1-2016

Primary and Secondary Virtual Learning in New Zealand: Examining Barriers to Achieving Maturity

Michael K. Barbour
Sacred Heart University

Niki Davis
University of Canterbury, New Zealand

Derek Wenmoth
CORE Education, New Zealand

Recommended Citation

Barbour, M., Davis, N. & Wenmoth, D. (2016). Primary and Secondary Virtual Learning in New Zealand: Examining the Process of Achieving Maturity. International Journal on E-Learning, 15(1), 27-45. Chesapeake, VA: Association for the Advancement of Computing in Education (AACE).

International Jl. on E-Learning (2016) **15**(1), 27-45

Primary and Secondary Virtual Learning in New Zealand: Examining Barriers to Achieving Maturity

MICHAEL BARBOUR
Sacred Heart University, United States
mkbarbour@gmail.com

NIKI DAVIS
University of Canterbury, New Zealand
niki.davis@canterbury.ac.nz

DEREK WENMOTH
CORE Education, New Zealand
derek.wenmoth@core-ed.ac.nz

Invited as a paper from SITE 2012

This article describes the organisational development of virtual learning in networked rural schools in New Zealand, specifically the obstacles that e-learning clusters of rural schools face in their journey to sustainability and maturity through the lens of the Ministry's Learning Communities Online Handbook. Analysis of a nationwide purposeful sample identified three common barriers: a lack of a coherent vision; difficulty in sustaining necessary funding and resources; and of the need for more collaboration within and between clusters. Based on these findings, it is recommended that VLN e-learning clusters develop specific strategies to encourage greater collaboration between schools and work towards greater consistency between their activities, including professional and organisational development and also of the approaches to virtual learning.

Virtual and online learning is becoming increasingly relevant and accessible to students in the school sector worldwide (Powell & Barbour, 2011; Davis, Eickelmann & Zaka, 2013). In New Zealand the Ministry of Education's Ultrafast Broadband in Schools initiative is on target to supply broadband Internet access nationwide by 2016, and the related Network for Learning (N4L) is improving access to resources and networking nationwide (Ministry of Education, 2012; Davis, 2015). Challenged by geography, with ongoing natural disasters such as earthquakes and floods, New Zealand has already developed multiple programs, types of programs, legislative and policy regimes that affect the development of such distance learning for students in primary and secondary education. There are five main types of providers that have increasingly adopted online and blended learning: the Virtual Learning Network (VLN) e-learning clusters of schools that collaborate to teach less common subjects; Te Aho o Te Kura Pounamu/The Correspondence School (TCS) that offers courses and whole programs nationwide (Davis, 2015); three regional health schools to support students with health challenges; and courses that are offered online to secondary school students by some tertiary institutions.

This article provides a case study of the Ministry of Education's VLN of e-learning clusters of mainly rural schools in 2011, which by then had evolved into 15-20 individual clusters throughout the country. Each of these VLN e-learning clusters were created to address different needs in a range of geographic locations through various funding initiatives, which stimulated each e-learning cluster to focus on different aspects of e-learning (Powell & Barbour, 2011). The purpose of this research was to study the organizational development of primary and secondary online learning or virtual schooling in New Zealand, specifically how the Ministry of Education's (2011) *Learning Communities Online* (LCO) Handbook that had been developed to support VLN e-learning clusters had been used to inform that development and to provide online illustrations to inform further developments. The study also investigated their resilience by identifying common barriers that e-learning clusters faced in their development and how mature and sustainable clusters overcame those barriers.

Our goal for this article is to explore these common challenges e-learning clusters faced during their development. The article begins with an overview of the development of primary and secondary online education in the schooling sector of New Zealand, followed by a description of the methodology. Next, three common barriers that existing and emerging e-learning clusters have or are likely to face in their development are discussed, including a further interpretation of the data suing Davis' arena of change with digital technologies in education (Davis, Eickelmann, & Zaka, 2013). This leads into two recommendations that are reviewed at the end of the article.

LITERATURE REVIEW

One of the difficulties with research in this field is the terminology surrounding online learning, virtual schooling and e-learning. The Ministry of Education (2006) defined e-learning as "learning and teaching that is facilitated by or supported through the smart use of information and communication technologies" (p. 2). The reality of the New Zealand context is that many of the e-learning clusters that existed in 2011 were established with the support of Ministry of Education funding for e-learning projects that may or may not have included an element of online or virtual learning. For the purposes of this article, the term e-learning is used in line with the Ministry's definition and the term online learning to refer to the provision of "courses through distance learning methods that include Internet-based delivery" (Clark, 2000, p. i). In addition, because primary and secondary (or K-12) online learning is often referred to as 'virtual schooling' in North America, the use of the term virtual schooling is maintained for that North American literature.

The Development of Primary and Secondary Online Learning in New Zealand

While the use of distance education at the primary and secondary levels began in New Zealand around 1922 with the introduction of the nationwide TCS (Davis, 2015), the use of online learning began with the creation of the Canterbury Area Schools' Association Technology (CASAtech) project in 1993 (Wenmoth, 1996) that later became the Canterbury Technology Schools Project (CANTAtech) in 1996, then CantaNet after it merged with AorakiNet (CantaNet would eventually become NetNZ in 2014, following a merger with OtagoNet). CantaNet was followed by followed by the OtagoNet and FarNet e-learning cluster around 2001-2002 (Bennett & Barbour, 2012; Pullar & Brennan, 2008). In 2003, the VLN was officially established as an initiative of the eSection of TCS, in partnership with the Ministry of Education and the various rural e-learning clusters that had been independently developing throughout the country (e.g., CantaNet, OtagoNet, FarNet, etc.). The primary focus of the VLN was to provide a brokerage service for the sharing of courses and resources between these clusters of schools, plus access to Ministry funded infrastructure including video conferencing, *Moodle* LMS and ePortfolio software (i.e., *Mahara*).

