



TEACHING & LEARNING
RESEARCH INITIATIVE
NĀU I WHATU TE KĀKAHU, HE TĀNIKO TAKU

Extending innovative e-learning leadership

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Introduction/research aims/rationale

This project grew out of the desire to understand and share the strategies that successful school leaders use to identify, implement and integrate digital technologies in school settings. What may come naturally to some leaders presents significant challenges for others; the catalyst for this project was the opportunity to systematically investigate the leadership of one experienced principal who was highly competent digitally and who recognised the opportunity to support colleagues nationwide.

While digital technologies are a key element of future focused education and can be deployed to support pedagogical innovation, they frequently present complex problems for school leaders (Fullan 2011; Fullan & Langworthy, 2014). The New Zealand Curriculum (Ministry of Education [MOE], 2007, p. 36) explicitly states that “schools should explore not only how ICT can supplement traditional ways of teaching but also how it can open up new and different ways of learning.” As principals lead their communities and schools in developing and reviewing their school curriculum it is essential that there is a clear statement of intent regarding the use of digital technologies to not only support but also transform learning. Opportunities and challenges for transformation are likely to be increased in countries with self-managing schools, such as Flanders (Vanderlinde, Dexter, & van Braack, 2011) and New Zealand. Wylie (2013) clarifies this in her critique of New Zealand’s 21st century schools initiative.

In this project the Principal Investigator (PI) Dr Julie Mackey and CoPI Distinguished Professor Niki Davis worked collaboratively with key informant and co-researcher Carolyn Stuart, Principal of Tawa Intermediate School (TIS) and four other experienced principals (Peter Simpson, Belfast Primary School; Anne Lye, Churton Park School; Brendon Henderson, Newlands Intermediate School; and Trevor Jeffries, Levin Intermediate School) to identify and analyse effective e-learning leadership strategies, and to make these visible and accessible for other school leaders. The project was situated within the special context of leading and being prepared for change enabled by the Ultrafast Broadband in Schools (UFBiS) initiative and became informed of the Network for Learning (N4L) developments when Principal Stuart left TIS to become the Education Sector Lead for N4L in April 2013. The project was fortunate that the Acting TIS Principal, Keith Rickard, and the incoming TIS Principal, Brendon Henderson, continued to support the project. The researchers were also mindful to identify strategies that strengthen networks between schools and parents/whānau and the wider school community with the aim of addressing current inequities in educational outcomes and increasing opportunities for teaching and learning processes that support 21st century learners.

Our research question was: *How can school principals effectively lead equitable e-learning in collaboration with their school communities to improve student outcomes?*

Research design and methods

The overarching methodology was an in-depth, collaborative case study investigation of one intermediate school that was purposefully selected (Maxwell, 2005) for its intrinsic value. The pilot study conducted in 2012 had provided evidence that the school was operating at the “extending” and “empowering” levels of the e-Learning Planning Framework (MOE, 2014) with digital technologies firmly embedded and integrated in the vision, culture and practices of the school and influencing the five dimensions of the framework.

TIS was recognised as a leading school in its sustained and innovative use of digital technologies to transform teaching and learning and therefore it provided a valuable context within which to explore the opportunities, challenges and complexities of effective digital technology leadership in a school and its community. The purpose of the research was to identify and make explicit the leadership practices where technology had been applied to equitably transform practices that benefited students’ learning. The research was also designed to be equitable in the inclusive selection of the principals recruited by the case study principal (Davis, Mackey & Stuart, 2015); the participant researchers included principals of schools with fewer resources and more challenges.

In the spirit of TLRI, partnerships were embedded in the research design, which was inherently collaborative with the lead principal contributing to the development of the research proposal, and all of the principals joining the research team as co-researchers. These knowledgeable and experienced peers played a pivotal role by probing deeply into the nature, context, components, interrelationships and complexities of the case study (Yin, 2014) of effective digital technology leadership in the lead school. They engaged from the perspective of professional colleagues with an avid interest in understanding key strategies because, as Cohen and Manion (1994, p. 123) suggest, such “insights may be directly interpreted and put to use.” All of the participating principals worked alongside the university researchers and were able to draw on their own extensive experience of leading schools to guide, enrich and inform the data gathering, analysis and opportunities for dissemination. The underlying principle of engagement in this project recognised that, for transformative practice to be sustained, participants need to be closely involved in all aspects of the design and the investigations. A collaboratively-developed Code of Conduct guided the research team, and two leading international researchers, Professors Lynne Schrum (USA) and Bridget Somekh (UK) acted as critical friends to the project. In addition, a small advisory panel met with the researchers at critical points in the project and brought external expertise in the areas of Māori research, school leadership and digital technologies.

A key feature of the research design was the sustained nature of the investigation. This began with a pilot study by the university researchers, including preliminary observations and interviews in mid-2012. The two-year funded project followed and involved regular meetings of the whole project team (approximately one per term) including two 2-day retreats. These meetings were an important feature of the project as they enabled the participants to develop as a community of practice and to establish open relationships essential for the nature of the project. “The heart of learning in a (community of practice) is discourse and dialog to build personal, individual understanding and shared, group understanding” (Kirschner & Lai, 2007, p.128).

