Online Māori Resources and Māori Initiatives for Teaching and Learning: Current activities, successes and future directions[1]

Peter J Keegan, Te Taka Keegan and Mark Laws

Abstract: This paper provides an overview of some current Māori information communication technology (ICT) initiatives, online Māori language resources and Māori initiatives for teaching and learning. The first section provides examples of key ICT and web-based resources in the Māori language and for the Māori language (for example, monolingual sites in the Māori language, bilingual/multilingual sites providing education/historic information, online dictionaries, and other computer mediated communication resources). The second section focuses on a recent bilingual Student Online Learning and Management System called 'eWānanga', which provides a learner support service that is based on traditional educational learning models intermixed with Māori pedagogies to offer students more appropriate flexible blended learning. The third section discusses web/ICT resources and online learning systems based on Māori experiences in New Zealand. The paper concludes by noting gaps, areas of concern, future directions and lessons to be learnt for other indigenous groups around the world interested in both developing web/ICT resources and engaging in online learning activities.

Keywords: Māori ICT initiatives, Māori online learning, Māori online resources

Introduction

A Google search for Māori language resources will return about 550,000 results highlighting the current extent of computing resources available for the Māori language. The authors of this paper have been involved either directly or indirectly with many Māori language computing developments over the last two decades. A review provides an opportunity to reflect on what has been achieved, what issues still remain and what the future may hold given the increasing permeation of information communication technology (ICT) in teaching and learning and yet being aware of the unpredictable nature of ICT and future developments.

The paper begins with a very brief background of Māori in New Zealand. This is followed by a short overview of two extremely important developments, the Māori Language Act of 1987 and the establishment of the Māori Language Commission. The first major section of this paper focuses on Māori language web/ICT resources as at July 2010. The second section discusses eWānanga bilingual Student Online Learning and Management System. The final section concludes discussing Māori ICT/web usage, benefits, drawbacks and possible future directions.

---

[1] An earlier version of this paper was presented at The World Indigenous Peoples' Conference on Education (WIPCE 2008), Melbourne, Australia, 7–11 December, 2008.

Background

Māori is the only indigenous language of New Zealand (Harlow, 2007). Prior to the arrival of Europeans in the 18th century, the language was spoken in various dialects throughout the length and breadth of New Zealand. A closely related language, Moriori was spoken on the Chatham Islands (Rekohu) 750 km to the east of New Zealand.

Christian missionaries, arriving in the early 1800s, were quick to devise an orthography for writing Māori. They went on to produce and publish descriptions of Māori language, grammatical sketches and began translations of the Bible and other religious materials into Māori. Literacy and other new forms of technologies were readily embraced by Māori throughout the country and there was a great demand for written materials. Māori newspapers flourished, especially in the 1850s and 1860s and continued until World War Two. (Over 17,700 Māori newspaper pages have been preserved and collated into the Niupepa Collection, available online [1] with full text search facilities available for most pages).

As with many indigenous peoples, colonisation meant that Māori suffered greatly from loss of land, resources, language, culture and identity. The rapid post World War Two urbanisation only served to breakdown tradition Māori families and structures. However, Māori language and culture revitalisation began in the 1960s and gained momentum throughout the 1970s and the 1980s. Well known successes include kōhanga reo (Māori-medium early childhood centres), kura kaupapa Māori (Māori-medium schools), wānanga (Māori higher education centres) and the recent Māori TV channel [2] established in 2003 (a separate Māori-language only channel was launched in 2008). Initiatives mentioned rely on new technologies, which Māori have readily embraced since contact with Europeans. Although Māori is a still an endangered minority language (estimates by Te Puni Kōkiri suggest much less than 25% of the Māori population speak the language fluently – see Bauer 2008), it attracts large numbers of learners and has made considerable gains in terms of government support, teaching and media resources.

The Māori Language Act 1987

A major milestone in Māori language revitalisation efforts was The Māori Language Act 1987, which led to the establishment of a Māori Language Commission 'Te Taura Whiri i Te Reo Māori'. The act itself was due to the Labour Government acting upon the recommendations of the 1986 'Te Reo Māori' Māori language claim to the Waitangi Tribunal. The Tribunal was set up to make recommendations to government on breaches of the 1840 Treaty of Waitangi (signed by the Crown and Māori chiefs). The Tribunal report recognised the Māori language was a taonga (treasure), which was guaranteed protection under the Treaty of Waitangi, and therefore the government had been negligent in its responsibilities in preserving Māori language in all spheres including the education, media and government sectors.

The Māori Language Commission recognised the need for standardisation of orthography, new terminology development and the need for dissemination of information to the Māori language community. It has been aware of the role of ICT and new technologies in promoting Māori language development and subsequently makes available electronic resources from its bilingual website [3] that include publications written in Māori, historic Māori language information, Māori language statistics, orthographic conventions (especially advocating marking long vowels in Māori using a bar or macron over the long vowel), keyboard drivers and links to other resources.