Through successive information communications and technology strategies implemented by various ministries, the physical infrastructure and human expertise developed to allow the VLN to eventually grow by 2011 into 18 geographic e-learning clusters providing online learning (Dewstow & Wright, 2005; Powell & Barbour, 2011; Roberts, 2010; Wright, 2010; Zaka, 2013). Parkes, Zaka and Davis (2011) even describe the development of

a super cluster that has come together to explore the potential of blended learning in the CantaNet and WestNet clusters (i.e., the Southern Central Divide ICTPD cluster). In April 2010, the Virtual Learning Network-Community (VLN-C) was oficially constituted to formalise and extend the cooperation between the individual e-learning clusters (Wenmoth, 2011).

In 2004, ePrincipals led by Derek Wenmoth with support from the Ministry of Education produced the initial version of a handbook to assist schools in forming online learning clusters was published. Entitled the *LCO Handbook*, this publication contained a matrix to guide development through the phases from initial conception to implementation. During 2010 the *LCO Handbook* was extensively revised, including an additional stage sustainability and maturity to the LCO matrix and released in early 2011 (Ministry of Education 2011).

What is Known About Primary and Secondary Online Learning in New Zealand

In 2006, the International Association for K-12 for Online Learning (iNACOL) reported that while the use of distance education and online learning at the primary and secondary level occurs in many jurisdictions around the world, the organisation of these programs into single entities or schools is largely a North American phenomenon (Powell & Patrick, 2006). While this perspective was a somewhat limited, it did underscore how little is known about primary and secondary online learning outside of Canada and the United States.

The claim that there is a lack of knowledge about primary and secondary online learning in countries like New Zealand was supported by Barbour (2011), who examined 262 articles from the main distance education journals for Australia (i.e., *Distance Education*), Canada (i.e., the *Journal of Distance Education*), New Zealand (i.e., the *Journal of Distance Learning* – now the *Journal of Flexible, Open, and Distance Learning*), and the United States (i.e., the *American Journal of Distance Education*) from 2006 to 2010. He found only 24 of the 262 articles related to primary and secondary distance education and only one article that focused on primary and secondary distance education in New Zealand. Similarly, an examination of *Computers in New Zealand Schools: Learning, Teaching, Technology* – the main technology-focused practitioner publication in New Zealand – since 1998 revealed only 15 out of 129 articles on primary and secondary online learning.

Research into the organisation of online education in New Zealand schooling is scarce and rarely from the organisational perspective, the only New Zealand research-focused article that Barbour (2011) identified was Roberts (2009), which described the history and development of video conferencing as used in the primary and secondary environment by the VLN

e-learning clusters. In addition Stevens' (2011) thesis researched VLN leadership, Pratt and Pullar (2013) described the OtagoNet model, and Zaka (2013) provided an interesting case study of a school embedded in the CantaNet cluster. Almost all of the practitioner-focused articles from *Computers in New Zealand Schools* had an emphasis on how eTeachers or ePrincipals were using various tools to deliver online distance education, as well as more recent developments in course design for middle school students (Lowerns & Hartnet, 2015). In 2011 nationally funded projects had focused on the experience of the student in VLN e-learning cluster courses (Bolstad & Lin, 2009; Pratt & Trewern, 2011). More recent research focused on the student experience includes the indigenous Māori who are 'priority learners' in New Zealand identified has both relevance (Barbour & Bennett, 2013) and challenges, including Māori language revitalization (Jeurrison, 2015). Clearly there is a need for more research into this mode of educational delivery that first began almost two decades ago.

METHODOLOGY

The purpose of this research study was to capture, in a range of ways, information that would contribute to the knowledge base about the development of online learning in New Zealand, in particular, how the *LCO Handbook* was being used to assist and inform this development.[1] From this general purpose, two specific goals were identified in 2011:

(a) provide understandings of how schools involved are collaborating, and the impact and contribution of the LCO Handbook to their development and success; and

(b) to capture a series of case studies to help illustrate aspects of the LCO Handbook guidelines, and to provide examples of effective practice.

Based on these goals, two research questions were identified:

1. What common barriers do e-learning clusters face in their development towards maturity and sustainability?
2. How have mature and sustainable clusters overcome those barriers?

Given the exploratory nature of the proposed research study, a single case study with multiple embedded units of analysis was selected as an appropriate methodology (Yin, 2003). In this model, the VLN was the case, with each of the current and emerging clusters a unit of analysis within that case. The delay in publishing the details of this research serve well to protect anonymity in this relatively small population.

1 As outlined in the contract between the Distance Education Association of New Zealand (DEANZ) and the Ministry of Education.

The data collection methods included site visits to a selection of clusters across the nation to record 48 unstructured interviews with current and former ePrincipals, eTeachers, eDeans/Site Facilitators/Local Coordinators, other member school personnel, and students. The researcher also conducted observations of video conferencing classes and tutorials (i.e., synchronous online learning time), as well as students working during their scheduled asynchronous online learning time. Finally, documents, images and other physical artifacts from the individual schools and clusters were also collected. Overall, evidence was collected from individuals representing nine current and emerging clusters and site visits to 13 different schools (see Table 1 for a complete list of data collected). The study employed a purposeful sampling technique (Patton, 1990; Schatzman & Strauss, 1973). Informed by ePrincipals and national experts, the clusters were purposefully selected so as to include mature practice and locations where rich data was likely to be available. Where relevant, additional data were requested via email following the site visits.