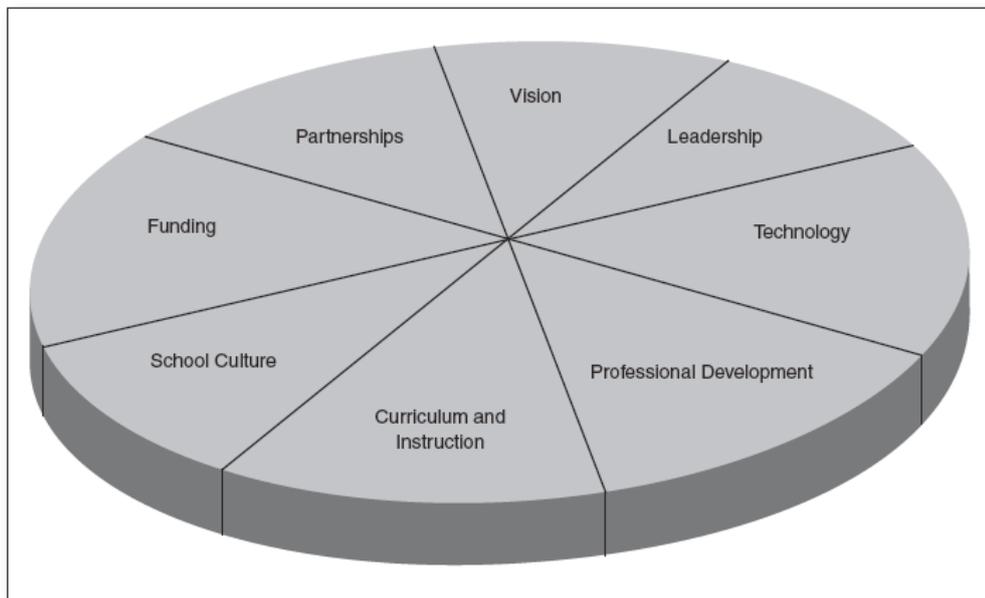
The project team used their full-day meetings to question and discuss technology leadership issues and strategies, and to exchange ideas, clarify insights, and build personal and shared understanding around themes emerging from findings. A highlight of the meetings was the opportunity to visit each school and better understand the particular contexts of fellow participants. Researchers were also supported asynchronously through the creation of a “blended research environment” by blending collaboration at its meetings with a group website in MyPortfolio (Schools) where a range of resources were archived and shared including draft and other publications and evidence (as agreed with the participant(s) following member checking). Over time this online environment became more of a repository and, in common with the case study school, Google Docs became more integrated for collaborative writing to complement phone calls, email and meeting times.

Data were collected from the case study school via classroom observations; interviews with the TIS lead principal, deputy principal, six teachers, groups of parents and students, the Board of Trustees, and the technology service provider; further interviews were conducted with the acting principal and the newly-appointed principal as well as the other principals; analyses of documents, meeting notes and websites. These researcher-led strategies were complemented by walk-throughs which enabled all of the project team to see the case study school in action on several occasions. This case material provided a vivid backdrop to the study but the real details and insights emerged from the sustained conversations recorded between the participating principals and the lead principal during the regular face-to-face meetings. These meetings enabled ideas to be revisited, and the strategies, implications and effects of leading digital technology initiatives within the school were discussed and interpreted over time.

Interview schedules were adapted from Schrum and Levin’s (2012) interview protocol from their research of award-winning schools in the USA. Levin and Schrum (2012) researched in-depth case studies of award-winning leaders of schools and districts where technology had been used successfully as a driver of school improvement. They identified a “jigsaw” of eight equally important pieces, all of which interact and are essential to sustain successful technology integration in K-12 schools: vision, leadership, school culture, technology planning and support, professional development, curriculum and instructional practices, funding

and partnerships. (See Figure 1.) These eight characteristics were adopted for deductive analysis of the data followed by inductive expansion to describe leadership processes and eventually a model to guide principals who lead future focused schools. Schrum and Levin's (2012) eight "jigsaw pieces" provided a better fit than the eLearning Planning Framework (eLPF) (MOE, 2014) which was dropped entirely after the evidence gathered from TIS during the first year was found not to fit within the eLPF matrix.

Figure 1. Eight dimensions of technology leadership



Schrum, L., & Levin, B. B. *Evidence-Based Strategies for Leading 21st Century Schools* pp. 1. Copyright © 2012 by Corwin Press. Reprinted by permission of SAGE Publications, Inc.

The collective analysis of the digital leadership within TIS found evidence and strategies related to all eight of Schrum and Levin's (2012) dimensions of technology leadership (see Figure 1). The team unanimously agreed that, while these dimensions are identifiable, they are interconnected and interact dynamically to enable and sustain technology integration in schools. The principals found the framework particularly helpful in thinking about and analysing their own leadership, and they frequently referred to particular dimensions when discussing the findings and examples emerging from the TIS case study. For example, a discussion about initiating BYOD implementation in a collaborating school might start with questions about the relative merits of different devices to support student learning and curriculum, but would soon expand to consider matters such as the ability of families and whānau to provide devices and the associated equity issues, opportunities for partnerships with the wider community for funding, questions about technical support and the ability of the school infrastructure to support multiple wireless devices, professional development for staff, and how the implementation of BYOD aligned with the vision of the school.

