Supporting Māori Language Learning using Augmented Reality

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ABSTRACT

With the advancement of mobile technology and the recent advances within the field of Augmented Reality (AR), the application of these tools to support language learning in new ways is now becoming a real possibility. However, due to the emerging nature of these ideas, the use of AR to teach language learning, especially for Māori language learning, is limited. This article looks at how AR could be adopted and used to support Māori language learning. It provides an initial discussion into how mobile technology has been used to assist language learning and specifically Māori language learning. The article then explores what AR technology and tools could be employed to develop AR learning applications. The article then presents ideas, based on the literature, for future AR applications to support Māori language learning.

Keywords: mobile learning, mobile assisted language learning (MALL), Te Reo, Māori language learning, augmented reality

1. INTRODUCTION

Language learning is best supported when the learner is embedded into a real context or environment (Dewey, 1938; Lave & Wenger, 1991). Mobile technology is one way that can enable learning outside the classroom, while learners are immersed within the real environment. The affordances of immediacy, portability and connectedness are key enablers of mobile technology which allows for learning to happen outside the classroom and to be more just-in-time and contextualised (Parsons, Thomas, & Wishart, 2016). As a result, there has been a marked increase in the body of research looking at how mobile technology can be adopted to support language learning, typically referred to as Mobile Assisted Language Learning (MALL), especially in terms of second language learning (Shadiev, Hwang, & Huang, 2017; Viberg & Grönlund, 2012). The vast majority of these studies have focused on supporting learning in an authentic learning environment and are typically focused on formal learning context i.e. used as part of an instructor-led learning activity (Shadiev et al., 2017).

With advances in mobile technology, such as the improvements in the support of AR, we are now able to better support and engage our learners. As highlighted by Godwin-Jones (2016, pg 9), augmented reality provides the "ability to add-on digital assets to explore and expand scenes and locales from the real world". The approach to supporting language learning by overlapping the real world with digital content helps support learning that can be localised, contextualised and meaningful. Since the recent advances of AR and renewed interest, as a result of new AR tools such as the Pokemon Go craze, there has been an increasing number of applications and research focusing on how AR can be used to support language learning. These studies tend, however, to be limited and short-term with small-samples groups and largely exploratory in nature (Wu, Lee, Chang, & Liang, 2013). The use of AR to support language learning has generally been more commonly targeting English language learning (Shadiev et al., 2017). A review of the literature has highlighted that there has been a relatively small number of applications and research exploring indigenous language learning, and specifically Māori language learning. While there are a growing number of mobile applications to teach Māori language (for a review of some of these applications please see Crow, 2015), AR is still not a feature of these tools.

Within this article, we will explore how AR technology and how it could be employed for Māori language learning. Firstly, we discuss how mobile technology has been used to assist language learning and specifically Māori language learning. We then introduce AR technology and the tools educators can use to build their own AR applications, then provide some ideas, based on the literature, to showcase how AR could be employed to develop a Māori language app for learning Te Reo.

2. MOBILE ASSISTED LANGUAGE LEARNING

Within MALL literature the adoption of mobile technology has largely been a complex and scattered field of research, with no clear single theory and concept. However, most learning theories focus on Situated Learning Theory, Activity Theory and Sociocultural Theory and approaches of collaborative learning, self-paced learning, and seamless learning integrating formal and informal ways (Crow & Parsons, 2015, Viberg & Grönlund, 2013). In a systematic review of the literature Viberg and Grönlund (2012) found that MALL is generally applied in a number of ways but generally focus on vocabulary acquisition, listening and speaking skills and language acquisition while grammar learning, pronunciation and writing skills were underrepresented in the application of MALL.