Table 1
An overview of data collection and participants form 9 clusters and 13 schools

Method of Data Collection	Data Collected
Interviews	10 former & current ePrincipals
	8 VLN cluster member school Principals and Deputy Principals
	12 eTeachers, eDeans / Facilitators / Supervisors
	18 Students
Observations	12 synchronous lessons (using video conferencing)
	10 asynchronous study sessions
Documents	ePrincipal reports
	VLN-C documentation
	Asynchronous course content
	Data collected by individual clusters
	School newsletters
	Digital images from site visits
	Plans of a new building

Although the LCO matrix guided the initial analysis in the 2011 to ensure adequate coverage of the system of online learning in New Zealand, the analysis was also inductive and did not assume that the matrix was correct (Ezzy, 2002; LeCompte & Preissle, 1993). The three researchers reviewed the material in several stages.

Following early review of the large dataset, subsequent analyses aimed to identify clear illustrations of one cell within the matrix, although this did not prove to be a simple task. The uneven spread of the illustrations across the matrix became clear with time, as did the way in which the digital stories and artefacts could be applied across more than one cell. Digital stories and artifacts were produced, and then member checked with the main participant(s). These have been incorporated into the online resource for the *LCO Handbook*[2] by linking to one of more appropriate cells of its matrix in the online version. This process of member checking and publication has provided a means of verification with the profession and no requests to make changes to represent the evidence more accurately have been received.

FINDINGS

A total of 14 digital stories and artifacts were developed and published in the matrix of the LCO Handbook (see http://www.vln.school.nz/lcomatrix/). The *LCO Handbook* envisaged each VLN cluster was as a learning community online or LCO. Each illustration may be accessed by clicking on the relevant cell on the interactive matrix. The longer description of that cell ends with the illustrative material, where available. These illustrations and the earlier evidence were further analyzed to provide answers to the research questions. The research questions focused on common barriers that clusters faced during their development and the strategies though which more mature and sustainable clusters were able to overcome those barriers. Three barriers were identified as being common among the clusters: lack of vision; funding, resources and the role of the ePrincipal; and lack of inter-cluster and intra-cluster co-operation. In many instances there was a great degree of overlap between these three barriers.

Barrier 1: Lack of Vision

The need to create a vision for an e-learning initiative is critical and was clearly evident in this data. A vision provides leaders with a common goal (Schrum & Levin, 2012) that they are able to work towards, along with a way to communicate the overall purpose and function of the cluster to potential partners and outsiders. One of the most interesting findings that emerged was that clusters that had the greatest level of support from their partner or participating schools were those able to articulate a vision for the cluster that went beyond the provision of distance education courses and opportunities that the tools could provide. Those clusters whose vision focused on the ability to provide distance education across the participating schools, or were based solely on teachers being able to use the tools to connect their students or themselves with like-minded colleagues, were the same clusters that were struggling to exist or were failing to emerge.

2 See http://www.vln.school.nz/pg/groups/2644/lco-handbook/ and http://edtalks.org/video/michael-barbour-new-zealands-virtual-learning-network for copies of these stories and artifacts.

The process of establishing or reestablishing a vision was critical to both emerging and struggling clusters. There were some struggling clusters where the number of participating schools, and even the level of participation by those schools still involved in the cluster, had decreased significantly. In contrast, many of the emerging clusters were located in urban areas, where the majority of participating schools would have large student populations. This complicated the visioning process for these emerging clusters, as the leadership of these large, urban schools was under the mistaken impression that they could offer all of the curricular opportunities demanded by their students. This was further complicated by the fact that schools in the same local area competed against one another for potential students. These two factors made creating a vision that included the sharing of resources and the provision of distance education a difficult sell for the cluster leadership. At the time of this study in 2011 there were few urban examples for these emerging clusters to look to for guidance. However, the participation of two Auckland-area schools in the FarNet and OtagoNet e-learning clusters could indicate some of the benefits for an urban school in participating in an existing e-learning cluster.

At the other end of the spectrum, many of the more sustainable (often older) clusters had begun the visioning process as a part of the specific funding initiative that had supported the creation of their cluster. In many instances, the e-learning cluster still retained much of that original vision and this may have been facilitated by little change in leadership or change that had come from within the cluster. Often, these cluster retained much of their original vision because that vision tended to be owned by individuals within the clusters, although it may not have been owned by the cluster as a whole. Thus the vision did not appear particularly strategic, instead relying on the energy, drive and passion of particular individuals. While these leaders remained with the cluster, and continued to take an active role those participating in the cluster, they ensured its sustainability.

However, while this institutional history has allowed many of these clusters to become sustainable with a well-defined vision for the schools that support them, very few of these clusters have reach maturity. The 2011 *LCO Handbook* combined sustainability and maturity into a single phase. In 2010, there were several e-learning clusters had reached the stage were their existence was not in question (i.e., the cluster was sustainable). However, there were no clusters that had reached the stage where the cluster was able to undertake a re-visioning process to update their mission to accommodate these changes (i.e., the cluster had reach maturity). For example, there was one cluster where the ePrincipal indicated that the participating schools were pleased with the current membership. However, if one or more of the larger, more urban schools within their geographic region were to join

the cluster, then other rural members may leave. In this respect it is interesting to note that since 2011 a new cluster called HarbourNet emerged in the Auckland region merged with FarNet, but that collaboration was not sustained and they became two separate clusters again (Carolyn Alexander Bennett, Personal Communication). Such challenges to modification of a cluster's vision for the purpose of sustainability and growth suggest that there may need to be a separation of sustainability and maturity into two separate stages of development.