The Māori Language Commission also sponsored the Kōrero Māori website [4] to raise the awareness and to provide opportunities for people to learn and use the Māori language. This site provides lessons and history for learners of the Māori language, resources for fluent speakers, Māori language resources for businesses, and a Māori Language Club (that intends)

to provide opportunities for Māori language speakers to converse. During the Māori language week of 2008 (21–27 July), the Commission released the first monolingual Māori dictionary on this website called He Pātaka Kupu [5]. Interestingly, a limited web version was made available before the print version appeared in late 2008.

Key Māori language ICT/web sources as at July 2010

Māori language ICT/web resources have been developed by individuals, Māori organisations, academic researchers, New Zealand government agencies, and commercially orientated groups involved in Māori language education. The dynamic nature of the web means that some sites are ephemeral and new sites and resources are being continually developed. Māori language sources in this paper have been grouped into three categories: Māori language lessons, Māori language dictionaries and general Māori language resources.

Most Māori language-related web sources provide information bilingually, both in Māori and English. One exception is the Māori language only Te Rauparaha website [6] hosted on Te Kete Ipurangi [7] where the information has been provided by Ngāti Toa Rangatira (a North Island Māori tribe).

Māori language lessons online

There appears to be only one tribal-based website, Kāi Tahu (sometimes spelt Ngai Tahu) in the South Island that offers significant Māori language lessons online. This is the *Kotahi Mano Kāika* (One Thousand Homes) website [8]. The site's goal is to have 1,000 Kāi Tahu homes speaking Māori by the year 2025. It assists this by providing strategies, advice and Māori language lessons.

Te Whanake (Māori language teaching) series [9] originates from the work of Professor John Moorfield. John has taught Māori language to adult learners of Māori primarily in universities in New Zealand since the 1980s. Not satisfied that the Māori language textbooks then available were appropriate in terms of content and pedagogy, John has developed, trialled, and revised his own textbook series. These were originally issued with audio tapes that could be used in university language laboratories. Ongoing development includes CD-ROMs, online lessons (with sophisticated animations), a dictionary (both in print and online versions), iPod capabilities and adapting materials for Māori television. John (not of Māori descent) has had wide support from Māori language experts and the Māori teaching community. His long time philosophy has been to provide resources for the promotion of Māori language as opposed to becoming a commercial success. He has often stated that many Māori have freely given time to assist his work and that Māori language resources should be made as widely available as possible.

Culture Flow [10] is an independent organisation that produces Māori language courses primarily for beginners. Resources are available as both stand-alone (CD) and online products. Among the resources available is a voice recognition Māori pronunciation tool. Māori language video lessons are online at MāoriLanguage.net [11]. These videos cover the basics of pronunciation, the alphabet and a whole series of greetings and phrases. The site has a YouTube presence providing waiata (songs) and karakia (prayers, incantations, chants). Māori.org.nz was the first significant Māori site to have a presence on the web. The site offers a wide range of information and products to do with Māori culture and also some Māori language lessons through its te reo (language) section [12]. He Kupu o Te Rā (Word of the Day) [13] provides registered users a word of the day via email, or through a news feed reader. The site also offers basic Māori language grammar lessons and some instructions on how to generate macrons.

Māori dictionaries online

Cited as the largest existing repository of Māori–English terms and meanings, Te Wakareo-ā-ipurangi [14] provides recognised Māori language dictionaries such as Williams (1971), Ngata (1993) and Te Matatiki (Māori Language Commission, 1996). Access is subscription based with the subscriptions costing $144 per year for a single user. Two key Māori dictionaries not available included *The Reed Dictionary of Māori* (Ryan, 1997) and Te Whanake series dictionary previously mentioned. Te Wakareo-ā-ipurangi is an attempt by a small commercial company to create a central repository of all available Māori language dictionaries. This is admirable goal and if realised would provide an invaluable resource. Many Māori dictionaries in New Zealand are published by commercial companies whose primary motivation is profit rather than promotion of Māori language. Companies may be reluctant to undertake ICT ventures such as making full search facilities available online as this may be perceived as having a negative impact on print dictionary sales. Hopefully, print only dictionaries such as *The Reed Dictionary of Māori* (Ryan, 1997) will be available in the future in eBook formats.

