Arnedillo-Sánchez, Milrad & Vavoula's book, *Mobile Learning* (2009), they insist on the importance of context when defining mobile learning. Similarly Woodill (2011) states that mobile learning is 'learning in context', believing that as people change their physical location, they will learn from both the real-life context that surrounds them and from the use of any mobile device that allows connectivity to information and communication facilities. The context also features heavily in Kukulska-Hulme's (2010) definition that identifies the learner at the centre of the mobile learning educational context. The context is described as "a new learning landscape supporting flexible, accessible, learner-focused education, integrating with other aspects of the learner's life and work, so that education is no longer seen as a separate activity that has to take place in a school, college, university or other establishment" (Kukulska-Hulme, 2010 p. 182).

Defining the Devices

The use of technology to aid social history themed interpretation is not a new concept. Additional interpretation stored on computers has been present in public spaces since the late 1960's (Parry, 2007 cited by Walker, 2012). Since the inception of the mobile phone in 1973 (Shiels 2003) mobile devices have come in increasingly varied forms with each successive generation of device adding new features and applications, such as Wi-Fi, e-mail, apps, music player, and audio/video recording (Wu et al. 2012). Shih reported in 2007 that mobile technology expanding pervasiveness into mainstream society is demonstrated by the fact that mobile phone connections outnumber landline connections in many countries (Shih, 2007).

Alfahad (2009) believes that just because a device is wireless it isn't automatically a mobile device, with there being strong debate about whether

larger devices, such as netbooks, notebooks, laptops or tablet computers, can facilitate mobile learning (Woodill, 2011). Keegan states that mobile learning should be restricted to devices that can fit in a woman's handbag or a man's pocket (cited by Woodill, 2011). Tribal Education Limited (2009) defines mobile devices as handheld technologies, and Traxler (2005) felt mobile learning could only occur if the device could be hand held or easily positioned on top of the user's palm.

Wang & Shen (2011) pointed out that it is because of a wireless device's size that it can provide different services and opportunities for mobile learning. Wang & Shen (2011) created four mobile device categories based on how they store, retrieve and transmit information to the user. These categories are: stand-alone; network-centred; mobile computers; and web portal, descriptions of which follow.

Stand-alone devices

The content on a stand-alone mobile device is loaded to the learner's unit from an originating computer. Stand-alone mobile devices are useful for learners requiring information such as podcasts or instructional guides, where there is no wireless Internet connection. A stand-alone mobile device could include an iPod, mobile media player, e-reader, or laptop, depending on what the device is configured to do.

Network-centred devices

Network centred devices primarily use the Internet and wireless local area networks to download and upload content during mobile learning. Network centred devices include smartphones and 3G enabled tablets. Network centred devices are often used to create collaborative mobile learning experiences where content can be shared among learners.

Mobile computers

Mobile computers, such as laptops and notebooks, are portable devices that can connect to a network, but retain full functionality even without Internet access. With larger memory, longer battery and more processing speed than many

handheld devices, mobile computers are best suited to downloading, storing and uploading large files, running a variety of applications at once and providing the capability for interactive multimedia learning content.

Web portal

Web portal mobile devices rely on a fast wireless Internet connection to access information and run applications that are stored on remote, Internet based servers, such as Microsoft's SkyDrive and Google Doc. SkyDrive and Google Docs provide large amounts of cloud based storage, and powerful word processing, spread sheet and presentation applications. An increasing number of mobile devices can operate using a web portal, with these devices including tablets, smartphones and PDAs (Wang & Shen, 2011).

The introduction of the iPad in 2009 reinvented the tablet computer market, with the iPad spawning a new generation of touch screen mobile computing devices (Meurant, 2010). Tablets, as mentioned earlier, are predicted to eclipse the desktop computer market by 2015 (Ericson, 2012), with some educators believing that the iPad, and its tablet equivalents, having the potential to revolutionise the delivery of educational content (Meurant, 2010). Although comparisons can be made between the functionality of personal digital assistants (PDAs) and iPads (Foltin, 2012), most researchers agree the major difference between the iPad and other products is its touch technology, its ability to create using the built-in camera and microphone, and its use of apps (Schaffhauser, 2012).

Manufactures of mobile devices have created operating systems that provide access to online stores, where apps with specific content can be downloaded (Gahran, 2011). Mobile applications are standalone software that can, in part or in whole, be downloaded to a mobile device that has the ability to connect to a network and has an operating system that supports that software (Gahran, 2011). Some apps are downloaded in their entirety to a device and after their installation require no Internet connection to work, while other apps require a connection to the Internet to function properly (Gahran, 2011). Those applications that need an Internet connection have either a combination of

device and Internet based content, or their content is entirely Internet based. App stores are accessed through the mobile device and currently only provide apps that are compatible with the device's authorised operating system (Gahran, 2011). Martin, Pastore and Snider (2012) point out that because native mobile applications are device specific, they can only be used on the operating system the app has been designed for. Apple, Android, Windows, and Blackberry all have their own operating systems, which has created separate app markets (Martin, Pastore & Snider, 2012). One exception to device specific native applications, are the cross platform, web based HTML5 apps. HTML5 apps can be accessed by all mobile devices with an Internet connection and an HTML browser, as they are completely hosted on the Internet and can be accessed from any device with an Internet connection (Martin, Pastore & Snider, 2012). Even with the accessibility of the HTML5 platform, the exclusive nature of some apps means that no single device can provide access to all available mobile device applications (Gahran, 2011).

Shifting Towards New Technology

Schools cannot remain technologically dependent on desktop computers, for as far back as 2004, Facer and associates have pointed out that the relevance of the desktop computer in students' lives is rapidly decreasing (Facer, Joiner, Stanton, Reid, Hull & Kirk, 2004). There is evidence that there is a decreasing relevance of desktop computers for students, with mobile devices becoming the preferred mode of information gathering and communicating with others (Facer et al. 2004). The number of people using a mobile device to access information through mobile broadband subscriptions has rapidly increased to one billion in 2012 (Ericsson, 2012).

The rapid uptake of mobile devices by younger sectors of society is exemplified in one large online quantitative study in the United States of America where the proportion of tertiary aged students possessing a mobile device increased from 1.2% of the population surveyed in 2005, to 67% in 2010 (Smith & Caruso 2010)). Students everywhere now have access to powerful, computing technologies that are portable enough to be with them at all times (Wang & Shen, 2011). From primary to tertiary, mobile devices continue to become ubiquitous throughout all

stages of education (Cyger, 2010), and as mobile broadband subscriptions move towards five billion in the coming 5 years (Ericsson, 2012), the number of students who are constantly connected via their mobile devices can only continue to rapidly increase (Cyger, 2010).

Current generations of learners moving through the education system are accustomed to sophisticated communication devices (Cyger, 2010), with Spikol & Milrad (2008) urging schools to start engaging with mobile devices as learning tools when planning learning experiences, as more and more students will be bringing devices into the classroom.

How New Zealand is accessing Internet content is rapidly shifting towards next generation mobile devices, typified by smartphones and touch screen tablets. A survey conducted by Ericson in July 2012 stated 7% of New Zealanders owned a tablet and 30% owned a smartphone (Ericson, 2012). The same survey indicated that by the end of 2012, 20% of the population will own a tablet and 50% will own a smartphone. Currently 46% of smartphone owners browse the Internet on a daily basis, and another 22% of respondents browse at least once a week (Ericson, 2012). Today's school students are growing up in a society where next generation phone and tablet use is a part of everyday life (Wang & Shen, 2011). Mobile devices allow users to access the Internet anytime, anywhere, and there is potential for these devices to be used as a tool to provide meaningful learning experiences in and outside of the classroom (Spikol & Milrad, 2010).

2.3 Is Mobile learning Effective?

Mobile Learning in the Classroom

The research design of this study is centred around creating a learning system that enables access to learning materials in various contexts and situations. Tertiary student perceptions of having anytime access to learning materials through the use of a mobile device has been comprehensively researched (Wu et al, 2012). Interviews conducted at a tertiary business course found students preferred online access to digital resources over textbooks as a learning aid (Evans, 2008), and a large, multi-discipline survey at a Saudi Arabian university

found student attitudes towards the use of wireless mobile technology highly positive, especially its anytime anywhere nature (Al-Fahad, 2009).

Although Wu et al (2012) meta-study showed 86% of mobile learning studies reported positive outcomes, it also revealed that the majority of these research-related positive outcomes focused on the participant's perceptions of mobile learning. When the studies that focus solely on participant perceptions are excluded, positive outcomes from mobile learning research seem to be counterbalanced by neutral or negative findings regarding the effectiveness of mobile learning when compared to other methods of learning. In 2002, Ketamo developed a mobile learning environment that was able to provide for some of the learning needs of the participants. Results from Ketamo's research showed that mobile devices did generally increase participant learning when used in conjunction with other technology but on their own they could not replace the learning benefits brought by conventional computers (Ketamo, 2003).

Doolittle & Mariano (2008) designed a historical learning resource that could be accessed by either a stationary computer or a portable digital media player. Working Memory Capacity (WMC) results showed that students in a stationary instructional environment performed better, with students showing a lower working memory capacity on the portable digital media player. The lower WMC scores by the students using the portable media device was attributed to the higher level of external distraction when compared to a stationary computer. 2009 Middle School research by Baya'a & Daher into mobile learning found that although all students responded positively to the use of mobile phones when learning mathematics curricula, other factors may have affected the students' positive perceptions. These variables included: that the mobile learning occurred outside the classroom, that the type of instruction given by the teacher leading the mobile learning changed from teaching to facilitation; and student choice into whether they participate in the research (Baya'a & Daher, 2009). Similarly, Hsi (2002) concluded that rather than the mobile device leading to increased participant learning, it was the inquiry based activities such as exploration, information search, communication and experience documenting that the mobile device facilitated that lead to the higher levels of meaning making.

Multiple studies have presented research outlining the advantages of distributing learning materials to students via mobile devices. Jones and Jo (2004) describe an ubiquitous learning system that provided middle school aged students (schooling level Yr 7-10) access to learning materials. Ubiquitous learning systems are tied closely to mobile learning, and can be defined as a simplified form of mobile learning that enables learning materials to be accessed in various contexts and situations (Yang, 2006). Participants in the 2003 study showed that ubiquitous learning demonstrated increased engagement, resulting in higher levels of interaction between students and the learning materials (Jones & Jo, 2004). According to Jones and Jo (2004) higher levels of interaction between the students and the mobile learning materials lead towards increased knowledge gain for participants.

Effectiveness in an Authentic Context

Tan, Liu, and Chang (2007) investigated research into two natural science themed, outside the classroom, mobile learning programmes. The first programme was developed by Chen, Kao, and Sheu (2003) and focused the students on bird watching. The second was also developed by Chen, Kao, and Sheu (2005), and focused the learning activities on butterflies. Each programme provided students with mobile devices that enabled access to learning resources that scaffold and individualise each student's learning experiences while they were in the outdoor setting (Tan et al, 2007). When compared to the traditional learning methods of whole group instruction with hard copy resources, both of these programmes provided evidence of increased student motivation and increased effectiveness of learning. Additional reported benefits over traditional teaching methods include: increases in student creativity; their ability to explore and absorb new knowledge and solve problems (Tan et al, 2007).

Both sets of research investigated by Tan et al (2007) used Radio Frequency Identification Technology (RFID) to scaffold students through each programme, and concluded that RFID programmes can provide museum-like learning experiences in an outdoor setting.

Integration into the Workforce

Many researchers believe that mobile learning improves communication between learners. Locke & Wachira's (2010) research indicated that it was the students' prior experience with using mobile technology that was the catalyst for better communication that allowed participants to feel more connected to other students during their learning experiences. Shih (2007) found when mobile devices were used in the classroom for communication, the communication of ideas and questions without disrupting the whole class, resulted in a productivity rise. Increased communication has been linked to increased productivity when mobile devices are used to expand investigation and discussion beyond the walls of the classroom (Rossing 2012). A 2007 study comparing mobile device to face to face communication noted that mobile device communication facilitated a higher level of participation and sharing of ideas. This study suggested that student use of mobile devices for communication and other learning would provide advantages for their future career development (Shih 2007). Mobile competency is now mandatory for many areas of the job market (Shih 2007), with an increase of mobile learning in the classroom increasing the likelihood students will be prepared for integration into the workforce (Shih 2007).

Learning Style Benefits

The presentation of instructional content has the potential to be individualised to the student's preferred style of learning using information and communication technology (ICT) more than traditional, teacher focused classroom instruction (Felder, & Soloman, 2000). When teaching led instruction is used, tailoring the delivery content to the preferred learning style of each student becomes problematic. Personalising content to the learning preferences of the student using ICT benefits student learning and increases academic performance (Zywno & Waalen, 2002). Rossing (2012) highlighted that the recent developments in mobile technologies offer the learner the benefits of individualised ICT instruction. However, Rossing believes that a higher level of academic benefit can be obtained when the mobile device's ability to present content in an individualised manner is combined with face-to-face learning. Rossing states that the intersection of a variety of different face to face and mobile learning

methods, that only mobile learning can facilitate, consolidates learning and provides the most likelihood of increased academic performance (2012).

According to Cyger (2010) many mobile devices are low cost compared to personal desktop computers, allowing them to be more financially accessible to the student population. However access to mobile learning devices is not equal across society. Rossing (2012) cites Rideout, Foehr and Robert's (2011) research showing that in North America, low income children eight years and under have 50% less experience with mobile devices than children in a higher income group. However Shih (2007) believes relative low cost is still the major reason the majority of secondary and tertiary students own a mobile device of some description.

Locke & Wachira (2010) describe how a less expensive, smaller, lighter, mobile device can accomplish many tasks that would otherwise require a larger computer, such as composing email, Internet searching and word processing. Moving from the traditional desktop computer to mobile, palm sized computers presents new opportunities for learning (Stanton & Cole 2003). As well as accomplishing many desktop tasks, their mobility and affordability represent advantages mobile devices have over desktop computers, such as more energy efficiency (Cyger, 2010). Mobile devices have solid state disk drives, allowing greater tolerance of the rigors of being portable, and regardless of their operating system mobile devices have access to the accelerating native and HTML5 mobile application market which is predicted to reach \$52 billion in revenue by 2016 (Juniper Research, 2012).

Mobile Learning as a Distraction?

When examining the effectiveness of mobile learning within a museum context, many researchers believe that mobile learning may bring little or no value to the learning process (Sung, Hou, Liu & Chang 2010; Charitonos, Blake, Scanlon, & Jones 2012). Walker (2012) points out that some toy museums, ironically, see mobile devices as toys that distract from educational content, and cites evidence that children randomly push buttons wherever there is technology present.

A study comparing traditional paper based with mobile learning methods found that the mobile learning programme facilitated less observation, led to shorter responses and less in-depth discussion (Sung, Hou, Liu & Chang 2010). Other studies observed mobile learning that isolated visitors from one another, and often inhibited real life social interaction (Vom Lehn, Heath & Hindmarsh, 2005).

Other research indicates that educator perceptions about mobile learning were often unfounded. Cahill, Kuhn, Schmoll, Lo, McNally & Quintana's (2011) research showed that some educators and museum professionals believed that novelty and usability issues with mobile devices distracted students from set learning and additionally encouraged a focus on the technology rather than the exhibits and interpreters (Cahill et al., 2011). Cahill and associates theorised that the negative views towards mobile learning held by the educators and museum professionals during their research trials may have been due to prior experience with mobile devices in other contexts, rather than based on any evidence.

However the distractive influence of technology is documented by Walker (2012) as a dominant and unintentional learning outcome in some mobile learning research. Walker (2012) outlines a mobile learning project where students use mobile phones to take and uploaded photos to be used for further study back in the classroom. Focus group interviews revealed that when students were asked what they had learned, the students mainly replied that they had learned about phones, cameras and the Internet (Walker, 2012). Contrary results are found in a 2007 study where secondary students initial focus on the PDA technology quickly succumbed to the desired learning intentions of the education programme (Beazley 2007). In a short space of time students became familiar with the technology and it served to focus them on making meaning out the specific content it was helping them interpret (Beazley, 2007).

Distractions from the learning content are also recorded in Spikol and Milrad's 2008 research into game based mobile learning. In their research trial, students used mobile devices to: provide navigation around an authentic site; access learning content related to the history of the site; and to answer questions determining where to navigate next. Spikol & Milrad (2008) reported high levels of engagement, but when surveyed, the majority of respondents felt they learnt

only a moderate amount of content. However, 75% of those surveyed felt motivated to learn more about the subject (Spikol & Milrad, 2008).

When mobile devices were compared to traditional worksheets, Cahill et al. (2011) found students spent the same amount of time completing the worksheets as annotating or reviewing their data on the mobile device.

Additionally students using mobile devices engaged in significantly more active socio-cultural behaviours related to the content of the museum programme than students using the worksheets (Cahill et al., 2011).

The Restrictions of the System

Dong & Agogino (2004) stress that educators need to take into account the limits of wireless technology to provide on demand, anywhere, anytime mobile learning. MacDougall (2012) lists the limiting technological factors to include: the availability, reliability and data speed of the wireless network to access mobile learning content; the cost of the required device and associated applications; the usability of the device's operating system; how prone the device is to technological failures; and the physical attributes of the mobile device.

Wang & Shen (2011) indicated the greatest limiting factor of a mobile device is the screen size: educators and researchers believing that mobile phone screens are too small to provide a comfortable learning environment. Due to the variance in the screen size of the different mobile devices, as well as different operating systems, Internet based education materials designed for the larger screen of a standard computer, such as an HTML website, or flash video, may be difficult or even impossible to view on a mobile device (Martin, Pastore & Snider, 2012). To provide for the varying screen size and different operating systems of mobile devices, increasingly Internet based content is being hosted on HTML5 websites. HTML5 websites are optimised for mobile technology and provide content that can be easily accessed by all modern operating systems as well as providing the ability to adapt any HTML5 content to a variety of screen sizes (Martin, Pastore & Snider, 2012).

Challenges with New Technology

Wang & Shen (2011) commented on the challenges facing educators when designing accessible mobile learning content. They described how the large variety of mobile devices available in 2011, each with its own functionality and running a multitude of operating systems, has created difficulty when developing resources that students can access using their own personal mobile device (Wang & Shen, 2011).

Most learners now use their personal mobile device as the first point of reference for information access. The delivery capability of each type of mobile device, and the appropriateness of the content for context and environment are important considerations for those designing content for mobile learning (Wang & Shen, 2011).

A 2009 study of primary aged students showed that new mobile experiences require structured practice with the mobile device to ensure task competency. (Nouri, Eliasson, Rutz, & Ramberg 2010).

Nouri et al (2010) also found that when the students had had an opportunity to orientate themselves with the new mobile technology, they were more likely to demonstrate increased learning performance, and less likely to ask teachers for assistance.

3G

Third and fourth generation high-speed cellular data networks provide mobile devices with access to broadband services (Telecom, 2013). Potentially, third and fourth generation mobile technology can provide mobile learners with a greater level of user satisfaction, allowing interaction with content and other learners in ways that a Wi-Fi connection currently cannot (Wang, Shen, Novak & Pan, 2009). However, 3G networks with broadband speed capability are expensive to build and maintain (Wang & Shen, 2011), and at the time of writing, New Zealand's geography is a limiting factor in the strength of mobile signal throughout the country, creating an unreliable, or non-existent 3G or 4G reception outside of large urban centres (Vodafone, 2013 Telecom, 2013).

2.4 Ubiquitous Learning

Learning Anytime, Anywhere

Mobile devices connected to networks provide the capability of anywhere, anytime learning (Sharples, Taylor & Vavoula, 2007)(Traxler, 2007)(Kukulsk-Hulme, 2010). Cyger (2010) pointed out that from 2010 most mobile devices have inbuilt functionality, such as Bluetooth and Wi-Fi, which allows connection to information and communication in a variety of ways and also highlighted the small, lightweight nature of the majority of mobile devices. It is the portability of the devices which Shih (2007) sees as providing the possibility for instant access to content. Rossing (2012) states that having access to a large amount of content allows students to collaborate and create knowledge. In 1982 Medrich, Roizen, Rubin, and Buckley point out that 85% of students' time is spent outside a formal classroom, with Shih (2007) and Cyger (2010) both believing that the time outside a classroom provides the potential for anywhere, anytime learning, often in a learning style that matches their own, transforming everyday events into meaningful learning opportunities. In 2009 Locke & Wachira (2010) researched students who were provided with a mobile device to use while travelling. All participants reported that the mobile device had positive impacts on their overall productivity.

The Importance of Context

In Kenneth Eble's *Craft of teaching: A guide to mastering the professor's art* (1988), he claims that students better understand and apply studied materials when they are engaged in real world issues and situations. Traxler (2007) also supports this notion that mobile learning has the ability to take students from engaging with issues and situations in the classroom, and allows them to be brought into an authentic context in the real world.

Quitadamo & Brown (2001) point out that authentic contexts provide a stimulus for students' learning, creating greater motivation and excitement for their learning process. Vavoula, Sharples, Rudman, Meek & Lonsdale (2009), state that learning in an authentic context exposes students to content that cannot be effectively covered in the classroom, can engage them with community resources, and provide social experiences outside the normality of everyday

classroom life. Sharples and associates point out that mobile learning, and its associated handheld and wireless technology, removes the barriers of traditional instruction, allowing the emergence of new learning opportunities. Mobile learning has the potential to deliver learners to authentic contexts for physically engaging learning activities (Sharples et al, 2007).

The potential mobile learning offers to provide access to information in authentic contexts (Sharples et al. 2007) aligns with teaching and learning practices that are culturally responsive to Māori (Greenwood, Te Aika & Davis, 2011). Similarly, McFarlane (2007) emphasises the importance of the context in which Māori students learn, with Māori preferring to meet, learn and debate in settings that embrace Māori culture and beliefs (MoE, 2012). Kukulska-Hulme & Traxler (2008) emphasize the importance of authentic contexts in which mobile learning occurs, with Greenwood, Te Aika & Davis, (2011) suggesting an optimum learning context for Māori being a context where spiritual, physical and emotional needs are acknowledged. MoE (2012) highlights that the assimilation of digital technologies (such as mobile learning) into Māori learning frameworks must be informed by Māori aspiration and kaupapa (MoE, 2012).

Chan, Roschelle, Sherry, Kinshuk, Sharples, Brown, and Hoppe (2006) agree with the benefits that mobile learning in an authentic context can bring to a learner, however they additionally argue for the benefits of mobile learning across all contexts of a learner's life, authentic or otherwise (Chan et al. 2006). Chan et al. uses the term 'seamless learning' to describe multi context learning, defining seamless learning as the ability to use a mobile device to switch learning scenarios easily and quickly (Chan et al. 2006). Chan et al's. definition of learning scenarios include learning individually, learning with other students in a small group or a large online community, learning with the possible involvement of teachers, relatives, experts and members of other supportive communities, learning face-to-face or in different modes of interaction and learning in or outside classroom, such as a park, on transportation, or at an historic site.

Seamless learning between physical contexts is mostly made possible by the portability of the mobile device, acting as a bridge between multiple physical contexts, such as between the museum and school or home (Wali, Winters, &

Oliver 2008; Spikol & Milrad 2008). The evolution of all mobile technologies has led to a potential new phase in technology-enhanced learning, marked primarily by a continuity of the learning experience across different learning contexts. As Cyger (2010) points out you can use mobile devices on a desk, on the floor, in bed, on the couch or in the car.

The context in which mobile learning occurs can be classified as formal or informal (Wang & Shen 2011). A formal mobile learning context occurs under the management of an educator, frequently in a purpose built environment. An informal learning context occurs under self-management of the learner in unspecified environments (Wang & Shen, 2011). Further, Wang & Shen believe that mobile learning in a formal learning context strengthens the link between the learner and the content, which they describe in behaviourism terms as “stimulus and response.” They also state that formal mobile learning improves the relationship between the student and the educator (Wang & Shen, 2011).

2.5 The impact of mLearning on Institutions, Teachers and Learners

Different Roles for Educators

Conversations with high school students reported by Baya’a & Daher (2009) show that the learning relationship between the teacher and student changed for some students during a mobile learning trial. Baya’a & Daher’s (2009) research revealed that during a trial mobile learning programme the use of a new learning environment, and the use of mobile devices, shifted the information source away from the educator. The change in location and information source, it was theorised, facilitated a more collaborative and enjoyable learning environment for the learner and educator. Similarly Cahill and associates (2011) found that when he compared mobile learning to traditional learning during his research trial, students using mobile phones engaged in more collaborative sense making discussions, than in a traditional instruction context. Traditional learning barriers, such as the learning relationship between teacher and student, and the location of instruction, can be removed by taking advantage of mobile learning’s ability to bring content to learners in authentic contexts for using physically engaging learning activities (Sharpley et al 2007). However, Kazmer (2007) cautions that this rapid development, and the likelihood

that instructors and designers will have difficulty predicting how students will personalise their e-learning spaces, makes it important to recognise the impact of the variety of contexts in which students learn and will use such resources.

Teacher/Institution Perceptions

In 2001 Prensky identified the growing digital divide between students and educators. On one side of the divide are the 'digital natives', the majority of students who have grown up familiar with rapidly evolving digital technology. On the other side are the 'digital immigrants', which include the vast majority of educators, to whom most developments in digital technology are a completely foreign concept (Prensky, 2001). Prensky's observation of a digital divide is still relevant today, with researchers observing that the exponential evolution of technology has resulted in the divide between digital immigrants and digital natives widening.

Sugden (2012) believes the majority of schools are still 'running scared' of mobile tools, with Locke and Wachira's (2010) research revealing that even when educators are required by their institution to include the use of mobile devices in their learning programmes, many struggle to find uses for the devices that directly enhanced their teaching. There is mounting evidence that the digital divide between digital immigrants and digital natives is increasing, with mobile learning seemingly more natural to the majority of students, and foreign to the majority of educators (Conole, de Laat, Dillon, & Darby, 2008).

A dominant view within education is that there is no room for mobile devices, especially mobile phones, in the school setting (Merchant, 2012). Although this view is changing due to increasing pervasiveness of mobile devices, generally, teaching professionals are struggling to keep up with mobile technology (Pachler, Bachmair, & Cook, 2010). Pachler et al (2010) argue that mapping student mobile practices to identify areas for innovation and evaluation will lead to "increased learning benefits" (p36). However they also state that understanding the relationship between mobile devices and learning is complex, with the result being that some primary and secondary institutions have taken measures to regain control of learning situations, such as a complete ban on personal mobile

technology. Mobile devices are forbidden during school hours at all three schools involved in this trial.

Educators are concerned that the technology required to implement mobile learning has the potential to put the students, or the institution, at risk. Typically, mobile learning provides small groups of students with Internet connected mobile devices (Wu et al., 2012) causing an abundance of technological issues (Csete, Wong, & Vogel, 2004). According to Bahli & Benslimane (2004) the largest threat to any wireless area network (WAN) are its users, with steps needing to be taken to mitigate internal attacks and quickly identify misuse. External threats to students centre around information theft, as most mobile devices are poorly protected and once connected to a wireless network, those outside the network can easily capture data (Bahli & Benslimane, 2004). Because of these issues many educational institutions struggle with how to, or even if they should provide wireless access for mobile learning to their student populations (McNaught & Vogel, 2006).

Chipman, Druin, Beer, Fails, Guha, & Simms (2006) confirm previously stated benefits of authentic contexts to the mobile learning process, but warn of the impairment limited resources can bring to a mobile learning experience. Nouri, Eliasson, Rutz, & Ramberg (2010) also clarify the importance of authentic contexts and appropriate resources in mobile learning. They stress that a desired learning outcome is not achieved simply by bringing children outside the classroom to an engaging physical location. The amount and quality of the learning taking place with a mobile device is proportional to the authenticity of the context and the quality of the mobile learning materials. In addition to the quality of the resources and the authenticity of the context, appropriate levels of support, or scaffolding (Vygotsky 1978), needs to be available to the learner in order to ensure higher levels of understanding when mobile learning. Scaffolding provided in the form of assistance from a more knowledgeable person, was crucial for the continuation of the learning process in research cited by Nouri et al. (2010). They concluded that the capacity of mobile technology was insufficient to scaffold learners past many mobile learning difficulties, and a real

dialog with a person was necessary to assist students past barriers, and ensure higher levels of understanding.

Mobile Learner Experience

As well as technological factors potentially having a negative impact on the success of the mobile learning, MacDougall (2012) also highlights the users own influence can influence the value of a mobile learning experience. Although the current generation of students are often labelled digital natives (Prensky 2001), as well as Vavoula and Sharples (2009) warn against assuming digital natives will automatically know how to best use mobile devices for learning. Rossing (2012) points out that some students require large amounts of one on one teacher input, with many of those using mobile learning in higher levels of education relying heavily on lecturers for guidance (Tribal Education Limited, 2009).

Human factors that influence the success of mobile learning (MacDougall, 2012) are summarised as: the familiarity with the mobile devices operating system; the attitude of the user towards adopting a new way of learning; the learner's own level of success during prior encounters with mobile technology, and technology in general; the availability of support when using mobile devices for mobile learning; the information being presented in a method that matches the learner's own preferred way of learning; and that the learner can see the added benefit of using technological innovations such as mobile learning (MacDougall, 2012). Vogel Kennedy and Kwok (2009) summarised the potentially mitigating human and technological influences on mobile learning by outlining that although learners may be provided with a range of mobile learning support, there is no guarantee that this will ensure learning.

2.5 Mobile Learning and the Social Construction of Knowledge

The Importance of Feedback

In a 2010 outdoor mobile learning study, researchers observed that when primary aged participants received feedback to their questions on their mobile device they expressed high levels of satisfaction (Nouri, Eliasson, Rutz, & Ramberg, 2010).

Despite the high levels of observed participant satisfaction, Nouri et al (2010) still concluded that feedback from a mobile device will always be in some degree limited when compared to feedback from an onsite, more knowledgeable person. The researchers drew this conclusion from observations that showed that someone with knowledge of the topic who was available to answer questions, could provide feedback beyond the capability of the mobile device. Being able to provide feedback beyond the capability of the mobile device. This was possible by responding to nonverbal behaviour and any participant conversation that placed the question in context. This additional information allowed the expert to provide adaptive feedback by asking clarifying questions and drawing reflective responses from the students, which often resulted in the adaptation of the task (Nouri et al, 2010)

Short Message Service (SMS) messaging using mobile phones for feedback has been trialled at a variety of higher education institutions. A university trial where SMS messaging was used for formative assessment, feedback and collaborative learning tasks found that when surveyed, students had a positive response towards all aspects of using SMS messages (Brett, 2011). Similar positive SMS feedback came from the University of Dublin where students texted in questions anonymously to be answered by lectures individually or in groups (Pachler, Bachmair, & Cook, 2010). Constraints around using SMS messaging include a shift of student attention from their learning task (Roschelle, 2003 cited by Markett, Sánchez, Weber, & Tangney, 2006), a removal of communication that is centred on the educator, a small screen size, restricted text input functions, including a 160-character limit (Markett et al. 2006).

Positive aspects include: SMS is relatively low tech, it requires little of the network, it works well in developing countries, mobile phones are pervasive in most societies and are affordable (Brett, 2011; Markett et al. 2006).

Group Size

A mobile device to student ratio of 1:2 or 1:3 was selected for this study, based on the following literature. Granić, Ćukušić & Walker's (2009) research suggests that generally students like working individually or in small groups, and at their own pace. Working in small groups with a mobile device creates an inclusive

environment where students are able to express their own comments, opinions and thoughts without feeling embarrassed or inhibited in front of their teacher and peers (Granić, Ćukušić & Walker, 2009).

The decision not to have students with individual mobile devices hinged upon research that suggested that the portability of mobile devices can enhance social interaction. Tallon and Walker (2008) reported that when given a choice, groups of school aged students preferred to share a mobile device, rather than collaborate over a network using individual mobile devices.

Tallon and Walker (2008) also reported that students working individually submitted more responses, which suggests that social interaction contained within a small group of students may be able to resolve many individual questions and problems.

Collaborative Mobile Learning

Vygotsky (1978) developed a theory of Social Constructivism, theorising that each student acquires new knowledge based on the pieces that each group member contributes. Zurita & Nussbaum (2004) describe how social constructivism theory can be applied to educational content and activities where learners collaborate, with So & Brush (2008) describing collaborative learning as a form of learner with learner interaction.

Patten, Sánchez, & Tangney's (2006) research demonstrates how mobile technology can be used to socially construct meaning, which they then describe as *Instantaneous Collaboration*. Patten et al. (2006) advise Instantaneous Collaboration is defined as where learners use the functionality of the mobile device to communicate with other learners in real time, and when learners collaborate in a group to use a mobile device. The research into collaborative learning in the context of mobile learning, showed instantaneous collaboration can improve learning outcomes for students.

According to Tallon and Walker (2008) student sharing of mobile devices may promote intra-group collaboration, and be a more preferable mode of learning than collaborating over a network using individual devices. Zepke & Leach (2002) identify *kanohi ki te kanohi* (face-to-face contact discussion and recognition) as a

preferred learning mode for Māori students, due to this element being more conducive of building whakawhanaungatanga (relationships). Vavoula, Sharples, Rudman, Meek, & Lonsdale (2009) also found that the mobile learning programme itself promoted kanohi ki te kanohi within a group of students.

Research into student collaboration and group engagement stimulated by a mobile learning experience found that engagement is dependent on the design of the mobile learning experience. The research stresses that the design of tangible mobile technology needs to support concurrent, multi-user interaction, with research results indicating that one user input devices contribute to off-task behaviour, boredom and less 'on task' collaboration (Scott, Mandryk, & Inkpen, 2003).

Wang and Shen (2011) also emphasise the potential mobile technology has to promote collaborative learning in social and informal learning environments. Informal collaborative learning is the result when learners take advantage of resources provided by mobile technology, and the environment they are in, to make decisions and to solve problems in informal social and collaborative contexts. The more mobile technology is integrated into formal and informal social contexts, the greater the learning and collaboration between students (Wang & Shen 2011).

In contrast, other museum based research conducted by Walker (2012) found mobile devices negatively impacted on collaborative activity, with devices commonly used in museums, such as PDAs, isolating visitors and inhibiting social interaction. Falk & Dierking (2008) conclude that most of the evaluation data of mobile learning in museums suggests that the current generation of digital devices inhibit group interaction.