Barrier 2: Funding, Resources, and the Role of the ePrincipal

As expected of any e-learning initiative, issues surrounding funding and resources were a common barrier. Adequate and stable funding was vital to sustainability and maturity across multiple schools, in some instances covering massive and challenging geography. The necessary funding and resources for e-learning clusters described in almost every interview included funding for the role of the ePrincipal and other cluster leadership, teachers for the distance education programme (both eTeachers to teach the courses and eDeans (Facilitators or coaches) to support students at the local or school level), professional development (both face-to-face and online) for those involved in cluster activities, and the asynchronous (e.g., learning management system) and synchronous (e.g., videoconferencing bridge and equipment) tools. In some instances, VLN e-learning clusters relied upon the support from their participating schools to provide its funding and resources, whereas other clusters relied upon the Ministry of Education or some nationally funded support. Pullar and Pratt (2013) provide an illustration of OtagoNet's arrangements of 'reprocity' among the cluster's schools. Such reciprocal benefits are also seen in the United States in Iowa Learning Online including a description of the roles that are key to such partnership models (Niederhauser, Davis, Roblyer, Gilbert, 2010).

However, as online distance education has no formal recognition within the schooling system in New Zealand, it was not supported by appropriate policy or any formal funding mechanism. Limited support was provided nationally for infrastructure requirements (the video conferencing bridge, Moodle LMS and other tools) and generally procured out of separate Ministry of Education budgets. Therefore the e-learning clusters had to negotiate resources from their schools and/or rely on government grants when such sources were available. These grants not sustained long-term were often were focused specific initiatives that forced clusters to expand or dilute their vision, such as including blended learning in the 'supercluster' mentioned earlier (Parkes, Zaka & Davis, 2011).

Most mature clusters negotiated with the schools in their e-learning cluster to fund the ePrincipal, eTeachers and the hardware required. As described by Pullar and Pratt (2013) in relation to OtagoNet most e-learning clusters expected participating schools to provide one eTeacher who taught a single course and then the school gained the opportunity to enroll the negotiated number students into the range of distance education course offered by that cluster, and sometimes a few courses offered by other clusters. Each school is also expected to provide an eDean to support students learning at a distance. Where the number of students participating increased, some ePrincipals requested such schools increase their contribution. However, no VLN e-learning cluster had a formal system in place to require any school to contribute additional distance teaching. The ePrincipal usually remained a member of staff in one of the member schools, which expected the member schools to cover part of that cost. Participating schools signed a formal agreement to contribute a percentage of a teaching unit (in the host school) or a specific amount of money to fund the leadership of the cluster. Participating schools were also responsible for purchasing and maintaining their own video conferencing equipment, along with any additional hardware, software and personnel to support this mode of distance education at their school. Schools principals who understood and bought into the cluster's vision were generally quite willing to accommodate these expenses.

However, for the struggling e-learning clusters it was often difficult to get participating schools to allocate the funding necessary for all of these resources, especially where the item had origionally been funded by a grant. National funding for two years had stimulated the role of ePrincipal and a business case could not be made for maintaining the funding for the position, which remained largely undefined (Wenmoth, 2011). Two years after the ePrincipal funding ended, Stevens (2011) found that there was little consistency in this key role although it was seen as critically important. For example, a variety of nationally funded projects had originally provided the necessary video conferencing and computer equipment and some schools found it challenging to plan for upgrade of this equipment, especially where there were a low number of students participating. In addition, some of the struggling clusters simply went without one or more of the items listed above within their cluster. For example, in 2011 the ePrincipal of TaraNet does so in addition to their full-time teaching position because there was no funding for the salary of an EPrincipal. The TaraNet example is an important one, because all ePrincipals interviewed emphasized the importance of having a full-time ePrincipal, but many indicated it was one of the most difficult things to get participating schools to fund. Similarly, all of the ePrincipals interviewed, as well almost all of the participating school principals and deputy principals, wished to see the Ministry resume funding of the

ePrincipal. Arguments for this funding ranged from the nature of responsibilities of the ePrincipal to the view that the ePrincipal should be viewed in much the same light as the principal of a regular school.

However, many ePrincipals were unable to articulate a clear vision for what the role of ePrincipal entailed. In addition, struggling clusters with a narrow vision focused tightly on the provision of distance education and/or clusters that had a relatively small number of students had particular difficulty in making their case. This appeared to have weakened the case for central funding of e-learning cluster leadership.

Barrier 3: Lack of Inter-Cluster and Intra-Cluster Consistency and Co-operation

In 2011 the VLN was a collection of largely regional networks of schools that had been established and developed through variety of funding initiatives. The specific focus of the funding programme(s) that supported the creation of a cluster had influenced its vision and activities. While there was some consistency in terms of activities (e.g., almost all of the e-learning clusters provide distance education offerings to their students), there was little consistency of vision across the clusters. This lack of consistency hindered national development of online learning practice or policy in New Zealand. Despite the creation of a national council, the VLN-C, views on the development of online learning throughout New Zealand remained varied although most agreed on the need for additional government resources. There were legitimate local concerns that a national system would not be attuned to and, even if it was familiar with those local issues, unable to accommodate. This was part of the culture of New Zealand in 2011 and remains linked with the very diverse ecologies of New Zealand plus the impact of self-managing schools. For example, Wylie (2012; 2013) describes the many ways in which schools in New Zealand are disconnected from the Ministry of Education and from one another. She suggests that much stronger connections and relationships are needed, locally and centrally, to address the fundamental challenges that schools face today.