The sixth edition of William's dictionary (1957) is available online, as a result of ongoing work of the New Zealand Electronic Text Centre [15] and while it is full text searchable the interface is cumbersome to use. Also, the macron symbols have been stripped off all the texts reducing the significance of what is displayed. The Ngata dictionary (1993) is also available online for no cost as a result of Learning Media, an independent New Zealand educational resource provider [16]. Te Whanake series previously mentioned provides a useful dictionary called Te Aka [17]. Te Aka is derived from narrative texts and resources from the Te Whanake Māori language series and consequently gives links to associated topics, explanations, colloquialisms, maps and illustrations. Research undertaken by Laws (2006) has led to the creation of the English–Māori word translator [18]. Not only does this resource translate between English and Māori but many of the Māori keywords can be played so that correct pronunciation can be heard. Tai Tokerau is available at Te Papakupu o Te Tai Tokerau [19]. This dictionary focuses on words used by native speakers, words listed in manuscripts, and names, with all terms being peculiar to the Tai Tokerau area. Finally, specialist dictionaries such as *Te Reo Pāngarau: A Māori Language Dictionary of Mathematics* [20] has been available for several years. A second edition of *Te Reo Pāngarau* was released in 2010, to our knowledge this has yet to be incorporated into the online version. In 2009, the (Māori) science equivalent to Te Reo Pāngarau was released, i.e., *Te Reo Pūtaiao: A Māori Language Dictionary of Science* was released and is also available online [21].

Other Māori language resources online

Although not an online Māori resource, it would be remiss of the authors not to mention the most ambitious Māori language IT project ever completed; the localisation of Microsoft Windows XP and Microsoft Office 2003 into Māori. This involved the translation of over 900,000 words in 180,000 separate strings. Windows Vista and Office (2007) have subsequently been localised and are available free from Microsoft [22]. This software allows a computer user to interact totally with an operating system and some application software and only ever encounter the Māori language, an important enhancement to the Māori language linguistic landscape that should be recognised.

Māori language week 2008 celebrated the launch of the Google interface in Māori. Users of the New Zealand localised Google site [23] are able to display the interface in te reo Māori. This feature raises the mana of the Māori language and implies that the Māori language does have modern relevance. In Māori language week 2010, Google added a keyboard to the Māori language version of the New Zealand website [23], allowing the input of the macron vowel. Google also opened its translator toolkit [24] in 2009 to be used with Māori language translations, a free online tool that has the potential to radically reduce the time and subsequent costs of Māori to English and English to Māori translations.

The New Zealand Māori Internet Society has been a Māori advocate on the Internet for over 10 years. The discussion portion, also known as the Aotearoa Māori Internet Society offered discussion on many topics including the latest inroads that Māori language is making in various computer platforms and interfaces. As at July 2010, it appears the societies' only web presence is via Facebook. Te Kete Ipurangi [7] was one of the original websites funded by the New Zealand Government that were committed to a bilingual approach. The Māori education section of the website has links to many Māori language resources with a focus on materials that are relevant to teachers of Māori language. Te Ara – The Encyclopaedia of New Zealand [25] provides a comprehensive guide to New Zealand, covering people, culture, environment, history, economy, and society. The Māori language portion of the website is distinctive in that the content isn't simply a translation of the English version, but rather its content is written from a Māori perspective in te reo Māori. Te Ngutu Kura Māori Spell Checker provides a spell checker customised for the Māori language [26]. It was created by one of the pioneers of Māori language ICT resources, Karaitiana Taiuru, and is available as a free download. The Haemata Web Store [27] specialises in selling Māori language products for use at home, at school, at work and during leisure times.

The creation of Māori resources has been enhanced by the increasing acceptance of Unicode standard [28]. This standard defines encoding systems for characters of almost every language script known. It is used to ensure consistency of display across computer platforms, across computer programs and across languages. Currently in Version 5.0 the Unicode Standard has gained worldwide acceptance and is seeking to gain worldwide implementation. The adoption of Unicode means that macrons used in the Māori language can be easily and consistently displayed in computer programs.

eWānanga: Student Online Learning Management System

The term eWānanga, or 'electronic Wānanga' is an English–Māori hybrid term used to represent the amalgamation of two concepts: one is based on ICT and the other on mātauranga and āhuatanga Māori (knowledge and traditional customs). The eWānanga term is now used in several different ways. In one approach, eWānanga depicts Te Whare Wānanga o Awanuiārangi (the indigenous-university of Awanuiārangi) within the online environment (a virtual Wānanga). In another context, eWānanga is the name of the online Learning Management System called the eWānanga LMS [29]. Furthermore, eWānanga illustrates a philosophy founded on flexible teaching and learning practices that reflect Māori pedagogies within a mixed-mode blended delivery structure (eWānanga kaupapa). The name also represents one of the teacher education courses offered partly online called the Bachelor Māori Education (BMEd eWānanga). Finally, the term is used to describe the eWānanga Centre for Creative Teaching and Learning (eWānanga Centre). The eWānanga Centre was established to manage the eWānanga LMS, cultivate the eWānanga kaupapa, provide professional support for all online teachers and students, and to undertake new emerging research and development initiatives (Laws, 2006).