In addition to an observed reduction of the effectiveness of collaboration during a mobile learning trial, Scott, Mandryk, & Inkpen (2003) observed a reduction in the participants physical mobility. However they concluded that the reduction of collaboration and mobility was mainly due to the design of the mobile learning programme, and could potentially be avoided with a different programme design.

Role of Social Media in Mobile Learning

In 1978 Vygotsky suggested that making meaning is a social practice. Vygotsky's theory of the social practice of meaning making has been made possible in an online environment by the pervasiveness of social media into mainstream society (Kress, 2012). As of January 2013 the world's most frequented social media site, Facebook, had one billion users, with 604 million of those users accessing their Facebook account using a mobile device (AOL Tech, 2013).

Mobile devices allow students to stay connected to other students by providing the opportunity for continual access to social media websites. Pachler, Ranieri, Manca & Cook (2012) emphasize how society, especially in developed countries, has evolved to a point where learners and teachers are increasingly connected in a mobile society. More than ever before social media technology is enabling complex webs of relationships and networks that allow the exchanging of information and sharing of knowledge (Pachler et al 2012). Smordal & Gregory's (2005) research found that students prefer using mobile devices more for communication than for access to information. In 2012 Charitonos, Blake, Scanlon, and Jones conducted research into the use of social media to aid meaning making on fieldtrips. They provided students with access to a social media space for leaving opinions and adding to the opinions of others. This online space also was designed to provide a way for students to get and stay connected to each other (Charitonos et al. 2012). Charitonos et al's. research found that when they closely analysed the learning trajectory of a small focus group of the trial population, they found that social media added to students' ability to make meaning of the content presented during the fieldtrip.

Facebook has the highest number of users worldwide of all the social media websites (AOL Tech, 2013), with Facebook's influence on education being examined by many researchers. Fewkes & McCabe's (2012) research examined secondary students' interviews which highlighted that the potential for social media to integrate into everyday classroom learning is dependent on the attitudes of the teachers and learners. Fewkes & McCabe's study also highlights the positive attitudes towards using Facebook for learning, with over two thirds of the participants surveyed using Facebook for learning on a regular basis.

Pimmer, Linxen & Gröhbiel's (2012) research into tertiary students found that the social interaction of students using Facebook included the exchange and interaction with educational content such as quizzes, case presentations or the exchange of learning resources. The participation of students in an online learning community has provided the opportunity for students to develop and demonstrate new ways of learning (Greenhow & Robelia 2009).

The use of social media in education blurs the boundaries between entertainment and learning, with students combining the two practices on social media websites (Pachler et al 2010). Facebook's emphasis on entertainment places may limit its ability to support learning, with those using Facebook behaving according to established entertainment norms (Zhao, Grasmuck & Martin 2008).

Additionally the commercial nature of Facebook, and the structure Facebook provides for the social interaction of users makes it a questionable tool for education Friesen & Lowe (2011). With the inability to follow conversation threads, and the emphasis on approval through the prominence of the 'like' button, Facebook creates a learning environment that is structured to avoid disagreement and debate, two key components of any social learning environment.

In addition to the internal limitations of Facebook to support learning, Pimmer and associates (2012) research into the effectiveness of Facebook in a tertiary learning context also highlighted limitations outside the website. In focus group interviews they found educators intentionally avoided the use of social media, with knowledge and expertise developed on Facebook not being taken into account in formal learning contexts and potential resources located on Facebook not featuring in any learning contexts controlled by the faculty and staff (Pimmer et al, 2012).

Pimmer and associates identified that educator's reluctance to refer to, or integrate Facebook in formal learning contexts, was mainly due to educator concerns over the accuracy of the content hosted, and the difficulty in checking the information's validity. Educators identified Facebook's lack of quality control

mechanisms as the major issue, with currently Facebook providing no way for students to check the quality and source of learning content being presented on the site (Pimmer et al. 2012).

The emphasis on Facebook in this literature review, at the expense of other social media research is due to this research's inclusion of a Facebook comments bar as part of the trial education programme.

2.6 Mobile Learning Content, Methods and Frameworks

The Importance of Content

Interpretation is defined by Falk & Dierking (2008) as a negotiation in the form of dialogue, which includes dialogue between individual and environment which can be facilitated by technology. Consideration needs to be given to interpretation made available to the users of mobile technology during this research, with the success of any mobile learning programme relying heavily on the effectiveness of the content and related activities (Walker, 2012). Walker also emphasised that any learning attributed to an outdoor mobile learning programme is directly proportional to how engaging and motivational the students find the content (Nouri, Eliasson, Rutz, & Ramberg, 2010).

Other supportive research (Teng, Bonk, Bonk, Lin & Michko, 2009) indicated that the quality of the online media influenced student motivation to engage with the learning material, influenced their perceptions of the content, and directly impacted upon how much they learnt from it. Inversely, other research (Stanton & Cole, 2003) has outlined how inappropriately designed mobile learning experiences proved to be a barrier to student learning.

When material is being designed for mobile learning, both the software on the device, and the device itself must allow for multiple interaction styles (Scott et al. 2003). Providing learners with a variety of ways to interact with the content will allow students to learn in a style that suits them and the learning context they are in.

Audio

One form of content delivery is podcasting, where a mobile device is used to download and then play audio broadcasts from the Internet (Evans, 2008), which

student surveys have indicated could enhance student learning (Hew, 2009). Evan's research into the effectiveness of podcasts at the tertiary level, found that the majority of learners preferred to revise using podcasts when compared to traditional methods. During interviews students indicated that the advantages of podcasts included: revising from podcasts being quicker than revising from written notes; podcasts being more effective mode of learning than text books; students felt more receptive to learning content when compared to traditional lectures; students advised they could relate more to the lecturer in a podcast, than in the flesh; and could listen to the podcast in a variety of contexts where other modes of learning would not have been possible, for example, on public transport. However, when Hew (2009) compared the test results of students who used podcasts for revision to students who used traditional lectures for revision, it was found that there was virtually no difference between the test scores for the two groups.

In a complex mobile learning trial, involving a variety of content delivery methods, Brown, MacColl, Chalmers, Galani, Randell, and Steed (2003), described that in a museum context, out of the variety of methods trialled, audio appeared to be the most effective form of content delivery.

Walker (2012) also points to the dominance of audio based mobile learning content within a museum context. He highlights a variety of research that shows that the use of audio on mobile devices enhances visitor experience, is equally effective in a variety of frameworks, and concludes that audio is a powerful form of meaning making.

Video

Recent development in wireless mobile technology has increased the ease of streaming of video content from the Internet to mobile devices, which has created the potential for an increase in the variety of learning content for mobile devices (Wang & Shen, 2011). Historically, accessing Internet video content on mobile devices was restricted by the format of the video, and the restrictions of the mobile device's operating system, which resulted in an environment where not all devices could access all video content (Norman, 2011). YouTube (<http://www.youtube.com>) is the largest video content sharing website in the

world, and has grown to dominate online video-sharing destinations (Snelson, Rice, & Wyzard, 2012). Since 2010 YouTube has been shifting its hosted video content to HTML5 format, enabling all mobile devices with a modern web browser to access video from the YouTube website (Parr, 2010). This shift to HTML5 video has been replicated by other smaller video hosting websites, such as Videmo. In 2009 a large tertiary based study of over 3000 participants indicated that students preferred video based content when given a choice of learning materials (Shen, Wang, Gao, Novak & Tang, 2009), however Oyman and Singh (2012) point out that video streaming is still relatively new and further research is needed to better comprehend it's potential role in mobile learning.

Mobile Learning Frameworks

A study of an art gallery's education trail showed increased student engagement (Beazley 2007). In this trail secondary students used mobile devices to access Internet-hosted content that directed groups around a range of related content. The creator of the programme and the author of the research, Ingrid Beazley, reported high levels of engagement from students, with the trails that she designed moving the students from observational to reflective modes of understanding. Beazley spent 6 years refining her trials and emphasises the key qualities for a successful mobile trial; that learning experiences are fun, challenging, carefully designed, and a mixture of guided and self-directed learning (Beazley, 2007).

Similarly, research conducted into the use of mobile devices to mix virtual and physical worlds for game based learning experiences showed increased levels of engagement (Spikol & Milrad 2008). This research trial identified that mobile learning with a game play element promoted a wide range of thinking and social skills, including exploration, content generation, collaboration, problem solving and navigation in space. The mobile learning game which they developed involved students working in groups using mobile devices to navigate around a historic site to interpret content. Students used the content to answer questions, which if were answered correctly would lead the students to their next location. The gameplay goal of the learning experience was to solve a narrative that connected the locations together.

From this outside the classroom learning experience, Spikol & Milrad (2008) recorded wide ranging learning benefits for students using a mobile learning gameplay approach, which included increased motivation to engage in the learning content. The results of an analysis of observational data indicated however, that participants were more motivated by the game play, than the content they were learning about

2.7 Summary

Drawing conclusions from the literature, it appears that:

- The anytime anywhere nature of mLearning appears to increase student engagement
- New technology such as tablets opens up a new area to explore with mLearning
- Authentic Context is important when exploring historic sites
- Distractions can influence the effectiveness of mobile learning
- Due to the variance of mobile technology available, a careful selection process is important
- Different learning styles may be able to be accommodated via mLearning
- Group size is important in planning programmes
- The use of HTML5 websites for hosting the material is an area to explore
- Audio and video material may capture student attention
- Social media may be used to enhance participant learning
- Game based mobile learning can create external motivation to engage with content

The following chapters explain the methodology used for this research, the programme design and the content on which the mobile learning methods are based.

Chapter 3 – Methodology

This research used a multi-method approach, and the methods combined were multi-choice testing and focus group interviews. In this Chapter I present a rationale for the methods of research and analysis, and I discuss the limitations of this research project.

3.1 Quantitative - Multi-choice Testing and Feedback Form

Aliaga & Gunderson (1999) define quantitative research as collecting and analysing numerical data using mathematical methods to explain phenomena. Numerical data analysed for this study will be collected from multi-choice tests and feedback forms. Multi-choice questioning is an effective, efficient, and easily analysed form of quantitative data collection (Jacobs, 2004). In Bontis, Hardie & Serenko's (2009) analysis of student performance, they compared student results from different assessment methods, such as in-class participation, case exams, written assignments, simulation games and multiple choice. They found multi-choice was the strongest predictor of overall student performance. When compared to other forms of quantitative data collection the relative accuracy of multi-choice testing justifies its inclusion in this research as a data collection method.

3.2 Qualitative - Focus Group Interviews

In part, the qualitative focus group interviews were designed to flesh out participant perceptions of the learning methods used, what they thought worked and what didn't work at a metacognitive level. Kitzinger (1995) describes the focus group method as particularly useful for getting participants to notice and reflect on their own thinking processes. This trial's focus group aim of participants noticing and reflecting on their learning, falls into the same metacognitive category as Kitzinger's research and could bring meaningful insight to the quantitative multi-choice data. Horner (2000) describes focus group interviews as having the ability to gather detailed information about participant's insights, as well as their experiences, and beliefs about a selected

topic, with the method utilising student to student communication to identify, refine and clarify issues important to the research.

Horner (2000) suggests that focus group interviews encourage active participation from school students, with students grouped in year levels helping participants feel freer to express their ideas. Kitzinger (1995) agrees that students who are reluctant to participate may be more likely to contribute in a group environment. Horner (2000) also highlights that focus group interviews promote student participation. He goes on to say that increased participation results in increased access to the student's worldview, with the likelihood that the researcher will impose their own adult interpretation on the student's discussion reducing as a result.

Ideally focus group interviews are structured to allow participants to explore the issues of importance to them. Kitzinger (1995) emphasises that discussion between group members creates a relaxed environment where students will use their own words, generate their own questions and often pursue their own priorities. Kitzinger also highlights that a focus group interview can generate more critical comments than other interviews, and often takes the research in new and unexpected directions (Kitzinger, 1995).

3.3 Mixed Methodology

A mixture of qualitative and quantitative approaches were combined to create the research method used in this trial. According to Creswell, Shope, Plano, Clark, & Green (2006) when data is collected, analysed and then mixed, it can be defined as both a methodology and a method. Johnson & Onwuegbuzie (2004) highlight that a mixed method could include a mixture of quantitative and qualitative research techniques, methods approaches, concepts or language.

The mixture of data collection chosen for this research project was a quantitative multi-choice test, and two sets of qualitative focus group interviews. This mixed methods model of research was chosen for a variety of reasons which are addressed in this section, however the main reason was this model best met my need to identify the effectiveness of different mobile learning methods and

gaining insight into student perceptions of learning within the authentic context of the historical sites.

Discussion, reflection, and opinion collected from the focus group interviews may give a deeper level of meaning to the percentages, averages and other statistics generated by the multi-choice testing. Johnson & Onwuegbuzie (2004) highlight that one of the advantages of mixed method research is how quantitative numbers can be given meaning by the addition of qualitative words, pictures, and narrative. Often called an interpretative perspective (Hesse-Biber, 2010), quantitative research is used to place people's experiences in a context, and to aid the understanding of a bigger picture. In this model quantitative research is seen as a secondary method that adds to the primary qualitative research. Hesse-Biber (2010) notes that this design gives priority to the qualitative aspects of the study. A design where qualitative gives the quantitative meaning, is similar to an explanatory sequential design model (Johnson & Onwuegbuzie, 2004) where the collection and analysis of quantitative data is followed by the collection and analysis of qualitative data. However labelling the method explanatory, or interpretive may prove redundant to answering this theses research questions, as according to Hesse-Biber (2010) there are countless sequential designs. Johnson & Onwuegbuzie (2004) suggest that the final decision in the combination of research methods used should not be based on its name, but on the mixture that offers the greatest chance of answering the research questions. The complimentary mixture of quantitative and qualitative methods selected for this research were based on the need to answer the projects research questions: which methods, delivered in an authentic context, are the most effective at increasing student understanding and retention of the Waikato Wars content; and what are the participants' perceptions of the mobile learning experience?

By combining the selected qualitative and quantitative methods for this research project, each method has the potential to enhance the other in answering the projects research questions. The strengths of one method can be used to overcome the weaknesses in another. Creswell and associates (2006) suggest

that for educational research, qualitative research is significantly improved by a shift to a mixed method model.

The corroboration between the multi-choice and the focus group results for this research provides stronger evidence for a conclusion. Creswell and associates (2006) highlight that qualitative research has been used successfully in the past to confirm quantitative findings, and Johnson & Onwuegbuzie (2004) advise that insights provided by the use of qualitative and quantitative methods that complement each other, often leads to stronger evidence based conclusions, with insights and understanding often being missed when only a single method is used. Wood, Daly, Miller & Roper (1999) also suggest that mixed methods have the greater potential to provide the framework for constantly evolving research that leads to increased understanding and robust conclusions.

This research project is looking for insight into mobile learning practice at historic sites, what works, what doesn't, and why. A mixture of qualitative and quantitative research could produce more 'complete' knowledge to inform the development of mobile learning practice. Mixed methods can provide both confirming and contradictory evidence that is not available in the quantitative, or qualitative data alone (Creswell et al, 2006). Confirming and contradictory evidence provides opportunity to explore any unusual results generated by a mixed methodology. Hesse-Biber (2010) believes that issues and discrepancies in quantitative findings can be explored to a greater depth by an examination of the related qualitative data. They also point out that a mixed methodology often creates a journey that leads to the discovery of ideas.

The mixed methods used in this research also have the potential to generate new research questions. Hesse-Biber (2010) suggests that together, qualitative and quantitative techniques are more likely to expand knowledge regarding the overall research problem and/or generates new problems and questions for further research. Wood, Daly, Miller & Roper (1999) highlight case studies that show how the mixed method models provide a richer context for interpretation, validation, and for the generation of new research questions.

3.4 Limitations

This mobile learning programme consists of four different methods of presenting the Waikato Wars programme learning content. Each method covers approximately the same amount of content, but the content covered by each method is different. One limitation of assessing the effectiveness of the different methods used is that if some events were simply more memorable, more dramatic, then that content is more likely to be remembered by the participants regardless of the method in which it was presented. (McCabe & Peterson 1990). Conclusions based on the effectiveness of each of the four methods used during this trial need to take into account that each method presented different content. Care was taken when dividing the content between the methods to divide memorable sections of content equally between the four methods, however the method of division was reliant on the professional judgement of the researcher. How memorable each method's content was may have influenced the participant's ability to choose the correct answer, more than the method of presentation. This limitation needs to be taken into account when assessing the validity of these results.

3.5 Summary

In applying a mixed method model to this research, it was the researcher's aim to provide valid and robust quantitative data, enhanced by the qualitative feedback to inform future programme development and show clear enhancements to student learning in order to meet the varied and growing needs of students who use these education services and to best answer the research questions.

Chapter 4 – The Research Design

In this chapter I present an overview of the physical locations of the trial education programme, justify the choice of participants used in the trial, and highlight ethical and cultural considerations of the research and how these issues were addressed. The chapter then moves into outlining the sequence of research and how the content was designed, how the programme was delivered including an explanation of the mobile devices chosen, and how QR codes and social media are used in the programme. The final part of the chapter explains copyright issues and justifies the absence of a control group.

4.1 The Historic Sites

Out of the 33 New Zealand wars sites identified in the Waipā District (Prickett, 2002) three sites were chosen by the researcher to trial the delivery of the education programme content using mobile devices.

The sites chosen were:

- Karangapaihau Catholic mission, Rangiaowhia;
- St Pauls Anglican Church, Rangiaowhia;
- What is currently recognised as the Ō-rākau Pā site, Ō-rākau.

The rationale for the selection of these particular sites are as follows:

- There is a variety of interesting, relevant and detailed information pertaining to these historical sites
- These sites are closely connected, historically and geographically, and can be used to tell a sequence of events in a linear fashion
- They are within easy travel distance of central Te Awamutu;
- They are conducive to the use of a device transmitting a Wi-Fi signal, such as a 3G hotspot;
- There are strong 3G mobile receptions from two telecommunication companies;
- The educator's own anecdotal evidence suggests that most Waipā residents are unaware of the 1864 war that occurred around where they live.

- This in turn has created an opportunity to present interesting local knowledge that the students know very little about;
- As the sites are in close proximity to many of the homes of Te Awamutu school students, this may increase the possibility students of making a connection between the sites, the events that took place there, and their own lives.

4.2 The Participants

Three schools within the Te Awamutu town boundary were invited to participate in the research to achieve the target of 30 participants between the Year 5 and Year 10 class level.

Year 5-10 students were selected as the trial population for this research due to the increased relevance of the Waikato Wars to Waipā's schools' curriculum in 2014. 2014 marks the concurrent anniversary of the Siege of Rangiaowhia, The Battle of Ō-rākau, the subsequent confiscation of the land, and the formation of the district's towns. District wide coordination of a commemoration and celebration programme began in 2011 on a local government and a school level. The researcher was approached the honourable Mayor Alan Livingston and school representatives, in his role as a museum educator, to consider ways that these events could be integrated into Waipā schools 2014 curriculum. In particular the researcher was asked to consider how younger students, between the year levels of 5-10, could gain an understanding of the formation of the district.

The target participant number of 30 was made up of:

- 10 students from a secondary school's year 9 and 10 student group
- 10 students from an intermediate school's year 7 and 8 student group
- 10 students from a primary school's year 5 and 6 student group

Three groups of 10 students were chosen for two practical reasons: one was the increased ease of participant transportation; and the second was due to the number of mobile devices available for the research trial.

4.3 Research Consent

Following preliminary verbal discussions with class teachers to get an indication of whether they may be interested in participating in the research, each school Principal was approached and written permission was gained in order to recruit students to be involved in the trial. Each school's Principal was provided with a covering letter that included information about the mLearning education programme and proposed research, the process for the unstructured interviews, and a consent form that was returned to the researcher.

Once the signed consent was received from each school Principal, individual teachers were contacted via phone call and follow up covering letter (Appendix A). All three teachers coordinating the research at their school had previously participated in Te Awamutu Museum education programmes and were familiar with the researcher. As with the Principals, each teacher received a covering letter that gave an outline of the education programme, the multi choice tests, the evaluation form, the process for the unstructured interviews and links to an introductory YouTube video (Appendix C).

The teacher coordinating the participants in each school invited students from their own and other classes to participate in the research, introducing the research to the students by playing a video hosted on YouTube that outlined a brief explanation of the research, the education programme, the multi-choice tests, the evaluation form and the focus group interviews.

At the conclusion of the video students interested in participating in the research self-selected by approaching their teacher. These students received a student consent form, a parent/caregiver covering letter, and a parent/caregiver consent form (Appendix A).

Participants returned the completed consent forms to their classroom teacher, who forwarded them to the researcher. In two of the selected class groups more than the target of ten students self-selected to be involved in the research. In these cases, 10 students were chosen to participate through the use of a computer application which randomly selected 10 students.

4.4 Ethical Considerations

Access to participants

Access to participants was sought through:

- Seeking written permission from three school Principals;
- Working with the classroom teacher/subject specialist to give students an opportunity to self-select for the research;
- Obtaining informed written consent from parents/caregivers.

Through work as Education Facilitator at Te Awamutu Museum I had established professional relationships with several teachers and senior management at the three proposed schools. I had also facilitated up to 3 social history based education programmes with some of the students selected for this research. This previous contact was not anticipated to have any significant bearing on the proposed research project.

Confidentiality

The multi-choice test results were stored on a secure, password protected server. The names of participants were not used in any publication of the multi-choice test data. Comments transcribed from the interview were not associated with the names of the students.

Students had the opportunity to leave comments on an embedded Facebook comments bar during the trial education programme. Profiles used to leave comments were created for the purpose of the trial, and are not connected to the students in any way. Qualitative or quantitative data was not collected from the Facebook page for this research.

Potential harm to participants.

The classroom teacher took responsibility for each group of students during the trial education programme. It was their responsibility to complete all relevant school related documentation for students leaving the school grounds to participate in the trial. The teacher took full responsibility for the health and safety of the children during the course of the education programme, including the transportation to and from the historic site.

Even though the researcher facilitated the educational experience, it was up to the teacher to manage their students. Each teacher was made fully aware of their responsibilities by signing a Health and Safety form before leaving the school grounds with the students (Appendix D). The signed Health and Safety form was collected by the researcher before the beginning of the trial programme.

All Internet access via the mobile devices was controlled through the configuration of tablet Internet browsers which allowed limited access to approved sites only.

Time away from normal school classes included:

- Travel to and from the historic sites – thirty minutes; historic site education programme – two hours; Historic site multi-choice test –fifteen minutes.

Participant lunch time used included:

- Two fifteen minute multi choice tests; two thirty minute focus group interviews.

Total participant time used: four hours and twenty five minutes.

The potential time away from normal school classes was indicated in the proposed covering letters and video to participants, teachers, principals, and parents or caregivers (Appendix A).

Student participants completed a multi-choice test 3 times. Two randomly chosen focus groups were interviewed twice. Any one student could spend up to four and a half hours involved in this research.

All participation in this research study was voluntary and all participants were given the right to decline, however all consented to participate. All participants had the opportunity to withdraw fully from the study at any time up until the interview stage was completed, and were advised they could also withdraw any information provided at any stage.

Arrangements for participants to receive information

Digital and hardcopy access to the completed thesis will be provided to all involved parties. Additionally students involved in research and their caregivers/parents will have access to evaluation forms, and interview transcripts that the student participated in for up to five years after the conclusion of the project.

Raw data is available to be emailed/mailed to the participant or their parent/caregiver upon request to the researcher. Information about the access to raw data is included in the covering letters to students and their caregivers, and is additionally mentioned in the YouTube video.

4.5 Cultural Considerations

Once the content was finalised, extensive consultation over the programme content was sought with Waipā District Council's iwi liaison, and tikanga consultant Mr Chuck Davis. Mr Davis's input was required to ensure the programme content, and the content delivery methods were culturally appropriate to local Māori.

It is of paramount importance to note that hapū and iwi connected with the historic sites used in this research and frequented during the education programme had over 1.2 million acres of land illegally confiscated by the New Zealand Government during the Waikato Campaign of 1863-1864 (Belich, 1986). Rangiaowhia, one of the historic sites visited, is the ancestral home of Ngāti

Apakura who currently have a claim before Te Rōpū Whakamana Tiriti O Waitangi regarding, among other things, the confiscation of land around the Rangiaowhia area. During the land confiscation, people died at Rangiaowhia and Ō-rākau Pa. The heaviest loss of life occurred at the Battle of Ō-rākau, which pre-confiscation was Ngāti Maniapoto controlled land. The Battle of Ō-rākau saw more than 160 Māori die (Belich, 1986), most dying in the most 'regrettable' manner (Cowen, 1922). Government forces buried many Māori men, women and children in unmarked mass graves in the proximity of the Ō-rākau Pa site.

Due to these and other unresolved historical issues surrounding these sites, many Māori consider the land where the education programmes were to take place an urupā, and tapu in nature. It is because of the scared nature of urupa that some Māori, and the children they are the guardians for, will not go to these sites without the right protocols being followed. Additional to Chuck Davis's input to ensure cultural sensitivity, it was proposed in this research's ethics application that Te Reo specialist Rangi Waitai would be consulted, however she was unavailable prior to the running of the trial education programme. As a result, a local representative for Ngāti Apakura, Mrs Jenny Charman, was consulted regarding the content of the trial education programme. It was decided by the researcher that because of Chuck Davis strong links to Ngāti Apakura, and Ngāti Maniapoto, as well as being iwi liaison of the Waipā District Council, his input along with Mrs Jenny Charman into the programmes content would ensure the programmes were as culturally sensitive as possible. Mr Davis gave suggestions regarding the pronunciation of many Māori words, the inclusion of macrons where possible, and additional site information that added to the existing content of the interpretation. The suggestions given by Mr Davis were then incorporated into the programme, with the changes being shown to him, for which he gave his approval for facilitation before the trial. Mrs Jenny Charman approved programme content and also provided the researcher with documentation regarding Ngāti Apakura's current application for compensation with the government as well as providing encouragement and support.

4.6 Multi-choice Test Development

The purpose of the multi choice questions used during this trial was to test participant knowledge before, immediately after, and 4 months after the mobile learning intervention. Multi choice questions can be considered to have a high degree of reliability because of their objective scoring process (Haladyna 2004).

The 24 multi choice questions used in this research had three components:

1. the stem- which contained the problem to be solved (Considine, Botti & Thomas 2005)
2. the key - the correct answer (Isaacs 1994).
3. 2 distractors – plausible, incorrect answers (Haladyna 2004)

Haladyna (2004) concluded that a three option multi choice question, consisting of one correct answer and two distractors, is a reliable framework for a multi choice question. The reliability of three option multi choice question has been shown to be comparable to that of four or more options (Nunnally & Bernstein 1994). The reason for this is that in most multi choice questions have only one or two ‘working distractors’, with three or more option questions reducing the probability of the inclusion of weak distractors (Masters, Hulsmeyer, Pike, Leichty, Miller, & Verst 2001). Advantages of three option questions are that they take less time to complete by the participant and less time to construct by the researcher (Considine, Botti & Thomas 2005).

For this trial, the stem of each multi choice question was written as a partial sentence that required completion, or was a question in itself. Research indicates there is no significant difference in test performance between these two types of question stems (Masters et al. 2001).

The researcher’s development of the question stems, the key and the distractors was based on research into what makes a reliable multi choice test. Questions stems, the key and distractors were: written in a clear and concise manner; similar in terms of grammar, style and length; presented in a logical sequence; the distribution of the key throughout the test options to avoid placement bias;

that the options be vertically formatted; and the design of each question tested one specific element of content (Haladyna 2004; Masters et al. 2001)

As suggested by Haladyna (2004), the multi-choice questions were reviewed by another educator before implementation and were subsequently trialled on a group of year 13 students by their classroom teacher. These students weren't involved in the research trial, with the test being used by the teacher as a summary to the topic they were studying. Feedback from the teacher identified some grammatical errors, which were changed before the implementation of the test in the research trial.

4.7 The Research Sequence of Events

Before the Education Programme

Prior to completing the education programme each group of ten participants completed the 24 question multi-choice test at their school. The multi-choice test asked participants questions about the Waikato Wars themed content of the education programme on which the research was based. The same questions were reused for all multi-choice testing throughout the research. The results were not made available to the participants at any stage during the course of the research.

Two of the groups completed the pre-test 1 day prior to participating in the education programme, the third group completed the pre-test on the same day as the trial.

The test was administered by the researcher at the participant's school at a time and venue selected by each school's coordinating teacher. Each of the three venues where the pre-test was conducted were close to, but separated from, other school students and staff. Each participant received a hardcopy print out of the 24 multi-choice test with each test being labelled with the students' year level. Each participant also received a pencil, were advised to not name their hardcopy of the test and to complete the test individually. To aid in participant comprehension the researcher read each of the 24 questions, and possible answers aloud, with participants individually selecting one answer out of a choice of three for each question. Each test took approximately 10 minutes. At the

conclusion of the test the researcher collected participant hard copies and entered each group's results separately into an online database.

On the Day of the Education Programme Delivery

The programme started with the assembly of the participants at the former Karangapaihau Catholic Mission site in Rangiaowhia. The researcher provided an induction to the use of the tablets, which included: a guide to the basic functionality of the tablet; a demonstration of how to scan a QR code; and a tour of the HTML5 website where the interpretive content was located.

Participants self-selected their own groups of 2 or 3 and received a ThinkPad, or an iPad tablet. Each mobile device was wirelessly connected to the Internet via a 3G wireless modem that was held by the researcher, with each group scanning QR Codes to connect to the sites interpretive content.

Participant groups were free to move around the site and choose where they interacted with the content. Each group was directed via QR Code to the three different digital mLearning programmes – Video presentation, Audio presentation and Still slide show presentation. At different points during the Karangapaihau section of the education programme each group was directed to the researcher who gave a verbal presentation of content.

After each group listened to the presentation from the researcher, he worked with the group to demonstrate how to leave comments and questions using the web based comment box and contact form.

At the conclusion of all four information delivery methods students were directed to an online multi-choice test located on the same HTML5 website as the interpretive content, where 8 of the original 24 pre test questions were asked again. The 8 questions related to the Karangapaihua interpretive content, with the test designed to be completed by the whole group and submitted on the website. At no stage was feedback given on the answers submitted by each group. Once the answers were submitted by each group, participants, teachers, and supporting adults moved on to the next historic location, St Pauls Anglican Church.

At St Pauls Anglican Church, and then Ō-rākau the process of the participants accessing the interpretive content and commenting was repeated. As the groups finished interacting with the site specific interpretive content via their mLearning device and also the researcher presentation, they then completed the portion of the 24 multi-choice questions that related to that site's content. The average length of the education programme was 1.5 hours for each of the 3 groups, excluding transportation.

At the conclusion of the education programme participants completed a feedback form. By using the tablet to scan a QR Code participants were redirected to an online survey (Appendix E). This survey comprised five questions. Four of these questions asked participants to rate the effectiveness of the different methods of learning using a scale of one to four, where 1 was 'very effective' and 4 was 'not effective'. The final question on the feedback form asked participants about the importance of being able to leave comments and ask questions about the interpretive content on the website itself. Once the feedback form was completed, students, adult helpers, teachers and the researcher all returned to the participant's school.

Immediately following the programme

At their school participants were required to complete the 24 question multi-choice test, which was administered by the researcher in the same manner and under the similar conditions as the pre-test. The 24 questions were the same pre-test questions used throughout the research. At the completion of this test the researcher thanked the participants.

The focus group interviews

Within two days of the completion of the education programme, at a time arranged between the researcher and the organising teacher, a randomly selected group of 4-5 students from each year group participated in an unstructured focus group interview led by the researcher. Each focus group interview lasted between 20-30 minutes and consisted of an informal discussion loosely based on the methods used during the education programme and the results from student's feedback forms

Post Education Programme

Three to four months after the completion of the education programme, at times arranged between the researcher and the organising teacher, the researcher returned to each of the three participating schools to re-administer the multi-choice test and the evaluation form. Immediately after the 3 month post-test, participants from the original three focus groups were re-interviewed regarding their attitudes towards the effectiveness of the methods, and other techniques used during the education programme. See Appendix B.

At the conclusion of this interview all participants, organising teachers, Principals and adult helpers were thanked for their time and contribution towards the research.

4.8 The Content Delivery

At each location in the trial, the programme content was divided into 4 sections, with each section being presented by a different method. Three of the methods used the mobile device, with the fourth method being verbal delivery by the educator. The inclusion of the educator talking as one of the methods of content delivery would allow the participants to compare all four methods of content delivery in feedback forms and in the focus group interviews.

The four methods used in the research trial were as follows:

1. Verbal delivery by the research educator
2. Digital video
3. Digital audio
4. Digital copies of still images accompanied with written interpretation. The still images accompanying interpretation could be compared to either a picture book, or a slideshow with captions, with the content intended to be viewed in a linear fashion.

The final version of these resources, how they were hosted and the source they were accessed from by participants was the result of significant trial and error by the researcher. The below descriptions are of the final methods used by the researcher to host the digital information.

Verbal delivery by research educator

Although the researcher was familiar with the content surrounding each site, scripts concerning the content of interpretation to be spoken by the researcher were written. These scripts allowed the researcher to provide consistency of information to the participants, and to carefully define the content so as not to reiterate content provided to the participants during other methods of site interpretation. For ease of presentation the scripts were refined down to key points, which the researcher had with him during the running of the trial education programmes.

Digital Video Interpretation

In order to abide by New Zealand copyright standards for educational use (Copyright Council of New Zealand, 2012) video interpretation for the historic sites was constructed out of small sections of video from a variety of different sources. Two separate sequences of video were then overlaid with audio commentary given by the researcher. Finally the video was optimised for mobile devices and uploaded to an HTML5 video-playing platform, where it was stored for private viewing only. An HTML5 video player enables the video to play in the browser window, rather than in a separate video player, allowing the content to be available for viewing on all mobile devices with a modern operating system (Parr, 2010).

Digital Audio Interpretation

Scripts were devised by the researcher for a target audience of school students in years 5-10. These scripts were designed to be listened to in specific locations, giving reference to visible landmarks. Giving reference to landmarks assumes the audience has basic geographical knowledge of the Waipā district, such as locating south and identifying Mount Pirongia, a large volcano that dominates the Waipā landscape. The Audio interpretation was recorded by the researcher as a series of mp3 podcasts. These podcasts were uploaded to the HTML5 audio playing platform and were restricted to private access. As with the HTML5 video HTML5 audio loads and plays the content in the mobile devices web browser without having to download the file, or to have it play on a separate player.