In 2011 there appeared to be room within the existing system for a greater level of consistency and cooperation. In fact, 30 of the 61 unique examination level senior high school courses listed in the VLN brokerage website for 2011 had more than one cluster or provider offering the course.[3] For example, in 2011 there were five clusters that offered level three art history and it is also offered by TCS. Similar concerns arose for the primary level offerings; both BayLink and the VLN Primary had separate Te Reo Māori courses listed in the VLN brokerage site. In addition, one of the benefits of participating in the VLN was the facility for subject matter teachers to

3 See http://pol.vln.school.nz/

collaborate with each other online, according to the school leaders interviewed, but there was no evidence of such collaboration and this was confirmed by the eTeachers interviewed. There was a lack of consistency between course design and delivery, as well as little interaction between teachers of a similar course or subject area. The need to adapt to the variety of different approaches chosen by individual teachers may have impacted students' overall experience and their ability to achieve in the e-learning environment.

The lack of consistency appeared to be a major barrier, both to the further development of a specific clusters and the VLN-C nationally. It should be noted that the issue multiple providers focusing on many of the same subject area is a natural consequence of the emergent nature of these clusters and it may have been a strength through the developmental stage supporting the cluster to address local needs of teachers, learners and their local communities. However, as the clusters grow towards the "Maturity/Sustainability" stage, the challenge of limited resources suggested that duplication of services could undermine sustainability.

DISCUSSION

The importance of vision and leadership for school development has long been recognized (Timperley, Wilson, Barrar & Fung, 2007; Yee, 2000). Recently the complexity of leading technology-rich schools has reinforced the importance of vision (Schrum & Levin 2012; Makey, Davis, & Stuart, 2015). The need for school leaders, including school principals, ePrincipals and government agencies to collaborate in the development of vision at multiple levels to inform the development of e-learning across schools is a strong theme in these findings and a smaller preceding study in New Zealand (Stevens & Davis, 2011). Powell and Barbour (2011) described how the development of the VLN e-learning clusters was encouraged by synergetic government initiatives and strategies that may not have been specifically designed to foster virtual schooling. A lack of clear vision increased challenges for the leadership of New Zealand's e-learning clusters in 2011, including marketing, sufficient finance and other support from cluster schools and national agencies.

The lack of funding and inadequate resources is a common theme in educational technology initiatives (Cuban, 2001; Reeves, 2000, 2003). It has also impacted online learning programs offered to primary and secondary students in other jurisdictions (Berge & Clark, 2005; Ferdig & Cavanaugh, 2010).

While national funding for the role of the ePrincipal had not proved sustainable, many of the schools in e-learning clusters had recognized a return on investment made by their school and remained willing to fund cluster

leadership. In these instances, the administration of the participating school has not seen virtual learning as an "additive" cost to their school's budget. For example, the choice not to update a school's video conferencing equipment or support an ePrincipal will save an "additive" cost, but will result in the loss of students who moved away because they missed access to the subjects. When a sufficient number of students left, it affected operational budgets, including staffing and facilities. Schools that have chose to invest in participation in their e-learning cluster were able to retain more students and consequently retain the funding. For example, Stevens (1995, 2005; Stevens & Moffat, 2003) aptly illustrated this point when he documented how the roll of Oxford Area School grew from 300 students to 500 students over a period of two and a half years as a result of student retention due to their participation in the CASAtech e-learning cluster.

The lack of intra-cluster consistency and cooperation was not surprising given that these clusters were developed under different funding initiatives with a variety of goals (Powell & Barbour, 2011; Stevens, 2011). However, it was surprising to find so little inter-cluster cooperation beyond the brokerage of courses across the clusters and membership of the nationwide VLN-C It had been expected that eTeachers, in particular, would be poised to leverage the distance education resources beyond their own distance teaching, as online learning have been found to be more technically savvy and willing to experiment (Archambault & Kennedy, 2014; Archambault & Crippen, 2009; Dawson & Dana, 2014; Rice and Dawley, 2007). In contrast, collaborative course development is common within virtual schools that offer a range of distance courses where fits with their culture and practice Davis et al. (2013), but such collaborative preparation and delivery is challenging in self-managed schools that may compete for students. Beck and Maranto (2014) identified that opportunities to update personnel practices to empower such collaborate development within a virtual school, but regret to report that they did not find any in their survey of charter schools in the United States.

The four years that have passed since the collection and first reporting of the evidence, which was aligned with the *LCO Handbook* have included an increasing critique of such application of maturity models to changes with digital technologies in education and a move to recognize the value of interpreting change using an ecological perspective. Davis, Eikelmann and Zaka (2013) applied Davis' arena of change with digital technologies in education to virtual schooling (see Figure 1), and illustrated it with Zaka's (2012) thesis case study of a class in a school embedded within the CantaNet cluster.

From this perspective the evolution of schooling with e-learning is subject to changes in behavior in many embedded and interlinked ecosystems within the school, the region, nationally and globally.