Over a 6-year period the eWānanga LMS has migrated across different operating systems and undergone many iterations based on software upgrades, proven design and development cycles, research into relevant Māori content and resources which are all designed to provide users with a Māori-based e-Learning experience (Laws, 2007). The eWānanga LMS has a multi-modal approach to deliver flexible blended activities at various levels of teaching/learning methodologies for certificate, diploma, degree or postgraduate study. Staff can conduct lectures and tutorials online; facilitate 'one-to-one' and group chat-room sessions with courses. Staff can activate forum postings to generate further discussions. A secure online journal is available to record the students' work and progress. Support for uploading any digital resource type (with size limits) for easy access and distribution. It has also created

a growing environment where staff research, resource development and production of DVD and CD multimedia resources to support the student learning practice. Users can also select different language options and features. Furthermore, the eWānanga LMS is used as an administration tool for staff to manage student assessments, assignments and evaluations.
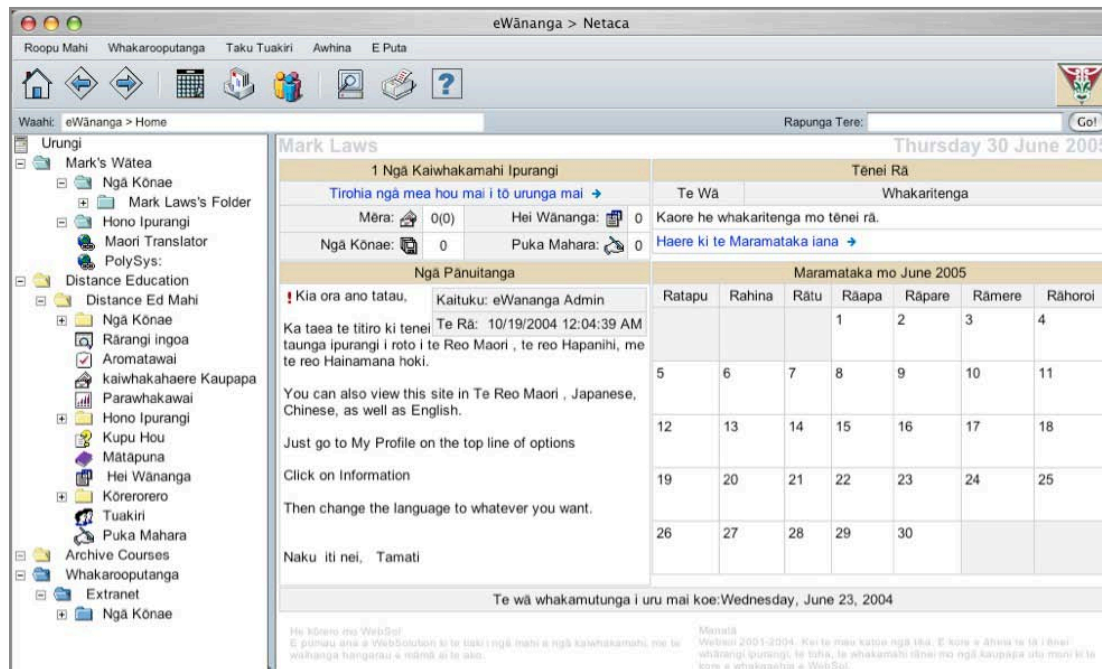

Figure 1. An early version of eWānanga using the 'Netaca System' developed by WebSol Ltd in 2003 [30]. Netaca already had multilingual functionality (Chinese, Japanese and English) and was later customised to incorporate Māori and a unique bilingual interface feature.

True bilingual interface

The world has quickly moved toward becoming a multilingual population through the acquisition and proficiency of second and third languages by individuals, communities and countries [31]. All multilinguals and bilinguals have a native or a first language (L1) with a lesser second/third language (L2) to a certain level of proficiency in the use of and/or in learning the L2 (Romaine, 1995).

When Te Whare Wānanga o Awanuiārangi entered into an agreement with WebSol Ltd, it requested that the Netaca system be redesigned to provide a unique bilingual interface feature. This allowed the individual user to manually set their first language preference (L1) as the default language (in Figure 1 this is set to Māori). Now the unique bilingual feature permits the user to also select their second language option – their L2 (in Figure 1 this is English). When activated, single word translations from Māori to the target language English are automatically displayed to the user via a pop-up 'tool-tip' when they 'mouse-over' (using the hover function) selected words or phrases in the menu bars, headings in the activity windows, messages, events or in the navigation menus. The user at any time can go back to their language preferences and change their L1 and L2 settings. Because Netaca already had two additional language localisations installed (see Figure 1), this extended the usability to different language combinations of L1 and L2 which offers greater range and scope for multilingual users. For example, a native Chinese speaker learning Māori would choose their L1 then select Māori as their L2 to see the Chinese–Māori translations accordingly.