Digital copies of images

Images sourced from Te Awamutu Museum's Education collection and relating to the events surrounding the historic site were uploaded to an HTML5 website where a slide show was created and hosted within the website. Written interpretative content designed and developed by the researcher was displayed with each individual image. When viewed, the slide show allowed the user to choose how much time they spent viewing the picture and reading the interpretation before progressing to the next image. Each image and associated written material added to the previous image, leading the viewer through a linear storyboard of events.

4.9 The Programme Delivery

Using the Internet as the host for programme content was decided upon due to most students being familiar with webpage navigation and conventions. Beazley (2007) suggests that familiarity with the Internet increases participant comfort, as well as the likelihood the participant will be able to successfully use the mobile technology for its desired purpose. Initially it was the researcher's intention to create an mLearning education programme that would utilise currently available Internet resources. The researcher conducted a review of the online content relating to the Waikato campaign of the 1864 Waikato War in February 2012. This review was undertaken to evaluate the current resources available on the topic that would suit presentation through an mLearning medium. This review revealed that although there were resources that could be classified into video, audio, images and information, this content was not always appropriate for an education programme.

Written accounts of relevant Waikato Wars information available on the Internet ranged from small extracts to entire books. Most were written for an audience above primary and secondary school level. Some suitable information is located on New Zealand history online (Te Tari Taiwhenua - The Department of Internal Affairs, 2012). This information is pitched at secondary students but isn't available on all mobile devices.

Most Waikato Wars images located on the Internet were of poor quality, and were often reproduced on websites without the permission of the copyright holder. One exception is Alexander Turnbull Library's digital collection (Manatū Taonga The Ministry for Culture and Heritage, 2012), where the search engine *Timeframes* allows access to many relevant high quality images. On their own, these photos lack the interpretation that places them in the context of the four historic sites used in this trial. Additionally, due to complicated security measures designed to impede copyright infringement, most images were not available to be viewed on all devices.

Some relevant Waikato Wars audio, mostly in the form of mp3 podcasts, are available for open access listening on the Internet. Many of the podcasts are extracts from written accounts of the Wars, with the majority being hosted on New Zealand History Online (Te Tari Taiwhenua - The Department of Internal Affairs, 2012). Podcasts relating to the Waikato Wars were also available to be either streamed or downloaded from websites hosting the material, like iTunes (Apple, 2012) and Radio New Zealand National (Radio New Zealand, 2012). The content of this audio was generally of high educational value but there were a number of problems: only small sections of any one audio episode was applicable to the four Waipā historic sites that the education programme was to be based around; the content was not available on the host websites indefinitely and could be withdrawn at any stage; downloadable audio content required a device hosted mp3 player to play it; not all content was available on all mobile device operating systems; and when the audio was streamed from the a host site it was difficult to locate the specific applicable content out of a long audio podcast.

From this initial research into the Waiakto Wars information and resources currently available on the Internet, a concern developed that even with some form of framework linking the resources together, the quality of the available content would lead to a confusing interpretation of the historic sites by most, if not all students. The quality and relevance of the content has been outlined by many researchers as crucial to the success of any mobile learning programme (Nouri et al. 2010; Teng et al. 2009; Stanton & Cole. 2003). It would be highly

likely that if the quality of the interpretive material was poor, it would lead to a poor interpretation by the students. This poor interpretation could provide misleading results regarding the ability of mLearning to increase understanding and retention when compared to an existing NEW ZEALAND Wars programme, and may skew student perceptions regarding the effectiveness of mLearning in the interview process.

My investigation in Waikato Wars material that was available on the Internet in February 2012, and the resulting conclusion that there was a distinct lack of site specific, audience appropriate, digitally accessible content, resulted in the decision for the researcher to develop his own content for a mobile learning programme. This content would be created by converting Te Awamutu Museum Education department's existing Waikato Wars content and resources into a variety of digital resources that could be accessed by mobile devices.

4.10 Copyright Issues

Enabling mobile device access to high quality interpretation currently only available on DVD was pursued by the researcher as the next step. A request was made to Landmark Productions for parts of their documentary series, The New Zealand Wars, in particular episode 3 - The Waikato Campaign, to be used during this research trial. The request was rejected due to the risk generated by placing documentary content on an open access medium that couldn't guarantee a restricted audience. The New Zealand Film Archive was also contacted to obtain small sections of other relevant film for the use, with the application being rejected on the same premise.

Most of the Waikato Wars resources in possession of the Te Awamutu Museum's Education services are typed notes from amateur local historians, a collection of articles, books, and access to archival material made available by Te Awamutu Museum's Collections manager. These resources were used either with the copyright holder's permission, or following the guidelines set out by the New Zealand Copyright Council for educational, and/or personal use.

4.11 The Mobile Learning Devices

Preliminary thoughts were that a smartphone screen of 7-10 cm was too small for a small group of students to view effectively. Melhuish & Falloon (2010) point out collaboration and interaction between students should be easier with a 25cm screen on a handheld tablet, than a bulkier laptop or even a smartphone, where the small screen size can make sharing and group work difficult.

Sponsorship was needed to provide enough tablets for the education trials that happened over the course of a week. One iPad tablet was loaned from Te Awamutu Museum's Education department, one ThinkPad tablet was purchased, and two ThinkPad tablets were loaned from Te Awamutu yechnology consultant Marcus Gower for the duration of the research trial. All devices used in this trial had a similar screen size. The number of 10 students per education trial was determined by the number of available tablets that the researcher had access to during the duration of the trial period and the preferred participant group size of between 2-3 students.

Each group of participants connected their tablet to a 3G Mobile hotspot to access the online interpretation of each location.

4.12 Social Media

An embedded comment box from social media platform Facebook was included on each location's website. The embedded Facebook comment box let participants leave comments, and for those comments to be viewed on the location's website, as well as on the tablet's profile. This function was included to allow participants to make comments and ask questions regarding the interpretive content of the education programme. With 750,000,000 estimated unique monthly visitors (eBizMBA, 2012) Facebook is by far the most used social media platform and was the only social media platform offering this embedded function on a HTML5 platform at the time of this research trial.

Each mobile device had its own profile created with the social media site Facebook. The device's Facebook profile allowed the participant groups to leave comments and ask questions after each section of interpretation on each of the 4 historic locations websites during the education programme. Comments could

be seen only by other research participant groups. Participants could 'like' and comment on other participant groups comments without leaving the locations website. Additionally participant groups could also email comments and questions directly to the researcher, though an embedded contact form within the website. Participants were made aware how to leave questions and comments using the embedded Facebook comments and contact forms during the IT orientation at the beginning of each education programme.

4.13 Group Size

A mobile device to student ratio of 1:2 or 1:3 was selected for this study. Granić, Ćukušić & Walker's (2009) research suggests that generally students like working individually or in small groups, and at their own pace. Working in small groups with a mobile device creates an inclusive environment where students are able to express their own comments, opinions and thoughts without feeling embarrassed or inhibited in front of their teacher and peers (Granić, Ćukušić & Walker, 2009).

4.14 QR Codes

Once the content was approved, an HTML5 website was developed as a framework to host the interpretation for each of the four historic locations. Participants were then linked to the interpretation for each website by scanning a quick recognition, or QR code with the mobile device's camera. QR Codes are 2 dimensional barcodes that can hold large amounts of information, and once scanned redirect users to an Internet webpage address (Rouillard, 2008).

Barcode scanning apps can be downloaded to a mobile device, with the camera used to scan the QR code. Once scanned the URL contained within the QR Code is opened in the device's web browser. QR Codes allow mobile device users to shift from an offline to an online state without typing a URL into a web browser, potentially making the transition quicker and easier (Rouillard, 2008). A QR Code storing the URL of the digital interpretative content website was physically located at each of the 4 historic sites, the researcher produced, laminated and provided the QR Code to the site for quick use by the students involved in the trial.

4.15 Control Group Issues

The decision not to have a control group was an attempt to reduce the influence of the mobile device itself when measuring the effectiveness of mobile learning. New technology, such as mobile devices, has been shown to create research bias, which was named by Clark (1983) as the 'Novelty Effect'. Clark's research demonstrated that participants paid increased attention to technology that is new to them, with Malan (2007) demonstrating that novelty of mobile technology may show benefits that are as long term as the technology is novel.

A control group where the content was delivered by solely verbal means was not used due to the potential of the novelty effect to influence results. The novelty effect identified by Clark (1983) may cause the comparison between the two groups to be skewed. It was thought by the researcher that if the verbal delivery of information was included as part of the trial education programme, that any extra engagement provided by the novelty of the mobile device would transfer to all aspects of the trial programme.

The following chapter covers programme content used during the research trial.

Chapter 5 – Programme Content

In this chapter I describe how the content of the education programme was organised and provide specific information regarding the actual programme content.

5.1 Content Organisation

Programme content was divided evenly between four methods of presentation:

1. Audio
2. Video
3. Slideshow
4. Researcher – Face to face presentation

At each separate site (Catholic Mission, St Pauls, O-rākau Pā) participant groups scanned a QR Code with their mobile device. The QR code prompted the device's browser to open a web page, from which participants could access all of the learning content relating to that particular location.

Students were directed by the researcher to access the programme content from left to right across the top menu bar. The screen shots of the programme content used in this description are taken from the iPad tablet in portrait mode. The programme content could be viewed on the ThinkPad Tablet and the iPad in a landscape or portrait viewing orientation.

5.2 Karangapaihau – Rangiaowhia Catholic Mission

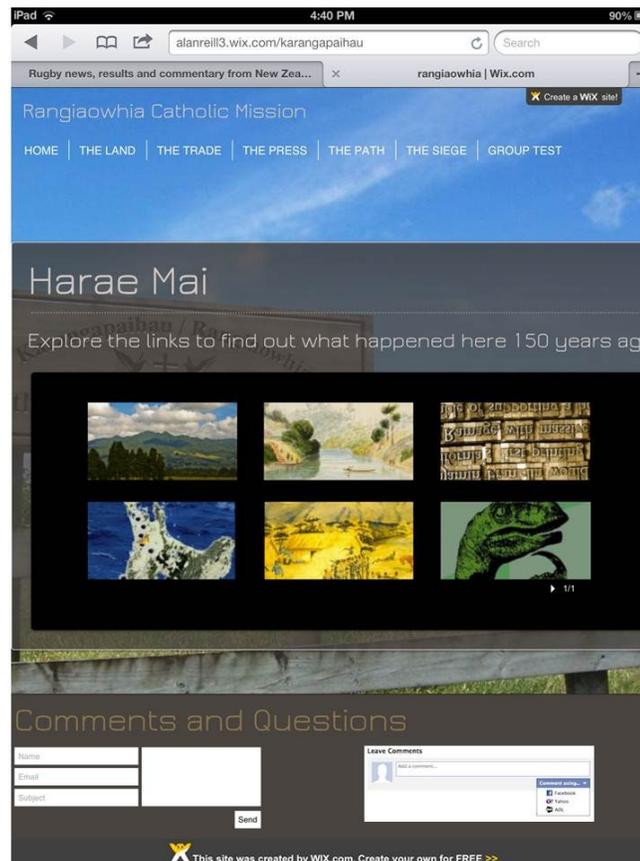


Figure 1 Karangapaihau Home Page

Figure 1 is the homepage for the Karangapaihau, Rangiaowhia Catholic Mission and was the first site of the Waikato Wars Education Programme. The web address for this page is <http://alanreill3.wix.com/karangapaihau> From this site participant groups could link to all the programme content created for the interpretation of this site. At the bottom of the page are the two participant feedback options: an online form that emails the student's questions to the researcher to be answered after the programme, and a comments box, where questions and comments can be written by participants and are available to be seen on each of the four mobile devices used in real time.

The question and comments banner is an embedded feature hosted by Facebook, and was logged into by a Facebook profile that was created for each individual tablet. Under each tablet's separate Facebook profile, participants could leave comments and ask questions that would be visible on the bottom of each Karangapaihau webpage.

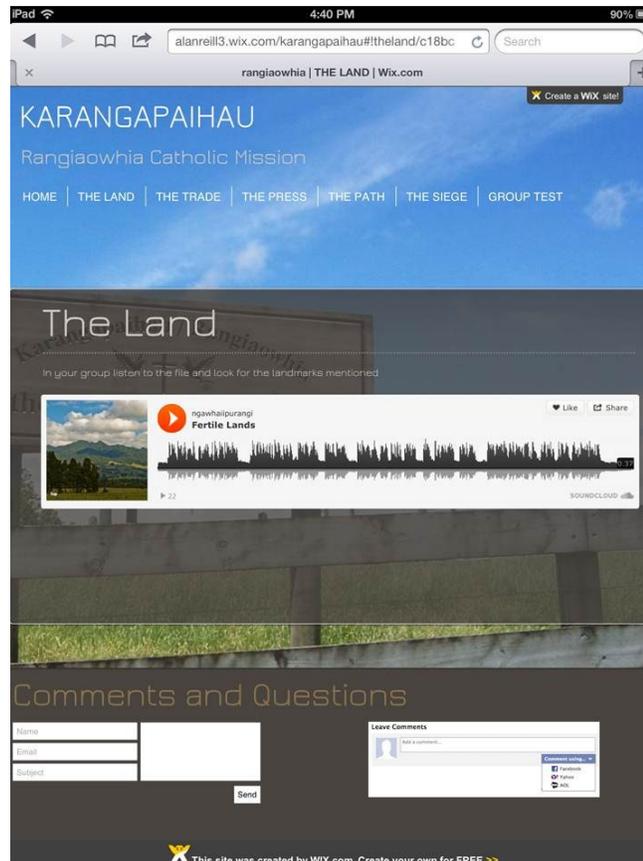


Figure 2 The Land

Figure 2 is an image of the first content participants accessed on the Karangapaihau website, the Fertile Lands audio podcast. The Fertile Lands audio podcast identified physical landmarks, and explained factors that lead to the fertility of the land around the Karangapaihau site.

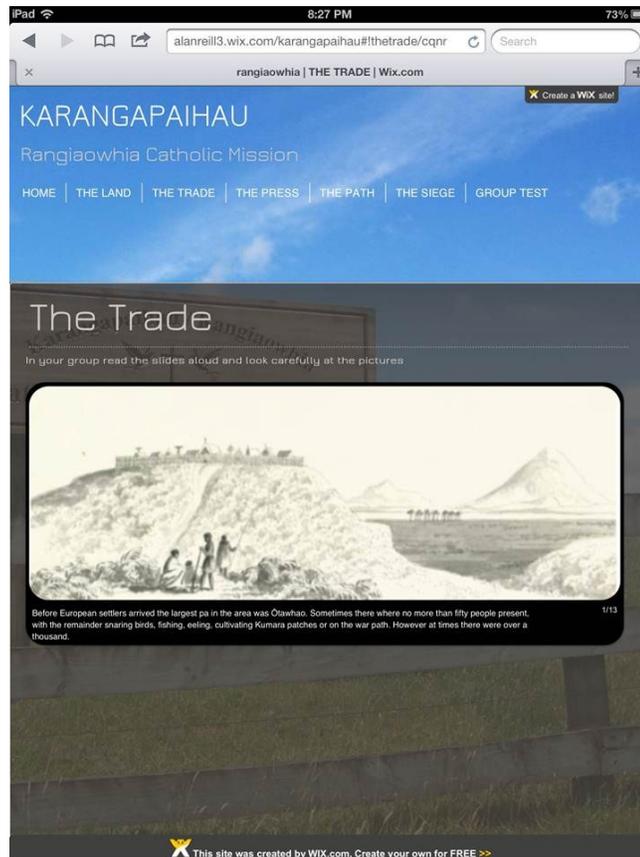


Figure 3 The Trade

Figure 3 captures the first image and written interpretation of the embedded slideshow 'The Trade'. The directional arrows, that allows students to navigate to the next page of content, appears when the sides of the image were pressed on the tablet. 'The Trade' slideshow details how Māori use of the land around Karangapaihau changed with the arrival of the missionaries, and new agricultural technology. With new crops, techniques and technology Māori transformed Rangiaowhia into the agricultural centre of the Waikato, exporting the bulk of its produce using the river system and traditional transportation. The burgeoning city of Auckland, and its increasing population became increasingly dependent on Rangiaowhia. These were prosperous times for Rangiaowhia Māori.

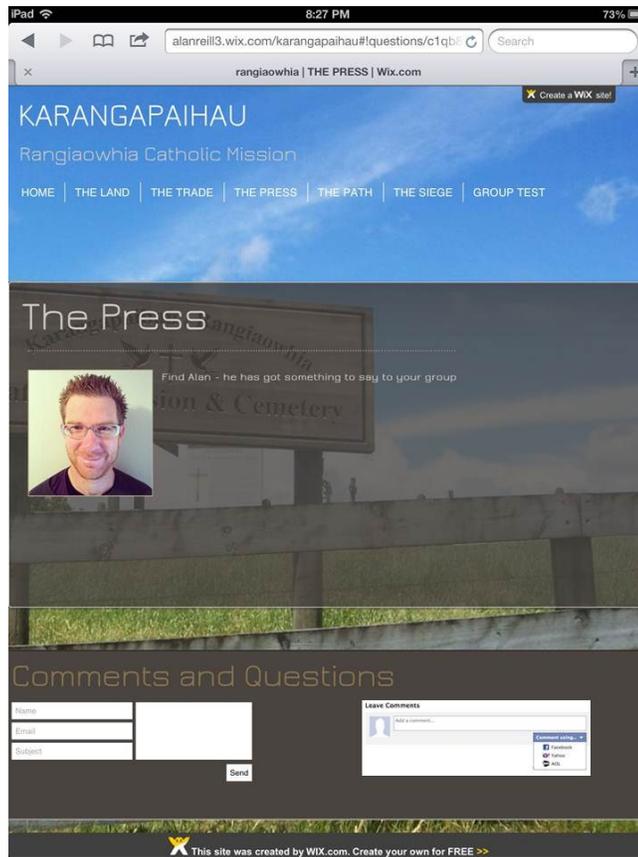


Figure 4 The Press

Figure 4 gives the participant group a visual prompt to find the researcher in order to receive the researcher's spoken content for Karangapaihau. Researcher spoken content for Karangapaihau was based on two local Māori entrepreneurs who travelled to Vienna on the invitation of an Austrian explorer. After being the honoured guests of the Emperor, and training at the Royal Printers, they returned to New Zealand with their own printing press that was presented as a parting gift. This press was used to print pro Kingitanga information in te reo Māori and was distributed throughout the Waikato. In retaliation the Government set up a pro government Māori language newspaper in Te Awamutu.



Figure 5 The Path of War

Figure 5 shows the embedded YouTube video content titled ‘The Path of War’. When play was pressed, the video expanded to fill the tablet screen in a portrait orientation. The video explains a variety of factors that lead to the Government’s decision to declare war on the Kingitanga and its supporters; travels the path the Government forces took as they fought their way into the Waipā district; and details how General Cameron ordered the skirting of Paterangi Pā in order to attack the undefended Rangiaowhia.

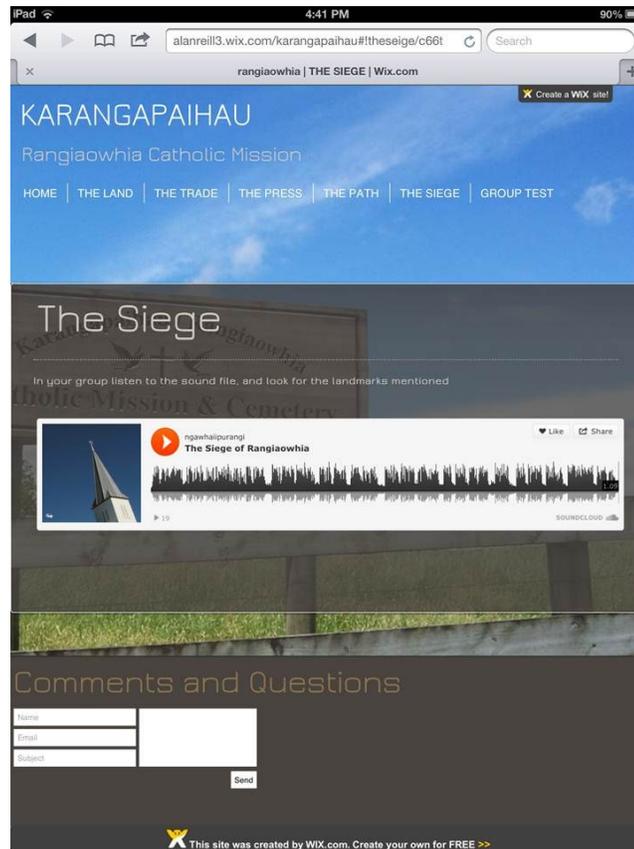


Figure 6 The Siege

The audio podcast recounting the siege of Rangiaowhia is captured in Figure 6. The podcast details accounts of the Government forces' raid on the mostly old men, women and children occupying the agricultural village of Rangiaowhia.

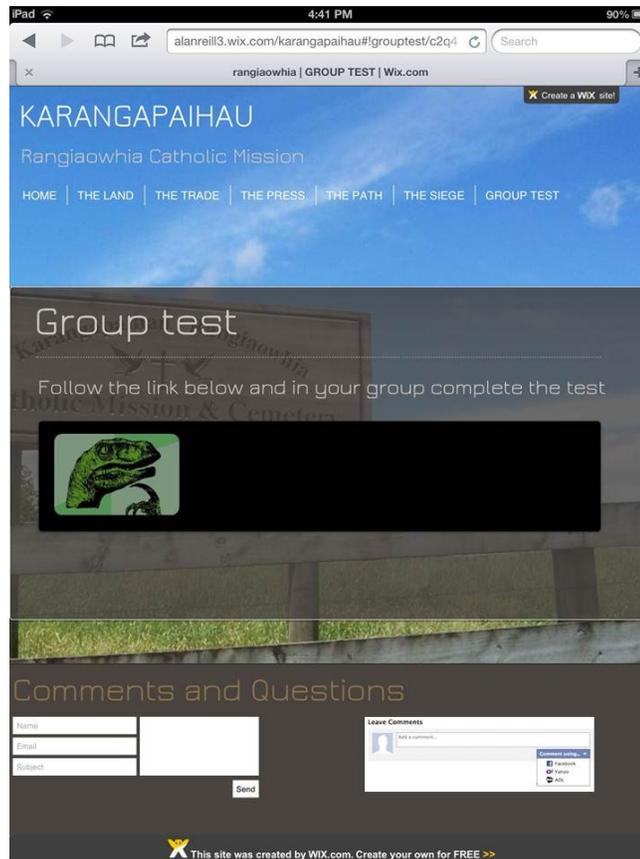


Figure 7 Karangapaihau Group Test link

The final page of the Karangapaihau website contained in figure 7 shows the link to the participant group test, figure 8.

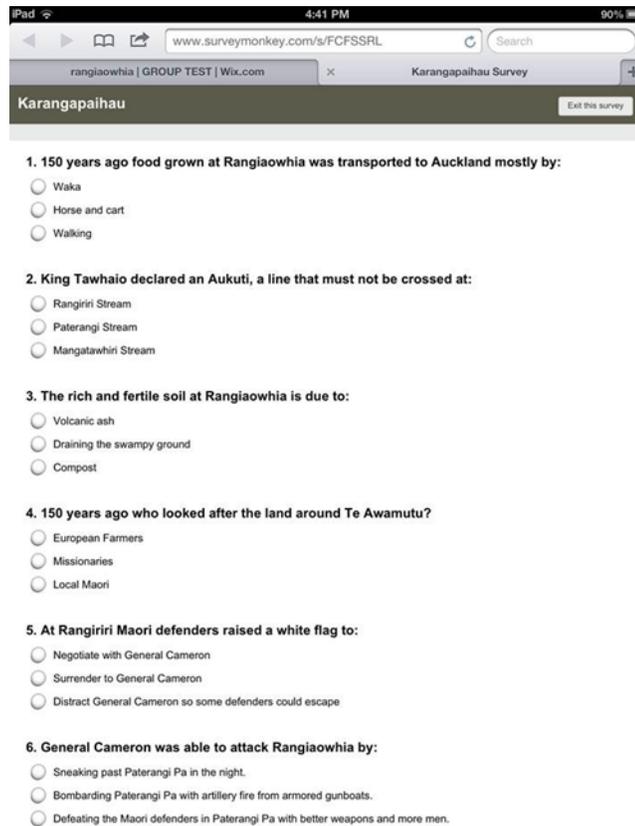


Figure 8 Karangapaihau Group Test

This link opened an additional browser window displaying 8 multi-choice questions of the 24 questions used to measure understanding throughout the trial. These 8 questions used in the group test related to the content covered on the Karangapaihau website and were answered as a group.

Not at this or any point during this trial were participants given summative feedback on their multi-choice selections.

Once the participant group had selected their answers to the eight questions and pressed the submit button, the multi-choice window closed and the students were returned to the Karangapaihau website.

5.3 St Pauls Church - Rangiaowhia

The second historic location of the Waikato Wars mLearning programme was inside St Pauls Anglican Church, also at Rangiaowhia. Inside this church, built eight years before the conflict in 1856, participant groups scanned a QR code with the mobile device to access the website containing the site related programme content.

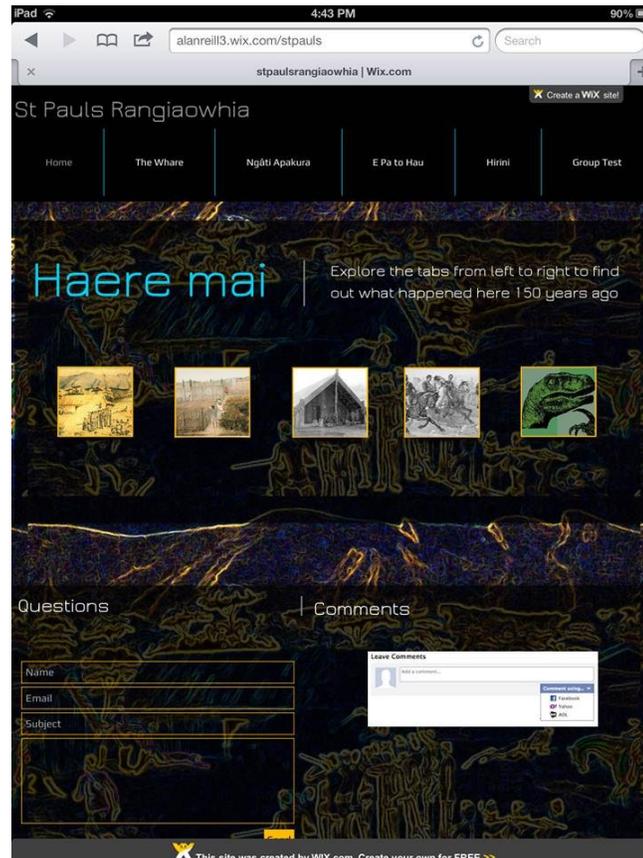


Figure 9 St Pauls Home Page

Figure 9 shows the homepage for the St Pauls website. The web address for this page is <http://alanreill3.wix.com/stpauls>. Although visually different from the Karangapaihau website, this homepage contains the same content layout and navigation, and still required students to engage in the content in a linear fashion.

As with the Karangapaihau site, the homepage provided links to the entire programme content created for the interpretation of this location. The comments or questioning options located at the bottom of each webpage worked in the same manner as the Karangapaihau page, with participants placing comments or ask

questions under the profile of the tablet they were using. Comment forms were emailed to the researcher and the correspondence on the Facebook comment bar on the right could be seen on each group’s mobile device.

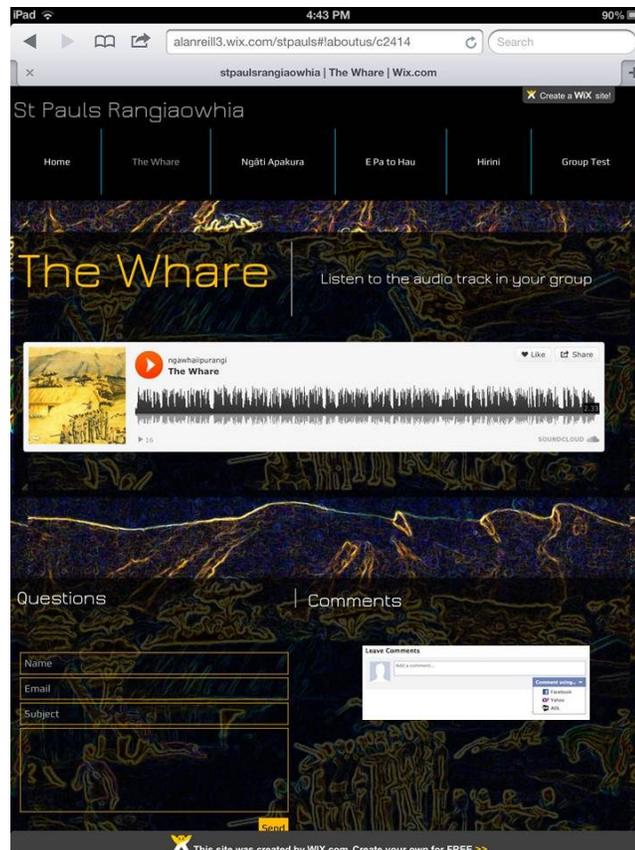


Figure 10 The Whare

Figure 10 shows the audio player ready to play “The Whare” podcast. The audio contained recounts of the Government siege of Rangiaowhia, in particular focusing on a whare that was burnt to the ground. The first-hand accounts tell of a traditional Raupo whare where a handful of resisters offered some defence. The whare was set on fire, and unarmed, surrendering Māori exiting from the whare were shot by Government forces. After the siege, Rangiaowhia, along with 1.2 million acres of the Waikato was confiscated by the New Zealand Government.

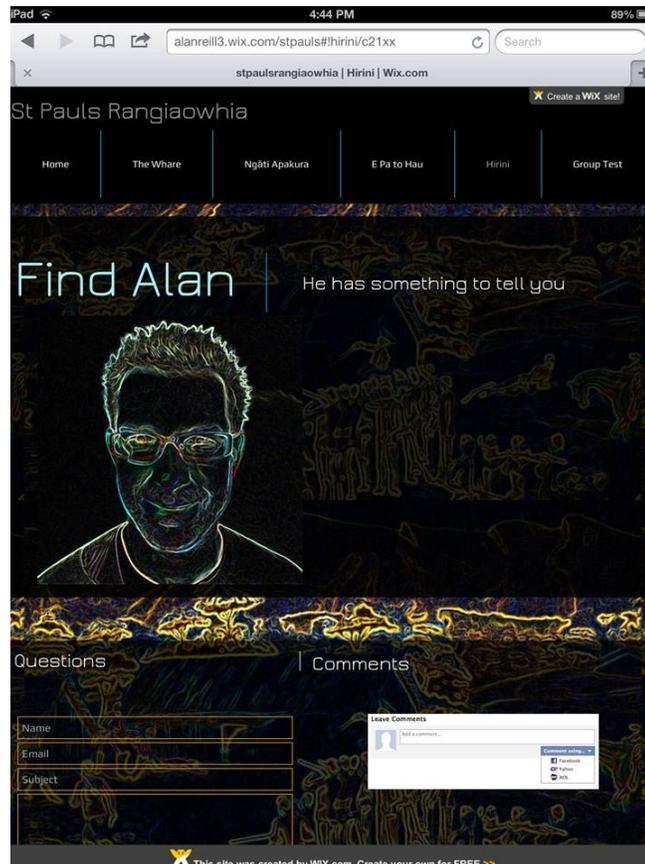


Figure 11 St Pauls Find Alan

Figure 11 is the webpage that prompted participant groups to find the researcher in order to receive the spoken section of St Pauls content.

The researcher explained to the participant group the events that took place after the siege of Rangiaowhia, including the brief skirmish at Hairini Ridge, the relocation of General Cameron’s armed forces; and the looting of Rangiaowhia.

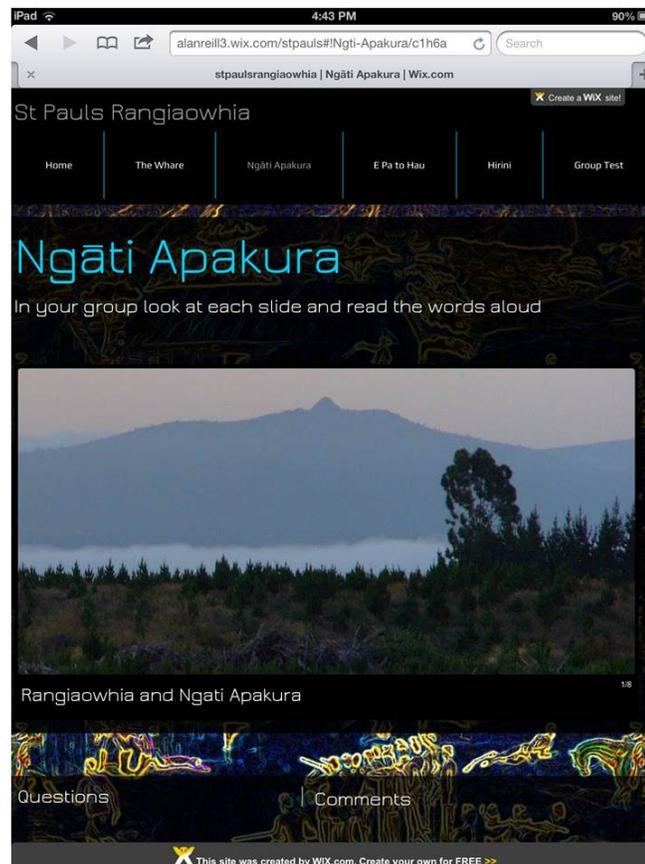


Figure 12 Ngāti Apakura

Figure 12 shows the beginning of a slideshow describing the plight of Ngāti Apakura, whose ancestral homeland was Rangiaowhia.

After their land was taken, Ngāti Apakura RaNgāti ra Te Wano lead Ngāti Apakura south. On this journey, Titiraupenga Maunga was climbed and Te Wano died at the summit. Continuing the journey south the majority of Apakura perished before reaching their destination, infected by a highly contagious disease for which they had no immunity.