Figure 2: Tawa Intermediate School Vision Statement (in 2013)



Comparisons among different schools were also helpful in developing understanding of how the dimensions impacted on each other, and the need for leadership strategies to be adapted or translated for different contexts and at different stages of development, not merely copied or transferred. For example, in an early discussion about BYOD, one principal noted that staff were anxious about how BYOD would affect classroom practice and the implications for equity and cyber safety; whereas later in the project the same principal reported that the initial implementation had gone well and the leadership team were now thinking about collaborative professional development models and ways to make better use of technology to strengthen home-school partnerships, for example through classroom blogs. Other principals brought different challenges and questions to the discussion, for example concerns about the need for a coherent approach between the intermediate school and its contributing primary schools as well as the secondary schools in the region to minimise the financial impact of any BYOD strategy on families. These differences deepened the conversations and the researchers observed how the principals challenged and extended each other's thinking in ways that were specific to their contexts, for example:

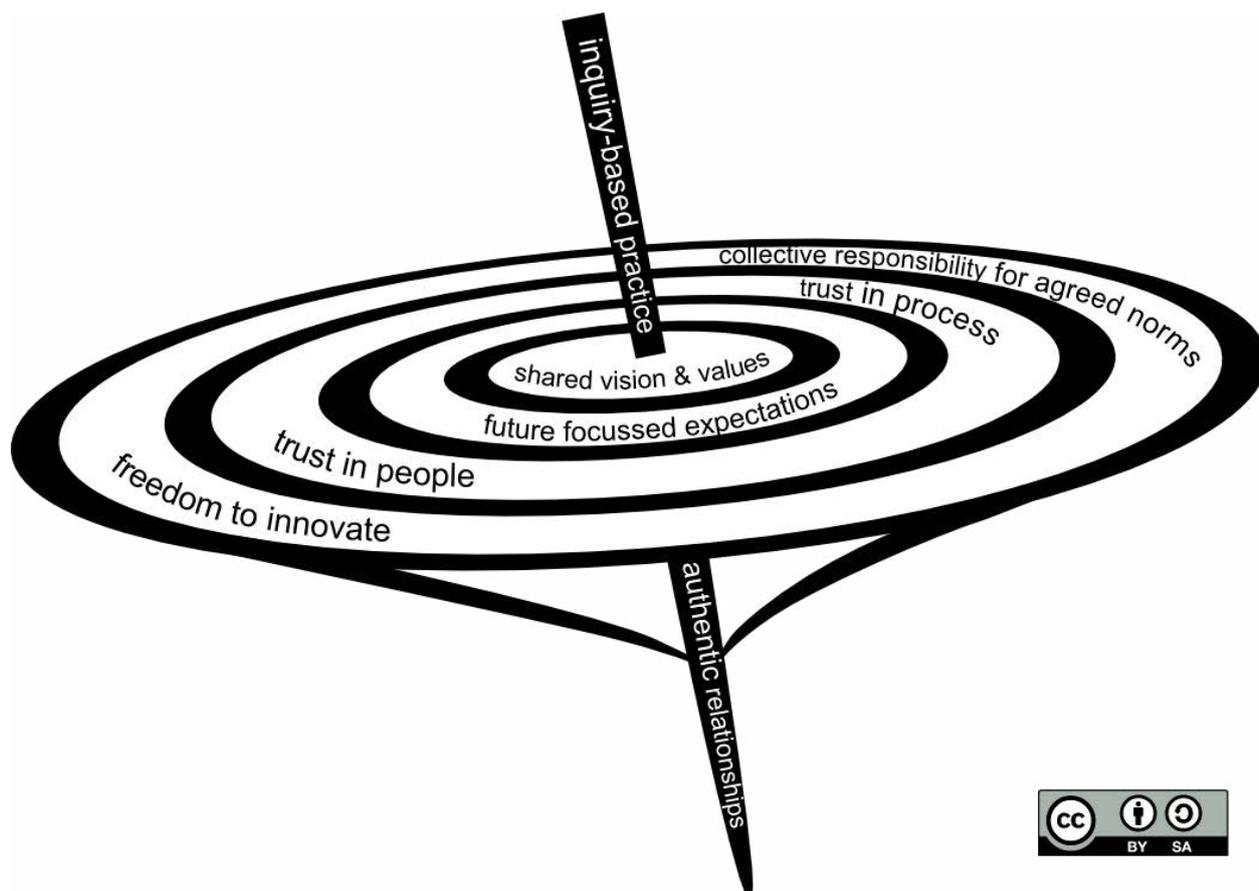
We were able to compare the TIS case study with our own contexts and to draw on international examples too through Lynne Schrum's work. While every context is a bit different, it is reassuring to share successful strategies and principles of effective leadership, and to really discuss the complexities involved in leading digital change in schools especially when embarking on a significant project like our BYOD implementation [in my school]. (Principal Lye, 6 February 2014)

These multiple perspectives generated many questions about the leadership strategies employed at TIS, and these strategies were articulated and clarified as they were revisited in light of emerging opportunities and challenges in the participants' schools over the 2 years of the project. Specific leadership strategies fell into broad approaches which were summarised as:

- developing a school-wide understanding of the role and importance of digital technologies to enable student learning and prepare students for the future in line with the school vision
- modelling technology use by senior leaders in the school and making sure teachers appreciated and experienced new technologies as learners themselves before being expected to use them in classrooms
- encouraging teachers to take risks and use technologies in responsible ways to improve student learning
- making the most of available technology even where that resulted in support of an eclectic range of old and new devices.

The project team also identified that it was not just the strategies themselves that were important, but that part of the success of the digital leadership seen at TIS could be attributed to the order and timing of processes, and Principal Stuart's ability to stand firm on expectations when necessary. Principals were constantly thinking about their own schools in terms of prior experiences, culture, openness to change, resources and other priorities. It was not enough to know about successful strategies and to understand the eight dimensions related to a specific technological change. As Levin and Schrum (2012) demonstrate through their extensive case studies, the dimensions are components of a dynamic jigsaw puzzle and leaders must be intentional in addressing all of these in order to effect positive change in their schools. What emerged from our final collective analysis was the analogy that leading digital change was like mastering the art of spinning a finely balanced top (see Figure 3).