The eWānanga Netaca LMS with its multilingual capabilities coupled with the 'true bilingual interface' feature made this the first system of its kind in 2005. This feature replicates to some degree the natural phenomena of a bilingual person who can concurrently switch between more than one language at any one time (Laws, 2007). Apart from the obvious language translation features, this built-in design can provide the user the option to acquire new vocabulary in their second chosen language by identifying unfamiliar words and terms through their repeated observation and use (Laws, 2007).

The implementation of this unique design is different to the standard localisations, operating systems, and web-based interfaces that currently offer multiple language support [32]. Although these all provide bilingual and multilingual functionality (in some cases as many as 40 languages), the user can only select one of the languages to be displayed [33]. These types of systems only provide a 'mono-lingual interface'. That option maybe okay if the user is mono-lingual or prefers to only use one particular language, but if the user is bilingual; their options to view their other language(s) are limited to selecting and viewing these separately. Furthermore, with the increasing development of bilingual websites that create content-specific translations of the selected languages, these are usually displayed either together or on separate pages [34]. This dual language design requires more physical page space or extra pages to accommodate the translations. In most cases it is also difficult to embed two languages into the same navigation menu items, tabs, buttons and activity windows. Many of these websites will only display a limited amount of bilingual content [35], usually in the form of introduction pages with navigation headings and relevant language specific topics.

Recently Google developed their 'Google translate website' [36] to provide both novice and expert word, sentence and complete page translations supported by over 50 languages. The technology and techniques used by this website are based on Google's 'Translator Toolkit', a powerful language editor to help improve translators to develop their languages to be used in a range of search engines, plugins, toolbars and mobile communications. An interesting bilingual solution is the 'WordTranslator' toolbar which has been developed for web browsers. The WordTranslator toolbar uses a similar design technique to Netaca's bilingual interface feature to hover over a word to translate it in a customised floating popup window. Users select the option to translate from English (L1 default) into another target language. Currently 39 languages are supported with further languages being developed and implemented, including Māori. The significant design feature of WordTranslator allows the user to hover over any word on any web page to view the target translations. This is not limited to menus, navigation bars, instructions or content anymore. This approach is unlike all other types of bilingual and multilingual systems (including Netaca) as all have the translations 'hardwired' into their systems by the language translation specialists. Google has extended the online 'true bilingual interface' feature to the next level.

The additional integration of the English–Māori Language Translator and Spellchecker, including various Māori language-based programs are all direct results of the commitment to provide relevant bilingual features and effective language resources for the learner using the eWānanga LMS (Laws, 2007).

Kaupapa Māori

Online student-centred learning approaches are well recognised as a formidable pedagogy within mainstream institutions (Ministry of Education, 2002/04: New Zealand Council for Educational Research, 2004). But many of those practices and guidelines do not fit the Māori holistic perspective on learning (Hond, 2004). Māori epistemologies form the basis of all teaching and learning practices within the wider Māori educational framework which are based on Kaupapa Māori methodologies (Ohia, 2006). Te Whare Wānanga o Awanuiārangi views all its educational practices as being inextricably linked to āhuatanga Māori according to tikanga and te reo Māori (customs, culture and language). It is a given that the educational practices in the Wānanga teaching and learning environments of the classrooms, lecture

theatres, tutorials, discussion groups, meetings and field trips (to name a few) will occur every single day. There was also this expectation that it would also occur online, given the same types of practices happen seamlessly on Māori radio, TV, film, in Māori newspapers, magazines and on the Internet. Therefore, the framework was also applied to the development and production of digital resources, methods and the delivery practices for eWānanga (Ferguson, 2006: Laws, 2006).

Based on a collaborative research project and an online survey asking staff and students their impressions about the Māori content and the Māori teaching and learning practices, Wānanga staff developed a new set of effective Māori e-Learning and e-Teaching guidelines with exercises that integrated certain traditional customary practices of karakia, mihi, whakapapa and waiata into the online environment (Laws, Ferguson, & Werahiko, 2008). When staff and students log onto eWānanga Māori customs, culture and language are widely practised. Karakia would be used to clear the way for work to proceed and to finish, mihi established new online relationships through whakapapa, and existing links were continually reinforced. Various forms of online recital in oratory, chants, laments and songs would also be used to enhance learning styles in both synchronous and asynchronous settings. Rigorous debates in discussions forums are a primary part of the users' online activities, thus certain practices underpinned by kawa, manaaki and aroha (protocols, respect and compassion) were paramount to online etiquette and best practice by staff and students. Participation is very high, students respond well to their various activities and are comfortable being part of the eWānanga environment that is underpinned by kaupapa Māori.

> Another essential element is to merge Māori epistemology and tikanga with technology. Instead of viewing this with incredulity and scepticism, we need to look at this as a challenge that is attainable and exciting. Kaupapa Māori has both unchangeable and changeable elements that allow us to remain authentic to āhuatanga and tikanga Māori as well as participate in the modern world. (Ohia, 2006)

A further outcome of the Māori e-Learning and e-Teaching guidelines produced a number of new hybrid English-Māori terms, all based on the eWānanga concept. For example; e-Pouako (online teachers), e-Akonga (students learning online), e-Kete (electronic directory), e-Kanohi (video conference) and e-Kōrero (online discussion).