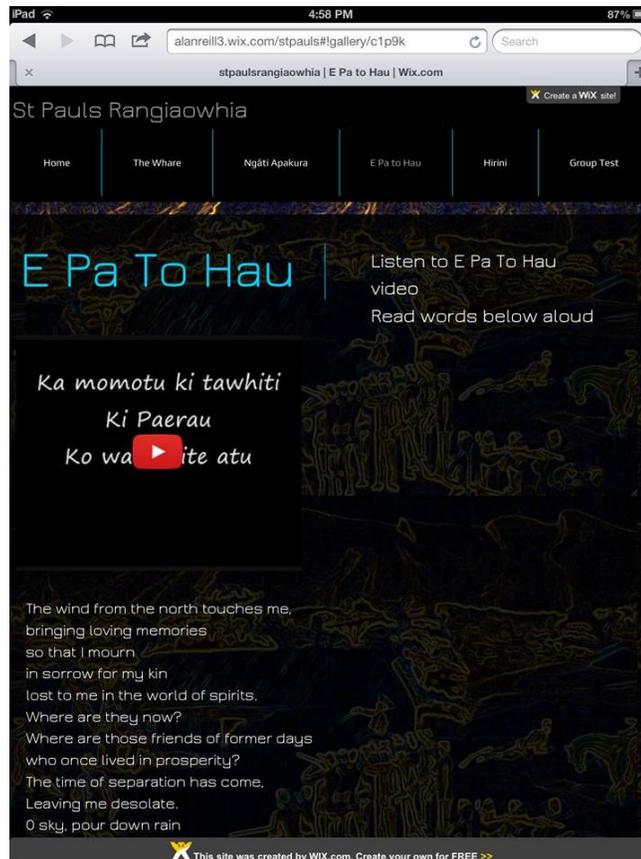


Figure 13 E Pa To Hau

Figure 13 shows the video 'E Pa To Hau' embedded in the webpage. The English translation is included below the video. This ode was written by Ngāti Apakura survivors of the exodus from Rangiaowhia, to immortalise in song their fall from a prosperous to an impoverished people at the hands of the New Zealand Government.

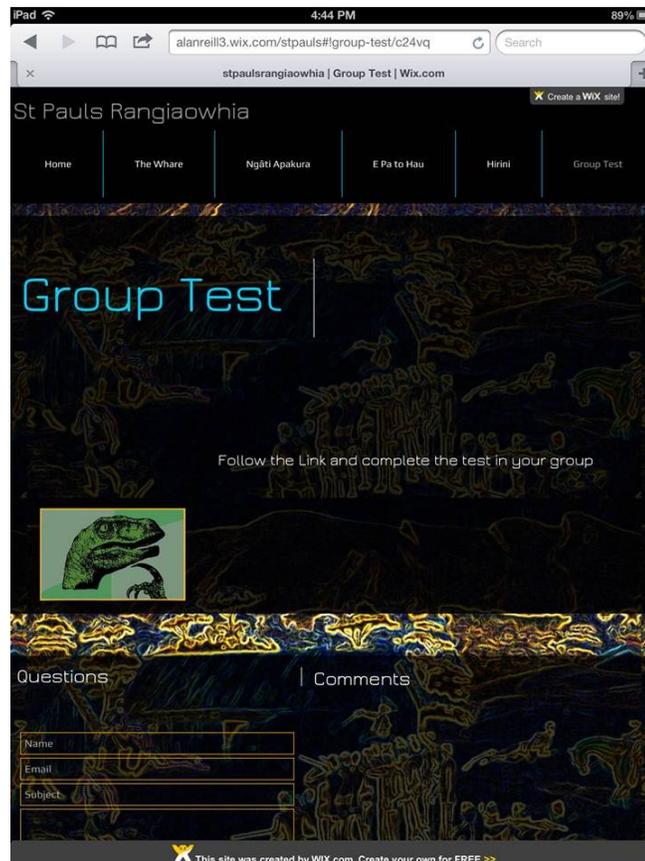


Figure 14 St Pauls Group Test Link

Figure 14 is the St Pauls website providing a link to the participant group test. As with the other websites created for this trial, this link opened an additional browser window displaying four (of the 24) multi-choice questions, shown in Figure 16. These 4 questions related to the content covered at this site.

The smaller number of questions for participant groups to complete is due to the proportionally smaller amount of programme content covered at the St Pauls location.

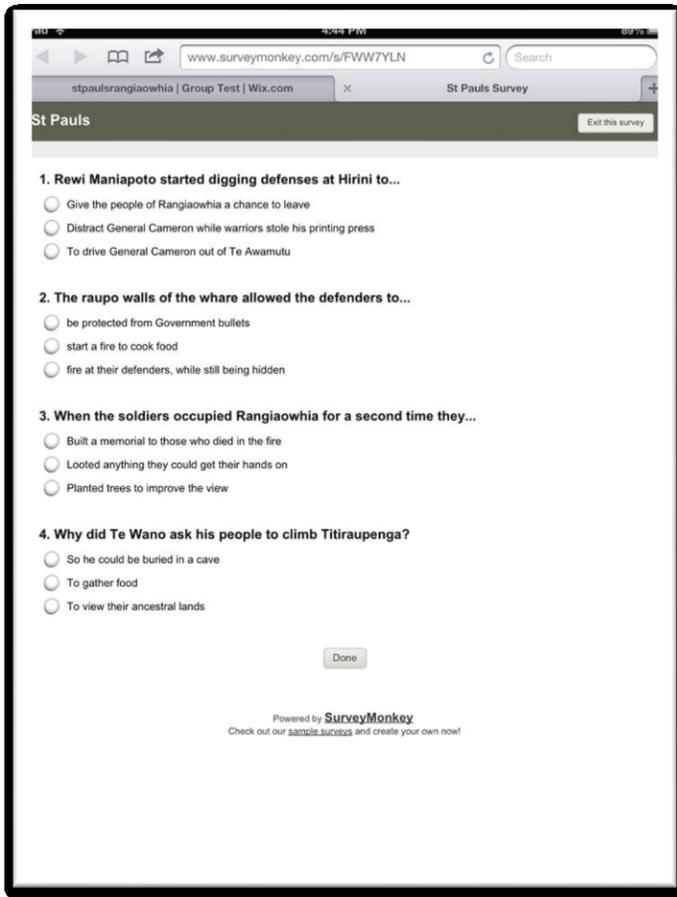


Figure 15 St Pauls Test

5.4 O-rākau Pā

The QR code scanned at O-rākau Pā opened the homepage depicted in Fig 16. The web address for this homepage is <http://alanreill3.wix.com/Ō-rākau>

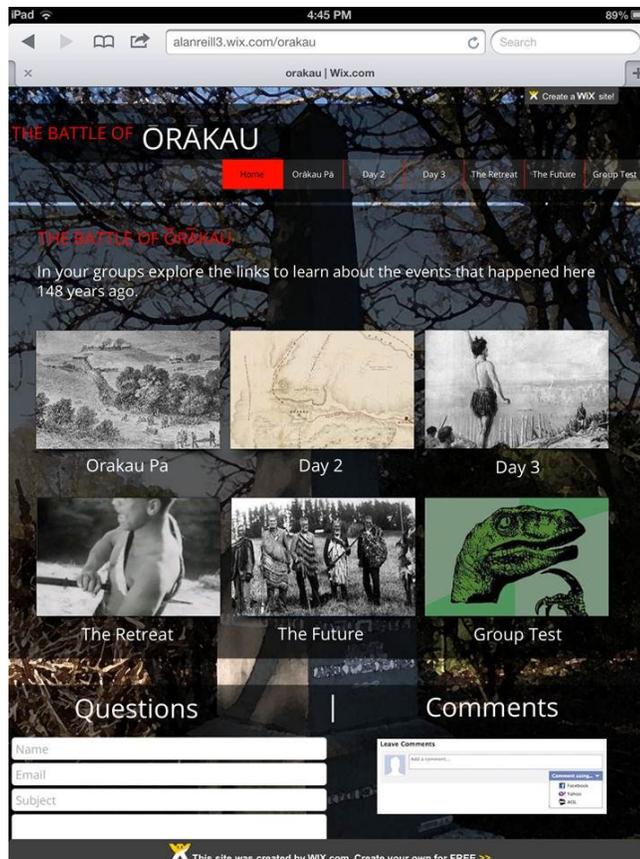


Figure 16 O-rākau Home Page

The visual appearance of the O-rākau homepage is different, but the format, features and navigation of the site are similar to other sites created for this programme. Like the previous sites, the ability to leave and send comments under the profile of the tablet, is a fixed feature available at the bottom of every page on the O-rākau site.

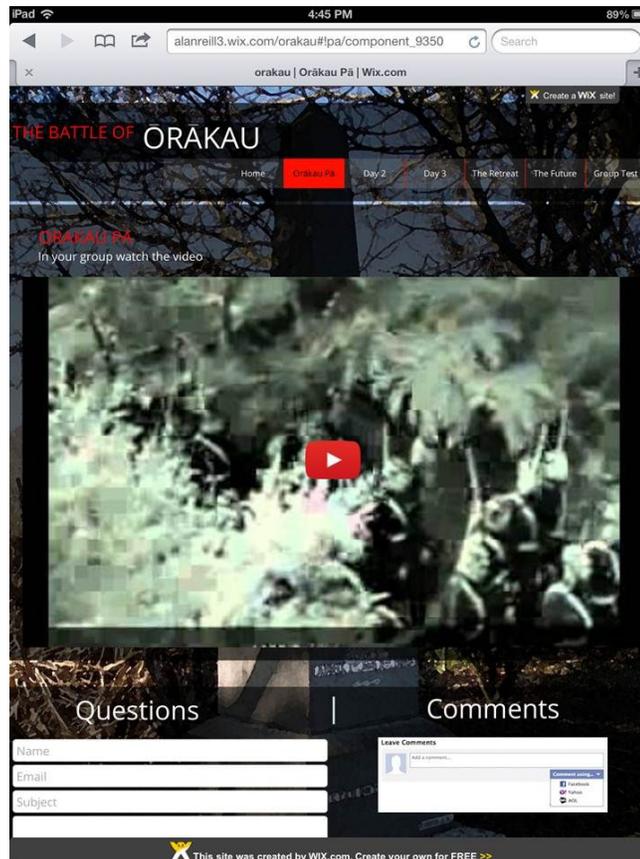


Figure 17 O-rākau Pā

Figure 17 shows the O-rākau Pā YouTube video embedded in the O-rākau Pā webpage. This 3 minute video explains the motivation behind the creation of the Pā at O-rākau, how it was constructed, its weaknesses, and the Government forces' reaction when it was discovered before its completion. The video finishes at the end of day one of the Battle, where 250 warriors and 50 women and children were surrounded by over 1600 Government troops.

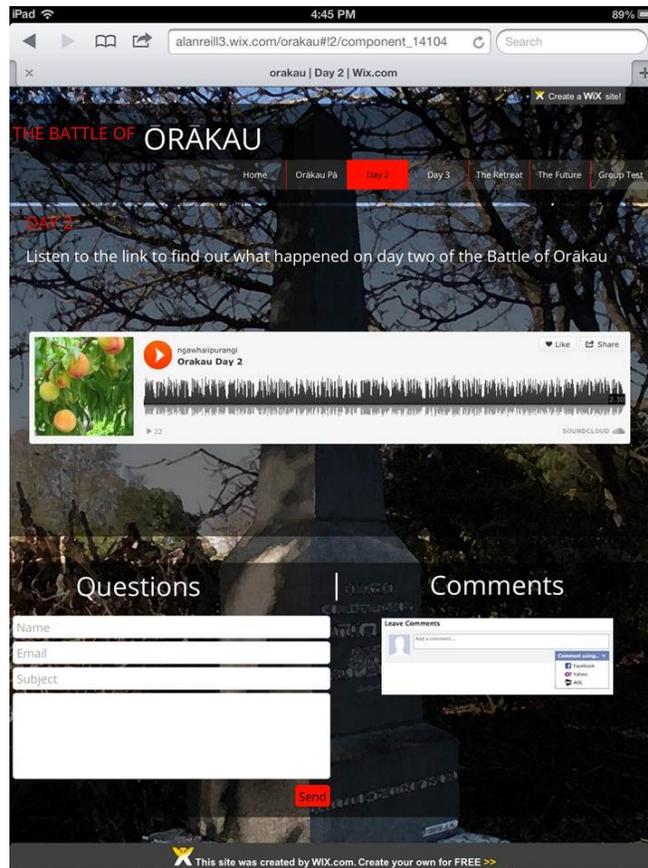


Figure 18 Day 2

The Soundcloud hosted audio podcast O-rākau Day 2 is displayed in Figure 18. The audio podcast starts at the beginning of day 2 of the Battle of O-rākau. It describes the Government forces' tactical efforts to speed up the surrender of the three hundred defenders inside the pā. The podcast also details the defenders' rejection of an internal suggestion that they tactically retreat, despite the worsening conditions inside the Pā, due to lack of water, food and ammunition.

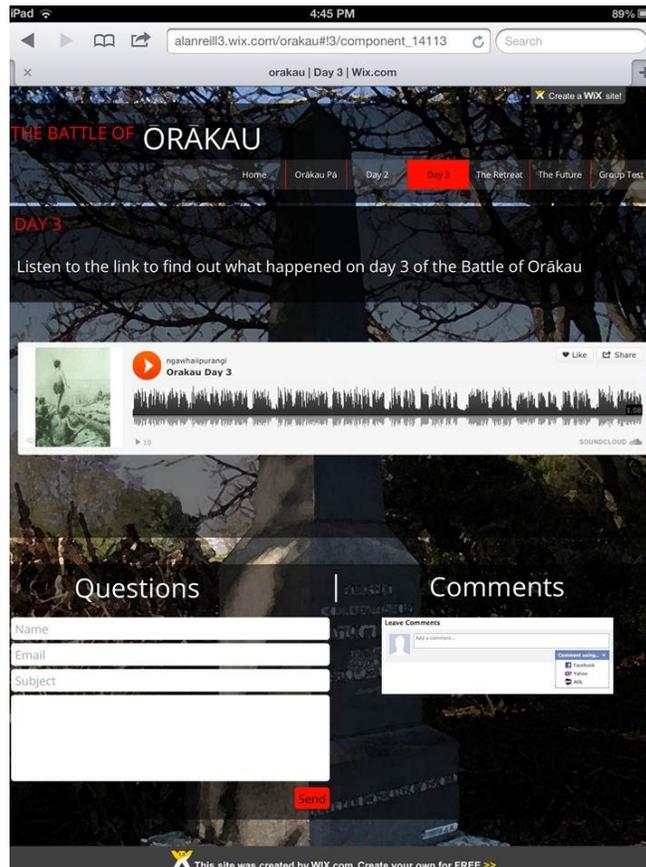


Figure 19 Day 3

Another audio podcast is displayed in Figure 20 and is used to recount the events of day 3 of the Battle of O-rākau.

This audio podcast details how on the third day of the battle, General Cameron called a ceasefire and offered terms of surrender. Despite the dire conditions inside the pā, Rewi Maniapoto rejected the General's terms. The women and children were offered freedom, but again the offer was declined, with the women and children declaring that they would stay with their men. Fighting continued, with the audio ending with a consensus from inside the pā that it must be abandoned.

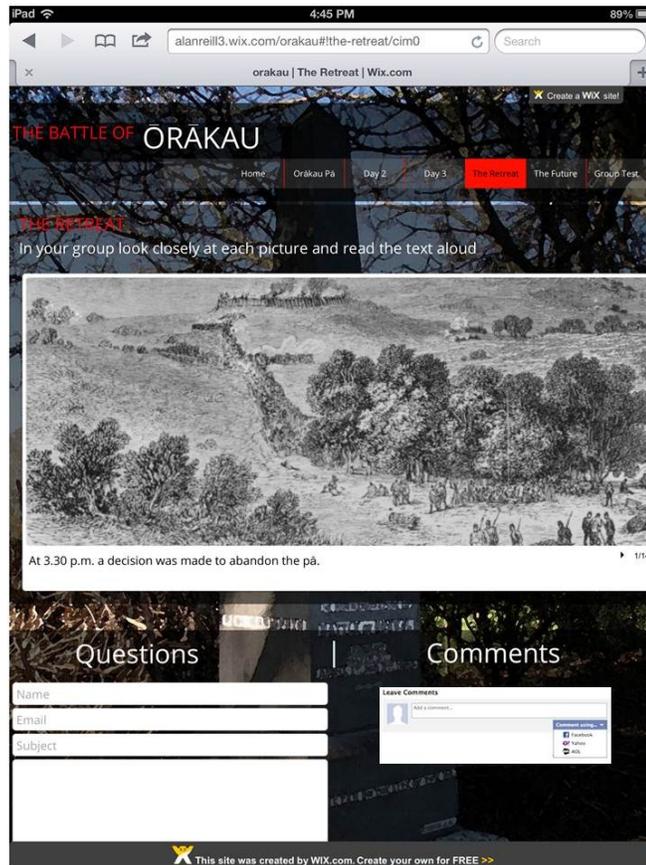


Figure 20 The Retreat

The screen shot in figure 20 is the first slide of the embedded slideshow 'The Retreat'. The pictures and associated captions for The Retreat slideshow portrays the breakout of the defenders from the Pā, the pursuit by the Government forces, and the large loss of life on the side of the defenders.

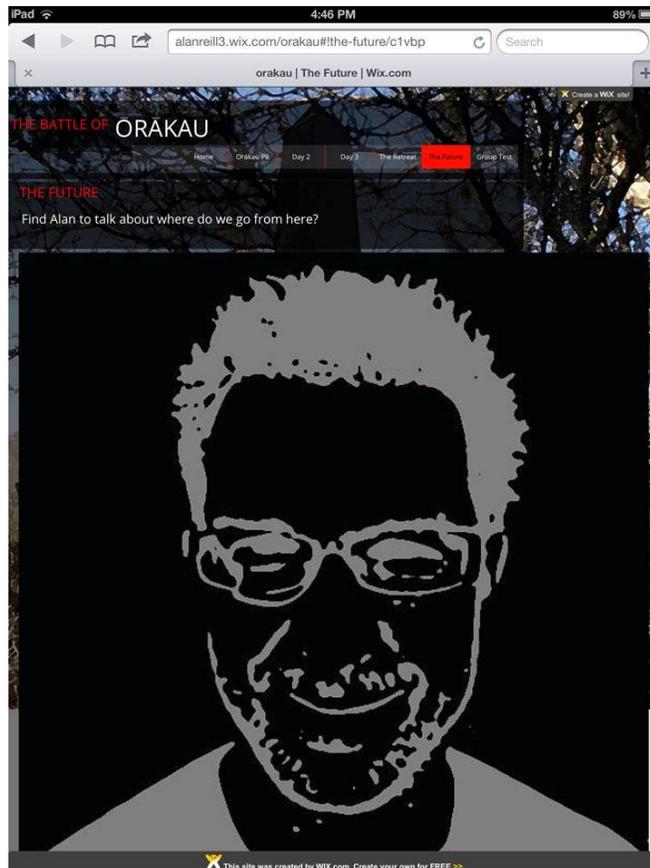


Figure 21 The Future

The image in Figure 21 prompts the participant groups to find the educator for a spoken presentation. The key messages of the researcher's presentation were noticing how our community recognise the Waikato Wars, including the Battle of O-rākau, and how we remember those families that died defending their homes.

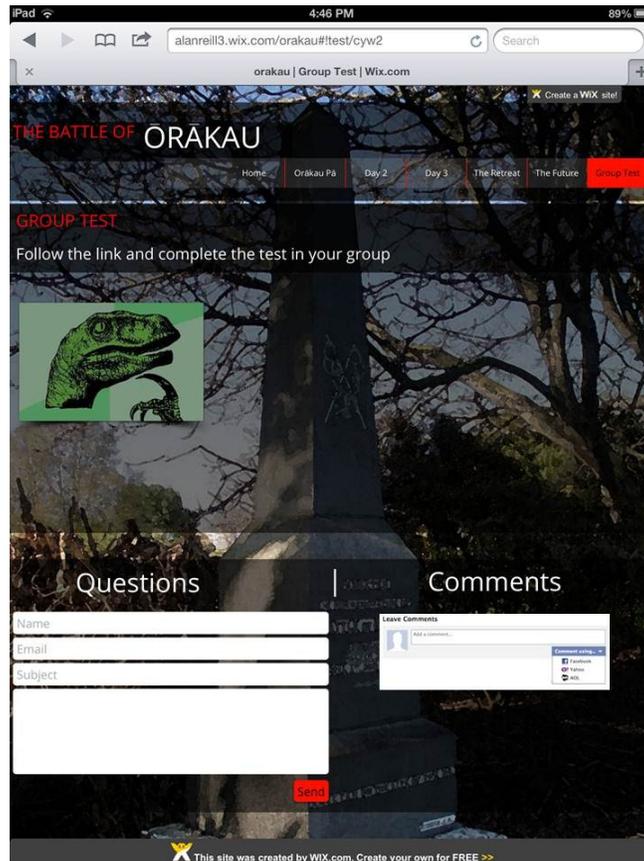


Figure 22 O-rākau Group Test Link

Additional content included: the return of land to Rewi Maniapoto, linking historic land confiscation with the Treaty claim process; recognising that 2014 is the sequential commemoration of the Battle of O-rākau; and thinking about what we could do as a community to help others in our community understand our history.

Figure 22 shows the final part of the programme, prompting participants to work in groups to answer the multi choice test on the O-rākau based content. As with the other websites created for this trial, this link opened an additional browser window displaying twelve multi-choice questions relating to the content covered at this site. The screen shot shows only 6 of the multi-choice questions. The larger number of questions for participants groups to complete is due the proportionally larger amount of programme content covered at the O-rākau location.

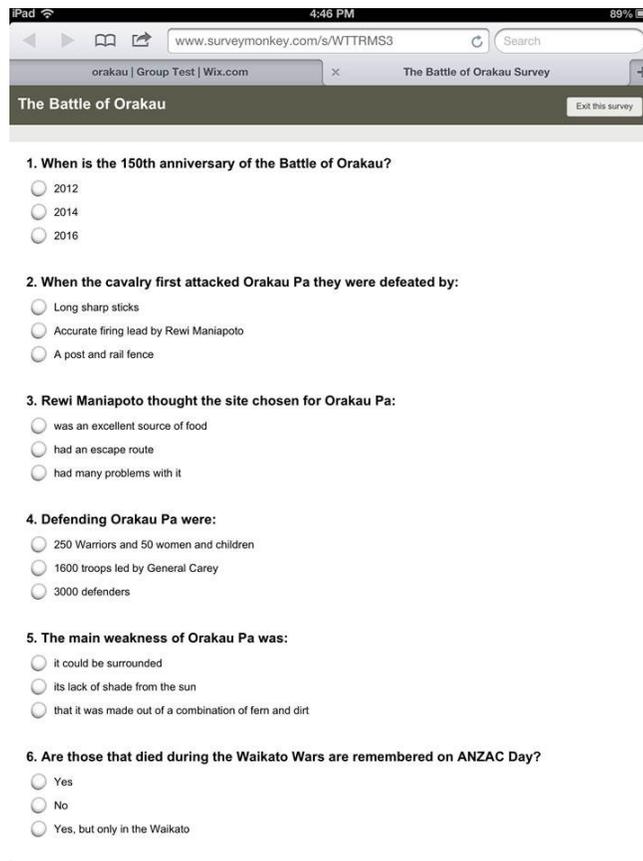


Figure 23 O-rākau Group Test

5.5 Summary

This chapter gave a detailed summary of the online content used for the mobile learning programme through screen shots and written descriptions. The content was divided between three HTML5 websites that are optimised for multi-platform mobile device use. Included in this summary are hyperlinks to the three websites where all the online content is located.

Chapter 6 – Analytical Processes and Quantitative Results

This chapter details with how quantitative and qualitative data was collected and analysed. Quantitative analysis is discussed, with the average scores of the pre, post, and retention multi choice tests for the Year 5/6, Year 7/8, Year 9/10 and the participant group as a whole being displayed in tables and graphs. Quantitative data on the participant's perceptions of the preferred size of a mobile learning group and the importance of making comments is also represented in this chapter. The chapter concludes by describing the process of qualitative data recording, transcribing, and analysis.

6.1 Quantitative Data Analysis

At their school, participants completed the 24 question Multi-Choice Test, and the Multi Choice Feedback Form at the pre-test, post-test and retention test phase of the research trial. At the completion of each round of testing I entered each participant's hard copy of the test into an online survey site, Survey Monkey, that collated and stored the data. The analysis tools embedded in the Survey Monkey website allowed for the selection of data, rules to be specified and applied to the selected data, and for the results to be displayed. This analysis allowed the percentage average of correct answers to be calculated for the Year 5/6, year 7/8, and the Year 9/10 Multi-Choice Test results. Average responses were also calculated for the multi choice questions relating to group size and the importance of feedback. The results are displayed in the following tables.

6.3 Year 5/6 Multi-Choice Test Average Percentage

YEAR 5/6			
	Pre Test	Post Test	Retention
Audio	44.3	65	54.2
Slideshow	55.9	60	56.25
Educator	25	50	33.33
Video	15	50	37.5

Figure 9 Yr 5/6 Average Percentage of Correct Answers

In Figure 9 the average score of the Year 5/6 participant group is shown as a percentage for each of the methods used during the trial's three testing periods. The three testing periods were the pre-test, the post test and the retention test. The post test results show that the group's average percentage of correct answers increased at a varying rate for each of the four methods of intervention trialled. The post test for the Video method shows the greatest level of increase for the Year 5/6 group at 35%, followed by Educator 25%, Audio 20.7% and Slideshow at 4.1%. The retention test also shows a higher average score for each method when compared to the pre-test scores, but when the retention test results are compared to the post test scores the average percentage of correct answers has decreased at varying amounts for each of the four methods. When compared to the pre-test, the retention test shows the Video method produced the greatest level of increase for the Year 5/6 at 22.5%, followed by Audio 10.7%, Educator 8.33% and Slideshow at 0.3.5%.

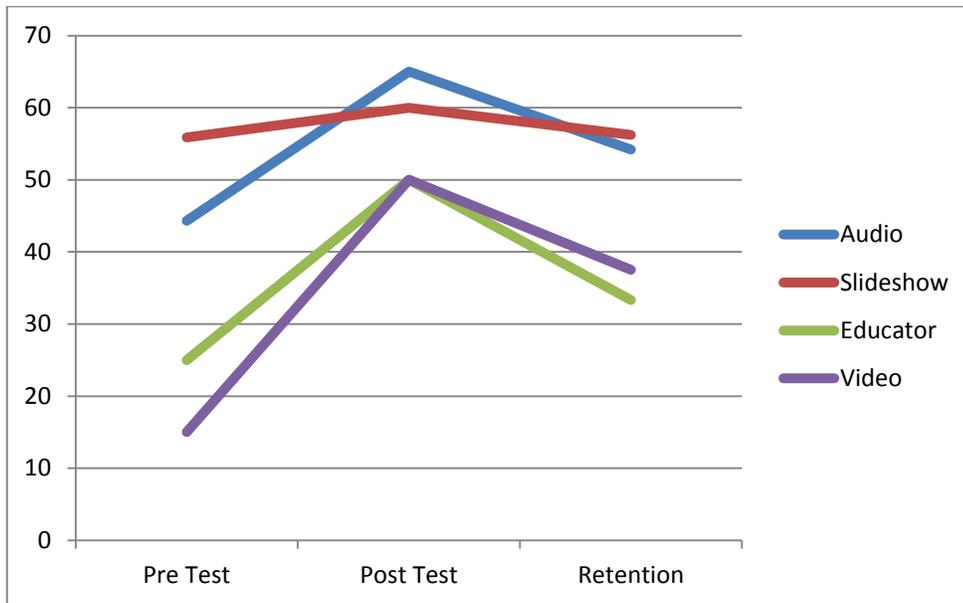


Figure 10 Yr 5/6 Average Percentage of Correct Answers Line Graph

Figure 10 visually displays the Year 5/6 group’s change in average understanding scores for each of the four methods trialled, at the pre-test, the post test and retention test stage of the trial.

6.2 Year 7/8 Multi-Choice Test Average Percentage

YEAR 7/8			
	Pre Test	Post Test	Retention
Audio	44.4	88.3	83.3
Slideshow	53.6	63.3	65
Educator	42.6	70	60.55
Video	44.45	58.33	35.9

Figure 11 Yr 7/8 Average Percentage of Correct Answers



Figure 12 7/8 Average Percentage of Correct Answers Line Graph

The table in Figure 12 shows the average percentage score of the Year 7/8 participant group for each of the methods used during the three trial testing periods. Figure 28 visually displays the Year 7/8 group's change in average understanding scores for each of the four methods trialled, at the pre-test, the post test and retention test stages of the trial. The post test results show the groups average percentage of correct answers increased at a varying rates for each of the four methods of intervention trialled. The post-test the Audio method shows the greatest level of increase for the Year 7/8 at 43.9%, followed by Educator increasing 27.4%, Video increasing 13.88% and Slideshow at 9.3%. The retention test also shows a higher average score for each method when compared to the pre-test scores. When the retention test results are compared the post test scores the average percentage of correct answers has increased by 1.7% for the Slideshow method, stayed the same for the Audio method, and decreased at varying amounts for remaining two methods, Video decreasing 22.43% and Educator decreasing 9.45%.

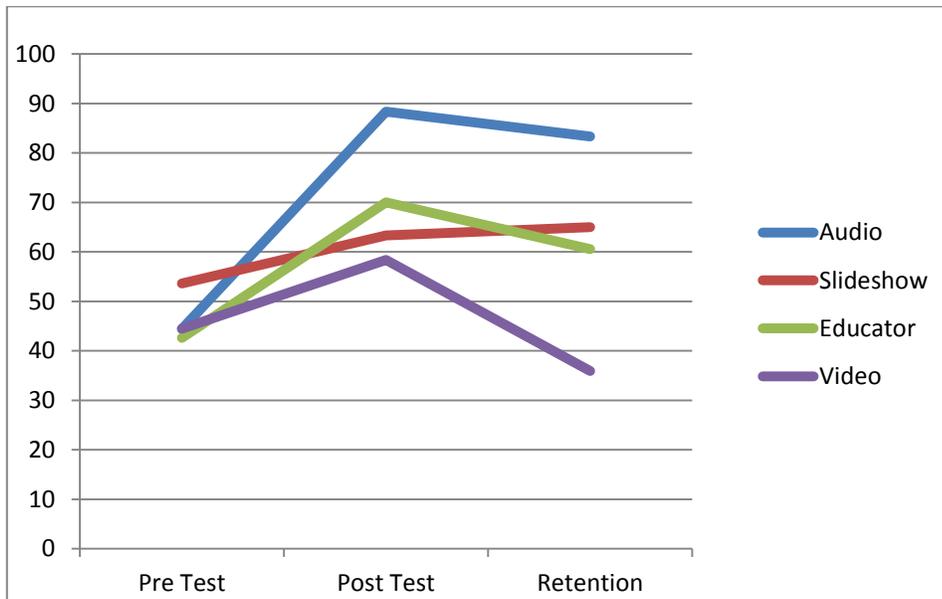


Figure 13 7/8 Average Percentage of Correct Answers Line Graph

6.3 Year 9/10 Multi-Choice Test Average Percentage

YEAR 9/10			
	Pre Test	Post Test	Retention
Audio	35	90	80
Slideshow	33.33	78.33	58.33
Educator	33.33	88.33	58.33
Video	31.66	66.66	57.6

Figure 14 Average Percentage of Correct Answers

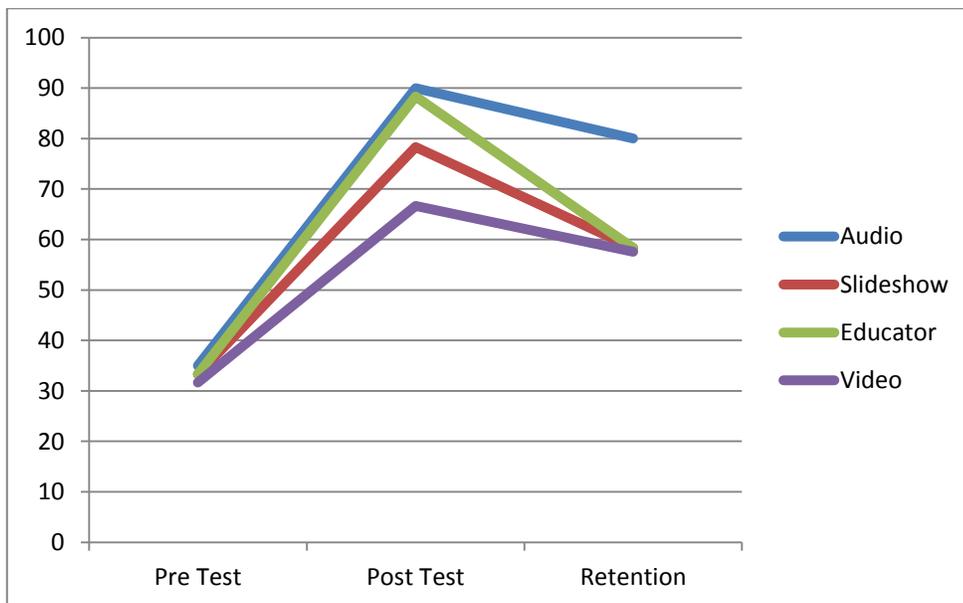


Figure 15 9/10 Average Percentage of Correct Answers Line Graph

In Figure 29 the average score of the Year 9/10 participant group is shown as a percentage for the four methods used during the trials' three testing periods. Figure 30 uses a line graph to visually depict the change in the average Year 7/8 participant score for each of the four methods tested over the three testing periods. The three testing periods were the pre-test, the post test and the retention test. When the post test and pre-test results are compared to the pre-test, it shows the group's average percentage of correct answers increased at varying rates for each of the four methods of intervention trialled. In this comparison, the Audio and the Educator method shows the greatest level of increase at 55%, followed by Slideshow 45%, Video at 34%. The retention test also shows a higher average score for each method when compared to the pre-test scores, but when the retention test results are compared the post test scores the average percentage of correct answers has decreased at varying amounts for each of the four methods. When compared to the pre-test, the retention test shows the Audio method having the greatest level of increase for the Year 9/10 group at 45%, followed by the video method at 26%, with the slideshow and Educator methods both recording at 25%.