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3. MĀORI LANGUAGE LEARNING

Māori language learning is an important focus and strategic importance at all tertiary institutions. With the active promotion of Te Reo and Māori learning and teaching a key outcome of many staff capability frameworks. Eastern Institute of Technology (EIT) is no different. The recently launched initiative focusing on the continued support and development of Māori has resulted in a new framework, Herea Te Ra, the EIT Māori Capability Development Framework (Clarke & Sibley, 2017). This framework focuses on encouraging staff to develop skills across five key areas for greater Māori achievement. One of these areas specifically focuses on the development of Te Reo, in particular, the improvement of Māori language and pronunciation/ names. A large focus for the core capabilities is on supporting staff to developing competences on pronouncing key Māori words and names, basic greetings and farewells, and generally taking the opportunity to use Te Reo in appropriate settings. In terms of resources that have been provided relate to a combination of formal (orientation in Te Reo and Marae Protocol and NZQA certification in Te reo Māori), informal (fortnightly conversation and waiata sessions) alongside additional external resources, such as the Te Taura Whiri te Reo Māori website (http://www.tetaurawhiri.govt.nz/te-reo-maori-2/whakahuatanga-pronunciation/) which contains a list of vowels and consonants, sound recordings of pronunciation, and links to other internal resources (Te Reo and Tikanga) which contain documents for Te Reo Māori pronunciation, everyday expressions, a frequently-used words guide, and a link to a YouTube video of the local Waiata of Ngāti Kahungunu.

These additional resources are largely web-based and do not necessarily support learning that is embedded in the learning environment. However, additional resources are slowly being developed and added to provide more ways to support the learning of Te Reo. New opportunities for including links to mobile apps are a key opportunity that might help learners to bring their learning with them.

4. MOBILE MĀORI LEARNING APPS

There has been some seminal research looking at the literature regarding the use of mobile technology and apps for Māori language literacy in the wider context of indigenous language learning. These studies provide a good starting point to see how mobile technology and apps have been adopted in supporting Te Reo proficiency.

In a doctoral research study by McKenzie (2014), into the challenges and opportunities of using mobile devices to attain Māori language proficiency, she identified that mobile technology provided the opportunity to provide the learner with a wealth of resources at a time and place convenient to the learner. In her exploratory research she compared the attitudes and results of fifty-two participants in a professional development programme for teaching and learning the Māori language for Māori immersion educational settings. Six were participating face-to-face and the rest using a mobile device. In her study, she found that the mobile device enabled learners to easily access audio and video content, but there was still a need for a more engaging interaction, learning that was not one-way and provided opportunities for engagement and discussion about content. Largely face-to-face instruction was preferred, however, the mobile tools provided an important supplementary support. This, therefore, highlights a key area where Māori mobile learning apps may fulfil a need.

In another Masters research by Crow (2015), he compared a number of different Te Reo Learning applications. He identified six different Māori language apps (u Talk Māori, Kaitiaki, Kura, Puna, Te Pumanawa, Hika) and an additional 53 indigenous language mobile apps. He found that most apps were focused on vocabulary activities with reference material or just multimedia reference materials (such as audio, animation images and video). Most did not provide much interactivity (such as quizzes, flashcards, vocab matching), or the creation of user-generated content. Only two had any gaming aspect to the app (which was the primary focus of his review).

These two papers provide only a small sample of research looking at Māori language learning. They do however provide a good context for Māori language learning. However, none of these studies addressed how AR could supplement MALL and in particular none of the apps listed used AR to support language learning. On reviewing Google Play and the Apple App Store, we found only one application focused on Māori Language Learning using AR technology. Zippy's 3D Colouring App is targeted at young children where the children can colour in designs and bring these designs to life in a 3D world. This app focuses on teaching children the Māori alphabet and culture (Mack, 2018).

5. AUGMENTED REALITY SOLUTIONS AND TOOLS

The application of AR to support language learning typically focuses on three methods of engagement:

- Marker Based AR: this is where the camera on the mobile device engages with a physical object or image which is recognised by the app and which then triggers digital content (images, video, 3D multimedia, animation) that is projected over the real environment.
- Markerless AR: Makes use of sophisticated mobile toolkits (Google's ARCore and Apple's ARKit) alongside sophisticated algorithms and computer vision which means that virtual content is no longer reliant on the pre-knowledge of a user's environment or existing premade markers. Rather the camera recognises patterns, colours or some other features. In this approach, the camera is used to identify unaltered real-world objects such as book covers, posters or landmarks that have no artificial makers to assist object recognition.
- Geolocation: This is technically a subset of markerless AR however it is the location of the device that triggers the digital content. The limitation of this is that using GPS coordinates is imprecise and cannot work inside. However additional trackers such as Bluetooth Beacons will provide more localised location information including positions inside.