Figure 3. Spinning innovation: The dynamics of leading innovation and change



This analogy with the first version of the spinning top was published in the professional magazine *New Zealand Principal* (Stuart, 2014) where a brief explanation described the top balanced on the spindle of authentic relationships with momentum being provided by the energy of inquiry based practice. The central core represents the importance of shared vision and values leading to future focused expectations, while the outer rings of the top illustrate the balance between trust in people and processes, and between freedom to innovate and the collective responsibility for agreed norms. The diagram was also published in a second *New Zealand Principal* article (Stuart, et al, 2015) along with illustrations of the extended projects that were undertaken in the participating principals' schools during 2014. These publications, along with use of the spinning top model with teachers and principals have confirmed its value in the context of planning for and managing other school initiatives including co-teaching in large, multi-teacher spaces, which was also reinforced by the leader of the American Educational Research Association (AERA) Subject Interest Group "Technology as an Agent of Change in Teaching and Learning" at an international conference in the USA (D. Hearrington, Chair, Personal Communication, 2015).

The model provides a visual response to the project's research question "How can school principals effectively lead equitable e-learning in collaboration with their school communities to improve student outcomes?" Our major findings are encapsulated in this analogy and the following sections describe the elements of the spinning top model, supported by examples of leadership strategies enacted by the principal of our case study school. While the research team deliberately focused on the strategies used to establish and develop digital capability and e-learning within the school, our findings also point to broader characteristics of successful school leadership.

Key findings

Relationships are essential

The spinning top is grounded on the spindle of *authentic relationships*. Our study confirmed the widely-understood concept that the ability to establish and maintain genuine and respectful relationships with staff, students, Board of Trustees (BoTs), and parents/whānau, as well as wider community and professional groups, is pivotal for innovation, change and productive outcomes. (Robinson, Hohepa, & Lloyd, 2009, p. 85 called this aspect 'transformational leadership'.) Teachers noted the principal's care and interest in them, and the way she provided support in professional and personal matters; while BoT members commented on how well she knew the school community, and on her openness and accessibility.

The transformation of this school began with an emphasis on developing relationships and establishing an ethos and culture that fostered collaboration. (In this short video *Building quality relationships* Principal Stuart describes five building blocks used to establish and maintain relationships in TIS.) The principal repeatedly emphasised that she did not even begin to focus on the school vision and values until she had spent considerable time getting to know individuals within the school community and changing the ways in which staff communicated. At times this was challenging and teachers were reminded about agreed ways of communicating through everyday situations. As Robinson, Hohepa and Lloyd (2009, p. 188) suggest "trust grows primarily through daily encounters in which expectations are validated by actions".

Principal Stuart recognised that digital technologies could be used to foster relationships too. For example, the school was an early adopter of MyPortfolio (Mahara software and its online service was provided by the Ministry for Education at no cost to schools nationwide), and the principal set an expectation for teachers to share a weekly reflection with her from their individual e-portfolio journals. Not all teachers appreciated this, but the principal commented on how the process enabled her to interact regularly on a one-to-one basis, and how it strengthened relationships, particularly with teachers who grasped the opportunity and went beyond writing a factual summary of their week.

I get a huge amount from [MyPortfolio], I learn stuff that is happening for teachers in a way that I would never get any other way and it's not that my door is not open ... but at the end of the day, no one has enough time to have those 'deep and meaningful' [conversations]. Yet everyone has the ability to do that online ... As I said to staff even if you don't get anything out of them, they really, really help me to actually individually build my relationship with teachers ... Outside of MyPortfolio and the weekly reflections and even for more classroom observation stuff, I've never been [so] connected with staff. (Principal Stuart, 28 August 2012)

Some teachers adopted online journal reflections in their classrooms too, and one described a delightful scenario of how some children seemed more confident to talk about themselves via their portfolios than they did in person, thus helping the teacher to strengthen the relationships and connections with individual students, particularly with quieter members of the class. Parents also recognised that digital technologies were changing their relationships and communications with the school in that the principal and classroom teachers were more accessible through email, and similarly, students also appreciated the way email and e-portfolios enabled communication between them and their teachers and principal.

Teacher inquiry creates momentum

Principal Stuart recognised that the change was largely driven by her own and teachers' *inquiry based practice*, which is therefore depicted as the "handle" of the spinning top that would be "pumped" by these inquiries to create the momentum. The teachers' focus on improving student achievement through teacher inquiry was identified as the driving force in identifying and effecting change within the school, and at TIS digital technologies were frequently an enabler of new or different classroom practices designed to engage students and improve their learning. Teacher-led inquiry is recognised as a critical component of effective teaching and learning, and it relies on evidence-based practices to understand and improve student achievement (Ministry of Education, 2007). However, it is challenging for school leaders to ensure that individual enquiries contribute to better outcomes for students, and the achievement of school vision.

Vision and expectations provide direction

The two inner rings of the spinning top, *shared vision and values, and future focused expectations*, represent a range of key strategies that drive the curriculum and school direction. A strong vision for learning enabled by digital technologies was developed via thoughtful conversations co-constructed with the assistance of an external facilitator. While Principal Stuart recognised that disruptive, or significant, change in schools needs to be led by those with leadership responsibility, she also firmly believed that colleagues need to co-create and "own", rather than "buy-in" to the school vision. Central to the vision statement is the understanding that, along with best educational practices, digital technologies were an integral and non-negotiable aspect of future focused, relevant education to enable student achievement.