6.4 Participant Multi-Choice Test Percentage Average

Group			
AVERAGE			
	Pre Test	Post Test	Retention
Audio	41	81	73
Slideshow	48	67	60
Educator	34	69	51
Video	30	58	44

Figure 16 Average Percentage of Correct Answers

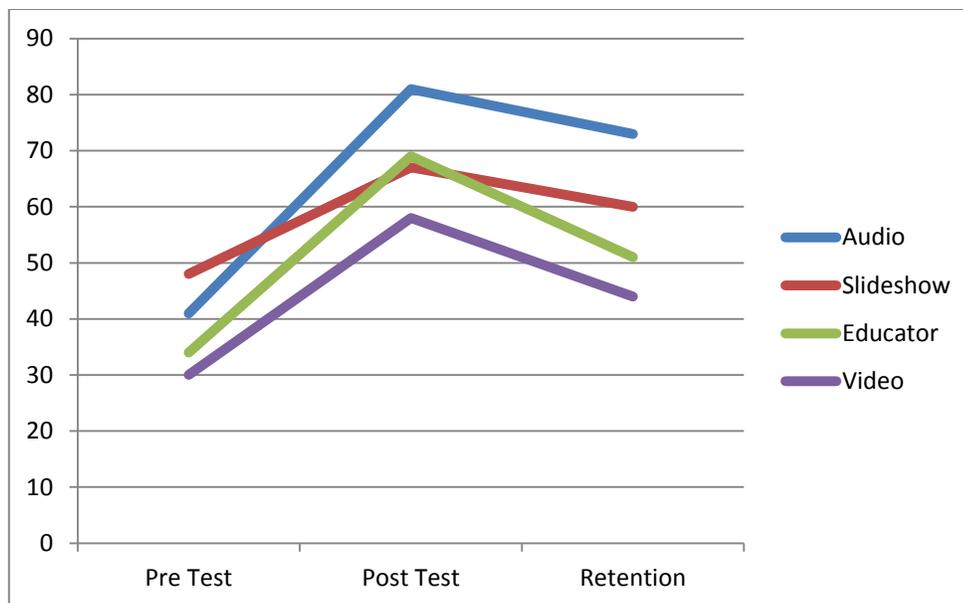


Figure 17 Average Percentage of Correct Answers Line Graph

The table in Figure 17 shows the average percentage score of the entire participant group for each of the methods used during the trials over the three testing periods. Figure 17 visually displays the combined participants group's change in average understanding scores for each of the four methods trialled, at the pre-test, the post test and retention test stages of the trial. The post test results show the group's average percentage of correct answers increased at a varying rates for each of the

four methods of intervention trialled. The post test Audio method shows the greatest level of increase for the Year 7/8 at 40%, followed by Educator increasing 35%, Video increasing 28% and Slideshow at 19%. The retention test also shows a higher average score for each method when compared to the pre-test scores, with the Audio method 32% higher, the Video 24%, the Educator 17%, and Slideshow 12%. When the retention test results are compared to the post test scores the average percentage of correct answers decreased at varying amounts for all four methods, with the educator showing the greatest decrease 18%, followed by Video with 14%, then Audio at 8%, and Slideshow at 7%.

6.5 Method Effectiveness Rating by Participants

Students were asked to rate the effectiveness of each method used during the trial programme on a scale of 1-4, where 4 was very effective and 1 was not effective. The participants were asked to rate the effectiveness of each method at the post test and retention test stages of the research trial.

Nga Wahi Ipurangi Feedback

1. Below are some of the ways you've learnt about Rangiaowhia during the education programme.

Answer Options	Very Effective		Not Effective		Rating Average	Response Count
Listening to the researcher	18	10	1	0	2.59	29
Watching video	17	9	2	1	2.45	29
Listening to voice message	10	15	2	1	2.21	28
Watching and reading a slide show	7	18	3	1	2.07	29
<i>answered question</i>						30
<i>skipped question</i>						0

Figure 18 Method Effectiveness Rating Table Post Test

The table in Figure 18 shows a tally of each of the ratings the four methods were given by the trials participants at the post test of the research. Figure 33 also shows the average rating given to each method by the participant group. The average rating for each of the four methods being between 2.07 and 2.59 out of four. At the post test stage the highest rated method was Listening to the Educator/Researcher with an average rating of 2.59, followed by Video with 2.45, Audio with 2.21, and the Slideshow with 2.07.

Nga Wahi Ipurangi 3 Month Feedback Whole group

Below are some of the ways you've learnt about Rangiaowhia during the education programme.

Answer Options	Very Effective		Not Effective		Rating Average	Response Count
Listening to the researcher	6	12	3	1	2.06	30
Watching video	16	11	1	0	2.54	30
Tablet Audio	3	16	7	2	1.94	30
Watching and reading a slide show	10	11	4	3	2.04	30
<i>answered question</i>						30
<i>skipped question</i>						0

Figure 19 Method Effectiveness Rating Retention Table

The table in Figure 19 shows a tally of each the ratings the four methods were given by the trial's participants at the retention test of the research. Figure 35 also shows the average rating given to each method by the participant group. The average rating for each of the four methods being between 1.94 and 2.54 out of four. At the retention test stage the highest rated method was Video with an average rating of 2.54, followed by listening to the Educator/Researcher with 2.06, Slideshow with 2.04, and the Slideshow with 1.94.

6.6 Commenting on Content

At the post test and retention test stages of the research, participants were asked to rate the importance of posting Facebook comments on the content they watched and listened to (Figure 20) on a scale of 1-4, where 4 was very important and 1 was not important. Participants gave an average rating of 1.03 at the post test stage of the research, and a 1.33 at the retention test stage.

Nga Wahi Ipurangi Retention - Commenting

Facebook:

Answer Options	Very Important		Not Important		Rating Average	Response Count
Is writing comments about the things you watch/listen	7	4	8	9	1.33	30
<i>answered question</i>						30
<i>skipped question</i>						0

Nga Wahi Ipurangi - Commenting

Facebook:

Answer Options	Very Important		Not Important		Rating Average	Response Count
Is writing comments about the things you watch/listen	2	7	10	10	1.03	29
<i>answered question</i>						29
<i>skipped question</i>						1

Figure 20 Commenting on Content Effectiveness Table

6.7 Group Size

Nga Wahi Ipurangi 4 Month Feedback

What is the best group size for mobile learning?

Answer Options	Response Percent	Response Count
1	6.7%	2
2	56.7%	17
3	27.6%	8
4	10.0%	3
<i>answered question</i>		30
<i>skipped question</i>		0

Figure 21 Group Size Preference Table

At the retention stage of the research, the participants were asked the preferred group size for mobile learning, given the choice of 1, 2, 3 or 4 participants in a group. Figure 21 shows 56.7% of the participants chose a group size of two, 27.6% prefer a group size of three, 10% a group size of four, and 6.7% of participants preferred a group size of one.

6.8 Recording, Transcribing, and Analysis

Focus group interviews consisted of between 5-6 participants from each of the three participant groups: one focus group of 5 students from the Year 5-6 participant group, one focus group of 6 students from the Year 7-8 participant group, and one focus group of 6 students from the Year 9-10 participant group. A focus group size of under 7 was chosen because: research indicates groups smaller than eight produce the greatest number contributions per participant; smaller groups also result in a lower incidence of one participant dominating the interview; and small group interviews are more enjoyable for participants than individual interviews (Asquith 1997).

In total six focus group interviews were conducted, with each of the three focus groups being involved in one interview at the post test stage of the research, and one at the retention test stage of the research. Each focus group interview was

conducted at the participants' school grounds, at a location and time specified by the participants' classroom teacher. An IOS application, Audio Memos was used on an iPad to record each of the six focus group interviews, in which I facilitated the proceedings. In these interviews, controlling dominant group members while encouraging the contributions of more reserved participants proved crucial to ensuring that all members had the opportunity to contribute to the discussions. Open questions focusing on the effectiveness of the methods trialled were used to start the interview, with more specific questions used to further expand participant thinking and give participants the opportunity to express their opinion as the interview progressed. Each interview lasted approximately 20mins.

Focus group interview transcripts were transcribed by the researcher into a word processing document, and emailed to focus group participants for verification.

Method of qualitative analysis.

I completed all aspects of the qualitative data collection and analysis myself, which according to Krueger & Casey (2008) adds legitimacy as the researcher is involved in all stages of the research. Additionally, Morse and Field (1995) point out that being involved in all aspects of data collection allows the researcher to notice patterns, themes and theories that are generated while the qualitative data collection is in progress, and after the data analysis has begun.

A framework for analysis was developed from Ritchie and Spencer (2002) who suggest the following are important for qualitative analysis.

1. Familiarisation with content
2. Identifying themes and defining concepts
3. Categorising different types of attitudes and behaviours
4. Mapping the range, nature and dynamics of the responses and motivations
5. Finding associations: between experiences and attitudes, between attitudes and behaviours, between circumstances and motivations

6. Seeking explanations, explicit or implicit
7. Developing new ideas, theories or strategies (Ritchie and Spencer 2002 p.176).

Accordingly, each transcript was read independently, where I searched for similar words, patterns and themes. A three level framework developed by Vavoula & Sharples (2008) was used initially to categorise the information into three levels: Micro level - assessing user's experience of the technology including usability aspects and utility of functions; Meso level - looking at the user's learning/educational experience; and the Macro level, in which the I tried to understand the impact on learning/teaching practice as well as the appropriation of the new technology and new practices (Vavoula & Sharples, 2008 p.4-5).

Specific contents were then extracted from the transcripts, compiled, summarised and organised into the Micro, Meso and Macro categories. During this process results from the quantitative data were also categorised into the Micro, Meso and Macro categories so that both the qualitative and quantitative results could be discussed in a combined way. As categories and subcategories formed, distinct relationships emerged between themes, categories and subcategories. The categories were revised on a number of occasions in order to exclude all non-relevant material.

6.9 Summary

In this chapter I have detailed how quantitative and qualitative data was collected and analysed, and presented the initial findings. Quantitative analysis was discussed, with the average scores of the pre, post, and retention multi choice tests for the Year 5/6, Year 7/8, Year 9/10 and the participant group as a whole being displayed in tables and graphs. Quantitative data relating to the participant perceptions of the preferred size of a mobile learning group and the importance of leaving comments is also represented in this chapter. The chapter ended with a description of the process of qualitative data recording, transcribing, and analysis

used during this research trial. Specific qualitative data is integrated into the discussion in the next chapter, the discussion.

Chapter 7 – Discussion

7.1 Introduction

In the discussion, Vavoula & Sharple's (2008) suggested mobile learning framework of analysis has been used to categorise the qualitative and quantitative data into the Micro, Meso and Macro headings, and subsequent subheadings. A combined quantitative and qualitative framework that combines all sets of data under a variety of headings and sub-headings, allows that data to be discussed in a mixed way. In the Micro section, the qualitative and quantitative data relating to the participants audio and visual experiences and technological restrictions such as downloading, movement and expense are discussed.

In the Meso section of the analysis, the discussion is centred around the users learning/educational experiences relating to: audio, video length; single user resources; learning style preference; navigation of the content and devices. The seeking solutions part of the Meso section discusses solving technological problems in groups; questioning; group support; and social media.

In the Macro section of the analysis the impact on learning and teaching practice is discussed with reference to; student perceptions of the programme; an over emphasis on technology; audio mobile learning; passive learning; distractions; student centred learning; content coverage; the importance of context; educator bias, and pre and post activities. The macro section also outlines the appropriation of the new technology and new practices including: game based learning, learning trails; student involvement in the design process; Māori Kaupapa and catering for a variety of learning styles. The final section of the discussion outlines this mobile learning trial's ability to address some of the problems identified with the original Waikato Wars Education Programme.

7.2 Micro Level:

The Micro Level of analysis assesses the user's experience of the technology including usability aspects and utility of functions (Vavoula & Sharples, 2008 pg.4).

Participants Audio and Visual Experiences

Audio Experiences

In the focus group interviews, participants highlighted environmental distractions to the podcast/audio method. These auditory distractions included difficulty hearing the audio in the high traffic noise of O-rākau Pā, and audio interference created by other devices. Despite these distractions the podcast method still recorded the highest increase in average student understanding scores in the post and retention multi-choice tests.

In the focus group interviews students identified many benefits for the podcast method of learning. Examples of students responses include the following.

Researcher: What about the audio, with just talking?

Student 1: I think the audio would be better at the site in smaller groups

Student 2: You don't have to be looking at the screen you just have to be able to hear what they are saying.

Student 3: You can look around. You don't have to focus on the pictures.

Student 4: I wasn't the one holding the tablet so I had to look over at it and it was making my neck hurt but with the audio I could just listen.

In these comments participants identify that an advantage of engaging with the podcast content was that it did not require them to look at the tablet screen. The visual content on the tablet screen was identified by many participants as often difficult to see throughout the duration of the programme. The above participant comments highlight that as the podcast method had no requirement to look at the screen, it was easier for some students to focus just on the audio content.

The video method of content delivery combined both audio and visual content. Some participants identified difficulty focusing on visual content of the video method. The distractions identified in viewing the visual content included: reflective glare on the tablet screen in an outdoor environment, and the positioning of the screen so that all members of the groups could see the visual content.

Researcher: Anything else that sticks out that you remember, it could be about anything, any aspect of it, your groups, the people you were working with, things that weren't working, frustrations?

Student A: It was sunny.

Student B: There was sun on the screens and you couldn't see what you were looking at.

Appendix:

A combination of these and other factors may have contributed to some participants choosing not to look at the visual component of the video method. Even when attempts were made to make the content easier to view, such as moving to the shade, visual barriers to viewing the content lasted as long as the participants were in an outdoor environment. Viewing the content in an indoor environment was not identified as a problem by any of the focus group participants, as shown by the comment below.

Researcher: So sound was an issue but also actually seeing the screen with the reflections on it?

Student: Except in the church, you could see the screen.

Appendix: Transcript 3

Visual Content

The strong preference for a group size of two was explored in the focus group interviews. A group size of two was selected by 56% of participants as the ideal size for mobile learning four months after the trial. The second highest selection was

groups of three, at 27%. Some participants identified that positioning the screen of the mobile device so all group members could see it was made easier in a group size of two.

Researcher: Could you explain why 2 was the best number

Student 1: If you have two then you can put the device in the middle, but three is awkward.

Student 2: You have to look ahead and someone has to look over your shoulder.

Student 3: It depends if it's audio or visual.

Researcher: So for the visual stuff that you were looking at, the iPad wasn't big enough?

Student 1: It was for two but I think three would be too crowded.

Appendix: Transcript 4

Technology Restrictions

Downloading and Waiting

Participants had to wait for learning content to download to their mobile device during the mobile learning programme. The researcher's pre-trial testing of download speeds indicated that participants would have to wait longer than they may have expected due the capacity of the mobile technology to transfer data from the Internet to their device. The expectation that students would have to wait for the content to load, especially the video content, was indicated to each group during the 5 minute technology induction at the beginning of each education programme. Even though students were advised at the beginning of the trial that some content may take longer to download than they may expect, during the focus group interviews some students identified the amount of time they spent waiting for content to load as frustrating. Other participants indicated that download time experienced was within tolerable limits. These differing reactions to the downloading of content are highlighted in the following focus group extract.

Student 1: I have fast Internet at home, so when something is slow, I can't stand it.

Student 2: I'm used to it because we have only just got broadband.

Student 3: I'm used to slowness

Student 4: I think it depends on each person, from what they've come from and what they can tolerate. Your level of patience.

Appendix: Transcript 4

All groups experienced wait time for content to load on their mobile device, with the length of time students had to wait depending on the size of the file they were to download. Some students found it a distraction to their learning, others did not.

In the retention focus group interview, 4 months after the initial mobile learning trials, students' frustrations towards waiting for content to download seemed to have dissipated.

Researcher: What if you had to wait a long time on the day, or sometimes the tablets didn't work, how did you feel about that? Was that something that was frustrating?

Student 1: Not really if it doesn't take too long like 5 mins.

Student 2: You have to be patient.

Researcher: But things would be quicker here on that computer if you had a fast Internet connection here.

Student 1: It probably would.

Appendix: Transcript 5

Movement

At any one time during this mobile programme there were potentially up to four mobile devices sharing one 3G mobile broadband connection to the Internet

through one mobile access point held by the educator. The mobile access point had a range of approximately 15 metres. During the focus group interviews students identified how being wirelessly tethered to the researcher limited their movement around the site.

Researcher: Did you find there were any problems when you were using the tablets in your groups?

Student: They were a bit slow and fuzzy and sometimes it got annoying when we were trying to do it fast.

Student: One thing was the Internet. So if you walked away to a different spot where it was less sunny, it would lose the Internet connection.

Appendix: Transcript 1

The last comment describes how participant movement around the site was restricted by the limitations of the technology used. After the research trial the researcher discovered that when the mobile access point is connected to an external power source the device's range increases from fifteen metres to sixty metres. Portable external power sources are commonly available, and a range of sixty metres could be used to enable participants to move freely around the historic site while downloading the Internet based content. This mobile technology refinement could help students by decreasing learning distraction and is a consideration to the future development of this programme.

Expense

The cost of mobile broadband data would be a prohibitive factor in the future development of a mobile learning programme based at historic sites. The trial education programme was run once for each of the three groups of participants. There were 10 participants in each group, making 30 participants in total, with each group sharing four tablets between them while they were completing the education trial.

Data usage by the four mobile devices during the three trial programmes was 2.4 gigabytes. Currently, the most cost effective broadband data accessible in the historic locations used during this trial is fifty dollars for two gigabytes of data (Vodafone, 2013) (Telecom, 2013). The cost of delivering Internet based resources to devices using mobile broadband would either need to be absorbed by the current programme cost budget, or be passed onto the visiting schools and students. The current data charge rates may be a deterring factor for the researcher's continuation of this model of mobile learning content delivery.

7.3 Meso Level:

The Meso Level of mobile learning analysis looks at the user's learning/educational experience (Vavoula & Sharples, 2008 pg.4).

Learning Experience

Audio

The highest increase between the pre-test and the post-test scores were the audio content questions with an average increase of 40%.

Sound transmitted from the mobile device was included in two out of the three mobile learning methods - video and audio. Video and audio content were downloaded to the participant groups' tablets via a portable wireless access point, which the researcher carried. As previously mentioned, the wireless access point, with a transmitting range of approximately fifteen metres, limited all participant groups downloading programme content to a circle 30 metres in diameter. The close proximity of the participant groups within this space was identified as a barrier to understanding audio programme content.

Student A: Or like when we were sitting in the church and there was like four different tablets going at once and they were overlapping and you couldn't understand so we had to go outside.

Researcher: What was overlapping?

Student A: The sound and the song. We were listening to a recording or a song. People would start it at different times and it was all mixing.

Appendix: Transcript 6

This extract from a focus group interview highlights how auditory barriers identified by participants were often quickly mitigated by group actions. The participant above describes moving outside to clearly hear the audio content, changing their learning environment to eliminate the audio based distraction. Other participants also commented on moving location or rewinding the audio content in order to hear it clearly.

Student: It was annoying because we had to move about maybe five times because we heard theirs going over the top of ours, we had to pause it and then rewind it again to hear it.

Appendix: Transcript 1

One participant commented on how audio-only tablet content enabled them to use their imagination, visualising the historical retelling of events.

Student: It probably gives you a wee bit more help with getting the image in your head. Your imagination.

Appendix: Transcript 5

The dialogue below details how audio content aided participant understanding, when compared to reading written text.

Researcher: What worked well about just listening on the tablets, just the talking.

Student: If you just read it, and you didn't know the word, how to pronounce it, then it would be easier than that.

Appendix: Transcript 5

However in the multi-choice feedback immediately after the trial, participants rated tablet audio the second most ineffective learning method, and when asked again 4 months later rated tablet audio as the most ineffective method. Focus group comments give some meaning to this ranking of ineffectiveness, commenting that tablet audio content was not enough to maintain their attention.

Student: Sometimes with that audio you weren't really listening, you were like looking at the scenery and stuff and just like watching what other groups were doing and you lost focus because there was nothing to watch.

Appendix: Transcript 2

The participant below described how audio was not their preferred method of learning.

Student: The weird thing for me is that if I'm listening to something then three seconds later I completely forget what I heard and then when I really need it its gone and when I don't need it at all it pops back into my head.

Appendix: Transcript 6

Part of the audio podcasts used during this programme directed participants to look towards physical landmarks and in different directions in an attempt to connect programme content to the sites they were standing in. Feedback from the focus group interviews suggest this may have not worked for the majority of students.

Researcher: In one of the audio it said "Look to the south... etc etc." what did you think about the audio telling you where to look?

Student 1: That was helpful.

Student 2: It was helpful because when you said look towards the hill. But when it said look to the south, it was hard because you didn't have a compass to know which way was south.

Appendix: Transcript 5

Student 1: Then you said "like look south", we didn't really know where is south. Because if you turned south there was nothing there. A tree.

Student 2: Oh yeah that part where the lambs were, we were like. yeah, where's the hill?

Student 1: Or where's the mountain thingy?

Student 2: There were mountains everywhere. We were like which one?

Appendix: Transcript 2

The second highest increase between the pre-test and the post-test scores were the educator content questions with an average increase across the group of 35%.

Listening to the researcher also received the highest effectiveness rating immediately after the trial, and the second highest rating four months later. Focus group feedback for the programme content presented by the researcher was positive.

Researcher: I gave a presentation also, was it a benefit to be able to listen on your own device or was it better me talking?

Student 1: I preferred you talking because if there was a question, you could answer it most of the time. And like if we had a tablet, we could just look away, and we wouldn't bother, but it would be rude to look away from you. You're giving you more respect if we are looking at you.

Student 2: You have good actions.

Student 1: It doesn't say north or west. You can just point to direct you.

Researcher: So the body language helps?

Student 1: Yes.

Appendix: Transcript 5

This is another limitation of the research, as it is questionable whether participants would give unbiased feedback on the effectiveness of the content delivered by the researcher, directly to the researcher (King & Fraser, 2005).

Researcher: What worked well about me talking to the groups?

Student 1: I think it was better because you made it more interesting for us and showed us where all the places were.

Researcher: So when you say more interesting, what do you mean?

Student 1: When you're reading it, it's not that interesting. It's not as interesting as talking. Cause when there's someone talking you get more expression and when your showing the places, it's easier, cause you can point to them because on the video or recordings there's nothing pointing like south

Student 2: Yeah and if we had questions we could just ask, but if we had the iPad we couldn't ask it anything.

Researcher: Did anyone have a particular preference?

Student 1: Yeah being talked to. Because you just get the information directly and you can't ignore them.

Student 2: Yeah, you have to be listening but if you were listening to video then you can be rude to the video.

Student 3: You can just replay the video or the voice recording if you didn't get it the first time.

Student 1: But his voice was clearer to hear. It's not a quiet little voice.

Student 2: Yeah.

Student 1: And it's easier when you're talking to us because you don't add anything that doesn't need to be said.

Appendix: Transcript 3

Participants identified benefits of listening to the researcher including: a clear audible voice; relevant content delivered; face to face engagement; body language; physically pointing locations out; and question interaction.

The third highest increase between the pre-test and the post-test scores was the video method questions, with an average increase across the group of 28%.

Both the slide show and the video methods required each member of the group to be able to see the mobile device's screen to gain an understanding of the content. In contrast, the audio method required a small amount of screen viewing in order to navigate a webpage to play the audio content.

Students from each of the three focus groups commented that positioning the mobile device so all three group members could see the screen in an outdoor environment was difficult due to screen glare, even in a shaded location. This often led to those group members not holding the device to quickly lose engagement with the visual content.

Researcher: Anything else that sticks out that you remember, it could be about anything, any aspect of it, your groups, the people you were working with, things that weren't working, frustrations?

Student A: It was sunny.

Student B: There was sun on the screens and you couldn't see what you were looking at.

Appendix: Transcript 2

In an effort to mitigate the effect of screen glare in viewing the visual content, some groups relocated to shade to improve their ability to view the screen. Although this did improve the ability to see the visual content for some members of the group, the different viewing angles of the group members resulted in situations where the content was visible for some group members but not for others.

Video Length

Some participants from the Y5/6 student group identified the video content as too long to maintain focus on.

Researcher: So there was some different ways of learning during the trial, one way was watching video, what did you think about the video?

Student 1: Sometimes they were long and we wanted it to go faster in our group

Appendix: Transcript 1

Although some participants commented on the length of the video being too long, other participants defended the length of some videos.

Student: Some of the videos were good. Like the ones that were maybe a minute

Appendix: Transcript 1

The second highest, and the highest rating for learning method effectiveness for the initial and the four month feedback forms was the video method. This high participant rating contradicts the multi-test scores for this method, which suggested that for the whole group, video was the second least effective method at increasing participant understanding and retention. During the focus group interviews participants commented on why they thought video an effective method of learning.

Student 1: That you could actually have the pictures and the moving images. If someone just told you about them, you couldn't see what it actually looked like, or some example of what it would look like. So that was good.

Student 2: You could imagine it if you had the picture and the person talking.

Student 1: You could see what was going on.

Student 3: If you didn't know what the words were, then you can look at the pictures and they could tell you.

Student 1: And the person speaking, you wouldn't have to read it and get it wrong.

Appendix: Transcript 5

The lowest increase between the pre-test and the post-test scores were the slideshow content questions with an average increase across the participant group of 19%. The slideshow was also rated as the least effective in the initial feedback, and the second least effective in the four month feedback forms.

Contrary to the group's perception, some participants commented on the effectiveness of the slideshow method, specifically that they felt they had more control over the speed that the information that was presented, an ability to go both forward and back over information, and being able to raise and resolve questions with other group members. These reflections are included in the focus group comments below.

Researcher: Another way of learning there was when you had the pictures and you read the captions aloud in your group. Then you had to push the button to see the next...

Student: When we had to go through each picture and then had to read it out. I found that one the best for learning things because it wouldn't go

too fast and you could just read it out slowly and understand what it was saying.

Appendix: Transcript 1

Student: If you couldn't hear, then you could like read the words and make sense of the pictures.

Appendix: Transcript 6

The slide show method included some written content that students were directed to read in their groups. At no time did the researcher ascertain the comprehension level of the students participating in the research trial. The written content of the website and the descriptive comments used in the slideshow were written to a level of comprehension that was set by the researcher's experience as a Yr 5-8 primary school teacher. One strategy employed by the researcher was the use of groups to aid in student comprehension, with the researcher's assumption that if texts were read aloud in groups, then the likelihood students would comprehend the texts would increase. This is supported by some participant comments during the focus group interviews. Other participants describe difficulties in reading the picture captions aloud, as outlined in the focus group passage below.

Student: If you're reading on a tablet and you don't know the question or how it's pronounced, then if you don't know it and you just keep on going then you might not really know the whole meaning of it.

Appendix: Transcript 1

Other focus group participants identified difficulty pronouncing unfamiliar words.

Researcher: Anything that didn't work well about the pictures and the writing?

Student: Some of the Māori words were hard to pronounce it was hard to know what they were meaning.

Appendix: Transcript 5

While group members commented that the meaning of some words was unknown.

Student: Yeah some of the words we couldn't understand what the meaning was.

Appendix: Transcript 6

Whenever there is written text for students to process, student ability to comprehend what is written is essential for their ability to understand. The importance of students to comprehend text is demonstrated in the comment below.

Student: And another thing was if you didn't understand the sentence, and then you would go back and read it and sometimes you still didn't understand it or it didn't match with the picture or something.

Appendix: Transcript 6

Single User Resources

Although the participants were placed in groups, and given a mobile device to share, the methods used to engage the students with the content did not support collaborative learning. This trial's mobile learning resources were designed by the researcher to be navigated by one user, while the other members of the group watched the interaction taking place. Scott, Mandryk, & Inkpen's (2003) research emphasises that one user interaction programme design contributes to off-task behaviour, boredom and less on task collaboration in group mobile learning situations. Another avenue of research could be whether participant focus would be improved by creating and using multi-user mobile learning resources that engaged the whole group.

Learning Style Preference

The following extracts of participant dialogue highlights that different students have different learning style preferences, with different ways of learning working better for some students than others.

Researcher: What about the pictures, and the words down the bottom and scrolling through those and reading them out?

Student 1: Reading them out loud made them clearer, but most people just read them in their head.

Student 2: I think people just wanted to get along with it so no one was really looking at the pictures, they were just reading the next one.

Student 3: That was probably the least effective way for me

Student 2: I thought the video was the least effective for me just cause having the pictures all changing, it kind of distracted from what the voice was saying. Like trying to concentrate on both, it was harder than just reading it out loud.

Appendix: Transcript 3

Student 3: Also it was kind of interesting for the people that like to read like me and (another student) we love to read, if we were reading then we would take more of it in cause we are used to reading.

Appendix: Transcript 6

Comprehension

The comprehension levels of students attending LEOTC programmes could be attained through consultation with the classroom teacher, and adaption to the written text could be made according to provided pre-visit information.

Providing appropriate levels of written text for individual students would be a challenge for the continued development of mobile learning experiences, but providing texts that students can read is essential to increasing their understanding of written programme content.

Navigation

Navigation of the Content

In the example below, the participant outlined having difficulty navigating to the correct location of the interpretive content, and then unintentionally navigating away.

Researcher: What was something that was frustrating was there anything that was frustrating?

Student: Probably what I said before

Researcher: That it wasn't loading up fast?

Student: Yeah and then (another student) would accidentally touch something by accident or I might have touched something and then we would have to go back and wait for it to load again.

Appendix: Transcript 1

Additional to the frustration the student felt about slow loading content, the above comments suggest that some students experience frustration when trying to navigate to the correct content. Unintentional navigation, finding the right content again and waiting for this content to load reload would have more than doubled the students wait time for the correct resource. Although the current generation of students are often labelled digital natives, Prensky (2001) and Vavoula (2009) warns against assuming digital natives will automatically know how to best use mobile devices for learning. The MoE (2007) guidelines for the design of online resources specify appropriate and easy-to-use web-page navigation as part of a successful web-based

experience for school students. These guidelines were taken into consideration during the design and creation of Internet based content, however additional consideration needs to be given to the applications, often known as plugins, embedded within the website itself. HTML5 plugins that were embedded into the webpage allowed the participant to view, hear and navigate the video, audio and slideshow content all within the web browser of the mobile device. During the mobile learning trial participants identified problems with navigating the embedded video players controls.

Researcher: Were there any other problems when you watched the video?

Student: Like for the recording thing we couldn't make it go back, so that was a bit annoying.

Researcher: So you had trouble replaying the content?

Student: Yeah sometimes. When something came on and we try to think about it, it goes too fast.

Appendix: Transcript 1

This comment identifies the video player plugin as having unfamiliar navigation controls for this participant. The New Zealand Council of Educational Research emphasizes that the navigation of video and audio, and animated Internet based content needs to be easily identifiable, which it was not for some participants involved in this trial. Navigation should include easily identified access to moving forwards and backwards, repetition of video, audio, and/or animated content, printing facilities and access to help (NEW ZEALANDCER, 2004).

Any further development of this mobile learning programme would need to consider whether navigational controls were easy to use for the majority of students.

Navigation of the Devices

Participants indicated unfamiliarity with the navigational controls of the mobile devices during the focus group interviews as being a barrier to interacting with the programme content.

Student: And with the buttons (holding ThinkPad) you could accidentally push the buttons and go somewhere else

Appendix: Transcript 2

Participants also identified differences between how long it took to become orientated to the two different mobile devices used in this trial. Device functionality that the students are familiar with lessens the amount of time students spend on learning how to use the technology in order to complete the learning task (Macdougall, 2012). The focus group interviews highlight that the participants involved in the study were more familiar with the functionality of the iPad, with the majority of students having used a touch screen Apple product before. Most students expressed a preference for the iPad over the ThinkPad tablet.

Student: I know how to work an iPad because my sister has one, but I didn't know how to work a tablet. I had no idea what to do.

Appendix: Transcript 4

Student familiarity with the iPad may be due to the dominance of Apple products in the tablet market (Alexander 2012). Providing devices that students are more likely to be familiar with may lead to less time orientating to the device, and is a consideration for any future purchases of mobile devices.

Focus group interviews indicate that participants had the majority of technological related problems with the ThinkPad tablets. In one focus group interview, students commented on their frustration when the ThinkPad tablet unexpectedly exited out of the Internet based content. The dialogue continues as follows.

Researcher: Was that the tablets or just the iPad?

Student 1: Just the tablets, the iPad was alright

Student 2: I think the iPad was quite good, was probably the best one

Student 3: I liked the iPad.

Appendix: Transcript 3

According to Macdougall (2012) on factor of mobile learning programme success is how prone the device is to technological failures. Focus group comments suggest the participants encountered a higher likelihood of technological failure on the ThinkPad tablets than the iPad. ThinkPad related failure could be caused by a variety of factors, and a technological analysis of the device is not within scope of this research trial.

Seeking Solutions

Solving Technological Problems in Groups.

The focus group interviews highlight a range of mobile device related technological issues that interrupted the participant's learning. Students tended to work within their selected groups to solve technological based problems, approaching the researcher or classroom teacher for assistance after attempts to solve the problem within their group had failed.

Researcher: So everyone here is used to using an iPad - apart from you. How about you?

Student 1: Um, I haven't used any of these before.

Researcher: You haven't used any of them before? So it was all new? Did you find it hard to figure out what to do on them or...

Student 1: Not really since I've got (Student 2)'s help and stuff.

Researcher: You helped each other in your group?

Student 2: Yep, and (Student 1) did funny things to it made it go back a page and make it on this funny page when you were doing something.

Researcher: So what did you do?

Student 1: She helped me.

Appendix: Transcript 4

As well as overcoming technological barriers, participants described how they worked collaboratively to overcome other learning distractions.

Student: I remember with (another student) if he didn't get the word he just kept asking us questions, especially if he didn't get a word. Like what does that word mean?

Appendix: Transcript 2

The collaborative, problem solving nature demonstrated by participants in this trial contrasts with Rossing's (2012), and Tribal Education's (2009) mobile learning research. In both of these mobile learning trials tertiary students demonstrated a dependence on interaction with a lecturer to overcome any mobile learning issues. The inclusion of groups in this mobile programmes design may explain the difference in the level of expert reliance for the tertiary level research and this research.