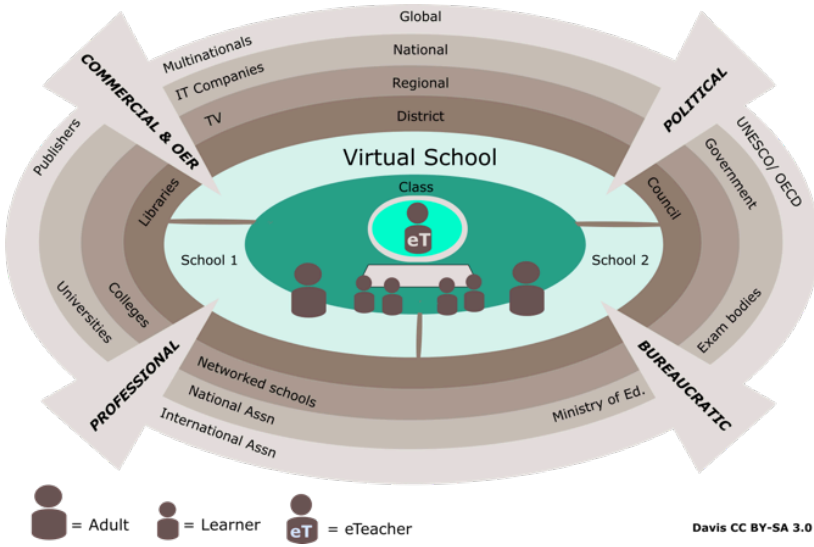

Figure 1. Davis' global arena of change with ICT in schooling showing a distant teacher working with students in at least two schools, as well as the ecosystems within which a teacher is nested at the centre (developed from Davis, Eickelmann & Zaka 2013 p. 442).

Applying Davis' arena of change may explain the lack of collaboration across schools and clusters. These VLN e-learning cluster eTeachers remained most closely involved in the ecologies of their respective schools adapting only the teaching of one course offering to e-learning with occasional support from their ePrincipal and possibly occasional communication with their school's eDean. This can be contrasted with the ecology of eTeachers who work off campus and sometimes co-located with other eTeachers in a virtual school or virtual schooling service (see Davis & Niederhauser [2005] for one contrast of such practices). Processes that could lead to the maturity envisaged in the matrix of the *LCO Handbook* in 2011 have little impact on these eTeachers or other school staff including school principals.

RECOMMENDATIONS

This study and the literature reviewed lead us to make two recommendations that are discussed in this section:

1. Government agencies, clusters and others offering e-learning in the schooling sector consider strategic investment to build leadership capacity in New Zealand to deploy distance learning in ways that benefit national and individual school visions.
2. A national survey of virtual schooling is undertaken on a regular basis to inform policy as well as the whole sector, as it has done in Canada since 2008 and the United States since 2004

Primary and secondary distance education including online networked schooling has evolved to meet relevant local and regional conditions of many self-managing schools throughout New Zealand, particularly those in rural areas. It has continued to evolve since the findings of this study were gathered in 2011. This study and other research currently underway in Northland funded by the nationwide Network for Learning indicate that further strategic investment is likely to be required to make the most of online networked schooling in New Zealand. We recommend that such investment include support for increased regional and national capacity building with school principals and ePrincipals, as well as other agencies and services.

Two other countries that have also evolved a range of online provision in primary and secondary schooling are Canada and the United States. All three countries began their online learning journey about the same time, and all three countries have seen the development of multiple programs providing online learning opportunities and that development has occurred in an uneven fashion with some programs thriving and others struggling. Some differences in Canada and the United States can be explained with regulatory regimes and government actions with individual provinces or states. These differing systems of regulation and activity gave rise to a series of annual reports describing the policies and legislation governing primary and secondary online learning, along with the level of online learning activity, in each of the provinces and states (see *State of the Nation: K-12 Online Learning in Canada* and *Keeping Pace with K-12 Digital Learning in the United States* [Barbour & LaBonte, 2014; Gemin, Pape, Vashaw, & Watson 2015]).

While varying jurisdictions do not impact primary and secondary online learning in New Zealand, there are more widespread variations due to self-managing schools (Wylie, 2012) and an additional piece of legislation governing Te Kura TCS (Davis, 2015). Multiple programs, types of programs and partnerships have evolved. There are four main types of providers: the VLN e-learning clusters of schools; TCS Te Kura; the three health schools; and courses offered into schools by some tertiary institutions. One of the themes from our interactions with those involved in the delivery primary and secondary distance learning was a fundamental misunderstanding and/or lack of knowledge of other providers within the New Zealand context.

It is for these reasons we also recommend a national survey similar to those in Canada and the United States to inform policy as well as schools.

While these two recommendations are made in relation to Virtual Schooling in New Zealand they also have implications for other countries and globally. Capacity building for school principals is likely to be necessary in other countries and there is some evidence to suggest that leadership practices in Virtual Schools in the United States and other countries would also benefit by adopting more contemporary personnel practices to better enable learning within and across organizations (Beck & Maranto, 2014).

ACKNOWLEDGEMENTS

This research was supported with funding from the Ministry of Education, VLN and participating institutions, including Wayne State University and the University of Canterbury. It was managed for the Distance Education Association of New Zealand through CORE Education, which also granted ethical approval. We would like to thank them all for their support.

References

Archambault, L., & Crippen, K. (2009). K-12 distance educators at work: who's teaching online across the United States. *Journal of Research on Technology in Education, 41*(4). 363-376.

Archambault, L., & Kennedy, K. (2014). Teacher preparation for K-12 online and blended learning. In R. Ferdig & K. Kennedy (Eds)., *Handbook of Research on K-12 Online and Blended Learning* (pp. 225-244). Pittsburgh, PA: Entertainment Technology Center Press, Carnegie Mellon University.