All digital content and resources, initiatives and methodologies are now designed to provide both staff and students with an online experience unique to the Wānanga (Laws, Hamilton-Pearce, Werahiko, & Wetini, 2009). This is a multi-modal approach that delivers flexible, blended, bilingual/bicultural activities at all academic levels. eWānanga has also created a growing environment for staff to engage in new and emerging research activities in ICT underpinned by Kaupapa Māori theory and practice (Ferguson & Werahiko, 2009). ICT tools such as Podcasting, Skype, QuickTime video streaming and social networks like Facebook, YouTube and Mahara (e-Portfolio) are being used to allow students to engage with much wider audiences. But on the other hand, some educators initially displayed a natural fear and/or barrier towards ICT for online teaching, which reflected in the research that is showing a national trend (New Zealand Council for Educational Research, 2004). Therefore, the implementation of the eWānanga training workshops and professional development programmes, all of which cover the kaupapa, the LMS, the ICT tools and current research, have now reduced many of those initial staff anxieties. Thus, having a greater understanding and broader knowledge supported by informed research has ultimately reflected in a quality Wānanga staff teaching and student learning experience.

New LMS platform
With the early adoption of the Netaca system in 2003, this provided the Wānanga with a long term strategy for the direction of eWānanga LMS and its philosophy. Becoming an early

adopter within the e-Learning paradigm placed staff in a position to use the technology with confidence, allowed them to explore new ground and also create a vision for the future.

From those early beginnings, participation on eWaānanga was not high compared to the overall numbers at the Wānanga. There were about 10% of students with 5% of staff registered on the system by 2005. There was a slight improvement in 2006 and in 2008 it was over 25% – 1000 users (940 students and 60 staff) participating across 40 courses. About the same time growth was expected to rise and a plan was developed for eWānanga to accommodate for this growth as well as build new opportunities for creative ways to innovate the teaching and learning practices using advanced ICT.

As mentioned earlier, a comprehensive online survey was conducted to ask staff and students certain questions relating to eWānanga. More specifically, a section asked about the current eWānanga Netaca system (Laws et al., 2008). The feedback was clear that the Netaca system was not providing the expected services and could not be expanded to accommodate for additional services such as audio/video conferencing. Therefore in 2009, eWānanga migrated to Moodle [37]. With Moodle's growing acceptance and use by the tertiary education sector, the available expertise, know-how, intellectual capability and related services, it has helped sustain and grow the new capability of the eWānanga LMS. Furthermore, the open-source nature of the Moodle development environment means the Wānanga has engaged in new research and development projects with other tertiary institutions and organisations. For example, the true bilingual interface feature is already in the pipeline as a future Moodle development solution [38].

Figure 2. Snapshot of the current version of the eWānanga LMS developed using Moodle [37]. Logs show eWānanga has 1,155 users, 110 staff participating across 343 courses with access to 2,972 digital resources.

Te Whare Wānanga o Awanuiārangi now uses the term eWānanga as a trademark in relation to all its e-learning educational practices and services. This was filed with New Zealand Trade Mark in August 2005.

Discussion

Māori Web/ICT developments are clearly an integral part of Māori language revitalisation efforts, which began in earnest in the 1970s. The Māori Language Act of 1987, effecting the establishment of a Māori Language Commission and government support for Māori language education has enormously assisted developments. Educationalists such as John Moorfield, Richard Benton (see Keegan, 1996) and other visionaries were able to grasp the potential contribution of modern technologies before the web became more available to the New Zealand public in the 1990s. In addition, a small, but highly active cohort of Māori students were able to gain IT qualifications, pioneer new developments (some have been noted in this paper) and more importantly gain positions at academic institutions to train other Māori. As the web became more widely available, other Māori individuals, community groups and organisations have in turn contributed their own resources. Māori developments have not been in isolation. Much has been gained through interactions and involvement with indigenous groups undertaking ICT/web developments, especially those in Hawai'i involved in the revitalisation of the Hawaiian language [39].

Revitalisation of the Māori language will have gained significant inroads when all ICT/web activities can be conducted fully in the medium of the Māori language. With the localisation of Microsoft Windows and Microsoft Office many computing activities can now be conducted in te reo Māori. To date, two versions of Windows and Office have been localised into te reo Māori. It is hoped that localisation will continue for future Microsoft products, such as Windows 7 and Office 2010.

Clearly the eWānanga approach provides an insight into how new developments can totally integrate Māori language, culture and knowledge with Web/ICT management, teaching and learning resources. Although there will always be room for improvement, it is the philosophy of eWānanga that will always drive new developments, and not the technology.