Most language learning focused applications have typically focused on marker-based AR and geolocation. However, based on recent advances in mobile and related technology, markerless technology is becoming more possible and potentially offers the most exciting opportunities for learning.

There are a number of tools that enable students and teachers to develop AR applications ranging from requiring little technical ability to other tools that require more advanced knowledge. These tools generally are marker based but also provide more advanced markerless AR and geolocation tools.

HP Reveal, formerly known as Aurasma (https://www.hpreveal.com/), is a fairly simple marker-based AR tool where digital information (images, video and selected 3D content) can be overlayed over images uploaded to their systems. The user gets limited ability to develop the content. This is, however, an excellent tool for any level of ability.

Wikitude (https://www.wikitude.com/) is a more advanced version of HP Reveal and supports a wider range of marker-based (including a wider range of 3D models) and markerless AR object tracking (referred to as Instant Tracking) where objects can be placed within an environment with no need for a marker). In addition, it also provides support for geolocated content where digital content can be fixed to a fixed point of interest (POI) based on GPS coordinates and digital data is triggered based on GPS location, network or beacon.

ARIS an Augmented Reality Interactive Storytelling Engine (https://fielddaylab.org/make/aris/) is a slightly different tool, it is an open source platform designed for teachers and students to easily create and play mobile games, design tours and create interactive stories utilizing geolocations which trigger predeveloped scenarios

AR Development platforms such as Unity (https://unity3d.com/) coupled with Vuforia (https://www.vuforia.com/) provide a sophisticated platform to develop your own apps which are significantly more customisable than the tools mentioned previously. However, since they are development tools they do require some coding ability to create more interactive environments. Therefore development by students and teachers may be harder however with the use of the 3D store to get premade 3D models (with many free), and the use of code libraries, its use becomes somewhat more achievable. These development tools provide for markers, markerless and limited geolocated AR.

With the more advanced opportunities of markerless technologies, coupled with sophisticated technologies, such as computer vision and other tracking technologies, this provides a wider, more powerful opportunity to engage the learner (Genc, Souvannavong, Akinlar, & Navab, 2002). The implementation of marker-less AR within educational contexts is very small (Bacca, Baldiris, Fabregat, Graf, & Kinshuk, 2014). This is typical, as these more sophisticated tools are not well supported in mobile phones, however, this is slowly changing with the integration of AR Core within the latest Google and Samsung phones (Google, 2018). As yet the application of this true markerless AR is primarily confined to using external sensors such as Microsoft Kinect and similar technologies in order to create AR applications for educational settings (Bacca, Baldiris, Fabregat, Graf, & Kinshuk, 2014). Development using these tools is significantly more difficult as it requires the understanding of complex algorithms and sophisticated programming languages. Some tools mentioned above (such as Wikitude) have started integrating these technologies into their authoring tools. They are, however, still limited.

We will look at how AR could be employed to support language learning, specifically Māori language learning.

6. SUPPORTING MĀORI LEARNING WITH AR

The following provides some ways that AR technology can be used to teach Te Reo, based on ideas from the literature.

6.1 Marker-Based AR

Marker-based AR has been widely used in MALL as it can be developed more easily than other solutions (Godwin-Jones, 2016). It has been adopted especially for vocabulary learning and pronunciation (for example, Vate-U-Lan, 2012; Barreira, Bessa, Pereira, Adão, Peres, & Magalhães, 2012; Küçük, Yilmaz, & Göktas, 2014). The advantages of using this method to teach vocabulary are that the approach enables the learning to happen within the context of the learner's environment. This context is important to vocabulary learning as it enables learners to form stronger associations between the new word and the objects in the real world (Santos et al. 2016). Looking at the application of AR in vocabulary learning the vast majority of these studies are focused on young children. One study does show how these approaches can be used with older participants within situational contexts although they use sensors rather than AR markers. The European Digital Kitchen Project (Seedhouse, Preston, Olivier, Jackson, Heslop, & Balaam, 2014) is an EU-funded language learning project which focuses on the support of language learning and learning of cultures and cuisines within the context of using a digital interactive kitchen. This provides step-by-step cooking instructions enhanced by digital sensors inserted in or attached to all the equipment and ingredients. The learner is learning aspects of the language whilst performing a meaningful real-world task and will simultaneously experience the cultural aspect of learning to cook a foreign dish.