Barbour, M. K. (2011). The promise and the reality: Exploring virtual schooling in rural jurisdictions. *Education in Rural Australia, 21*(1), 1-20.

Barbour, M. K., & LaBonte, R. (2014). *State of the nation study: K-12 online learning in Canada.* Cobble Hill, BC: Canadian E-Learning Network. Retrieved from http://canelearn.net/wp-content/uploads/2015/10/StateOfTheNation2014.pdf

Beck, D., & Maranto, R. (2014). Empowering teachers? An exploratory study of personnel practices in virtual charter schools in the United States. *Journal of Open, Flexible and Distance Learning, 18*(2), 59-81.

Bennett, C., & Barbour, M. K. (2012). The FarNet journey: Perceptions of M ori students engaged in secondary online learning. *Journal of Open, Flexible & Distance Learning, 16*(1). Retrieved from http://journals.akoaotearoa.ac.nz/index.php/JOFDL/article/view/105

Berge, Z. L., & Clark, T. (2005). *Virtual schools: Planning for success.* New York, NY: Teachers College Press.

Blomeyer, R. L. (2002). *Online learning for K-12 students: What do we know now?* Naperville, IL: North Central Regional Educational Laboratory. Retrieved from http://www.ncrel.org/policy/pubs/pdfs/pivol11.pdf

Clark, T. (2000). *Virtual high schools: State of the states - A study of virtual high school planning and preparation in the United States.* Center for the Application of Information Technologies, Western Illinois University. Retrieved from http://www.ctlt.iastate.edu/research/projects/tegivs/resources/stateofstates.pdf

Cuban, L. (2001). *Oversold and underused: Reforming schools through technology*, 1980–2000. Cambridge MA: Harvard University Press.

Davis, N. E. (2011). Online and blended learning rolling into New Zealand schools. *Computers in New Zealand Schools, 23*(1). Retrieved from http://education2x.otago.ac.nz/cinzs/mod/resource/view.php?id=139

Davis, N. E. (2015). New Zealand's development of Ultrafast broadband in schools including the largest nationwide school. In P. Twining, N. E. Davis, & A. Charania (Eds.). *Developing new indicators to describe digital technology infrastructure in primary and secondary education* (pp. 67-70). Montreal, CA: UNESCO Institute for Statistics.

Davis, N. E., Eickelmann, B., & Zaka, P. (2013). Restructuring of educational systems in the digital age from a co-evolutionary perspective. *Journal of Computer Assisted Learning, 29*(5), 438-450.

Davis, N. E., & Niederhauser, D. S. (2005). Socio-cultural analysis of two cases of distance learning in secondary education. *Education and Information Technologies, 10*(3), 249-262.

Dawson, K., & Dana, N. F. (2014). Professional development for K-12 online teachers. In R. Ferdig & K. Kennedy (Eds)., *Handbook of Research on K-12 Online and Blended Learning* (pp. 245-266). Pittsburgh, PA: Entertainment Technology Center Press, Carnegie Mellon University.

Dewstow, R., & Wright, N. (2005). Secondary school students, online learning, and external support in New Zealand. *Computers in the Schools, 22*(1), 111-122.

Ezzy, D. (2002). Qualitative analysis: Practice and innovation. London: Routledge.

Ferdig, R., & Cavanaugh, C. (2010). *Lessons learned from virtual schools: Experiences and recommendations from the field.* Vienna, VA: International Association for K-12 Online Learning.

Gemin, B., Pape, L., Vashaw, L., & Watson, J. (2015). *Keeping pace with K-12 digital learning: An annual review of policy and practice.* Durango, CO: Evergreen Education Group. Retrieved from http://www.kpk12.com

Harms, C. Niederhauser, D. S. N., Davis, N. E., Roblyer, M. D. & Gilbert, S. (2010). Educating Educators for Virtual Schooling: Communicating Roles and Responsibilities. In C. M. Stewart, C. C. Schifter, & M. E. Markaridian Selverian (Eds.) *Teaching and Learning with Technology: Beyond Constructivism. Routledge Research in Education* (pp. 70-88) London and New York: Routledge

Jeurissen, M. (2015). Learning te reo M ori via online distance education: A case study. *Journal of Open Flexible and Distance Learning, 19*(1). Retrieved from http://journals.akoaotearoa.ac.nz/index.php/JOFDL/article/view/229

Lai, K. W., & Pratt, K. (2010). Technological constraints and implementation barriers of using videoconferencing for virtual teaching in New Zealand secondary schools. *Journal of Technology and Teacher Education, 17*(4), 505–522.

LeCompte, M. D., & Preissle, J. (1993). *Ethnography and qualitative design in educational research* (2nd ed.). San Diego: Academic Press.

Louwrens, N., & Hartnett, M. (2015). Student and teacher perceptions of online student engagement in an online middle school. *Journal of Open Flexible and Distance Learning, 19*(1). Retrieved from http://journals.akoaotearoa.ac.nz/index.php/JOFDL/article/view/241

Mackey, J., Davis, N. E., Stuart, C., Henderson, B., Rickard, K., Lye, A., Jeffries, T., & Simpson, P. (2015). Leading a technology rich school. *SET: Research Information for Teachers* (2), 17-25.