There is much information available now on the web for people wishing to learn the Māori language. Unfortunately, there are few opportunities to actually *use* te reo Māori. Websites where the total content is available in the Māori language are not common. Some sites appear to have been created in English and translated into Māori as a secondary task. Ideally web sites should be constructed in Māori and then translated into English as this would allow more than just language but the actual Māori culture perspective to be permeated throughout the resource. For this kind of activity to occur there needs to be more Māori and/or Māori literate IT specialists working in the IT-related industries.

The porting of Te Whanake series to iPod and television is a clear signal of the rising importance of smartphone, netbook and (computer) notepad technologies. Smartphones are becoming cheaper, more capable and powerful and likely to be ubiquitous in the future. The added advantage of portability is clearly appealing to younger people. It is clear that developers once concerned about multiple operating systems, must also consider multiple hardware devices.

There are two issues with Māori ICT resources which are of major concern. The first is the lack of evaluation and research into the actual use of existing resources. There appears to be very little research in this area. Many sites and developments would benefit from gathering end user data other than site logs and email feedback. This is likely to become more of an issue as the number of sites and resources increase. One site, Māori.Language.info [40]

claims to evaluate and provide feedback on some of the existing Māori language websites and resources. The second major concern is the issue of sustainability. Many websites and resources rely on the efforts and free time of a small number of individuals. There is potential for resources to become quickly out of date if funding and individuals are no longer available to provide support for maintenance and ongoing development. This is likely to lead to sites and resources disappearing or no longer being maintained on a regular basis.

Conclusion

Web/ICT resources have become an integral part of Māori language revitalisation efforts and Māori learning. These efforts and resources are potential models for other indigenous groups developing their own resources. Sustainability of existing developments remains a major issue. Clearly, there is a need for research and evaluation of existing resources. As ICT becomes more integrated into the lives of younger Māori, it is clear that we need to utilise this resource to ensure the future survival of Māori language and culture in an ever changing world.

References

Bauer, W. (2008). Is the health of te reo Māori improving? *Te Reo*, *51,* 33–73.

Ferguson, S. (2006). *He whakamātau rangahau mō te ako-ā-ipurangi tuatahi mō Te Iti Rearea.* A case study conducted for the e-Learning Guidelines New Zealand. Massey University. Retrieved 7 May, 2006 from http://elg.massey.ac.nz/index.php?title=Case_Study_People

Ferguson, S., & Werahiko, H. (2009). Does culture count in an e-learning environment? *Journal of Australia Indigenous Issues: Special Issue of World Indigenous Peoples' Conference on Education (WIPCE) 12*, 7–11.

Harlow, R. (2007). *Māori: A linguistic introduction*. Cambridge: Cambridge University Press.

Hond, R. (2004). *A perspective regarding Māori and e-learning*. *With reference to: Barriers /capability/participation/good practice/quality.* Report to the e-Learning Advisory Group, Ministry of Education, New Zealand.

Keegan, P. (1996). *Initiatives in Māori networking*. Proceedings of the 6th Biennial Conference of the New Zealand Computers in Education, Hamilton, New Zealand (pp. 35–52).

Laws, M. (2006). *eWānanga – A name, a course, a system and a department.* A case study conducted for the e-Learning Guidelines New Zealand. Massey University. Retrieved 7 May, 2006 from http://elg.massey.ac.nz/index.php?title=EW%C4%81nanga

Laws, M. (2007). *Putting the 'e' into Wānanga.* Te Ihi o te Mātauranga Research Conference, Te Whare Wānanga o Awanuiārangi, Grand Tiara Hotel, Rotorua, New Zealand.

Laws, M., Ferguson, S., & Werahiko, H. (2008). *Ngā Kaupapa Māori Arataki mo te 'eWānanga'. Māori guidelines for the Student Online Learning and Management System*, Māori e-Learning Guidelines Case Study, e-Learning Guidelines New Zealand. Massey University. Retrieved 7 May, 2006 from

http://elg.massey.ac.nz/index.php?title=Ng%C4%81_Kaupapa_M%C4%81ori_Arataki_mo_te_eW%C4%81nanga

Laws, M., Hamilton-Pearce, J., Werahiko, H., & Wetini, T. (2009). *The new role of the Wānanga Educator – Te kanohi hou o te Techno-Pouako.* Teaching for Excellence – Excellence in Teaching, National Conference. Universal College of Learning, Palmerston North, New Zealand.

Māori Language Commission: Te Taura Whiri i te Reo Māori. (1996). *Te Matatiki: Contemporary Māori words*. Auckland: Oxford University Press.

Ministry of Education. (2002). *Highways and pathways exploring New Zealand's e-learning opportunities.* The Report of the E-Learning Advisory Group, Wellington, New Zealand. ISMN: 0-477-04770-X.