This example provides an interesting idea for Māori language learning. It is important that learning happens within the context of the learner's environment. If marker-based AR is to be used there must be a need to engage with the markers. Embedding the app into a learner's activity can help support this. Therefore providing opportunities to learn and pronounce Māori words within the office context might provide an excellent opportunity to support just-in-time learning of Te Reo. Providing markers within a classroom and office space that can be engaged with by enabling learners to view digital content, such as the translation and pronunciations, will mean that learners are able to engage with the content when they want.

6.2 AR with Geolocation

Following on from this idea, but within a wider context of situational learning, learning that is supported by exploring the environment is a powerful way to promote language learning. Since AR can be used to present information relevant to a particular place, AR is a good match for teaching culture and languages (Santos, et al., 2016, Irving & Hoffman, 2014). The digital content does not necessarily need to be triggered by the location, for example in Liu, (2009), QR codes were used to support the exploration of a digital environment. However by using POI and GPS coordinates we are able to make interaction more ubiquitous as the user does not need to find the markers.

The approach of creating field tours has been well adopted within the mobile learning literature (Liu & Tsai, 2013). The opportunity of overlaying this with digital content triggered by the location of the device makes this a powerful tool for learning. In Juan, Furió, Alem, Ashworth and Cano (2011), they discuss a game called HARP's Alien Contact! The game requires students to walk around outside their school and using a combination of GPS POI and markers, clues with digital content (text, video clips, or audio clips) appear on their devices. The focus of this game was to support students to work in teams to interview virtual characters, collect digital data, and solve math and literacy problems to determine whether there are aliens outside.

Therefore, following on from the idea of placing markers within the office and classrooms they can also be attached to locations. For example, a virtual tour of locations that explores the environment within a Māori cultural context and supports the explanation of words. This could be coupled with physical markers to provide more opportunities to engage with specialised content providing additional language learning.

6.3 Markerless based AR

As mentioned, it is when we are able to move away from markers (physical or activated by a location) that the real power of AR becomes a reality. There are opportunities for identifying objects and translating documents, signs and voice, all of which

are not pre-stored in the application. Then on superimposing information or translations, the app can provide a significant learning opportunity. For example, the Google initiated application Wordlens (http://www.questvisual.com/) can embed real translation into signs and documents, Voice translators like Converse (http://www.itranslate.com/convers) and apps that can recognise images such as Bixby Vision (http://www.samsung.com/global/galaxy/apps/bixby/vision/) all provide a glimpse into the future of mobile and AR.

Within a language learning application, the opportunities are huge. Adding a few, small, easy to understand bits of information to a real scene can help the processing of information more quickly and clearly (Wikitude, 2017). In an example provided by Wikitude (2017), they outline the use of AR to help with automobile roadside assistance service, whereby a user can diagnose a problem with their engine, through the use of their phone, image tracking and AR digital information (see how it would work here https://youtu.be/WdlXEhqyFeQ).

For Māori language learning, the ability to translate and learn more about words and objects, where the app is not relying on premade markers, can better provide for just-in-time learning. Computer vision has the future potential to enable a learner to point their device to any object within their environment and get information about it in Te Reo Māori.

7. CONCLUSION

The power of AR coupled with mobile technology brings new opportunities to MALL and Māori language learning (an area with limited research). It is this power that will potentially bring added benefits to people who wish to learn a new language. This article brings together a discussion of language learning within the context of technology. This is just the beginning of a wider research project aimed to implement and trial some of the solutions mentioned in this article.

This article forms an initial study addressing the current research into how AR could be employed to support those interested in learning a new language. The article starts to explore the potential of AR from a technical angle to explore how this technology could potentially be incorporated into the educational experience. Further research will be needed on the effectiveness of this approach to support language learning and the overall efficacy of these initial ideas.

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