The tertiary mobile programmes' designs had a one to one ratio of participant to mobile device, compared to this programme where students shared mobile devices in groups. When faced with technological difficulties, participants in this research trial worked collaboratively to overcome them.

Other focus group dialogue suggests that students who shared a mobile device when accessing learning content constructed knowledge collaboratively.

Student: Yeah in groups you could discuss it, instead of like talking to yourself. (Another student) and I might have got a different answer and then she would say how she got the answer and then we would go back to wherever she got the answer from and we would re-read it and we would be like yeah that's the answer.

Appendix: Transcript 2

Researcher: How important is it when you go out to historic sites, with the mobile device, to work with others in groups?

Student 1: I think it's helpful because if I missed something then my partner could have heard and I could ask them rather than come to you.

Student 2: You could help each other out.

Student 3: Share ideas.

Appendix: Transcript 4

These comments suggest that Vygotsky's (1973) assertion that learning is a social process applies to learning situations where students are collaboratively using a single mobile device. If students had individually used mobile devices to engage with the programme content then the face to face construction of meaning may not have happened. Face to face social interaction is also an important preferred learning method for Māori (McFarlane, 2007). The inclusion of face to face social interaction and the sharing of mobile devices, are important considerations of future programme design.

Asking Questions

Throughout the programme students asked questions regarding programme content directly to the researcher. In order not to provide an alternative method of content delivery, questions raised by participants that were covered by trial programme content were not answered. Students asking programme content questions were directed to either:

- Review the programme that they had already engaged in;
- Ask their question in the 'question and comments' section of the website for another participant to answer;
- Ask another member of the group;
- Or advised that the answer may be given in programme content that they hadn't engaged in yet.

During the focus group interviews participants were asked to comment on the avenues available to answer their programme content questions during the mobile learning programme.

Many focus group comments centred around a participant preference to ask questions directly to and get answers directly from the educator, rather than submit questions on the iPad. Many participants commented that they wanted feedback to their questions immediately.

Researcher: Anything else people thought maybe we could do differently?

Student: There was also like when we talked to you, we could actually ask you questions, which was good, but whenever we went to the iPad if you were with another group, or if we couldn't find you, then we got really confused on some things.

Appendix: Transcript 2

This comment suggest some students preferred direct interaction with a more knowledgeable person when seeking assistance. Nouri et al (2010) research highlighted that mobile technology itself could not provide the support required to assist learners past many learning difficulties. Technology continues to evolve rapidly, however Nouri et al's (2010) identification of the importance of a real life, more knowledgeable person to scaffold students past learning difficulties is reflected in this trial's focus group comments.

Group Support

The Slideshow method contained written interpretation at the bottom of each image. One member from each participant group was instructed to read the written interpretation aloud. In the focus group interviews some students identified difficulty correctly pronouncing Māori place names included in the written interpretation. The researcher's line of questioning investigated the resources that the participants might consider when seeking support.

Researcher: Could you talk to other people in your group and say 'hey what does that mean?'

Student 1: Yeah but if you're not very confident with history and stuff you don't want to get it wrong.

Researcher: Would you be more confident in asking someone in your group or would you want to ask someone like me?

Student 1: You

Student 2: I would ask anybody there

Appendix: Transcript 2

The above comments suggest that a variety of technological and content based support is required to scaffold students through a one off mobile learning programme like the Waikato Wars. The methods of support used and the type of

support given are both considerations for the future development of this mobile learning programme.

Technological Assistance

During each of the 3 trial programmes, the researcher was approached for technological assistance mostly at the beginning of each trial. The pattern of an initial spike, and then a quick reduction in mobile technological issues was a trend identified in Beazley's 2007 research. Beazley (2007) observed that an initial student focus on understanding how to use the mobile technology, rapidly evolved to using their understanding of how the technology works to effectively scaffold their interaction with the intended learning content.

Social Media

In this extract from the focus group participants were asked whether they would rather email their questions directly to an expert, or to place their questions in open forum, like a social media website.

Student: I think it's better to let everyone know, because if we emailed you, you might not know the question and some other people might know the answer.

Appendix: Transcript 1

Here the participant recognises that not all issues are covered in the mobile programme's content, or known by the researcher. Their comment suggests that placing their questions in an open forum may extend their learning to other sources of expertise in the community. If social media was available as a method of learning, additional scaffolding to supporting the student interpretation of the unregulated sources of information would be needed. Scaffolding that supported students to interpret the validity and accuracy of the comments may go some way to addressing many educator's concerns over using social media as a learning method (Primmer et al., 2012). As well as providing a source of information, social media could provide a platform where students shared their learning with others. A need to share new knowledge is identified in the focus group extract below.

Student: Maybe after you've been to the site you could go back to school and everyone is in class and we could say what we think, what we did there and share the knowledge with other people.

Appendix: Transcript 1

This participant suggests that there wasn't the audience or the opportunity to express their interpretation of the mobile learning experiences. Effective use of social media may provide an outlet for sharing experiences and knowledge, that the above student identified as lacking. During this trial, participants' groups choose not to use the comment box. When asked to rate the importance of being able to leave comments about the programme content on a scale of one to four, where one was not important and four was really important, the average rating immediately after the trial was 1.03/4. Four months after the trial the average rating increase to 1.33/4. Whether social media can be successfully integrated into the mobile learning methods for the Waikato Wars programme is dependent on the attitudes of the teachers and learners towards social media, as much as the programme design itself (McCabe, 2012). Programme design and effectiveness of social media to increase understanding in the context of this mobile learning programme would need to be investigated further.

7.4 Macro level:

In which the evaluator tries to understand the impact on learning/teaching practice as well as the appropriation of the new technology and new practices (Vavoula & Sharples, 2008 pg.5).

Impact on Learning and Teaching

Programme Feedback

At the beginning of the four month focus group interviews, participants were asked for their general recollections on the mobile learning programme.

Researcher: What can you remember about the trip?

Student 1: That it was really fun because we got to go to different places and see where it took place and how it took place and why it took place.

Student 2: I liked the trips because you were learning about Māori culture and I didn't know about it before, how there was the Waikato Wars, because I thought it was just a war all across New Zealand, not just in the Waikato.

Researcher: Anybody else remember anything about that trip? Anything at all?

Student 3: I didn't really care about history until that day, because I got to learn about lots of cool things.

Student 4: I liked going to the different places

Student 1: It was fun playing with the tablets.

Appendix: Transcript 5

Student 1: It was really good to find out about what actually happened in our own area because you always hear what's happened in America or England or somewhere like Auckland or stuff like that, but you never hear about your own area unless its like a big city or stuff.

Appendix: Transcript 3

Student 1: Yeah it was brilliant. I really enjoyed it.

Appendix: Transcript 3

The focus group comments on the researcher's request for general feedback highlight positive learning recollections that mainly focused on programme content. These comments suggest that the *use* of mobile technology did not dominate the learning experiences. This contrasts Walker (2012) findings, where student

reflections of their own learning were dominated by comments about functionality of the mobile device, and the new technological skills required in order to use the mobile device to participate in the mobile learning programme. For this trial, when the researcher invited general feedback on the mobile learning programme, some participants identified how mobile technology helped them focus on programme content.

Student 1: I think that it's really good experience to go and learn everything, and the iPads and the ThinkPad's really helped, because we got more engrossed in it because it was technology.

Student 2: Yeah it was cool using technology

Appendix: Transcript 2

In the above comments students describe mobile technology as a tool that helped them learn, rather than a distraction from learning. The distraction that mobile technology can bring to learning process can take many forms, and has been well documented by many researchers (see Cahill et al., 2011; Sung, Hou, Liu & Chang 2010; Charitonos, Blake, Scanlon, & Jones, 2012). This trial research suggests that gaining an understanding of, or that an infatuation with, mobile technology did not dominate the learning experiences, with participants metacognitive reflections focusing mostly on programme content rather than the mobile technology used.

If the learning intentions negotiated by the teacher and educator were focused solely on social history, even minimal technological distraction would need to be offset by the increased student understanding benefit brought about by the mobile learning programme.

Technology Dominating Learning

Time spent by students orientating themselves to the mobile technology may leave too little time left for content learning. All LEOTC educational experiences facilitated by Te Awamutu Museum are contained within a start and finish time negotiated between the classroom teacher and the Museum educator. Although flexibility is encouraged, Ministry of Education (2007) guidelines on the length of LEOTC programmes suggest that most LEOTC programmes should be between one and a half and two hours in length. In the researcher's 5 years of LEOTC experience the majority of LEOTC experiences facilitated by Te Awamutu Museum fall within the MoE's suggested timeframe. Education programmes between one and a half and two hours in length leave a limited window of time to meet the teacher's social history themed learning intentions for the historic location. Time that was spent by the students on familiarising themselves with the mobile technology would leave less time for them to focus on the actual learning intentions set for their visit.

Just Audio

As the method that produced the highest increase in understanding and retention was the mobile audio method. One avenue for future programme development could be providing an entirely audio based education programme. Following the results from this research, developing a mobile learning programme around an entirely mobile audio method may create a learning environment with less distraction, and a higher likelihood that students would leave the learning experiences with as much content knowledge as possible. Brown's (2003) research produced similar results, where out of a variety of methods trialled, an audio method was the most effective form of content delivery.

One consequence of reducing the mobile learning programme to a singular auditory method may be a lowering of participant understanding. Rossing's (2012) research has shown that mobile learning programmes that use a variety of methods create a learning environment where each method enhances the effectiveness of the others. Rossing's assertion is that when information is presented in a variety of intersecting learning styles, then student learning is consolidated (Rossing, 2012). Some focus

group participants reflected that information presented in a variety of methods increased their interest for the programme.

Student: I liked the different ways of learning, they weren't the same, they weren't just all PowerPoint's or talking or there would be one you had to read and then a power point, then you talking then another power point and then a video and it all like talked about different areas.

Appendix: Transcript 2

Rossing's belief that a combination of learning styles would lead to a higher level of student understanding, rather than just using the highest performing method for all programme content, has implications for the future development of this programme. If this mobile programme was reduced to one method, then the reduction, if any, of the audio methods effectiveness to increase understanding and retention would need to be measured.

Passive Learning

Passive learning occurs when students receive information by passively listening or watching content, such as listening to a teacher or watching a video (Barr & Tagg, 1995). One of main advantages of passive learning is that an educator can present a considerable volume of information in a short period of time (Barr & Tagg, 1995). The Waikato Wars education programme is underpinned by a teacher driven kaupapa of presenting to students a large amount of content in a short space of time. Passive teaching methods suit this purpose and have been historically used to deliver LEOTC programme content to the school students.

The mobile learning resources developed by the researcher for this mobile learning trial were adapted from existing Waikato Wars programme content into mostly passive video, audio and slideshow methods of learning. The decision to use passive mobile learning methods was due to the need to cover the large amount of content in a short space of time.

Four methods of engaging participants with programme content were trialled during this research project. These methods required varying levels of interaction by the participants to engage with the learning content.

The learning methods that required the least amount of interaction from the participants were the audio podcasts streamed using the mobile device, and the researcher talking. Once “play” was pushed, or the educator began talking, all that was required from the participants is that they were in range of the transmitted audio content, whether that information is from the educator’s mouth, or the mobile device.

Requiring slightly more participant interaction to engage with the programme content is the video method. The video method comprises of a mixture of audio and visual content. The video method is similar to mobile device podcast in that once “play” is pushed participants passively engage with the information. However, in order to engage with all of the video’s content, the participants must be able to both see and hear the visual and audio content of the video.

As the participants are sharing the mobile devices in groups of 2 or 3, positioning the device so all group members can receive the video content may require more participant interaction than solely auditory methods.

Although passive learning methods may meet the needs of presenting a large amount of information in a limited amount of time, research indicates that student engagement with the content may suffer as a result (Brandes & Ginnis, 1996). Changing the emphasis of mobile learning methods from passive content delivery to a student centred approach could increase student engagement with the programme content (O’Neill & McMahon, 2005).

Distractions

Distractions that affected the participants’ ability to engage with each method of learning were highlighted in the focus group interviews as having an impact on participant understanding.

Visual and audio distractions that affected learning in this mobile learning programme were identified by participants in the focus group interviews and described in the Micro section of this thesis's programme analysis. The main distraction to learning visually was difficulty of positioning the tablet so that all members of the group could clearly see the screen. Although some groups attempted to negate visual issues by relocating within the historic site, participants commented that visual problems persisted throughout the outdoor experiences.

Participants identified distractions to learning audio content centred on difficulty hearing programme content. Identified distractions included road traffic, other participant and tablet noise interference. Participant groups relocated within the historic site to negate these audio issues, replaying content where noise pollution from other sources was no longer an issue.

Visual learning distractions were persistent in this outdoor environment. Participant actions to resolve the visual issues only made slight improvements to their ability to see the screen.

Audio learning barriers were temporary in all parts of the mobile programme, but participant actions usually resolved audio issues immediately.

When audio and visual distractions to engaging in learning content are compared, staying engaged with visual learning content required more participant focus due to the permanent nature of the visual distractions. The persistent nature of the visual distractions during this mobile learning programme, and the effect it had on the participant's ability to focus on visual learning content may explain the lower performance of both of the visual learning methods of content engagement.

Costabile, De Angeli, LaNew Zealandilotti, Ardito, Buono, & Pederson (2008) agree that the distraction of participant focus from learning content is one of the most significant problems in mobile learning. They go on to say that the success of any method used in an outside the classroom mobile learning depends on it's ability to capture student attention and engage them in content.

This research trial identified the teacher talking method as the second most effective method in increasing participant understanding and retention. Additionally it had the least amount of distractions identified by the participants in the focus group interviews. These findings could be used to rationalise the continuation teacher-talking based method of programme delivery.

Although this mobile learning trial identified many distractions and produced mixed results in increasing student understanding, the researcher believes there are a variety of potential areas of development, that with further research could produce mobile learning methods that supersede the traditional presenter-based model.

Providing mobile learning methods that limit distraction, increase engagement and student understanding is the aim of this research project, and moving forward, is the aim of future programme development.

Student Centred Learning

One of the main principles for student centred learning is that the involvement and participation of the student is necessary for learning (Brandes & Ginnis, 1986).

Jonassen, Hernandez-Serrano & Choi's (2002) research into effective web based learning identified four student centred methods, that when used to engage students with Internet hosted content, had the greatest positive effect on increasing student understanding. Jonassen et al (2002) identified the four methods to be: experimentation, conversation, collaboration, and reflection; and when these are used to engage students with Internet hosted content, meaningful learning is more likely to be produced.

These methods of learning focus on the student, requiring involvement and participation to engage in the learning content (O'Neill & McMahon, 2005). Some aspects of student centred learning were included in this research trial's design, but were peripheral to the central methods of passive content delivery. These methods, such as an embedded comment boxes and feedback forms were unused by participants during this trial due to their peripheral nature. If the learning methods used to present the mobile content are redesigned to be student focused, in

particular focusing on Jonassen et al (2002) recommendations, a learning environment could be created where increased engagement and increased understanding go hand in hand.

Content coverage

One consideration of adopting a student centred approach for the Waikato Wars mobile learning programme is the effect this would have on the amount of programme content covered. Student centred methods have been shown to intrinsically motivate students to engage with programme content, however the amount of content that can be covered by student centred methods is far less than passive methods (O'Neill & McMahon, 2005). A switch to student centred methods would be at the cost of programme content covered. If student centred methods were to be adopted in the future development of this mobile learning programme, a balance between the teacher required content coverage, and the motivational advantages of student centred methods would need to be struck. Such a balance could only be struck with further investigation into student centred methods.

The Importance of Context

All participants from the focus group interviews identified that learning in an authentic context was essential to increasing their understanding of the mobile learning content. The following extract is from the seven and eight year level focus group.

Researcher: Okay, so you did learn though videos and those different types of media, and earlier you did mention that the Internet connection was a problem. The programme may have worked better if you could have been at school. You could have looked at all those videos and things first and everything would have worked really fast. You wouldn't have had any technological problems, you know, because you have got high speed broadband. So if you had done all that first and then you went out to the sites, would that have been better?

Student 1: No

Student 2: No

Student 3: No

Student 4: No because you would have forgotten most of it by the time you got out there.

Appendix: Transcript 6

Above, the researcher has suggested to the participants that separating the mobile content from the historic site could create a distraction free environment, and as a result make learning easier. The removal of the authentic context from the mobile learning experiences was rejected by all Yr 7/8 focus group participants.

In the extract below the focus group of Yr 5/6 students were also proposed distraction free alternatives to mobile learning in an authentic context. The Yr 5 and 6 participants, the youngest involved in this trial, clearly articulate how mobile learning in an authentic context allowed them to make connections between learning content and where the events took place.

Researcher: Imagine you could do all of this mobile stuff you experienced on the day either: in your class room beforehand, on a computer; or watch it at home for homework. Where do you think would work best for you?

Student 1: The sites

Student 2: Yeah

Student 3: Where it happened

Student 4: So you could imagine it

Student 2: So when you say, about the peach trees you could look around and say you think they were on that field over there.

Student 2: So you can picture it

Appendix: Transcript 5

Similarly, the researcher suggested to the Yr 9 and 10 participants that a change from mLearning at the site, to eLearning in the classroom before the site visit, may reduce distractions. One student identified the benefit of removing screen glare, but their continuing discussion recognised the benefits of being in an authentic context as outweighing the visual distraction of screen glare.

Researcher: What about before you went in your classroom, so you sat down on the computer and looked at the different things before you went out.

Student 1: In some ways that would be good because you wouldn't have the sun aspect but being at the site does help you relate to what happened.

Researcher: Okay, anyone else got anything to add to that? Do you agree or disagree?

Student 2: I think that I agree with (student 1) that going to the sites and actually learning about them makes you remember them more because you are experiencing the things there yourself.

Student 3: And it makes things stay in your brain.

Student 1: You're more likely to remember it

Appendix: Transcript 4

In the above transcripts, focus group participants identify an authentic context as an essential component of their mobile learning experiences. When the researcher proposed alternative learning situations that exclude authentic locations, students argued strongly for the benefits of engaging with mobile learning experiences at the site. Many of the comments recorded during the focus group interviews outline how the participant experience of learning in an authentic context was an integral part of

increasing their own understanding and retention. During the trial programme the authentic physical location contributed to student understanding of the learning content. The participant's comments suggest that engaging with the mobile learning methods in unauthentic locations would negatively affect their understanding.

Participant support of mobile learning in an authentic context is consistent with research emphasising that such learning:

- Exposes students to content that cannot be effectively covered in the classroom;
- Creates greater motivation and excitement;
- Allows students to connect with and engage with community issues in their community.

(see: Traxler 2009; Quitadamo & Brown 2001; Vavoula et al 2009; Sharples et al. 2007).

Educator Bias

The unintentional learning outcome of students focusing mainly on the mobile technology during outdoor experience was a concern expressed by the educational professionals in Te Awamutu Museum's LEOTC advisory group in 2011. Cahill et al (2011) have identified this concern as one held by many educational professionals however they identified this concern as being based on educators' prior experience with mobile technology, i.e. how teachers have seen students use the device in the past, rather than actual research indicating whether mobile devices can aid learning or not. Students do use mobile devices as primarily a social networking device (Pachler et al. 2012), however this does not mean they cannot be used for education ends (Sharples, 2007). The gap between educator and student knowledge has been well documented, and has been as identified by Prensky (2001) as the digital divide. An educator's lack of knowledge of the potential benefits of mobile learning may prejudice them against participating in social history themed mobile learning experiences. An increase of local educators' knowledge into the potential

multipurpose nature of mobile devices, and how they can be used to assist learning, will be used to inform future museum educator/teacher discussion regarding this topic.

Pre and Post Activities

The trial mobile learning programme created for the purpose of this research was designed to be independent from classroom activities. This is in contrast to the existing Waikato Wars programme that offers a plethora of resources for before and after classroom support. Participant feedback from the focus group interviews picks up on the lack of relevance to classroom learning.

Student: Maybe after you've been to the site you could go back to school and everyone is in class and we could say what we think, what we did there and share the knowledge with other people.

Appendix: Transcript 1

Perceived irrelevance to classroom learning may have contributed towards the lower levels of engagement in some learning experiences. Mobile learning experiences isolated from classroom teaching and learning may not provide enough support for effective student learning (Nouri et al, 2010). Nouri and associates suggest that both before and after classroom activities that support the mobile learning experiences can help students to engage and understand the programme content at a deeper level. Moreland et al. (2005) analysis of effective LEOTC experiences suggests that pre and post visit classroom activities are essential for effective site learning, and motivation to engage in site learning. Participants also recognised the need for links between the historic site mobile learning experiences and the classroom.

Future mobile learning Waikato Wars programme development will need to include relevant classroom activities that support student learning before and after the mobile learning programme.

Potential New Frameworks and Practices

Game based Mobile Learning

Another approach to increase student engagement and motivation for the trials mobile learning activities was suggested by a participant during the trial's focus group interviews.

Student 1: I reckon a thing that would make it better would be if you kind of have so if you listen to a slide show you would have something you would have to find a bit to help you find your next clue.

Student 2: It would have been cool if you did like an amazing race

Student 1: Not like it's a race in teams but like if you had little clues around and then you just start each group there were different clues placed in different areas and each group got an area to find things.

Student 2: Like a scavenger hunt

Researcher: That sounds like a really good idea.

Student 2: It would make it exciting as well

Student 1: People would probably listen to it cause they would be like if we listen to it then and, like, you have the next clue in audio so they have to listen or watch it to find where the next clue is.

They would have to listen to it and then do a challenge and then they would have to do a quiz and if you go it wrong you would have to listen to it again so you would get it into your mind.

Researcher: There have been some places in different countries who have tried things like that to do with historical sites. They've worked really well.

That's a really good idea. So you're saying if there was more purpose to it, or more of a game to it

Student 1: You'd have to listen to it to keep going.

Student 2: If it was a competition, you would be listening eager to win

Student 3: If it was a competition they probably wouldn't listen because they would be wanting to win.

Student 1: At the completion, at the end of the quiz, the team that got the most answers correct they would get like a candy bar or something, then they would want to listen, want to win.

Researcher: That's an interesting thing to look into.

Appendix: Transcript 6

The participant's suggestion of introducing gameplay into the mobile learning experience and the concept of including students in the design of mobile learning experiences, may have the potential to increase student engagement, motivation and content retention, and is deemed worthy of discussion.

Adding a game play element to the learning experiences (e.g. Spikol & Milrad 2008), or developing the experiences into a mobile learning trail (e.g. Beazley, 2007), may provide students with extra motivation to engage with programme content. Spikol & Milrad (2008) and Beazley's (2007) research provides evidence that the inclusion of mobile learning framework can provide students with extra motivation to engage in learning. Frameworks have been shown to provide students with additional motivation to engage in learning methods that otherwise they may have been reluctant to participate in. Learning methods that a game or trial framework could provide additional motivation for include:

- Passive methods of content dissemination;
- Methods that are not the students' preferred learning style;

- Methods that require additional focus due to a high level of environmental distraction;
- Or a combination of these barriers to learning.

Providing a mobile learning framework, such as a game, can provide additional student motivation but may dominate the learning experience. Spikol & Milrad's (2008) research highlighted that a game play framework can dominate student recollections of the learning experience. Their interviews with participants found most had limited recollections of the content, with the majority of student recollections being based on the competitive aspect of playing of the game. As well as the potential negative effect of mobile gameplay dominating student learning outcomes, game based mobile learning may also limit the effectiveness of any student centred learning methods contained within the programme.

Effective student centred methods such as experimentation, conversation, collaboration and reflection (Jonassen et al., 2002) may not be compatible with the competitive element of a game based framework. In Spikol & Milrad's game based trial, students competed against each other to complete a game as quickly as possible, with the frame work of the game providing an external, extrinsic source of motivation for the participant to complete the experience. Student centred approaches rely on students internal or intrinsic motivation to engage in learning (Ryan & Deci, 2000). Spikol & Milrad's (2008) research points out that engagement in meaningful, student centred learning may come second to the student's desire to complete the game.

Future mobile programme design that included both student centred intrinsic and game based extrinsic methods to engage participants would require careful consideration to recognise the potentially conflicting sources of motivation to engage. The mobile programmes design would especially need to provide for the tendency of a game based framework to dominate the learning experiences.

Is Gameplay Appropriate?

The Waikato Wars trial education programme is based around the 1863 invasion of the Waikato by the New Zealand Government, and the subsequent illegal confiscation of 1.2 million acres of Māori land (Belich, 1986). The content covered includes accounts of unarmed men, women and children dying in the act of legally defending their homes. Unmarked mass graves of Māori men, women and children are in the vicinity of Orākau Pā, and potentially other Waikato Wars programme locations (Cowen, 1922). Due to the tapu (sacred) nature of burial sites, the disturbing nature of the events that took place, and the significance of these events to all New Zealanders, the introduction of game based mobile learning framework to culturally sensitive educational content may be inappropriate. Researcher consultation with local Māori iwi representatives as part of the development of this mobile learning trial suggests that affected Māori may see 'fun' as an inappropriate outcome for a Waikato War education programme. According to Rivers (2006) having fun is a legitimate goal for New Zealand social history themed education programmes, however any gains in participant understanding from fun resulting from game based adaptations, would need to be approved by affected groups, specifically representatives of Ngāti Apakura, and other affected Māori. If some form of a game type format was used to tie aspects of the programme together, and increase student motivation to engage with the activities, then consultation with representatives of affected Māori iwi would need to be an integral part of the resource development process.

Culturally Sensitive Learning Trails

A culturally sensitive framework used to provide extrinsic motivation could be modelled on Beazley's (2007) learning trails. In Beazley's mobile learning programmes, a semi structured framework, similar to that of Spikol & Milard (2008), was used to lead the participants around a physical environment to engage with educational content. One difference between Beazley (2007) and Spikol & Milard (2008) model is there is no competitive element included in Beazley's mobile learning experiences. As well as Beazley reporting high levels of participant

satisfaction and engagement as a result of a mobile trail, she also has reported success in including reflection into mobile learning trial activities.

The integration of reflection into Beazley's mobile learning programme suggests that student centred methods identified by Jonassen et al (2002) can be successfully integrated into a mobile learning trail framework.

Student Involvement in Design

From the focus group interviews came the participant suggestion of game based learning. Other student suggestions for programme design improvement include the following extract from the focus group interviews:

Researcher: You mentioned some problems, what do you think are some solutions?

Student 1: Probably just some headphones, because then you aren't listening to other people.

Student 2: We could separate more

Student 3: Maybe we could move around different activities at different times.

Student 2: Maybe have one group start talking to you and then another with video, and then another with sounds so we all stand in different places.

Appendix: Transcript 5

Students were not involved in any part of the design process for this trial education programme. In the above extract from the focus group interviews, participants provide a variety of valid suggestions towards the enhancement of the mobile learning programme.

Student feedback on what worked during the programme, what didn't work and their suggestions for modification may be valuable for future programme design.

Spikol & Milrad's (2008) experience of involving participants in the design and redesign processes of mobile learning activities showed benefits for both the development of the mobile activities and for the students involved. They created workshops for some of the students who had participated in the mobile learning experiences, and from these workshops they report the development of a variety of new game concepts. Spikol & Milrad's model of involving participants in future programme design could be used to enhance the continued development of the Waikato Wars Mobile Learning Programme.

Māori Kaupapa

The researcher conducted no formal identification into the ethnic group that the students identified with, however classroom teachers of the participants confirmed that many of the students involved in the trial identified as Māori.

All students, Māori and non-Māori, identified context as an important aspect of increasing their understanding of the content presented during this trial. More research into the importance of authentic context for raising Māori student achievement during mobile learning experiences would fit with current Ministry of Education goals (MoE 2013). Mobile device access to learning content at an authentic site supports the kaupapa of the delivery of content in a Māori model of holistic learning. Zepke & Leach (2002) identify a Māori holistic learning model as one that incorporates wairua (spiritual), hinengaro (intellectual), tinana (physical), and whatumanawa (emotional) into a learning experience. Being in an authentic context allows for the wairua, tinana and whatumanawa components to be made possible through on site Pōwhiri, Karakia, Waiata and other traditional practices that gain authenticity by being conducted in appropriate context. It is the ability of the mobile device to bring hinengaro content to an authentic context that allows mobile learning to support a Māori model of holistic learning.

More Ways to Learn

This mobile learning trial divided up the learning content to be presented into either one of four different learning methods. Although four different learning methods were used, participants had no choice in the method that was used to present each section of content. In the focus group interviews a wide range of preferred methods used during the trial were identified by the participants. This variance in learning style preference recorded by focus group participants suggests that there was no one preferred method learning identified by the students. Milne & Dimock's (2006) research identifies that students need to be given choice in how they receive information. They emphasise that when a learning method matches a student's own learning preferences, students are more engaged and gain a higher level of content understanding than when compared to learning in a style that is not their preference. They suggest that the design of digital learning experiences needs to allow for learning method choice, so that students can choose methods that suit their own learning preferences.

For future programme development, providing students with a range of methods that allow them to engage with the learning content, may be beneficial to their learning.

7.5 Back to the Beginning – mLearning and the Waikato Wars

At the onset of this project mobile learning was seen as having the potential to resolve a range of subsidiary issues in the Waikato War education programme. These subsidiary issues were identified in section 1.4 and include mobile learning's potential to provide:

- Increased consistency of content delivery;
- More methods of learning;
- Experiences that were student centred;
- Hands on experiences;

- Experiences relevant to a 'digital native' generation;
- Meaningful interpretation for the currently sparse historically significant sites.

Consistency

It was theorised that mobile technology may be able to provide participants with a consistent learning experience. This trial did have consistency of educational content, but it was not able to achieve consistency in how that content was presented to the participants. The same content was available to all participant groups involved in the trial, however all groups experienced a variety of distractions that detracted from the different learning methods. As a result, reliable consistency across the mobile learning programme could not be guaranteed.

More Learning Methods

This programme divided the content into four learning methods. In the focus group interviews participants commented how:

some methods of learning suited them better than others;

feedback forms indicated a variety of learning preferences; and

a variety of methods contributed to their overall understanding of the content.

However, participants had no choice in the learning method that presented each section of content, with each different method confined to a set proportion of programme content. Having a choice in the learning method would have provided students with more opportunity to learn in a style that suited them.

Student Centred

When compared to the original Waikato Wars Education Programme, the trial mLearning programme provided students with increased levels of autonomy. Many students paused, rewound, re-read and discussed content in their groups. Students made choices about their learning environment, worked in groups to solve problems and to gain understanding of programme content. Increased student autonomy shifted the focus of the programme away from the educator further towards the student. However, this mobile learning programme could not be classed as student centred. Passive instruction was still present in the methods of content delivery used. The educator's central role in the learning experience was moved from the real world to the digital world, where the passive mobile learning methods transmitted educator constructed knowledge to the participants.

Hands on Experiences

'Hands on' is a term with a variety of definitions. It is used by the Ministry of Education to describe a required component of an LEOTC programme, and is a reference for activities during the education programme for the students to do, things to touch, and generally being physically involved in the learning experiences. If the interaction with tablets in small groups can be defined as hands on, then this programme has created hands on activities.

Context

Learning in an authentic context was unanimously supported by focus group participants. Participants recognised that learning was more effective at the sites where the events took place, as they could make connections between the location and content that they were trying to interpret.

Digital Natives

Participant familiarisation with the navigation of the mobile device, and using it to access web based content, took time. Mobile learning is not an innate skill the digital generation are born with, gained through some sort of generational specific digital osmosis (Nouri, Eliasson, Rutz, & Ramberg 2010). Learning to navigate the mobile devices and the Internet based content took participants time to master.

Proficiency in mobile learning is a skill that is learnt through practice. Those participants who had had more practice with mobile technology were able to offer support to those who were less familiar with the device. Participants described mobile learning as a motivating factor, and although it proved a distraction while students familiarised themselves with the device, overall mobile technology served to enhance the programme rather than detract from it.

Site Interpretation

Digital content has a role to play in the interpretation of Waipā's sparsely interpreted historic sites. A large variety of interpretation was created and presented at historic sites for the learning benefit of the participants involved in this trial. Providing access to interpretation for students in an education programme is very different from providing interpretation for the general public. However more and more people have access to the Internet in their pocket, and the potential is there for mobile learning to provide site specific interpretation to New Zealand's historic sites for more than just school students.

7.6 Summary

The discussion chapter has analysed the qualitative and quantitative data using Vavoula & Sharple's (2008) mobile learning framework of analysis. The qualitative and quantitative data was organised and discussed under Vavoula & Sharple's Micro, Meso and Macro headings. The discussion ends with a focus on whether this trial's mobile learning programme was able to address a range subsidiary issues that were identified early in the research process.

Chapter 8 Conclusion

Recent developments in mobile technology have made possible the concept of anywhere, anytime access to the Internet, with mobile devices becoming increasingly pervasive in the lives of New Zealand school students. It was the researcher's thesis that mobile technology could create new ways of understanding social history programme content and so increase student learning in an authentic context.

Research Questions

Which method, delivered in an authentic context, was the most effective at increasing student understanding and retention of the Waikato Wars content? and

What were the participants' perceptions of the mobile learning experience?

Increases in Understanding

All of the mobile learning methods trialled resulted in increased student understanding of the programme content. Multi-choice testing showed that tablet audio was the most successful method of increasing content understanding and retention for participant groups. However participants rated tablet audio as the least effective method.

Inversely, participants rated the video content as the most effective method, whereas the test results suggested video was one of the least effective methods for increasing student understanding. The initial indication was that the quantitative multi-choice test results did not provide the complete picture. To base the future development of the New Zealand Wars mobile learning programme on the quantitative tests that indicated tablet audio was the most effective would be ignoring the multitude of factors that contributed to this result. The reasons for the high level of contradiction in the multi-choice test results and the student rating of effectiveness were sought in the focus group responses.

In the focus group comments, participants portrayed an in-depth awareness of the difficulties and distractions that inhibited, and the qualities that enhanced the effectiveness of each of the methods trialled. In effect, student perceptions gave meaning to the numbers. These perceptions were integrated with quantitative data in the discussion chapter, and have led to the following conclusions.