The BoT understood that digital technologies were not an end in themselves but held real potential for enhancing student engagement and learning. The BoT readily talked about digital tools meeting diverse student needs, and they shared examples of digital technologies enabling creativity, collaboration and communication (for example, students creating and presenting a dance video to communicate their interpretation of the school norms). The BoT endorsed digital technology as an enabler of the vision and approved the integration of digital technology and e-learning being embedded in school wide planning at all levels. There was no separate technology plan, and the school's charter and annual plan reflected the multi-faceted role of technology to engage, grow and inspire learners.

Considerable time and attention were given to exploring what student success meant in a digitally-enabled and constantly evolving environment. The principal and members of the senior leadership team actively developed their own and others' knowledge, capability and confidence to lead digital change with groups attending e-learning conferences and whole-school participation in an ICT PD cluster. Addressing this challenge was one of the points raised by collaborating Principal Simpson in response to Principal Stuart's invitation for "curious questions" before the first walk through of TIS by the research team.

Peter noted that he is curious about how TIS use UFB for inquiry learning, including the devices, speed of information flow, and the approaches. He will be interpreting that to support applications in his school that includes children as young as 5. (Posting online in the BRE, 7 March 2013)

In line with the co-constructed and agreed vision statement the principal upheld clear expectations about students having the opportunity to use digital technologies across their learning activities in all classes. With some exceptions (discussed later) specific technologies or practices were not mandated and teachers had considerable freedom to select digital tools and pedagogical approaches to meet learner needs. Support for new ideas depended on their alignment with the school vision to equip students with skills that would prepare them for the 21st century society. There was also an expectation of accountability requiring teachers to provide evidence of the outcomes for students (illustrating too how the "freedom to innovate" element of the spindle operated in alignment with the school vision and expectations, and driven by inquiry processes), as follows:

Her style is not to impose something on people but there are clear expectations that this is what you need to do and that comes from having that kind of clear vision of where she wants the school to go as far as where the 21st century learning goes. (Teacher 1, 3 September 2012)

I tend to just accept the idea that the staff have come up with, making sure that it fits within the digital direction of the school because we are really focused about how that works ... As long as it fits with those premises I am happy with staff to do whatever they want to experiment within their class, as long as you can show the outcome. (Principal Stuart, 28 August 2012)

Principal Stuart was clear of her role to “ensure that there is quality teaching and learning going on in every classroom” (Principal Stuart, 28/8/12). She also explained that in order to lead learning she needed to know what was happening in classrooms and would frequently drop in unannounced to observe. Teachers were encouraged to participate in this process by setting their own observation goals and criteria in a shared Google Doc. Many did this while others saw it more as a compliance activity and gained less from the opportunity.

It was common for visitors interested in how the school was using digital technologies to be shown around or invited to observe classes in action. The principal was confident that teachers and students would be actively engaged in well-planned learning activities, including the ubiquitous and appropriate use of digital technologies.

Trust in people and trust in processes

The two rings of “trust in people” and “trust in processes” reflect the ethos of the school and are related to the spindle of authentic relationships. These elements of trust permeated the school community from BoT through to early career teachers and were influential in enabling the implementation of digital technologies. The BoT spoke of robust processes where the benefits and risks of proposals were rigorously discussed from all angles. For example, they noted the discussions around BYOD implementation and their role in developing new policies or guidelines to ensure safety and promote equity. The BoT were receptive to ideas from teachers as well as leaders in the school. Reciprocal trust was expressed by the principal when she indicated that even when she did not necessarily agree with new ideas being proposed by teachers she would present them to the BoT for consideration, knowing that they understood the vision and the emphasis on student outcomes and would therefore make sound decisions.

This “trust in process” was deliberately fostered by ensuring teachers, as well as the leadership team, had opportunities for input into decision making, and ensuring shared ownership of key planning activities. A key strategy that was used for technology-related (and other) decisions was a differentiation between dialogue meetings when ideas were shared and opinions expressed, versus discussion meetings where decisions were made. The former enabled everyone to engage with the information and to listen to one another’s ideas without the pressure of getting their voice heard before a decision was made. This two-step process also provided time to reflect on the implications and options before coming to a discussion meeting to voice preferences and arrive at a decision. These strategies ensured everyone felt they had input and helped to build ownership of decisions. (Teachers would remind each other if they ventured into discussion rather than dialogue; providing an example of the ‘collective responsibility for shared norms’ in the next ring of the spinning top.)

The culture of contribution, ownership and initiative was supported through a range of deliberate strategies. For example, Principal Stuart described her conscious effort not to add her own five percent to teachers’ ideas because this effectively reduced their ownership by 50 percent; and the introduction of the staff dialogue covenant which promoted respectful communication especially in meetings where conscious effort was made to listen without interrupting, encourage wide participation, and to take collective responsibility for productive meetings. This did not develop naturally and for a period “observers” were appointed among the members of the meeting to monitor participation and contributions. The outcome was improved communication plus more purposeful and productive meetings. When teachers were interviewed about technology and e-learning in the school several of them included responses about how people’s different ideas were respected and encouraged, and the benefits of effective communication among staff.

Freedom to innovate and collective responsibility for agreed norms

One of the most striking findings in this study was the degree to which teachers across the school were free to implement innovative approaches within their classrooms. This was enabled by deliberate leadership strategies to develop teachers' capability and confidence with digital technology, and by fostering a culture of collective responsibility. These strategies included the organisation of professional learning across the school, and ensuring that teachers were familiar with new technologies themselves before thinking about, or expecting, classroom implementation.