Ministry of Education. (2004). *Interim tertiary e-learning framework.* New Zealand. Retrieved 7 May, 2006 from http://www.minedu.govt.nz/NZEducatrion/EducationPolicies/TertiaryEducation/ELearning/~/media/MinEdu/Files/EducationSectors/TertiaryEducation/InterimTertiaryLearningFrameworkweb.pdf

New Zealand Council for Educational Research. (2004). *Critical success factors and effective pedagogy for e-learning in tertiary education: Background paper for Institutes of Technology and Polytechnics.* Wellington, New Zealand: NZCER.

Ngata, H. M. (1993). *English–Māori dictionary*. Wellington: Learning Media.

Ohia, M. (2006). *Critical success factors for effective use of e-learning with Māori learners*. Forward in the Institutes of Technology and Polytechnics eCDF Project Final Report, Tertiary Education Commission, New Zealand.

Romaine, S. (1995). Bilingualism. Oxford: Blackwell.

Ryan, P. M. (1997). *The Reed dictionary of modern Māori* (2nd ed.). Auckland: Reed.

Williams, H. W. (1957). *A Dictionary of the Māori language* (6th ed.). Wellington: Government Printer.

Williams, H. W. (1971). *A Dictionary of the Māori language* (7th ed.). Wellington: Government Printer.

Websites mentioned in this article

[1] Niupepa Māori www.nzdl.org/niupepa
[2] Māori Television www.maoritelevision.com
[3] Māori Language Commission www.tetaurawhiri.govt.nz
[4] Kōrero Māori www.korero.maori.nz
[5] He Pātaka Kupu www.korero.maori.nz/forspeakers/patakakupu
[6] Te Rauparaha www.tki.org.nz/r/maori/te_rauparaha
[7] Te Kete Ipurangi www.tki.org.nz
[8] Kotahi Mano Kāika www.kmk.maori.nz
[9] Te Whanake www.tewhanake.maori.nz
[10] Culture Flow www.cultureflow.co.nz
[11] MāoriLanguage.Net www.maorilanguage.net

[12] MāoriOrg.Net www.maori.org.nz/Kotereo
[13] He Kupu o te Rā www.kupu.maori.net
[14] Te Wakareo-ā-Ipurangi www.reotupu.co.nz/wakareo/introduction.cfm
[15] Williams at NZETC www.nzetc.org/tm/scholarly/tei-WillDict.html
[16] Ngata at Learning Media www.learningmedia.co.nz/ngata
[17] Te Aka www.maoridictionary.co.nz
[18]*English-Māori Word Translator (No longer active) http://www.translator.wananga.ac.nz
[19] Te Tai Tokerau Papakupu www.edesignz.co.nz/dictionary/index2.htm
[20] Māori Mathematics Dictionary www2.nzmaths.co.nz/maori/Dictionary
[21] Māori Sciences Dictionary www.putaiao.tki.org.nz/Papakupu-Putaiao
[22] Microsoft Māori www.microsoft.com/nz/maori
[23] Google in Māori www.google.co.nz
[24] Google Translator Toolkit http://translate.google.com/toolkit
[25] Te Ara www.teara.govt.nz
[26] Te Ngutu Kura www.maorispellchecker.net.nz
[27] Te Haemata Web Store http://reostore.haemata.co.nz
[28] Unicode www.unicode.org
[29] Te Whare Wānanga o Awanuiārangi: eWānanga Login http://ewa.wananga.ac.nz
[30] WebSol Ltd is now owned by Intuto www.intuto.com
[31] Ethnologue: Languages of the World www.ethnologue.com
[32] Bredge LMS www.go-eknowledge.com/lms.htm
[33] Blackboard LMS www.blackboard.com
[34] Building Bilingual Websites www.translatorsbase.com
[35] Kuwait Bilingual School www.kbs-edu.com
[36] Google Translate http://translate.google.com
[37] Moodle: Open Source Learning Tool www.moodle.org
[38] New Moodle 'Bilingual Interface' http://tracker.moodle.org/browse/MDL-16887
[39] Hawaiian Language Revitalisation www.olelo.hawaii.edu/khuok
[40] Māori Language Info www.maorilanguage.info

Author Notes

Peter J Keegan is a senior lecturer in Māori Education at The University of Auckland, New Zealand. Te Taka Keegan is a senior lecturer in Computer Science at the University of Waikato, Hamilton, New Zealand. Dr Mark Laws was an associate professor at Te Whare Wānanga o Te Awanuiārangi, Whakatāne, New Zealand.

"E te rangatira, e te hoa pūmau Maaka, me pēwhea ngā kupu hei whakawaha tiki i te mate tāruru nui, i te korengia ōu? Ko te aroha anō ko te whakamutunga i a koe ngā kakano i purapuratia mai ka ora mō ake tonu."

E-mail: p.keegan@auckland.ac.nz