Mobile technology enhanced learning

Participants described mobile technology as a motivating factor, and although it proved a distraction while students familiarised themselves with the device, overall, mobile technology served to enhance the programme rather than detract from it.

New developments in mobile technology will reduce learning distractions and enhance student learning. The seemingly expedient evolution of mobile technology is reducing the influence of technological distractions on mobile learning. Participants identified that all mobile learning methods trialled had distractions that were detrimental to each method's effectiveness. Visual distraction tended to be permanent in an outdoor environment, whereas auditory distraction could be mitigated by actions from the group. If technological distractions are minimised with the advancement of mobile technology, then this may influence the effectiveness of each method's ability to increase student knowledge and retention, and potentially utilise new methods of learning.

Student-centred Mobile Learning

Student-centred mobile learning contributed to increased understanding. Students made choices about their learning environment, worked in groups to solve problems and to gain understanding of programme content. However, due to the passive mobile learning methods transmitting educator constructed knowledge, this programme was still educator centred. An increase in the variety of learning methods such as experimentation, conversation, collaboration, and reflection may further increase the ability of the programme to revolve around the student. Student-centred methods have been shown to increase understanding, whereas passive methods can transmit large volumes of information. Due to LEOTC programme time constraints and required content coverage, an entirely student

focused programme may not be practical, and a combination of student centred and passive methods may be the best solution.

Including Face to Face Interaction

Face to Face interaction enhances mobile learning. Group based mobile learning also provides face to face interaction. The majority of mobile learning research indicates a device to participant ratio of one to one, which limits face to face interaction. Face to face interaction has been identified as a promoter of understanding, especially for Māori students. In this trial, when participants sought answers to specific content or technology related questions, they preferred face to face interaction with other group members or the researcher.

Social Media

Social media has potential to enhance student understandings. Social media was used during this trial to give students the option of adding questions or comments directly on the page where the learning content was hosted. No participant used it, and when they were asked to rate the importance of leaving comments, participants rated the ability to leave comments as not important. Programme design and a variety of factors may have contributed to this function being unused. However the addition of alternate views, or additional information could create strong links between the programme, the school and the wider community. Care would need to be taken in opening up an online forum on a topic that is sensitive to many members of the local community. Any online forum would need to happen in consultation, especially with Māori and other affected parties, be framed in a culturally sensitive manner, and primarily focus on helping the students to gain a higher level of understanding of the topic.

Working in groups increased student understanding. Sharing a tablet between a group of two or three students during this trial has contributed more than it detracted from the overall goal of increased participant understanding and retention. Contributing to increased participant understanding was the enforced student collaborative approach to learning. Over 92% of students indicated that they would prefer to engage with the learning content by sharing a tablet in a group. In

the focus group interviews students described how being placed in a group of three to share the tablet enabled students to collaboratively overcome technological problems, familiarise themselves with the mobile technology, engage with the learning content, scaffold other group members learning and answer review questions. Group based detractors to learning included difficulty positioning the tablet's screen in an outdoor environment.

Mobile learning could contribute to a preferred model of learning for Māori students, which involves the connection of intellectual, spiritual, emotional and physical modes of learning (Macfarlane 2007). Mobile learning fits well within this model. Mobile learning allows a variety intellectual content to be brought to a historic site, connecting information with the location, where cultural practices such as karanga, karakia, and waiata can be performed in an authentic context. A holistic kaupapa may help Māori students to learn in a preferred learning style, and could contribute to a higher level of understanding for Māori students. Providing learning experiences that lift Māori achievement is one of the MoE's current goals for LEOTC. A future area of LEOTC research would be an investigation into benefits of mobile learning for Māori students, and how mobile learning could be integrated into a preferred style of learning for Māori.

Student involvement in the design process could benefit student learning and the programme. During the focus group interviews students enthusiastically contributed ideas for future mobile learning design. Student involvement in the design of mobile learning programmes may have benefits for students, and the programme. Much like the advisory group of teachers required by an LEOTC contact, having an advisory group of students from a variety of year levels who participate in and then contribute to the design process, could be valuable for future programme development.

Further Research

Identified areas for further qualitative and quantitative research include:

- A balance between passive content coverage and student centred learning would need to be investigated further.
- The appropriateness of a game or trail mobile learning frameworks with culturally sensitive content.
- The effectiveness of student collaboration in the design process of any future mLearning programme
- How mobile learning fits within Māori preferred styles of learning.

Summary

This research investigated whether a mobile learning programme had the capability to increase student understanding of a series of historical events that radically changed not only the Waipā District, but all of New Zealand. These events can inspire, dishearten or both. Appropriate, culturally sensitive, mobile learning resources were developed, and trialled with students who responded positively to the content, context and engagement of the education programme. The four methods of content delivery increased student understanding at varying levels, with the tablet audio method performing the best. Focus group discussion suggests that audio's strong performance cannot be taken at face value, with a variety of programme specific factors leading to the audio method outperforming the other methods.

With continued development as discussed, a student centred mobile learning programme will become an integral part of Te Awamutu Museum's Waikato Wars education programme, which will aid students in understanding what this complex topic means to them, and relate that to where they live.

These research findings have contributed positively towards mobile learning methods that increase student understanding. This knowledge will inform the

current and future development of mobile learning experiences outside the classroom (mLEOTC), at Te Awamutu Museum.

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APPENDIX A - Transcripts

Transcript Number 1

Year 5/6 –

Post-test Interview

Researcher What I want to find out now is what you think about the programme you did yesterday. The first place we went up to was the graveyard, what did you think about that.

Student A little bit pooey and the boys were playing with the graves, pushing rocks and looking at the dead people.

Researcher Hhmm, so when we were standing up there, I gave out the tablets and you were using the tables. Did you find there were any problems when you were using the tablets in your groups?

Student They were a bit slow and fuzzy and sometimes got annoying when we were trying to do it fast. The iPad would have been good.

Researcher It was the first time you used them though, did you find that the more you used them the easier it got?

Student 1 Yeah

Student 2 Yeah

Researcher had you ever used anything like them before like any smartphones or touch phones or any other things like that?

Student I have. Last year I got my own iPod, so I've learnt how to do things on them and I've done things on my dads.

Researcher Is everybody the same?

Student I've got an iPad

Researcher So everyone here is used to using an iPad. Apart from you. How about you?

Student Um I haven't used any of these before

Researcher you haven't used any of them before so it was all new so it was all new, did you find it hard to figure out what to do on them or...

Student 1 Not really since I've got *Student 2's* help and stuff.

Researcher You helped each other in your groups?

Student 2 Yep, and *Student 1* did funny things to it made it go back a page and make it on this funny page when you were doing something.

Researcher So what did you do?

Student 1 She helped me.

Researcher What was something that was frustrating, was there anything that was frustrating?

Student 1 Probably what I said before

Researcher That it wasn't loading up fast.

Student 1 Yeah and then *Student 3* would accidentally touch something by accident and then I might have touched something and then we would have to go back and wait for it to load again.

Researcher Go back to the right place and do it again. What did you find, did you find anything, what did you think went well, was there anything that went well?

Student Um, yeah.

Researcher The first place that we went to we had to stand up and it was quite sunny, was there any problems with that? Or was that okay?

Student Finding shade probably, that was alright I reckon the last place was the best.

Researcher The last one was the best?

Student 1 Yeah

Student 2 Yeah

Researcher Okay, that was when we went to Ō-rākau, why was that better than the other two.

Student Um, cause the first one there was sheep poo everywhere.

Researcher That was quite distracting wasn't it

Student And Student 3 got it in her, ha ha ha. I went to open the gate and it fell over.

Researcher So just little thing that were quite distracting, and the last one was good because?

Student 1 Well we didn't have to do much except for search and it smelt really bad.

Student 2 It smelt bad down the bottom but when we got up the top it was okay up the top

Student 3 It was fine

Researcher What about the sun on the screen and seeing the different things

Student Yeah that was annoying

Researcher But it was okay inside, one thing I noticed was when you went inside the church everyone sort of sat down in their groups and they seemed to be able to see everything nice and easier, did you think it was better when we were inside? Or was it better when we were outside

Student Even when we were inside we had somewhere to sit, and outside was warmer.

Researcher The temperature was important too. So there was some different ways of learning during the trial, one way was watching video, what did you think about the video?

Student Sometimes they were long and we wanted it to go faster in our group.

Researcher Too long perhaps? Were there any other problems when you watched the video?

Student Like for the recording thing we couldn't make it go back, so that was a bit annoying

Researcher So you had trouble replaying the content?

Student Yeah sometimes when something comes on and we try to think about it, it goes too fast.

Researcher So you were trying to think about what just happened and then suddenly its onto the next thing, it was too quick

Student Yeah

Researcher Okay, that was some good points. Another way of learning there was when you had the pictures and you read the captions aloud in your group. Then you had to push the button to see the next..

Student When we had that little bit and we went through each picture and then had to read it out, I found that one the best for learning things because it wouldn't go too fast and you could just read it out slowly and understand what it was saying.

Researcher Yeah, its true.

Student 1 yeah some of the words we couldn't understand what the meaning was.

Student 2 So some of the words were too complicated, a bit too big. But if the words weren't complicated, if they had been easier to understand, do you still think reading out loud and going through the pictures was the best one?

Student 3 Yeah

Researcher Some groups didn't go through the pictures though because they chose not too, you don't think that was a problem? Like you don't have to go through the pictures, with the video you have to watch it all the way to the end, even if you wander off, but with the pictures you don't have to you can just say you've done it.

Student But some of the videos were good. Like the ones that were maybe a minute.

Researcher So the ones that were a bit shorter, that's a good point, shorter videos. Okay. Now another way was just me talking, but on the thing, so you were just listening to me talk. What did you think about that?

- Student 1* um, it was alright.
- Student 2* It was good having one person speaking and at some parts of it, because at some parts it was easy understand and then some parts of it when you said that there was another voice, it would go quick when they read it, but when you were doing it it was good.
- Researcher* So when some of the Māori words were read. What about when there were lots of people playing them at the same time and there were all the tablets.
- Student* It was annoying because we had to move about maybe five times because we heard theirs going over the top of ours, we had to pause it and then rewind it again to hear it.
- Researcher* How did you think it was in terms if you had gone there and everyone had sat in front of the same screen , it might have been a big one and everyone had done the same thing at the same time. Do you think that would have been better or do you think the groups would have been better? If you can imagine that?
- Student* The groups would have been better
- Researcher* Is there any reason why?
- Student 1* Because you would get, if the pictures were going, you would be able to go back if you wanted to to have more of a look.
- Researcher* I guess that's true if you were doing it as a whole class.
- Student* I thought that it could be in the middle because both reasons were good cause some ways it could be quicker and another way with the groups, you could do what Student 2 said.
- Researcher* Did you like being able to scan the codes and to use the tablets or did you not think that was, was that a good part of the programme or was that a part of the programme you didn't like.
- Student* It was good with the scanning because then you didn't have to go write lots and lots and lots up just to get onto the right page.

Researcher Was that something you would have to do in class that you have to type lots in.

Student Yeah

Researcher So the codes they worked okay, scanning the codes. Yep. On the website we didn't really use it, but there was a place for you to write some comments or write questions, but they never really worked that well. Do you think that would be important if you were going out to learn something and everyone had tablets do you think that would be an important part for you to write something in the bottom about what you thought, or what you think?

Student Yes and no

Researcher Why yes and no? what's the yes and what's the no

Student I think the yes, was letting people know what you think about it.

Researcher Would you rather send a question or comment to me later and I could read it and then email you back or would you rather put it there so everybody could see it?

Student Maybe give it to you,

Researcher I don't think anyone asked any questions, but you could have written some comments or something like that, because imagine if you had gone there without me, and someone went there with their smart phone and they pulled it out and they started scanning things and they had some questions and I wasn't there, if you had gone out with your family what would you rather do, go onto a Facebook page, and ask a question like if it was your mum or dads one, or somebody's Facebook page, or would it be better just to email your question.

Student I think its better to let everyone know, because if we emailed you you might not know the question and some other people might know the answer.

Researcher I hadn't thought of that, that's true. I guess other people might have the same question, then they wouldn't have to ask, they could just look though the comments perhaps.

- Researcher* Now the last way we had done was me talking. What did you think about that? Just listening to me talking?
- Student* It was alright. There was nothing wrong with it.
- Researcher* Because that's what usually happens maybe not with students your age, but with older students. I would go out to those sites and I would just go blah blah blah, and this happened over here and I would wave my arms around and I would be all dramatic and exciting but there wouldn't be any pictures or movies to go with it. So what did you think, if you were thinking about something that was going to hold your attention or make you focus, would it be someone doing this in front of you and being all exciting?
- Student* It was better than that, better than somebody just talking.
- Researcher* One thing I thought was that some of the words, some of the ideas ideas were a bit hard, you didn't know what they meant. Do you think it would be better if there, if I was doing it, you could say I don't know what that means you could ask questions and stop.
- Student* Yeah
- Researcher* Because you weren't able to ask questions to the tablet. What do you think about that, do you think its important to be able to ask questions?
- Student 1* I think its important to be asking questions, because if you don't know what it means or if you want to know what the words says and yeah things like that.
- Student 2* Yeah you don't know what it is.
- Researcher* When im in the museum, I go blah blah blah and hardly anyone ever asks any questions, I don't know whether people understand or not.
- Student* If you read a tablet and you don't know the question or how its pronounced then if you don't know it and you just keep on going then you might not really know the whole meaning of it.
- Researcher* I guess the pronunciation of those is quite tricky
- Student* And you wont get it as much as if its right.

- Researcher* With these things that happened at these sites there's no right or wrong, a lot of people have lots of different ideas about what happened at those battle sites. All about the same thing but all a little bit different, was there anything else that you thought could have happened during this programme that would have made it even better do you think?
- Student* Maybe after you've been to the site you could go back to school and everyone is in class and we could say what we think, what we did there and share the knowledge with other people.
- Researcher* Imagine if your whole class went out, everyone in your class had tablets what could make it better when we were out at the place, anything? Easier or better
- Student* I think with the whole class going out it would be more frustrating because some people might take forever, and some might be really fast and say can we go now? Can we go now?
- Researcher* Some people were reading things and some people would flick through quickly sort of would there need to be extra things at the end or
- Student* You would need to have more parent helpers and more people taking cars out.
- Researcher* That's what I thought, what would you think if there was a parent with each group? So each group of 2-3 had a parent as well in a group.
- Student* That would be good and helpful
- Researcher* would that be some good things and what would be some bad things?
- Student* I think some of the good things would be if we were stuck then they would be there to help us with what we were doing, if someone were mucking around then the parent could tell them to listen.
- Researcher* That's right, anything that might be bad though if the parent was there?
- Student* It might be bad because there might be too much parents going on just walking around and you could go ask one parent and you forgot their name

or you didn't know their name. if there was a parent they would need a name tag for the parent just so they know who everyone is and what their name is.

Researcher So if you were shy around some of the parents if you didn't know them.

Student The parents might be doing the whole job and for them doing the learning and not the children they are working with.

Researcher Yeah what if they took the tablet and they did all the pressing because you might break it. Would it be better if they took charge of it, or would it be better if you had it

Student We would learn more, they would just be hogging it and they would learn more than us and we would probably not understand what things were for the group test.

Researcher So you think you need to have the tablet in order to learn, you need to be able to touch things.

Student Yeah

Researcher Cool. Well, I think, is there anything else anyone else wants to say?

Student Probably one thing I would want to say because in our group with

Student 3 and Student 4, my mum said that we worked the best probably out of the groups because we worked together as a team and we were sharing and were doing things together.

Researcher What do you think about, I noticed that when everyone got the tablets, they were like 'how does this work?'. And then as the day

went on they got better and better and better as the day went on, what do you think about the tablets going to the school first so you can have a bit of a tutu with them first, do you think that would be a good idea?

Student Good and bad because you could lose them or break them at school or do something to them to damage them. Yeah, people might do some stuff that they aren't supposed to with them.

Researcher Thank you again, you guys have been cool.

Transcript Number 2

Year 7/8

Post Test Interview

Researcher Welcome along everybody to this interview regarding the education programme where we went up to the historic sites to learn about what happened in the old days 150 years ago. Now why im doing this interview is I want to find out what things you thought worked well and what things didn't.

Researcher So has anyone at all got some comment to make to begin with.

Student I think that learning with the tablets was actually quite good, and it actually helped me learn quite a bit cause I can still remember some of the facts that I wouldn't remember usually.

Researcher Okay compared to what?

Student Compared to listening to the teacher and writing things down in my book.

Researcher Okay anyone else got anything to add to that? Do you agree or disagree?

Student 2 I think that I agree with Student 1 that going to the sites and actually learning about them makes you remember them more because you are experiencing the things there yourself.

Student 1 And it makes things stay in your brain.

Student 3 You're more likely to remember it

Student 4 I liked how you can scan things first

Researcher So you liked the whole scanning thing?

Student 1 Yeah and watching the videos.

Researcher Those are some positive things, how about some things that didn't work so well?

Student 3 Well the ipad conked sometimes and they didn't co operate that well. When they messed up that interrupted our learning.

Researcher Was that the tablets or just the ipad?

Student 3 Just the tablets, the ipad was alright

Student 2 I think the ipad was quite good, was probably the best one

Student 1 I liked the ipad

Researcher Everybody does. Hands up hold on not hands up, say yes or no if you have used the ipad or tablet before?

Student 4 Yes

Researcher What about if you have used an ipad before?

Student 4 Yes

Researcher Have you used these tablets before?

Student 1 Not a think pad, things like a tablet and like yeah

Student Its got like a qwerty thingey keypad.

Researcher Like a smartphone

Student no like an actual keypad

Researcher like a whole keyboard

Student yeah, like a keypad

Student I reckon the videos worked best and the slideshow thingey

Researcher Okay

Student Yeah cause it showed pictures of what was happening.

Student I really liked the slideshows because like when you read them you Sometimes focused on the pictures and when you focused on the pictures you forgot what you were actually meant to be learning.

Student I didn't really like the listening thing cause I couldn't really hear it properly because of the loud noises and everything else.

Researcher Okay so like the um, truck noises when we were at Ō-rākau, that sort of stuff?

Student Yep

Student And when you were talking like you couldn't really understand what you were talking about

Student When you said like look south, we didn't really know. Where's south? Because if you turned south there was nothing there, a tree

Student Oh yeah that part where the lambs were we were like yeah, where's the hill.

Student Or where's the mountain thingey

Student There were mountains everywhere, we were like which one?

Researcher This is good, this is good stuff.

Student I liked the questions at the end.

Researcher Which questions?

Student You know at the end, at the bottom there were comments and questions

Researcher And they didn't work properly?

Student Yeah

Researcher How important do you think it would have been to write comments and questions after each little bit was it important or not that important.

Student Sort of sort of

Student Because you wanted to comment and give feedback.

Student It would have been important if you didn't understand.

Student It didn't really matter

Researcher So generally speaking people said the videos were the best thing or was it, which thing worked the best

Student Probably the videos because most kids don't like reading these days.

Student I like reading

Student Yeah we know that you like reading

Student Most kids don't, so they probably watch videos better than they'll read

Researcher What about parts like, I made that whole thing almost year 13 level. So there was stuff that people would learn in Yr 13 to get credits and go to university. So its very high level stuff and I knew that a lot of the words and a lot of the stuff may be a wee bit hard for some of the group. What about that, what about when you came to something that you didn't understand in the video or you didn't understand something

Student What I did was I went back and looked at it and heard it again but like looked at what the picture was in the thingey.

Researcher So people actually did that they stopped and went back and did things?

Student I remember with student 2 if he didn't get word he just kept asking us questions especially if he didn't get a word. Like what does that word mean.

Researcher Oh that's something else I hadn't thought of you speak first and ill write down my ideas.

Student I liked how when it said find Alan you did a different picture every time. I liked using the pen. It was interesting.

Researcher Okay so that's another thing I want to mention is that another way of learning was coming to me and listening to me talk. I made all of the different things, I made those videos, I made the websites, so I don't mind which one of those was terrible and which one was best I did them all. You've commented about the videos and you've commented about the slideshows you commented about just the voice talking, but what did you think about when it was just me and I was talking out there.

Student I liked it better than the videos. If we didn't get something, we could ask you and you could show us where it was or something.

Student Cause with the videos if you get to something and you don't really get something you cant really ask the iPod or the iPad or something what it really means cause it wont be able to answer back.

Student I agree with student 1 but like when you might have told another group something else that you didn't tell our group, so I mean they had more information than us.

Student I agree with student 1 too.

Researcher Okay. No body ever asked me any questions I often said, blah blah blah blah and that was it, and everyone was like

Student Our group never got told

Researcher Each group got told the same thing

Student Our group came back to you if they needed and asked questions or things. And you like explained it, if someone said something then you could explain it.

Researcher So it was important that I was just there, so if you just rocked up there with your teacher and some tablets, it wouldn't be as good as if I was there to ask questions?

Student Yeah because you know like all of it.

Student Cause you made everything that we talk about

Student No not really

Researcher What about though somebody mentioned that it was good in groups or that someone in their group was saying someone liked to ask a lot of questions did you find that, would you rather have had a tablet each like ten tablets or would you have rather have worked in groups so if you got stuck you could ask questions.

Student Yeah I groups

Student I would rather have a tablet to yourself so then if you didn't get something then you could ask someone else as well but you could keep going back without disturbing the rest of the people in your group.

Student Yeah in groups you could discuss it, instead of like talking to yourself.

Student Student 2 and I might have got a different answer and then she would say how she got the answer and then we would go back to wherever she got the answer from and we would re read it and we would be like yeah that's the answer.

Researcher Yeah I guess you could buddy up

Researcher So in terms of the group size, what do you think was better, some people were in pairs and some people were in threes

Student I think pairs because three or four people, they don't agree on the same answers.

Student Yeah I don't know, I was in a group of three but I think pairs worked well. A group of three its normally one or two people doing all the work and the other persons just going yup, get it, get it.

Researcher Okay so if its two then its productive

Student People who were in twos discuss it more than in a group of three

Student Yeah but then again if its even if it's a vote, then you might vote for different things. But if you were in a group of three one person could decide.

Student Wouldn't you just go back and check the information

Student Or some people might not agree with it, they will be like what are you doing

Researcher Are you talking about when it came to the questions at the end of each thing, or are you talking bout people disagreeing?

Student Like the music thing

- Student* It would have worked better if we hadn't chosen our own groups if the teachers had chosen the groups.
- Researcher* Would it have been better if boys and girls were put together rather than being able to pick your friends.
- Student* Yeah it kind of became a social like thing, oh what are you doing this weekend, instead of focusing. But if I was buddied up with student 3 I would be like yes student 3 Im not really bothered im just doing my work. We wouldn't be like gossiping.
- Researcher* Because there was opportunities wasn't there, it wasn't like you were being naughty or anything but you'd push a button or push a link and then you'd have to wait and that would lead to time to talk to others.
- Student* But like maybe if the teacher arranged the groups then if we didn't get that answer if we didn't understand or something
- Student* With the tablets when you accidentally clicked on something and you would end up on something completely different that you didn't want to do. Like I ended up getting six or seven different tabs on the same thing and then you would have to X out of them and we were wondering why it wouldn't scan properly and you were like its probably because you have opened too many tabs and I was like WHAT?
- Student* With the tablets when they were operating it if you clicked on something else it would like come up but then when you wanted to go out of that it it wouldn't let you and then you could scan it and start all over again.
- Researcher* Yeah I know there were issues with the tablets and there probably always would be but it was interesting to note that most people had used an ipad before. What do you think about screen size do you think the screens could be smaller because when it comes to purchasing tablets you can get all sorts of different shapes and sizes and you could do exactly the same thing on even an iPod touch like what do you think about using a small phone screen if you were in pairs would that be.
- Student* I don't reckon that would be good. I think if it was like this big (pointing to tablet) then you could make it smaller and you could make it bigger, but if

you had a phone and you had to make it bigger you would have to scroll around. And on a phone you could be like that (pretend to show to group)... and on an ipad you could be like that (sharing in group)... but on a phone you would have to be quite scrunched up together.

Student Or a pair it would be like

Student That's why I like it when screens are big because its easier.

Researcher Easier to hold up? Were they heavy?

Student No no they weren't heavy at all. They were light.

Student The ipads were a bit clearer than the think pad, and like the ipad screen was like you could do more with but the ThinkPad's weren't letting you.

Researcher The ipads were easier, or just a bit more user friendly.

Student And with the buttons (holding ThinkPad) you could accidently push the buttons and go somewhere else backwards or go to the home

Student There are different controls for the ipad and the think pad so you just go on the iPod/ipad and you go on the think pad and be wondering why isn't it doing what I want it to.

Student But student 2 was holding it like this (hold up think pad) and she would go and press this button and the whole screen would go blank and we would have to turn it back on, we had to actually turn the whole thing back on and do it all again and then when we got onto it the browser wasn't working and then we had to keep doing it until the browser started working.

Researcher If these were in your classroom you would get more and more used to them and then you probably wouldn't have all those issues.

Student People would fight over them though

Researcher I'm just saying if you had the chance to use them before hand

Student Some people, like we had some in our classroom but ones that are in our classes most of them just have games on them like temple run and that sort

of stuff. If they weren't doing jump jam or something they will take them up there and just play temple run on them.

Student Do they?

Student Yeah

Student That's what room X does

Student Its kind of not helping them learn

Researcher In some respects yes, but in other ways, this is just my opinion, just what I think, is that why people know how to use the ipad is because they have played all those games and if you used the same controls to play games as you do anything else.

Student That's exactly what I done

Student Oh yeah and you just get used to it.

Student Yeah

Student Its all about technology these days, yeah its all automatic you barely have to lift a finger to do anything.

Student So like when you are playing temple run and you get a high score or something and you keep trying to beat the high score and you get kind of addicted and then when its time to do work. And your like oh okay, but your pretending to do work but your playing a game.

Student Or you rush your work and don't do it properly.

Student People have started to read more because they have put books on the ipads and since okay that's technology ill read it.

Student Yeah like all I have to do is that (pretending to swipe a page) this will be easy.

Student Its just basically the same.

Student Its kind of good that they are putting more educational things on the ipads.

Student But with the ipads if you read a book on the ipad, if you keep on reading it and get really engrossed with it. But if you run out of battery or something. Because I was doing this thing in a shop right and it ran out of battery and I was reading it, and when I put the charge thingey in it the book wasn't there. And I tried to get into it and it said it was deleted, because I didn't turn it off properly. But with a normal book it doesn't happen you can just keep on reading it.

Researcher Exactly

Student But it comes up with a thing that says you've got low battery so that's when you plug it in.

Student Its like you have 20% remaining battery.

Student But it didn't come up with that.

Student It might have come up with that before you came onto it.

Student Ooohhh yeah

Student Technology interests kids like if you read a book like not on an ipad, then for them it would be boring, but like on the ipad its like on technology so they would read more on the ipad.

Student But then like probably because its on a touch screen.

Student The other thing about it being on the ipad, its not the latest thing out but it's a thing that people want to have.

Student Its popular

Researcher Yeah when we went out two days ago, on the Tuesday there was no body that didn't want to use it there was no body that didn't want to hold it and touch it. And I mean if I had just a whole heap of text books imagine that if I just handed out text books when we were up there.

Student Then we would be like oh okay.

Student I would be the only one reading it

Student In 100 years ipads wont be as popular

Student In 100years they will have like holopads.

Student They will have ipads implanted in your brain

Student Ha ha ha

Researcher Now that would be sore, cause they are quite big

Student they will probably have an ipad bracelet thing.

Student There will be like a touch thing and it would be a hologram.

Student You could have special glasses and when your walking there will be a map thingey and you will just go jump wwwweeeeeee. And you would be jumping and using an ipad with your eyes

Researcher Right I think its morning tea time you guys have been awesome, thank you so much for telling so much about these different things and letting me know all this information its all been really good stuff and ill just stop this now. But before I stop are there any other comments, last opportunity to say anything.

Student I think that it's really good experience to go and learn everything, and the ipads and the think pads really helped , because we got more engrossed in it because it was technology.

Student Yeah it was cool using technology

Transcript Number 3

Year 9/10

Post Test Interview

- Researcher* To start off with any general comments about how things went, what worked well and what didn't.
- Student* I think that the tape recording worked better than the slide show
- Researcher* Yes there were four different ways, just the plain me talking and then there was the me talking in person and then there was the video and then there was the pictures that you scroll through. Did any one have a particular preference you know you said that it was jus the voice recording perhaps.
- Student* Yeah being talked to. Because you just the information directly and you cant ignore them
- Student* Yeah you have to be listening but if you were listening to video then
- Student* You can be rude to the video
- Student* You can just reply the video or the voice recording if you didn't get it the first time.
- Student* But his voice was clearer to hear its not a quiet little voice.
- Student* Yeah
- Student* And its easier when your talking to us because you don't add anything that doesn't need to be said.
- Researcher* Okay no that's cool. Other groups have said, younger students being Te Awamutu Intermediate and Te Awamutu Primary, they have suggested things like they felt more comfortable in the groups being able to talk about you know what they have just seen and like not very many people ask me questions when I did any of the talking nobody ever asked questions they felt more comfortable in their smaller groups being able to work out what that was all about if they didn't get it. You guys didn't feel that way at all.

Student No, but that's different age groups were more experienced

Researcher Yeah you might be more confident interacting with an adult.

Student Yeah because we had more confidence to ask you something if we don't know the answers.

Researcher So you would have preferred it perhaps if the whole thing was just me talking up there would that have been easier?

Student That would have been a bit boring

Student It would have made it even boring

Student Longer speeches are boring

Student I think its good when you have a couple of different ways to learn it because it kind of breaks up the sections so its not all one long period of time.

Student And when your talking you've got an enthusiastic voice it makes it sound better.

Researcher I created all those videos, you must have recognized my voice on everything and like I made all the slide shows and everything so it wasn't like, and everything in there I tried to be as concise as possible I didn't put any extra fluff in there so that was an interesting comment that I used more than necessary that it was too much. Perhaps the videos were too long then? Or was some of the information...

Student Some of them were too long

Researcher Yeah the videos were long, they were getting up to four minutes some of them.

Student One was even 5 minutes

Student With the whole confidence thing with the primary school kids they would be sitting there until somebody was brave enough to say something. You know what I mean.

Researcher No, no that hasn't been the case, in the interviews I couldn't shut them up basically, went through all their playtime and everything they got very into it. But it was just out there I guess when your in a role of being an 'expert' or having more knowledge sometimes people can be a bit more reluctant to challenge that or just accept it straight off or anything like that. So anyway, any other issues that you thought to do with the tablets themselves that were made it more difficult to learn or made it easier to learn perhaps.

Student sometimes the loading.

Researcher It loaded too slow?

Student And if your coming in a class it might be too loud for everyone, everyone might not be able to hear. Some of us had trouble hearing with all of the others.

Student Or we were confused about what to do on the ipad and what to do on the tablet after you used each one.

Researcher Did you find there was I noticed that on the day there was a preference towards one of them what people wanted to used, do you think there was a reason for that?

Student I think the ipads are like IPAD and tablets are like tablets.

Student Its branding

Student An ipad has had lots of advertising about it you've heard about it.

Researcher Has any one here not used an ipad before?

Student It was my first time

Researcher It was your first time, but have you used an iPod touch?

Student Yeah

Researcher Because they are pretty much the same functions, the sweeping and the expanding.

Student Yeah because I have an iPod touch I found it easier to use that than it was to use the tablet.

Student I have a tablet but its way smaller than that.

Researcher Yeah maybe a 7" one. because tablets all have similar operating systems, but this one has extra buttons down the side but in the situation that I was think about if I was to develop an education programme where I was to hand out tablets it would be great if you had the same ones in class, but your probably not going to

Student That would cost heaps though

Researcher I mean, that's kind of secondary theres always people wanting to give away stuff for educational initiatives. Money isn't always the biggest issue, its more whether it helps people to remember things it makes it more interesting brings another dimension perhaps.

Student Your from the museum aye, so at the exhibits and stuff you could put like a recorded voice thing so they push the button and it plays through it and then they could stop it and go back if they were halfway through it cause then it would just be talking to them.

Researcher There's lots of different ways to get information, and there are all sorts of methods of doing so. What about when you were outside with the screen and stuff did you find that was an issue.

Student The sun and all the noise, the cows and the traffic and stuff

Student All the people nearby playing their different parts of what you were listening too.

Researcher Lots of volume

Student You'd try and find a place for yourself but then other two people would be

Student They would play it loud so you would have to play it loud.

Researcher So sound was an issue but also the actual seeing the screen with the reflections on it.

Student Except in the church you could see the screen.

Researcher There were seats as well. Did you find having to stand up for reasonably long periods of time, having to stand up to see something was that an issue.

Student No that was okay

Researcher You didn't mind leaning against trees, sitting on fences, if there was purpose built seating would that have made it better?

Student It wouldn't have really affected things we still would have learnt the same

Student If you were standing and you got tired then we might wander off cause we might just walk away and sit somewhere else and if two people in the group and the other person wants to sit.

Researcher Yeah, what about another options I thought was that having say groups of three or having larger groups do you think a group of four would have worked with a group that big.

Student No, because like even with a group of three you would have to have one person in the middle, people would still be

Researcher Struggling to see the screen

Student Those little speaker things in our group, was only on one side so the person on the other side can hear as well.

Student Yeah and if there's four then the person, there will be two people on one side.

Student And the person furthers away wouldn't be able to see

Student But then you could use your brain and have two people on either side of the tablet.

Researcher In terms of cost for one of those other tablets, I could get a couple of iPod touches, which have got a much smaller screen but if there was one between two would that be something, if you held an iPod touch or would you see that not working.

Student That would still be the same really because that's bigger

Student That could work.

Researcher Just between two people.

Student Yeah between two

Researcher I guess that would be like sharing a phone between friends, if you had a smartphone or something like that.

Student But not between three

Researcher So things would be quite small then the pictures and the text

Student You would still be able to see it

Student And you can zoom in to make things bigger

Student Longer

Researcher how do you mean longer?

Student It would take longer to do stuff

Researcher Why is that?

Student What do you mean?

Student You have to zoom in and then you have to zoom out to see the different images

Student No you don't, you just have to scroll along a bit.