Principal Stuart initiated a deliberate shift from professional development (PD) led by external experts, to regular, inquiry-based, teacher-led professional learning opportunities which were responsive to teachers' needs to enable the vision of 21st century learning. Teachers met weekly or fortnightly to share, discuss and support each other on challenging students/groups of students and potential solutions to behavioural problems, using inquiry based methods. The principal described the value of teachers' professional dialogue groups in making a difference for individuals or groups of children, and this was reinforced by teachers. For example, one teacher spoke of the relevant feedback and collegial support saying:

Every Wednesday we have an hour before school and this term has been organised so that one week we follow a personal inquiry of a child in our class and we talk in teams. In the same teams, we give each other ideas on how to work with that [information] and that's very effective PD because it is very pertinent. (Teacher 1, 3 September 2012)

Teachers were also able to lead and join different professional development and inquiry groups within the school, depending on their needs. Professional development meetings were planned via collaborative Google documents, which could be edited and adapted to teachers' needs by the teachers themselves.

That is done on a Google doc, which is shared with all staff and all can look on the Google doc to see what professional learning that we've got planned in advance. For example, [teacher's name] who looks after maths she might come to me [and say] 'so I really need to slot in a couple of sessions around such and such'; we just look at the doc and then put them on where they need to go. (Principal Stuart, 28 August 2012)

The meetings were led by teachers sharing ideas within their group and practicing their new skills with each other. Therefore, innovative ideas were being built meaningfully by teams of teachers who wanted to find solutions for actual teaching and learning problems. Teacher 3 explained that teachers' leadership in professional development, as well as their willingness to share skills and experiences, enabled them to become key players in the changes within the school, in addition to school leaders who were driving the vision for 21st century teaching and learning.

The teachers, really, we have to take it on board for it to happen. Must have been my second year here we had these groups ... I think it was three or four areas and different teachers were leading them. I was in Google apps group and we were supposed to be exploring more about Google apps and then we had PD sessions, we kind of shared things a bit more. (Teacher 3, 3 September 2012)

In addition to formal PD, teachers were also engaged in informal PD where they exchanged ideas and supported one another. Some of that informal PD was facilitated by digital technologies. For example, good practice was often shared via collaborative Google Docs, MyPortfolio or Padlet (formerly Wallwisher).

We often use Google Docs ... to share information and lots of stuff are put into groups in MyPortfolio. (Teacher 3, 3 September 2012)

We put up a Wallwisher and people will add different stuff that they do in terms of digital and then we have a session where just everybody is sharing and they are really great. And of course we have [access to] all the links afterwards. (Principal Stuart, 28 August 2012)

The other key to supporting classroom innovation was the process used to introduce new technologies and strategies to staff. Over the course of the research two examples stood out as being major school-wide shifts; the first was the introduction of MyPortfolio, and the second the shift to Google applications. In both cases these digital tools were introduced to staff over a period of time to develop competence with the technology

itself, while also ensuring teachers experienced some of the potential for learning in meaningful ways that aligned with the school vision.

When MyPortfolio was introduced teachers were expected to contribute reflections on a weekly basis and to share these with the principal. This was a non-negotiable strategy that, as some of the interviewed staff mentioned, not all teachers would have followed if it was optional. During this phase-in period teachers were supported to use the e-portfolio tool and they experienced the value of regular feedback from the principal as she responded to their weekly reflections, while at the same time building confidence, capability, and some of the potential for e-portfolios for their own classes. This phased strategy enabled the principal to understand the practices and challenges of introducing e-portfolios, and ensured that adequate support was provided for teachers. Not all teachers used this lead-in time to full advantage but most teachers were well prepared to introduce e-portfolios to their classes and some had gained the confidence and capability to do this in innovative and engaging ways.

The second example related to the introduction of Google Apps as the principal explained:

We don't ever now expect teachers to use stuff in the classroom, if they are not really, really competent to use as learners themselves. So when we brought Google apps on and Google docs, we never ever told teachers to start using them with their class ... but what we did is start using docs for our own learning and [teachers] very quickly started using them with their class because they sort of benefited for themselves as learners. (Principal Stuart, 28 August 2012)

Principal Stuart described the school's early adoption of Google docs. It was notable that the questions asked by other principals explored this strategy in some depth to reveal that teachers were introduced to Google docs in staff meetings during which everyone recorded ideas on the same document. Staff quickly adopted this tool and not long afterwards, when most of the teachers were attending a conference, one teacher created a document and everyone contributed their notes and reflections to the shared record.

It was evident from interviews with teachers and classroom observations that these strategies prepared the way for many teachers to be innovative and creative in the way they appropriated technologies within their classrooms. Over the course of the project many examples were seen and discussed and two examples are provided in Appendix 1.

Teachers also described how they were using Google Docs noting that, while MyPortfolio provided a structured environment for the students to reflect on their learning and for the teacher to track progress, Google Docs enabled easier and more seamless sharing of documents, simpler access for students at school or home, and instant feedback. For example,

I really liked Google docs because once you've shared that with the kids and you can just ... keep looking. We use those a bit for writing and we find that great. Even like when they are writing, the kids still think it's really funny if you can add a comment to their writing as they are writing ... that's been a difference for them and for me as well I guess. (Teacher 3, 3 September 2012)

These examples of classroom practice reflect the enabling culture of the school where teachers are encouraged and supported to be creative in their use of digital technologies. At TIS classroom innovation occurred within a culture of trust and collective responsibility for learning by adults and children alike. Teacher 4 captured the essence of this in the following way:

I think, for me, Carolyn's philosophy seems very open door, very open mind, very willing to not have the answers, and in terms of her leadership, I think her biggest strength ... allows people to actually find their own path and make their mistakes or try different things and the learning that comes from it is usually a lot better than the highly structured learning. (Teacher 4, 4 September 2012)