Ministry of Education. (2006). *ICT strategic framework for education 2006-2007*. Wellington, New Zealand: Author. Retrieved from http://www.minedu.govt.nz/~/media/MinEdu/Files/EducationSectors/PrimarySecondary/Initiatives/ICTStrategy/ICTStrategicFrameworkEducation.pdf

Ministry of Education. (2011). *Learning communities online handbook*. Wellington, New Zealand: Author. Retrieved from http://www.vln.school.nz/pg/groups/2644/lco-handbook/

Ministry of Education. (2012). *Ultra-fast broadband in schools*. Wellington, New Zealand: Author. Retrieved from http://www.minedu.govt.nz/theMinistry/EducationInitiatives/UFBInSchools.aspx

Parkes, S., Zaka, P., & Davis, N. (2011). The first blended or hybrid online course in a New Zealand secondary school: A case study. *Computers in New Zealand Schools: Learning, Teaching, Technology, 23*(1). Retrieved from http://education2x.otago.ac.nz/cinzs/mod/resource/view.php?id=149

Patton, M. Q. (1990). *Qualitative evaluation and research methods* (2nd ed.). Newbury Park, CA: Sage.

Powell, A., & Barbour, M. K. (2011). An Examination of Government Policies for E-Learning in New Zealand's Secondary Schools. *Journal of Flexible and Distance Learning, 15(*1). Retrieved from http://journals.akoaotearoa.ac.nz/index.php/JOFDL/article/view/17

Powell, A., & Patrick, S. (2006). *An international perspective of K–12 online learning: A summary of the 2006 iNACOL international e-learning survey.* Vienna, VA: International Association for K–12 Online Learning.

Pullar, K., & Brennan C. (2008). Personalising learning for secondary students working in a blended (distance/face to face/vocational) learning environment. *Computers in New Zealand Schools, 20(*2), 6-16.

Reeves, T. C. (2000). Socially responsible educational technology research. *Educational Technology, 40*(6), 19-28.

Reeves, T. C. (2003). Storm clouds on the digital education horizon. *Journal of Computing in Higher Education, 15*(1), 3-26.

Rice, K., & Dawley, L. (2007). *Going virtual! The status of professional development for K-12 online teachers.* Boise, ID: Boise State University. Retrieved from http://edtech.boisestate.edu/goingvirtual/goingvirtual1.pdf

Roberts, R. (2009). Video conferencing in distance learning: A New Zealand schools' perspective. *Journal of Distance Learning, 13*(1), 91-107.

Roberts, R. (2010). Increasing access for learners: The Virtual Learning Network. In V. Ham & D. Wenmoth, (Eds.). *e-Learnings: Implementing a national strategy project for ICT in education,* 1998-2010 (pp. 144–152). Christchurch, New Zealand: CORE Education.

Schatzman, L., & Strauss, A. L. (1973). F*ield research: Strategies for a natural sociology.* Englewood Cliffs, NJ: Prentice Hall.

Schrum, L., & Levin, B. (2012). *Evidence-based strategies for leading 21st century schools.* Thousand Oaks, CA: Corwin Press.

Stevens, K. [Ken]. (1995). Geographic isolation and technological change: A new vision of teaching and learning in rural schools in New Zealand. *The Journal of Distance Learning, 1*(1), 32-38.

Stevens, K. [Ken]. (2005). Some policy considerations in the changing relationship between area schools and New Zealand rural communities. *Social Policy Journal Of New Zealand Te Puna Whakaaro, 5*(1). Retrieved from http://www.msd.govt.nz/about-msd-and-our-work/publications-resources/journals-and-magazines/social-policy-journal/spj05/05-school-relationship.html

Stevens, K. [Ken]., & Moffatt, C. (2003). From distance education to e-learning: The organization of open classes at local, regional and national levels. In J. Bradley (Ed.), *The open classroom: Distance learning in and out of schools* (pp. 127-133). London: Kogan Page Limited.

Stevens, K. [Kerry]. (2011). *The distribution of instructional leadership on elearning clusters: An ecological perspective.* Unpublished Master's Thesis. University of Canterbury. Christchurch, New Zealand.

Stevens, K. [Kerry], & Davis, N. (2011). *Leadership of online distance learning in schools in New Zealand.* A Distance Education Association Webinar and University of Canterbury e-Learning Lab webinar. Retrieved from http://www.deanz.org.nz/home/index.php/online-seminars/past-webinars

Timperley, H., Wilson, A., Barrar, H., & Fung, I. (2007). *Teacher professional learning and development: Best evidence synthesis iteration* (BES). Wellington: Ministry of Education.

Wenmoth, D. (1996). Learning in the distributed classroom. *SET Research Information for Teachers, 2*(4). 1–4.

Wenmoth, D. (2011). *Business case: Virtual Learning Network Community (VLN-C).* Christchurch, New Zealand: CORE Education Ltd.

Wright, N. (2010). *e-Learning and implications for New Zealand schools: A literature review.* Wellington, New Zealand: Ministry of Education.

Wylie, C. (2012). *Vital connections*. Wellington, New Zealand: NZCER.

Wylie, C. (2013). Improving learning opportunities. Why schools can't do it on their own. *SET: Research Information for Teachers, 1*, 45-48.

Yee, D. (2000). Images of school principals' information and communications technology leadership. *Journal of Information Technology for Teacher Education, 9*, 287-302.

Yin, R. K. (2003). *Case study research: Design and methods* (3rd ed.). Thousand Oaks, CA: Sage Publications.

Zaka, P. (2012). *Blended teaching and learning in a New Zealand rural secondary school using an ecological framework.* Unpublished Master's Thesis. University of Canterbury. Christchurch, New Zealand.

Zaka, P. (2013). A case study of blended teaching and learning in a New Zealand secondary school, using an ecological framework. *Journal of Open, Flexible and Distance Learning, 17*(1), 24-40.