Researcher So to get the detail you would need to do more fiddling around. What about if there was like a large screen, like a big portable LCD TV screen and there was just an educator, like you were saying my voice was interesting with lots of arm action etc. what if there was like a big TV screen, but same sort of stuff, but it was just sort of the whole group would watch the screen at the different places, would that

Student Would it still have the whole touchy touchy thing?

Researcher It would still have the touch screen because it would be like a smart TV. Like a portable one. so it was like you were saying the whole me talking, I didn't say more than I needed to and you know it was clear perhaps but if there was a big screen that I could then demonstrate stuff on would that be better than you doing all the touching? And moving around with the tablet?

Student If there was a small group of us say 10 of us then it would be easier to see.

Student Yeah, for younger children like to do the touching but they like to play.

Researcher Your not really into the novelty of the tablet wasn't something that made the learning better?

Student No no no no no

Researcher Okay sorry I don't mean to put words into your mouth

Student I, I don't know about you guys but, I really liked something

Student Little kids they might argue over who gets to hold it

Researcher So having some control over it was a good thing? But at the same time having a screen would be good in different ways.

Student The smaller children would be better with a big screen

Researcher Yeah the smaller children had a lot more issues with the technology around I guess not being as familiar with it as you, I guess you might have more opportunities to have smart phones and that sort of stuff. By the end of it they were really good but to begin with they were like you know, randomly pushing buttons and that sort of thing, didn't really get it. So yeah, it was a function that we didn't really use too much, but there was meant to be an ability to write comments on pages, see what other people had written with either a Facebook or some sort of social networking feature of the websites, do you think that was an important part of that sort of programme or was it not really matter.

Student I didn't realize we were able to do that, until probably the last activity.

Researcher Yeah I didn't point that out particularly well.

Student It depends on the person some people can actually be bothered to write out a whole comment but other people will say like nah

Researcher The idea was that you could write a comment and then the other groups would be able to see it sort of thing. Not important? Important?

Student Not really

Student Some people might use it or abuse it and write more of a distraction do you think?

Student Yeah

Student Cause it was more about us working what was on the site than what other people thought about what we were learning about.

Student Some other people would just use it to talk to each other

Researcher What about if you had questions or you weren't sure about things do you think putting a question out there like an email to an expert would that be worthwhile or would you rather just talk to someone who was there.

Student You would get your answer in full

Student It depends on how long you have

Student If they email back then at least you get your answer.

Researcher Like imagine you went out to that site and I wasn't there and you went out there with a whole lot of smartphones and something to scan some things, just with your teacher, so if you did have any questions, would the email them or put them on the Facebook link or something, is that something you would do or wouldn't do?

Student Yeah

Student It would depend on the situation if there was someone there that knows about it

Student It would be good to get it quicker otherwise we would just Google it

Student It depends on how much time whether they would reply straight away.

- Researcher* They reply straight away, but if you were emailing it then it might get back quicker. Another options could be just googling it I guess depending on what the question was. Any other comments or anything else you thought about that particular programme something worth pursuing or just keep doing what the museums always done sort of thing.
- Student* It was really good to find out about what actually happened in our own area because you always hear what's happened in America or England or somewhere like Auckland or stuff like that, but you never hear about your own area unless its like a big city or stuff.
- Researcher* I believe the content to be really important to everybody, but how its delivered is what im trying to work out is how is the best way of getting that information out to people. One thought I had had, was making it more of a game, and this is how I haven't really suggested this to any of the other groups, but the idea would be that rather than having a website with four or five different things to push on that website each QR code that you had to scan would lead you to just one thing, so it would lead you to scan it it would go to a video, scan it it would go to a voice, or whatever it was, and at the end of that video it would tell you where to go next like a little map pops up. So around that site or around the church you would be searching for different QR codes
- Student* And maybe like at the end you have some questions and you have to answer it, and whoever answers the first one wins or something.
- Researcher* Okay so you have some sort of competition of it. Make it more competitive.
- Student* Or you can have like scan the QR code and then do the work and then at the end you go and find the next one.
- Student* So you have to get the
- Student* And you have to get the answer right and then you get the clue sort of thing.
- Student* And it takes you to another link
- Student* Yeah that would be really cool

- Researcher* So adding competition into something like that you wouldn't see that as something that might be frowned upon or might not suit everybody.
- Student* No I think it would be fun
- Student* I'm keen that might be fun
- Student* But you would have to make it so every group wins at least once otherwise, some people might get a bit but then they will try harder if they want to win.
- Researcher* Of course it would be fair because everybody would be doing the same thing. But you couldn't really guarantee that if you were giving out something that you could divide up the winnings, like one group might be really talented at social history or might have had a lot of expert knowledge because their father is really into it or something.
- Student* If it was little kids you would have to make it so everyone wins otherwise they wouldn't really want to do it for nothing. And then older kids they know that if they lost, they don't get anything if you lose. Yeah you kind of get over it, but little kids don't get over it as easy.
- Researcher* So younger children, they still do it, but at the end, they all go into a draw or something like that so its all equal chances at the end so there was a bit of luck involved in it as well, something along those lines. Okay, that's cool. That's not really part of my project but good to bounce these ideas off you. So thank you very much for letting me digress. What about the pictures, and the words down the bottom and scrolling through those and reading them out. reading them out loud made them clearer, but most people just read them in their head.
- Student* I think people just wanted to get along with it so no one was really looking at the pictures they were just reading the next one.
- Student* That was probably the least effective way for me
- Student* I thought the video was the least effective for me just cause having the pictures all changing, it kind of distracted from what the voice was saying.

Like trying to concentrate on both, it was harder than just reading it out loud.

Student I really like the slide show but if it was saying it for you and changing for you.

Student If you have one person reading it, then you might know it and you might learn lots but the others might not get it.

Researcher Your doing the reading out loud for your group cause I know everybody learns differently everybody thinks differently so there's not going to be any particular right way to do it, but its always interesting to look at to see which will be most effective and so now ill have a general understanding when I compare the before and after tests to see if there's any way that increased learning the most and ill be able to see does that match up with what you thought worked best, does me talking get the best results sort of thing, if that was the indication. Then I believe learning is a mixture of understanding, that's why I've done the multi choice thing, but also I think learning is about remembering things, so there might be some things we did during yesterday that really stuck in your brain because we did it in a certain way, so in three months time at the end of the year, ill come back and ill just give you the same test again and I might get you in a small group to see if you had any other thoughts about whether it was worthwhile or anything different that's come to mind.

Student Yeah it was brilliant I really enjoyed it

Transcript Number 4

Year 9/10

Retention Test Interview

Researcher Welcome along to our second interview im just going to ask you a series of questions, your answers are greatly appreciated. About four months ago we all completed a field trip about the NEW ZEALAND Wars, what can you actually remember about the trip? What comes to mind

Students The cows.

Researcher You remember being at the site and seeing some cows at Ō-rākau.

Students I remember the church the most

Students I remember where we went. I remember we had to go find bullet holes.

Students Yeah, yeah in the church walls.

Students When it was saying how you were standing on THAT hill at the moment and when you look around and see all the places.

Students The mountains

Students Yeah and we didn't know where south was.

Researcher I'm just interested in what things you did remember, that's the good thing, that's what I want to try and work with.

Students what I mainly remember is how someone talked for the women and children and said that if the men will die then the woman and children will die as well.

Students Every girl seemed pretty shocked by that.

Researcher So that part from Ō-rākau

Students Yes

Researcher Anything else that sticks out that you remember, it could be about anything, any aspect of it, your groups, the people you were working with. Things that weren't working, frustrations.

Students It was sunny

Students There was sun on the screens and you couldn't see what you were

looking at.

Students Or like when we were sitting in the church and there was like four different tablets going at once and they were overlapping and you couldn't understand so we had to go outside.

Researcher What was overlapping?

Students The sound and the song. We were listening to a recording or a song. People would start it at different times and it was all mixing.

Researcher Great, that's all good stuff. So first where would you prefer to experience the video. What I mean is, would you prefer to watch that video at the site, would you prefer to watch it in class, at home in your own time? Would you have a preference for that?

Students Not at home

Students I think at the site because it helps you by telling you places and you can look around.

Students Especially if there is still something left from the event we can actually look at other than grass.

Students At home, everyone else would go and do their own thing on the computer. A lot of people would forget to actually do it.

Researcher Imagine it was like a homework assignment or something like that.

Students I would still forget about it.

Students If you left it to night, you would be so tired you would forget it all.

Researcher So it helped to be at the site?

Students Yes

Researcher What about before you went in your classroom, so you sat down on the computer and looked at the different things before you went out.

Students In some ways that would be good because you wouldn't have the sun aspect but being at the site does help you relate to what happened and like, because at the site, there wasn't much time and we could watch it once, watch everything once and then go. But if you were on the computer, you could go back and watch it again. Because that's what I was thinking, I couldn't hear one thing but we had to keep on going, or if I forgot something, what if I didn't remember it, we would have to go to the next thing and didn't have time to go back.

Researcher So if you had more time at the site.

Students Yes

Researcher Was it a group thing? Or was it a place thing?

Students It was quite hard when there was other people around.

Students It was easier in smaller groups to hear

Students A group of three was too many people to gather around a small screen.

Researcher Okay, so if you were in a group at school around a computer, would there be the same problems?

Students Probably not because its bigger.

Students And you don't have hands holding it.

Researcher So there are some pluses and minuses for both ways?

Students Yeah

Researcher If you had both, maybe you could watch it back in class as well as watch it out there, would you bother doing that? Would you want to see it again?

Students I think it would be helpful, if you could refer back to it.

Students Yeah

Researcher That's great. I asked about where would you prefer to experience that. What about the audio, with just talking.

Students I think the audio would be better at the site in smaller groups

Students You don't have to be looking at the screen you just have to be able to hear what they are saying.

Students You can look around you don't have to focus on the pictures.

Researcher I gave a presentation also, was it a benefit to be able to listen on your own device or was it better me talking?

Students I preferred you talking, because if there was a question, you could answer it most of the time. And like if we had a tablet, we could just look away, and we wouldn't bother, but it would be rude to look away from you.

Students We're giving you more respect if we are looking at you.

Students You have good actions

Students It doesn't say north or west, you can just point to direct you

Researcher So the body language helps?

Students Yes

Researcher The last one was the pictures and the text underneath was that something that would be best suited to before or after or during the programme.

Students It could be after or during I think because you can be at the site and probably relate to some of the things that have been said. And also after the sites you can think back.

Researcher Some of the pictures like the one of St. Paul's church there was an old photo and then there was a new one, so there was more of a connection. In the beginning I asked you what you remembered about the experience and you mentioned that some things didn't work and we already talked about the video, but what worked well?

Students It was quite interesting

Students It was good to know about the area that you come from.

Students Showing the photos in the video, you can look at it and think about it.

Students Eye catching

Researcher What didn't work well? You mentioned the sun and lots of voices, was there anything else that didn't work about the video?

Students When it stopped loading.

Researcher So technology was an issue? How much of an issue is it?

Students I have fast Internet at home, so when something is slow, I cant stand it.

Students I'm used to it because we have only just got broadband.

Students I'm used to slowness

Students I think it depends on each person, from what they've come from and what they can tolerate. Your level of patience.

Students I know how to work an ipad because my sister has one, but I didn't know how to work a tablet. I had no idea what to do.

Researcher So technology was sometimes a distraction.

Students Yes

Students There were games on there I was so tempted to play on them.

Researcher What didn't work with the audio. Just me talking?

Students We kept getting distracted

Students I thought it was pretty alright, it was good because you could look around and see the places if you knew which way was south it would be good.

Students I wasn't the one holding the tablet so I had to look over at it and it was making my neck hurt but with the audio I could just listen.

Researcher You mentioned with the audio that you could look around, you mentioned that it was great because you could look at the different things I was talking about. But you could also look at stuff and get distracted.

Students I think it was better than the pictures because you can relate to it because its got more expression, and the pictures is more interesting than just reading. Like when im reading I don't want anyone else to be talking so I tell them to shut up.

Researcher You mentioned some things that worked well with the pictures and some things that worked well with me, you said arm gestures worked well, and being able to ask questions worked well.

Students You couldn't look away from you cause its rude.

Researcher Would you prefer if you had a question, which you weren't sure if it was a foolish question or not, to be able to ask me or ask someone else? Ask a person in your group?

Students I would prefer to ask you because you would know things

Students And someone else in the group probably wouldn't know it

Students People wouldn't want to look bad in front of others.

Researcher I asked a question in the survey, what was the best group size?

Students 2 or 3.

Students I put three

Researcher Could you explain why 2 was the best number

Students if you have two then you can put the device in the middle, but three is awkward. You have to look ahead and someone has to look over your shoulder.

Students It depends if it's audio or visual.

Researcher So for the visual stuff that you were looking at the ipad wasn't big enough?

- Students* It was for two but I think three would be to crowded.
- Researcher* How important is it when you go out to historic sites, with the mobile device to work with others in groups?
- Students* I think its helpful because if I missed something then my partner could have heard and I could ask them rather than come to you.
- Students* You could help each other out.
- Students* Share ideas
- Researcher* Working within a group is better than working by yourself?
- Students* Yeah, so if you don't understand a word or a place that you don't know where it is or what it is. Or you might have someone who is Māori who is there and they might know where it is or be able to say that word.
- Researcher* How important was it to have me there or an instructor?
- Students* Pretty important
- Students* If neither of us knew then we could come to you as well.

Transcript Number 5

Year 5/6

Retention Test Interview

Researcher My first question is four months ago we completed a trip about the NEW ZEALAND wars and we've done a test and evaluation just now, I want you to tell me what else you remember about the trip?

Students How you taught us how they buried some people but they didn't have those stones.

Students How they had the graves raised but they didn't really have enough time or things to build them deep.

Researcher So they had shallow graves, anything else? Or it could be about anything else about what you remember about the day?

Students I remember that we went to a church

Students And there were sheep

Students It was really small

Students We went to a cemetery

Researcher Where would you prefer to experience the different things? Imagine you could do all of this mobile stuff you experienced on the day either: - In your class room before hand on a computer:- Or watch it at home for homework. Where do you think would work best for you?

Students At the sites

Students Yeah

Students Where it happened

Students So you could imagine it

Students So when you say, about the peach trees you could look around and say you think they were on that field over there.

Students So you can picture it

Researcher What if you had to wait a long time on the day, or sometimes the tablets didn't work, how did you feel about that? Was that something that was frustrating?

Students Not really if it doesn't take too long like 5 mins

- Students* You have to be patient
- Researcher* But things would be quicker here on that computer if you had a fast Internet connection here.
- Students* It probably would
- Researcher* What if you could look at that information back in the classroom because you had to learn about it for school. Would it be good to look at it before you went out and then after?
- Students* I think before because then you can remember it and have even more information when you are there.
- Researcher* What do you think worked well about the different types of learning. If you remember back to the day, in your groups, some people were watching a video. Can anybody remember what worked well about using a video to learn about the NEW ZEALAND wars?
- Students* That you could actually have the pictures and the moving images. If someone just told you about them, you couldn't see what it actually looked like, or some example of what it would look like.
- Researcher* So that was good.
- Students* You could imagine it if you had the picture and the person talking.
- Students* You could see what was going on.
- Students* If you didn't know what the works were, then you can look at the pictures and they could tell you.
- Students* And the person speaking, you wouldn't have to read it and get it wrong.
- Researcher* What do you think didn't work?
- Students* Probably if there was something you wanted to learn about and it wasn't in the video, then its best to have someone to talk to cause they can tell you what you were thinking. With the video its hard to programme a computer to answer your questions.
- Students* If we didn't know what the video was then we could still get the writing.
- Researcher* What about when you were standing out there and there were lots of other groups standing around with tablets. How did you find that?
- Students* It was frustrating because one person was in one part and one person on another part and you were all quite close together and it was hard to hear.
- Students* Yeah it was frustrating cause you might have got mixed up and didn't know what you were learning about.

Students Or they were too loud

Students We tried to listen to another recording, and another's might mix with ours.

Researcher What worked well about just listening on the tablets, just the talking ones.

Students If you just read it, and you didn't know the word, how to pronounce it, then it would be easier than that.

Students It probably gives you a wee bit more help with getting the image in your head. Your imagination.

Students You may get a word wrong but with a person talking you will get what the word is. And it helped on the video and some ones with out the video.

Researcher Some of the audio it said, look to the south... etc etc. what did you think about the audio telling you where to look?

Students That was helpful.

Students It was helpful because when you said look towards the hill, but when it said look to the south, it was hard because you didn't have a compass to know which way was south.

Students What were some bad things about just the talking on the iPad or tablet.

Students If you didn't know the meaning of what you were saying, then it might be better to have pictures, cause if you didn't know what they meant, then it would be better with pictures.

Researcher Did you ever ask anyone else in your group about what that meant?

Students Yeah I did

Students Yeah

Researcher What about the sound with lots of other people around?

Students Yeah

Researcher The next one was the pictures and the words. Looking at the pictures and someone in your group reading the words. Were there any good things about that?

Students Yeah, it wasn't too fast for you so you had as much time as you want to take it all in. and the pictures all went with it.

Students And you could read it yourself if you wanted to.

Students Whereas with the video, you would have to scroll back and you might go a bit too far or something,?

Researcher Anything that didn't work well about the pictures and the writing?

Students Some of the Māori words were hard to pronounce it was hard to know what they were meaning.

Students If you didn't know what the word meant you had the pictures to help you.

Researcher The last one was ME talking, what worked well about me talking to the groups.

Students I think it was better because you made it more interesting for us and showed us where all the places were.

Researcher So when you say more interesting what do you mean

Students When your reading it, its not that interesting.

Students Its not as interesting as talking. Cause when there's someone talking you get more expression and when your showing the places, its easier, cause you can point to them because on the video or recordings there's nothing pointing like south

Students Yeah and if we had questions we could just ask, but if we had the iPad we couldn't ask it anything.

Researcher So was there anything you would do differently or think would work better?

Students Maybe more iPad's so we didn't have to work in groups of 3

Students I think it depends on who your working with because if your with someone you don't get along then you'll probably get into fights, but if you were with someone you like then it would be fine.

Students Probably the groups of two would be best.

Students I chose groußp of 1 but it was fine to be in groups.

Students I picked 2 because if you didn't know what something meant, then you could ask the other person and then you would know it better.

Researcher You mentioned some problems, what do you think are some solutions?

Students Probably just some headphones, because then you aren't listening to other people.

Students We could separate more

Students Maybe we could move around different activities at different times.

Students Maybe have one group start talking to you and then another with video, and then another with sounds so we all stand in different places.

Researcher When your learning with a smartphone or a tablet and can move around, its called mobile learning or M-Learning. When your doing M-Learning, how important is it to you to do it with other people, is it important or not?

Students I think it's not that important

Transcript Number 6

Year 7/8

Retention Test Interview

- Researcher* What can you remember about the trip?
- Students* That it was really fun because we got to go to different places and see where it took place and how it took place and why it took place.
- Students* I liked the trips because you were learning about Māori culture and I didn't know about it before, how there was the Waikato Wars, because I thought it was just a war all across New Zealand, not just in the Waikato.
- Researcher* Any body else remember anything about that trip? Any thing at all?
- Students* I didn't really care about history until that day, because I got to learn about lots of cool things.
- Students* I liked going to the different places
- Students* It was fun playing with the tablets.
- Researcher* The actual field trip places?
- Students* Yeah
- Students* I liked doing the qr code thingey.
- Researcher* So you liked doing the scanning with the tablets.
- Students* I also liked playing with the tablets and learning at the same time.
- Students* I liked the different ways of learning, they weren't the same, they weren't just all power points or talking or there would be one you had to read and then a power point, then you talking then another power point and then a video and it all liked talked about different areas.
- Students* I didn't like how the ipod or ipad kept on skipping or something, like we were right in the middle of something and it would just go right out of it.
- Students* Yeah we a retarded tablet.
- Students* YYYYYEEAAAAHHHHHHHH (loud multiple agreement)
- Researcher* So you had some tablet issues
- Students* I think it was like the church or something and like afterwards, after we had done our tasks we got to go around the church and see what was there and stuff.

Researcher So you got to do more of a free explore type thing.

Students Yeah

Students Yeah

Students We were looking for the bullet holes in the church and stuff

Students It was cool how some of the battle took place down here and you could actually see some of the bullet holes in the church.

Researcher So if you can think back to that day there were three different ways of learning, some parts were me just talking to your group, one part you were looking at a video, you listened to some audio and it asked you to look around at different things and another way was you watched pictures and then in your group you read a caption out loud and then you went to the next picture. So im interested in what you thought worked and didn't work in those different ways of learning. So with the video, what worked about that?

Students It got you hooked in

Students It was interesting

Students Yeah, but some times you were more interested in what the pictures were doing than what was actually being said.

Researcher So that's something that didn't work, you weren't able to focus

Students But it was better than just sitting there and reading things.

Students For me, I liked the reading bit but im not really good at listening.

Students I normally lose track while im reading so getting to listen and watch it really helped me learn.

Researcher So that was best for you. Think about other things to do with the video.

Students Oh but listening I didn't like it when it skipped or when it would pause and you had to wait for it to reload.

Researcher Technological issues?

Students Yeah

Students It seemed discombobulated

Students I didn't like the things by themselves

Researcher What do you mean?

Students I liked how you, like, made the videos and the talking bit by yourself?

Researcher How I made them by myself?

Students So we can like ask you questions about it, cause if it was a book and our teacher was reading it and none of us could understand it we could ask you, but if it was just out of a book, you wouldn't know about it.

Researcher So that was some things about the video, another way you were asked to learn was audio, you played a little sound file from the ipad. What worked about that?

Students There was some words that caught my attention like battle, death, just typical teenage things.

Students Sometimes with that audio you weren't really listening, you were like looking at the scenery and stuff and just like watching what other groups were doing and you lost focus because there was nothing to watch.

Students The weird thing for me is that if im listening to something then three seconds later I completely forget what I heard and then when I really need it its gone and when I don't need it at all it pops back into my head.

Researcher So was there anyone else with the audio that noticed anything that didn't work?

Students When we had the tablet and we were listening, it would go all crackly and stop and then we would have to restart it and another couple of seconds after we stopped it it would go all crackley again.

Researcher One thing people mentioned from the first interview was that sometimes with the audio, video there was lots of groups and it was hard to hear.

Students One thing was the Internet. so if you walked away to a different spot where it was less sunny, it would lose the Internet connection and when we were listening to it, some words you couldn't hear. Sometimes if there was a group beside you they would all be playing at once and you couldn't hear.

Students The microphone at the bottom kept falling out.

Researcher So the plug in microphone speaker kept falling out.

Students Those things were annoying

Students I reckon a thing that would make it better would be if you kind of have so if you listen to a slide show you would have something you would have to find a bit to help you find your next clue.

Students It would have been cool if you did like an amazing race

Students Not like it's a race in teams but like if you had little clues around and then you just start each group there were different clues placed in different areas and each group got an area to find things.

Students Like a scavenger hunt

Researcher That sounds like a really good idea.

Students It would make it exciting as well

Students People would probably listen to it cause they would be like, if we listen to it then and like you have the next clue in audio so they have to listen or watch it to find where the next clue is.

Students They would have to listen to it and then do a challenge and then they would have to do a quiz and if you go it wrong you would have to listen to it again so you would get it into your mind.

Researcher There have been some places in different countries who have tried things like that to do with historical tours and they've worked really well so that's a really good idea. So your saying if there was more purpose to it, or more of a game to it – if you had to listen to it to keep going.

Students If it was a competition, you would be listening eager to win

Students If it was a competition they probably wouldn't listen because they would be wanting to win.

Students At the completion, at the end of the quiz, the team that got the most answers correct they would get like a candy bar or something, then they would want to listen, want to win.

Researcher Its an interesting thing to look into, ill just move onto some questions here. With the pictures – which came up as a picture with words underneath, what worked well with that?

Students It sort of showed us, like where stuff took place. It showed us with the words what happened there.

Students If you couldn't hear, then you could like read the words and make sense of the pictures.

Students What was good about it was if it was just a picture, you would wonder what it was about. But with the writing, you had more understanding of what the pictures were about

Students Also it was kind of interesting for the people that like to read like me and Student 2 we love to read, if we were reading then we would take more of it in cause we are used to reading.

Researcher What about some of the things that didn't work about the pictures and words underneath.

Students Sometimes when it paused, like when it was loading or something, and it stopped and we were waiting for the next one, then we would be reading the sentence over and over again, you were like I don't get it cause the rest of the sentence was in the next slide. Or if you were talking on it, and if that crackles then your trying to hear what your saying, and trying to read the words.

Researcher Anything else?

Students Sometimes the words would change, but it would still be on the same picture, it was confusing, because what picture was the same as the words.

Students Sometimes it went too fast. And another thing, was if you didn't understand the sentence, and then sometimes you would go back and read it and you still didn't understand it or it didn't match with the picture or something.

Researcher Could you talk to other people in your group and say 'hey what does that mean?

Students Yeah but if your not very confident with history and stuff you don't want to get it wrong.

Researcher Would you be more confident in asking someone in your group or would you want to ask someone like me?

Students you

Students I would ask anybody there

Students There's no like right or wrong answer, its just like having a go.

Students Its what you know about it or what you don't

Students Its what you think.

- Researcher* There were some suggestions about what we could change, you mentioned about a completion or if it was like the amazing race that could work really well. You mentioned a change earlier that you would like to see about the video I think you mentioned earlier? But were there any other changes or any other things that people thought 'hey, yeah, that would actually make it's a lot better if this happened or that happened'.
- Students* There was this one part when we were at the church, there was this slide show type thing, it was just a Māori song. I didn't understand that, because none of that was in English.
- Students* There were words at the bottom
- Students* It was quite scary as well
- Students* I didn't understand that at all.
- Researcher* So if that was better explained, maybe the words at the bottom, there was a translation down the bottom.
- Students* I saw the translation down the bottom, it was in English
- Researcher* Anything else, people thought maybe we could do differently.
- Students* There was also like when we talked to you, we could actually ask you questions, which was good, but whenever we went to the ipad if you were with another group, or if we couldn't find you, then we got really confused, on some things.
- Students* Sometimes when we came to you and asked you a question you would answer it, but if we went back and it told us to ask you another question and you would explain it and stuff but we still didn't get it, like the ipad doesn't really, or the pictures don't really explain it.
- Students* Another thing I found was when your holding the ipad in the sun then it makes it so you cant see it.
- Students* Yeah
- Students* That's why at our first one when we went to the graveyard, we stood under that thing when you first go in.
- Students* Sometimes people went off to find shade under trees, or when the Internet connection cut out or something.
- Researcher* Okay so you did learn though videos and those different types of media, and earlier you did mention that the Internet connection was a problem. The programme may have worked better if you could have been at school. You could have looked at all those videos and things first and everything would

have worked really fast. You wouldn't have had any technological problems, you know, because you have got high speed broadband. So if you had done all that first and then you went out to the sites, would that have been better?

Students No

Students No

Students No

Students No because you would have forgotten most of it by the time you got out there.

Students You know that learning curve thing, well after 20mins it would be 50% lost.

Researcher So what's the difference about learning out there than learning in the class room?

Students Because when your there the video and stuff that listening to like match to where we are, like if we are at school listening to videos it says to look somewhere and you'll see this, and you went to look somewhere and you couldn't see cause your not there and you cant fully understand.

Students If your listening to stuff and your there, you can imagine it. But if your at school you do it and your like 'oh yep' and you go there and you cant imagine it again because no ones telling you or you've forgotten or it doesn't make sense to you.

Researcher What about having the ability to watch the same videos, at the site and do the activities at the site but then be able to listen to them again later would that be useful?

Students yeah

Students if you just like, it recaps your mind.

Students If you just like if we got a website and went on it or something and then if you go on it at school and you get the information and going onto it two days after and like yeah.

Researcher So the more times you see it the more you will remember?

Students So like at least twice a day

Researcher So when we were learning with the tablets, just like I did with that evaluation form I asked about group size. What do you think is the best group size? I noticed just by looking through them, different people have got different things.

- Students* I reckon if your learning with tablets, two, then everyone can see and no one is talking to the person next to you and no ones getting distracted and things like that.
- Students* Yeah yeah, I agree
- Students* Three or two, because two like you can agree with the same thing instead of fighting and three so you get more ideas not the same ones and see what other people think
- Students* I would say three because if you were disagreeing about something then the third person can just turn up and also you have more people to ask questions like if you don't know it and another person doesn't know it and we cant find you, then the other person he might know it, or he or she might know it.
- Researcher* What about having every person would have their own tablet?
- Students* That would be okay because some people fight over whose turn it is, sometimes but then if each person has their own tablet then there is no one to ask questions if like they might be on a different thing than you, you might be on this slide show but they might be on the voice one or video and stuff, they wont know what your talking about.
- Students* If everybody has a tablet each and like somebody might go to a different person and ask questions or something and you might go 'I don't actually know' and if you had four people some might slack off and do different things.
- Students* If everyone had an ipad or a tablet then it would defeat the idea of being in a group they might be going off doing something else, you'd be sitting there alone and they are on completely different parts of the story than you are. Because some people might be faster some people might be slower and when you go over there and ask and they would be like yeah I don't know.
- Students* That's kind of what happened with the groups as well some groups didn't really watch or listen to it and they were like talking and they didn't watch it and then they would go to the next one but the people who were actually watching it didn't understand they would go back and watch it again.
- Researcher* So your idea of the amazing race and having it linked to watching a video and getting an answer would be a good solution to that because you would have to watch it to get the right answer so you could get the next clue and keep going with the competition, that makes sense. That's the end of all the questions I had - Thank you very much

APPENDIX B Website Addresses

Kairangapaihau – Catholic Mission - <http://alanreill3.wix.com/karangapaihau>

Ō-rākau Pa Site - <http://alanreill3.wix.com/orakau>

St Pauls Church – Rangiaowhia - <http://alanreill3.wix.com/stpauls>

YouTube-<http://www.Youtube.com>

Introductory Youtube video-<http://www.youtube.com/watch?v=KEdU92yLPjU>

Nga Wahi Ipurangi Test (pre, post, and retention)

1. 150 years ago food grown at Rangiaowhia was transported to Auckland mostly by:

- Waka
- Horse and cart
- Walking

2. King Tawhaio declared an Aukuti, a line that must not be crossed at:

- Rangiriri Stream
- Paterangi Stream
- Mangatawhiri Stream

3. The rich and fertile soil at Rangiaowhia is due to:

- Volcanic ash
- Draining the swampy ground
- Compost

4. 150 years ago who looked after the land around Te Awamutu?

- European Farmers
- Missionaries
- Local Māori

5. At Rangiriri Māori defenders raised a white flag to:

- Negotiate with General Cameron

- Surrender to General Cameron
- Distract General Cameron so some defenders could escape

6. General Cameron was able to attack Rangiaowhia by:

- Sneaking past Paterangi Pa in the night.
- Bombarding Paterangi Pa with artillery fire from armored gunboats.
- Defeating the Māori defenders in Paterangi Pa with better weapons and more men.

7. Only old men, women and children left at Rangiaowhia. Where were the warriors?

- Paterangi Pa
- Gathering food
- Auckland

8. In which language did the printing press Te Hokioi print information supporting the Kingitanga?

- Māori
- English
- A mixture of English and Māori

9. Rewi Maniapoto started digging defenses at Hirini to...

- Give the people of Rangiaowhia a chance to leave
- Distract General Cameron while warriors stole his printing press
- To drive General Cameron out of Te Awamutu

10. The raupo walls of the whare allowed the defenders to...

- be protected from Government bullets

- start a fire to cook food
- fire at their defenders, while still being hidden

11. When the soldiers occupied Rangiaowhia for a second time they...

- Built a memorial to those who died in the fire
- Looted anything they could get their hands on
- Planted trees to improve the view

12. Why did Te Wano ask his people to climb Titiraupenga?

- So he could be buried in a cave
- To gather food
- To view their ancestral lands

13. When is the 150th anniversary of the Battle of Ō-rākau?

- 2012
- 2014
- 2016

14. When the cavalry first attacked Ō-rākau Pa they were defeated by:

- Long sharp sticks
- Accurate firing lead by Rewi Maniapoto
- A post and rail fence

15. Rewi Maniapoto thought the site chosen for Ō-rākau Pa:

- was an excellent source of food
- had an escape route

- had many problems with it

16. Defending Ō-rākau Pa were:

- 250 Warriors and 50 women and children
- 1600 troops led by General Carey
- 3000 defenders

17. The main weakness of Ō-rākau Pa was:

- it could be surrounded
- its lack of shade from the sun
- that it was made out of a combination of fern and dirt

18. Are those that died during the Waikato Wars are remembered on ANEW ZEALANDAC Day?

- Yes
- No
- Yes, but only in the Waikato

19. The land in Kihikihi that was returned to Rewi Maniapoto was returned by:

- General Cameron
- King Tawhaio
- Governor Grey

20. When Ō-rākau Pa was abandoned, those to wounded to leave were:

- Left behind
- Carried and protected by warriors

- Handed to General Cameron for protection

21. The response from the Ō-rākau defenders after they were given the chance to surrender was:

- Protect our women and children
- We will fight you forever
- We will leave peacefully

22. Ahumai responded on behalf of the women and children with:

- If men must die, then the women should live
- If the men and women must die, then let the children live
- If the men must die, then the women and children must die also

23. The death of most of the defenders resulted from:

- Hand grenades in the front trenches
- Lack of water
- Being pursued while escaping

24. Out of the 300 defenders, how many were killed?

- 17
- 140
- Hundreds were wounded but no defenders died

Nga Wahi Ipurangi Feedback

1. Below are some of the ways you've learnt about Rangiaowhia during the education programme. Think about what worked best for you, and rate the effectiveness of each way of learning.

	Very Effective			Not Effective
Listening to the researcher	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Watching video	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Listening to voice message	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Watching and reading a slide show	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. Facebook:

	Very Important			Not Important
Is being able to write comments about the things you learn important?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Done

Nga Wahi Ipurangi 3 Month Feedback TAP

1. Below are some of the ways you've learnt about Rangiaowhia during the education programme. Think about what worked best for you, and rate the effectiveness of each way of learning.

	Very Effective			Not Effective
Listening to the researcher	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Watching video	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Listening to voice message	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Watching and reading a slide show	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. Facebook:

	Very Important			Not Important
Is writing comments about the things you watch/listen and see important?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3. What is the best group size for mobile learning?

- 1
- 2
- 3
- 4

Done