The school had a strongly developed learning culture for adults and students, and this was appreciated and understood by everyone from early-career teachers right through to the BoT. One BoT member commented:

In terms of our staff, we are always asking them what can we do or what opportunities and we try to encourage our staff to be constantly living that 'lifelong learners' jargon in terms of what are the courses or what things

they want to be doing to stretch themselves. In doing so, they bring stuff back to the school. So I think we do look around ... and see ... all across the staff room, there are teachers who are actually having a crack at something ... Someone might have a little passion [as] a blogger, they certainly lead a whole lot of activity around blogging. So there is a whole lot of opportunities for leadership ... I can think of examples of people in their first and second years doing all sort of things, stretching boundaries and likewise people who have been around a long time doing that. (BoT, 28 August 2012)

Maintaining the dynamics of momentum and balance

The spinning top analogy recognises the dynamic interrelationships of the leadership strategies that were identified within this school where digital technologies were widely integrated as an essential enabler of the school vision to “grow, engage and inspire learners”. The analogy can be extended beyond the static image of the top to consider how expert leadership maintains the balance between the active processes depicted in the two outer rings of the top, managing both the momentum from inquiry-based practice and the speed of change to ensure the top keeps spinning in the right direction and does not over balance with loss of momentum, or spin out of control with too much. At times this meant setting non-negotiable boundaries and timeframes, and requiring certain levels of performance (for example, weekly reflections, or insistence on cloud-based applications over software purchases).

We endorse the dynamic inter-relationships of Schrum and Levin’s (2012) eight dimensions of technology leadership, and contribute a description of leadership processes and principles that work in synergy with those eight dimensions of the leadership of change with digital technologies in schools.

Moving beyond the case study of TIS under Principal Stuart

The research was strengthened by its design to extend its findings beyond the central school and brief accounts of the extended projects have been reported elsewhere (Stuart, et al, 2015). The key researchers also describe this equitable approach (Davis, Mackey, & Stuart, 2015) that enabled early dissemination into the collaborating principals’ schools, elements of which have been woven into the account above. There were some direct outcomes worthy of reporting.

In his video interview for this project in December 2013, Principal Henderson as TIS principal who followed Principal Stuart reflected on the strong culture supporting teachers’ practice in this technology rich school. After describing the use of Google Docs and other tools for both teaching and administration, Principal Henderson responded to the question “What leadership practices have you seen that are effective?” to provide evidence that the practices established by Principal Stuart while she was at TIS were sustained after she left,

there is a strong commitment of leadership ... it was modelled by leadership, it was modelled by [the DPs] as well [as Carolyn when principal]. There is an expectation that we use ICT and that was put across by the leadership group. There was resourcing so that there was funding made available for professional development ... (Henderson, 2013, 2.00-2.36 mins)

Our second illustration comes from Principal Lye who led the implementation of BYOD in her primary school informed by this collaborative research project and its community of practice. In her video she mentions ...

BYOD cannot be done quickly. We explored what other schools had done and we learnt from them. We were aware of the range of capabilities of our staff and the anxiety they felt, and we needed to find ways to bring staff with us and not make it too scary. We had to remind everyone that the pedagogy of good teaching doesn't change because we suddenly have a device available ... The lead team trialled things, worked through the glitches, and all the time the other staff were watching and getting enthused about what was happening. As it went on we weren't telling them they had to do this or that but they were asking ‘when are we going to get the new devices?’ and it was great to see their enthusiasm developing. (Lye, 2014, 32.00-33.06 mins)

The third example comes from Principal Simpson who, stimulated by observations of increased engagement of challenging children when they had access to ICT and the observation of another school during the TLRI

project, focused on leadership approaches to support 1:1 digital learning for priority learners. In discussion with the TLRI project team, he identified and provided the resources and professional support required to enable a classroom teacher to work successfully with a small group of priority learners in her classroom. The pilot project resulted in positive changes in behaviour for the group of students, and this, along with the school's involvement in the Māori Achievement Collaborative programme, led to an extension of the project in 2015.

For Principal Jeffries, involvement in the TLRI project has highlighted the advantages of collaborating with other local schools especially when thinking about digital learning philosophies and decisions about BYOD options. This is especially important for intermediate schools where students are transitioning from contributing schools, to local secondary schools. He notes how his involvement in the project has increased his confidence in decision-making especially in relation to matters such as Wireless SNUP¹, 1:1 devices², BYOD³ policies, and 24/7 learning; and how he has extended his e-learning leadership amongst his local education community where clusters of schools are now working towards regional initiatives to support e-learning in schools.

Finally we would like to note that this research is already informing research of leadership development in a community of practice for leaders of eight secondary and area schools in the far north of New Zealand that has been supported by the Network for Learning (Mackey & Davis, 2015 In Press).

Major implications for practice

Our study confirmed that even highly experienced principals benefit from the opportunity to explore leadership strategies employed in other schools over time, and that this experience contributes to their own ability and confidence to lead e-learning initiatives within their own schools and communities. Professional networks, both formal and informal, may provide ongoing opportunities for mutual growth.

Transformative change with digital technologies is complex and continually evolving, and principals need to address all eight interconnected dimensions identified by Schrum and Levin (2012) to encourage and enable change. While there is no formula for success, transformative practices occur in climates of relational trust, where innovation and risk taking are expected and supported. Therefore we emphasise the pivotal nature of relationships, and the need for school-wide processes, including distributed leadership, to support risk taking and learning.

School leaders are encouraged to develop an uncompromising vision for student learning and to evaluate the role of digital technologies to enable and support that vision. Positioning teachers as both learners and leaders enables them to develop experience and confidence with new technologies in safe and supportive environments, which in turn fuels classroom innovation as they identify how new strategies and tools can support student learning.

Finally, while this report highlights successful strategies and things that work, it would be incomplete without acknowledging that school leadership is challenging and requires a strong sense of educative purpose and conviction to maintain the momentum and guide innovation.

Today's effective principals and school leaders cross match their pedagogical understanding of how to raise student achievement, with their growing knowledge of what digital technology can deliver, to lead a school-wide curriculum that engages students and leads to increased achievement. (Principal Stuart, 2014, p. 6)

1 School Network Upgrade Project. <http://elearning.tki.org.nz/Ministry-initiatives/SNUP2>

2 1:1 access means that each student has access to a digital device (e.g. laptop or tablet) to support their learning. <http://elearning.tki.org.nz/Technologies/Learning-with-1-1-digital-devices>

3 Bring Your Own Device—students provide their own device to use in the classroom. <http://elearning.tki.org.nz/Technologies/Mobile-technologies/BYOD>

Limitations

The limitations of this research are common to all case studies; the findings are largely of the leadership of one technology rich intermediate school by a particular principal at a particular time in a city in Aotearoa/New Zealand. Application of these findings may only be made by those who cautiously interpret the research into their own context. However, the project did share the research with collaborating principals who have already been able to interpret and use this research to inform their own leadership in other schools, as described earlier. The theoretical findings in the form of Schrum and Levin's (2012) "eight keys" to leadership of schools that have been re-conceptualised with the analogy of a spinning top may enable experienced school leaders and those who work with them to better grasp the dynamic and chaotic complexities of leading primary schools in the 21st century.

Particular caution is urged for interpretation of this research for use in low decile schools and leadership of distance education. Day (2014) provides evidence that the leadership of such schools is particularly challenging. This was confirmed in a very limited way by including one such school and its principal in our research and that very small subset of data appears to indicate that the principal had that most challenging role, which involved significantly more negotiation with his communities and related institutions. In addition, this project did not include any learning or teaching associated with a teacher located in another school or other institution, thus potentially excluding application to networked primary schools such as those described in Barbour and Davis (2015 In Press).

Conclusion and recommendations

Schools in all parts of Aotearoa/New Zealand are under pressure to increase their adoption of digital technologies to fulfil their diverse missions, particularly for priority learners. The infrastructure of schools includes strategic development with digital technologies both locally and globally (Twining, Davis & Charania, 2015). This clearly requires the widespread development of leadership capacity because digital technologies, including better internet connectivity, are unlikely to lead to improved outcomes for students without ongoing effective leadership.

This case study of the leadership of a technology rich intermediate school, particularly the role of the principal that was researched in this project, is recommended to inform leadership development in schools nationwide and abroad. The leadership strategies have been synthesised into the spinning top in Figure 3.

Further research is urgently recommended to expand the evidence base, given the rapid increase of digital technologies in schools in New Zealand and abroad.

Tēnā koutou, he waka eke noa!

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The research team at their first meeting, March 2013.

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Appendix 1. Examples of digital technologies being used in classrooms

Teacher 5: MyPortfolio and iPad

Teacher 5 described various ways that MyPortfolio and iPad applications were being used, and the difference these were making. In one example Teacher 5 described how an iPad app allowed students to record the steps they took to solve mathematics problems, and both the teacher and students could then review the process. This same teacher also noted how MyPortfolio allowed him to track and monitor students' learning better. Teacher 5 described the following example of Sophie (pseudonym), a child with dyslexia:

You would have seen Sophie, the girl that did that little maths thing. Now, she is dyslexic, and academically she struggles quite a bit. But when she is on a computer, she is just a different person. ... Her MyPortfolio site is probably the best ... I just couldn't believe what she has done to it. It's stuff that I wouldn't even know. So I told the class and since then, she has just absolutely blossomed ... A really positive outcome. ... And she has done that little maths problem, she has now completed it and I had to look at it and listen to it. ... You can see she knows what she's doing, which is just great. [Her work was] random, all over the show ... no format, she was not putting it in order ... but because it is now taking it step by step, you can follow it ... that program was really good I think for her. (Teacher 5, 4 September 2012)

Teacher 3: MyPortfolio for collaborative novel reading and writing processes

Teacher 3 used MyPortfolio for collaborative group work to improve novel reading and writing processes. The teacher split her class of 30 students into five groups, assigning to each group one novel to read. She created a template page on MyPortfolio with key questions that focus the students on the important aspects of their book. The students copied the template page on their portfolio, read the questions, referred back to the book to find the answers, and presented their findings and anything else they find relevant about the book, via their individual MyPortfolio pages. They embed a range of media in addition to text, such as images, audio and video files. Their engagement has increased and Teacher 3 expects that they will keep researching and updating their pages with new content.

A parent reported that her child was more engaged in reading by using the computer for the book review process and being able to incorporate a range of media. The parent noted that it is easier for her child to review and change his answers, compared to times when book reviews were done using pen and paper.

Teachers also described how they were using Google Docs and its benefits, noting that while MyPortfolio provided a structured environment for the students to reflect on their learning and for the teacher to track progress, Google Docs enabled easier and more seamless sharing of documents, simpler access for students at school or home, and instant feedback.

I really liked Google Docs because once you've shared that with the kids, you can just ... keep looking. We use those a bit for writing and we find that great. Even like when they are writing, the kids still think it's really funny if you can add a comment to their writing as they are writing ... that's been a difference for them and for me as well I guess. (Teacher 3, 3 September 2012)